



PC Server 520

**User's Handbook
for PCI/Micro Channel**

Note

Before using this information and the product it supports, be sure to read the general information under Appendix B, "Notices" on page 393. Also read the general information under "Product Warranties and Notices" in the *User's Reference*.

Third Edition (May 1996)

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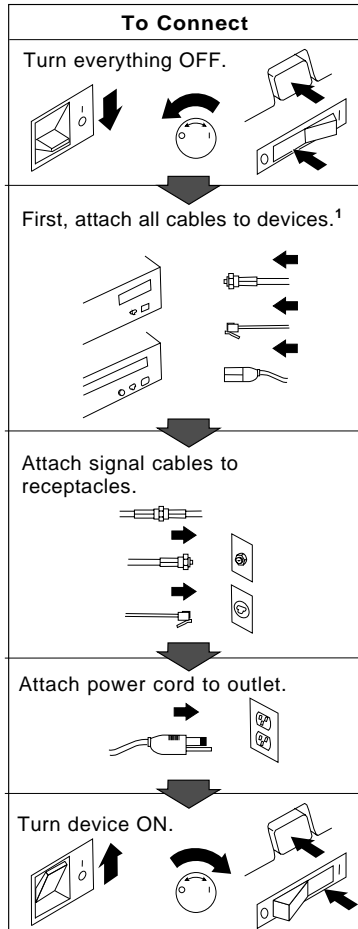
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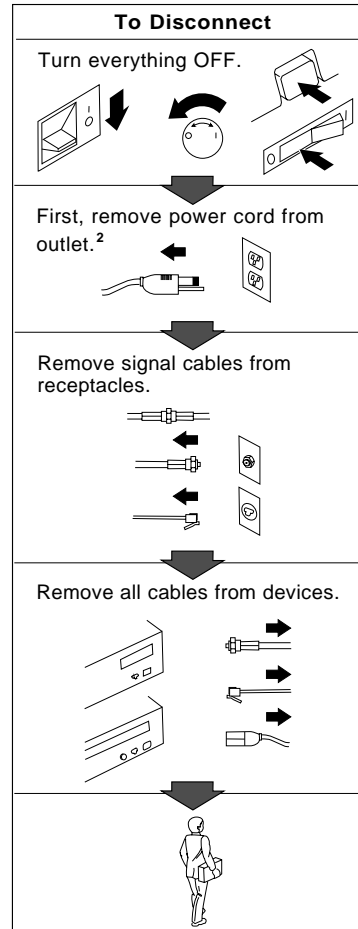
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 **DANGER:**

Electrical current from power, telephone, and communication cables is hazardous. To avoid shock hazard, connect and disconnect cables as shown below when installing, moving or opening the covers of this product or attached devices. The power cord must be used with a properly grounded outlet.



¹ In the U.K., by law, the telephone cable must be connected after the power cord.

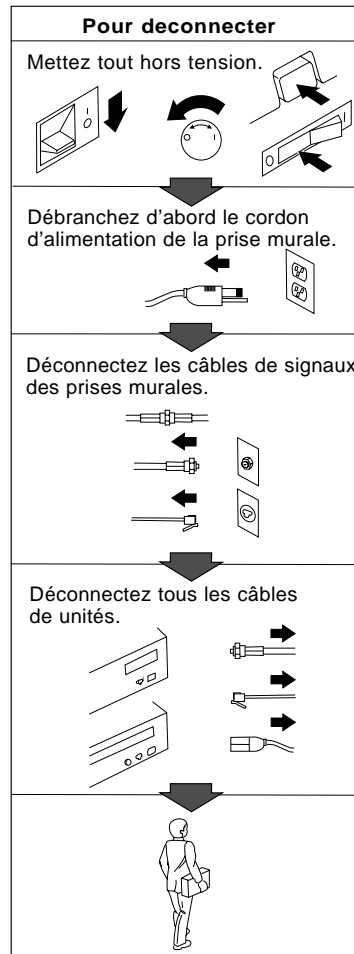
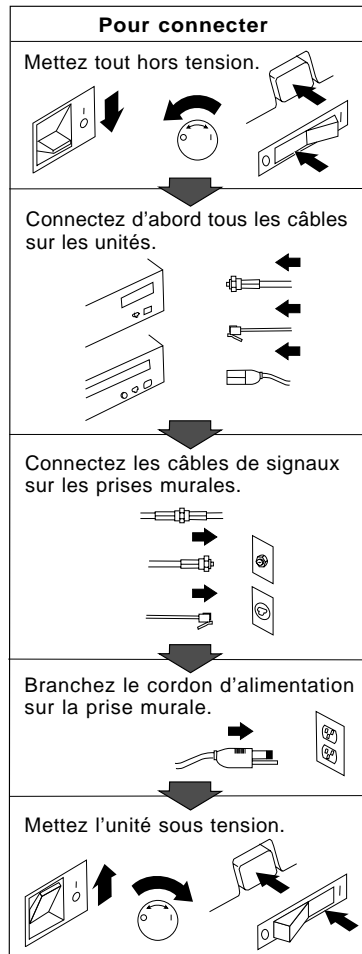


² In the U.K., by law, the power cord must be disconnected after the telephone line cable.



DANGER:

Le courant électrique provenant des câbles d'alimentation, téléphoniques et de transmission peut présenter un danger. Pour éviter tout risque de choc électrique, connectez et déconnectez ces câbles comme indiqué ci-dessous lorsque vous installez ou déplacez ce matériel ou les unités connectées, ou que vous soulevez un carter.*



*Le cordon d'alimentation doit être branché sur un socle de prise de courant correctement mis à la terre.

Laser Compliance Statement

The PC Server 520 contains an IBM CD-ROM drive that is a laser product. The IBM CD-ROM drive has a label that identifies its classification. The label, located on the drive, appears below.

CLASS 1 LASER PRODUCT
LASER KLASSE 1
LUOKAN 1 LASERLAITE
APPAREIL A LASER DE CLASSE 1

The IBM 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 EN60825.



CAUTION:

Do not open the drive; no user adjustments or serviceable parts are inside.

Class 1 laser products are not considered to be hazardous. The IBM CD-ROM drive has an internal Class IIIb (3b), 5-milliwatt, gallium-arsenide laser that operates at a wavelength of 760 to 810 nanometers. The design of the laser system and the IBM CD-ROM drive ensures that there is no exposure to laser radiation above a Class 1 level during normal operation, user maintenance, or servicing conditions.

Lithium Battery Notice

CAUTION:

Danger of explosion if battery is incorrectly replaced.

When replacing the battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the 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.

ATTENTION

Danger d'explosion en cas de remplacement incorrect de la batterie.

Remplacer uniquement par une batterie IBM de type 33F8354 ou d'un type équivalent recommandé par le fabricant. La batterie contient du lithium et peut exploser en cas de mauvaise utilisation, de mauvaise manipulation ou de mise au rebut inappropriée.

Ne pas :

- **Lancer ou plonger dans l'eau**
- **Chauffer à plus de 100°C (212°F)**
- **Réparer ou désassembler**

Mettre au rebut les batteries usagées conformément aux règlements locaux.

This book provides instructions on how to complete the installation, configure the server, and install and remove options. This book also provides information to help you solve some of the simpler problems that might occur. If you have not set up your server, see the Setup sheet for detailed information on unpacking the server and attaching cables. Refer to Chapter 2, “Installing Your Software” on page 19 for information on installing the operating system. Refer to the *User's Reference* for more detailed information on the features of the server.

How This Book is Organized

Chapter 1, “Introducing PC Server 520 Features,” provides a general introduction to the features of your server, such as the controls, connectors, and status indicators. It also includes instructions on turning on the system and using the CD-ROM drive.

Chapter 2, “Installing Your Software,” provides information about the tasks required to complete the installation. This includes installing the operating system using ServerGuide and installing the PeerMaster LAN software that is required for models that come with the PeerMaster adapter. This chapter also includes important suggestions on arranging your work area for comfort.

Chapter 3, “Configuring the Disk Array,” provides information about configuring models that come with an IBM PC ServeRAID Adapter. This chapter provides step-by-step instructions to perform the tasks necessary to configure, add, change, or delete one or more disk arrays.

Chapter 4, “Configuring the PeerMaster Adapter,” provides information about configuring models that come with an IBM PeerMaster adapter. This chapter provides step-by-step instructions to perform the tasks necessary to configure the PeerMaster adapter.

Chapter 5, “Configuring Your Server,” provides instructions for using the system programs. This chapter contains information about using the configuration and other utility programs.

Notices Used in This Book

Chapter 6, “Installing Options,” provides instructions for installing and removing options, such as memory, adapters, and internal drives. Instructions for setting jumpers, replacing the battery, and connecting external options are also included in this chapter.

Chapter 7, “Solving Problems,” provides 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. In addition, the chapter contains information on getting service and help.

Appendix A, “Server Records,” 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 this appendix.

Appendix B, “Notices,” contains product notices and trademarks.

An index follows the appendixes.

Notices Used in This Book

This book contains information notices that relate to a specific topic. Following are the notice definitions.

- **Notes**

These notices provide important tips, guidance, or advice.

- **Attention**

These notices indicate possible damage to programs, devices, or data. An attention notice appears 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 appears just *before* the instruction or situation that could be hazardous.

Related Publications

The following publications are included with your PC Server 520:

- The PC Server 520 Setup sheet contains information about unpacking and connecting cables to your server.
- The *PC Server 520 User's Reference* contains detailed information about the advanced features of your server.
- The ServerGuide *User's Guide* describes the advantages of IBM ServerGuide and operating system installation.

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

For a complete listing of publications available in the U.S. and Puerto Rico, call 1-800-426-7282. In Canada, call Customer Assistance at 1-800-465-1234. In all other countries, contact the IBM support organization that services your area, your IBM marketing representative, or your IBM reseller.

Welcome and Thank You

We appreciate your decision to purchase an IBM PC Server 520. Your server offers speed, power, expandability, and compatibility.

Your server comes with the ServerGuide package, which contains a number of CDs. These CDs contain operating systems, application programs, utility programs, online documentation, and more. Refer to the ServerGuide documentation for more information.

You can access the World Wide Web for updates to flash BIOS and the latest information about product compatibility and configuration. The web page provides a link to the Help Center. You can also link to other locations for additional information.

The PC Server 520 also comes with a full three-year on-site warranty. In addition, IBM's PC Server Startup Support provides coverage to PC Server customers during the first 90 days after installation at no additional charge. This comprehensive program enhances IBM's support for setup, installation, configuration, and problem determination. It provides assistance for popular network operating systems and network adapters from IBM and non-IBM vendors. In the U.S., call IBM at 1-800-772-2227, or in Canada, call 1-800-565-3344 if you need assistance.

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

Chapter 1. Introducing PC Server 520 Features

Your PC Server 520 has an Intel Pentium microprocessor and symmetric multiprocessing (SMP) upgradability, a PCI advance bus, an integrated SCSI-2 Fast/Wide Controller, large data-storage capacity, and improved system expandability. This server is specifically designed by IBM to handle heavy file-server applications or moderate database applications in today's network environment. Using Micro Channel and peripheral component interconnect (PCI) architectures, it provides compatibility with a wide range of existing hardware and software. Super video graphics array (SVGA) support provides compatibility with many existing application programs.

Your server offers dual-processor capability through a second microprocessor connector so that you can take advantage of SMP technology. If you have an SMP-capable operating system, you can maximize the benefits of this technology,

As an open-architecture, industry-standard system, the PC Server 520 has been tested with numerous IBM and non-IBM adapters and devices to assure compatibility. Rugged dependability is achieved by incorporating quality standards and design points, such as stringent IBM systems assurance testing and a cooling design called FloThru. FloThru cooling helps keep internal electronic components of the PC Server 520 running cool to improve reliability and accommodate the full configurations necessary in today's local area network (LAN) environments.

Refer to the Setup sheet for instructions on unpacking the server and attaching cables to it.

See Chapter 2, "Installing Your Software" on page 19 for information on installing an operating system and other software. In addition, this book provides information on configuring and using the server, installing and removing options, and using the system programs that are provided. The troubleshooting information will help you solve some of the simpler problems that might occur. Appendix A in this book provides a section for you to record all the important information about your server.

Refer to the *User's Reference* for more detailed information on the server features. That book also includes a glossary, warranty information, and other important notices.

This chapter contains:

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Features at a Glance

The following table summarizes the features of the PC Server 520.

<p>Microprocessor</p> <ul style="list-style-type: none"> • Intel Pentium microprocessor with 16 KB of internal cache • A processor upgrade, which adds another Pentium microprocessor, is available for symmetric multiprocessing <p>Cache Memory</p> <ul style="list-style-type: none"> • 512 KB of level-2 cache <p>Memory</p> <ul style="list-style-type: none"> • Error Correction Code on SIMM (EOS), 70 ns • Standard: 32 MB minimum, expandable to 256 MB • Eight 72-pin, single inline memory-module (SIMM) sockets <p>Diskette Drives</p> <ul style="list-style-type: none"> • Standard: One 3.5-inch, 1.44 MB • Optional (internal): <ul style="list-style-type: none"> – 3.5-inch, 2.88 MB – 3.5-inch, 1.44 MB – 5.25-inch, 1.2 MB <p>Hard Disk Drives</p> <ul style="list-style-type: none"> • Number and capacity of standard drives varies by model • Supports up to 20 internal hard disk drives, 18 of them hot-swappable <p>CD-ROM Drive</p> <ul style="list-style-type: none"> • Standard: SCSI-2 <p>Keyboard and Mouse</p> <ul style="list-style-type: none"> • 101-key keyboard • Mouse 	<p>Expansion Bays and Slots</p> <ul style="list-style-type: none"> • Six 32-bit Micro Channel slots, two 32-bit PCI slots • 22 drive bays, 18 of them hot-swappable <p>Video</p> <ul style="list-style-type: none"> • Super video graphics array (SVGA) connector • Compatibility: <ul style="list-style-type: none"> – Video graphics array (VGA) – Color graphics adapter (CGA) – Multicolor graphics array (MCGA) <p>Security Features</p> <ul style="list-style-type: none"> • Bolt-down capability • Door lock • Administrator and power-on passwords • Selectable drive startup • Security cover (optional) • LogicLock with active security <p>Integrated Functions</p> <ul style="list-style-type: none"> • LED usability support • Video connector • Two serial connectors • Parallel connector • Auxiliary device connector • Keyboard connector • Battery-backed clock and calendar • SCSI-2 <ul style="list-style-type: none"> – 1 16-bit external connector – 2 internal connectors (one 8-bit and one 16-bit) 	<p>IBM PC ServeRAID Adapter (disk-array models)</p> <ul style="list-style-type: none"> • Three 16-bit internal connectors • One 16-bit external connector • Support for RAID levels 0, 1, and 5 <p>Power Supply</p> <ul style="list-style-type: none"> • 434 watt with automatic range voltage selection (115–230 V ac) • Built-in overload and surge protection • Power supply upgrade expansion option <ul style="list-style-type: none"> – 220 watt automatic range voltage selection add-on – Built-in overload and surge protection • IBM PC Server 780W Redundant Power Option <ul style="list-style-type: none"> – 780 watt with automatic range voltage selection (115–230 V ac) – Built-in overload and surge protection <p>Upgradable POST and BIOS</p> <ul style="list-style-type: none"> • Upgradable electrically erasable programmable read-only memory (EEPROM) on the system board • POST/BIOS upgrades (when available)
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Before You Begin

- Make sure 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 51 mm (2 in.) of space around the front and rear of your server to allow the server's cooling system to work properly.
- Have a supply of 1 MB and 2 MB, 3.5-inch diskettes available. You will need these diskettes later, when you install your operating system and backup your configuration and all important data.
- Have small, flat-blade and Phillips screwdrivers available.

If you have not already done so, perform the following tasks. Instructions are located on the Setup sheet that comes with your server.

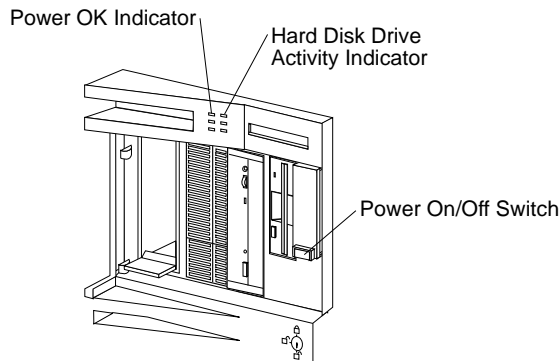
- Unpack your server.
- Remove the packing material.
- If you are not installing options at this time, connect the cables and power cord.

After you complete these tasks, return here for further instructions.

Note: For information about arranging your PC Server for comfort and ease-of-use, see “Arranging Your Workspace” on page 65.

Controls and Status Indicators

Your server has one power control button and two light-emitting diode (LED) indicators that show the system status. The amber indicator highlights an alert condition; the green indicator confirms that the server is operating correctly. These indicators are illustrated below and are described in the following list.



Power On/Off: Use this button to turn your server on and off. To turn on the server, lift the transparent cover over the Power On/Off switch; then, press and release the Power On/Off button. The Power OK indicator will illuminate in approximately one second.

Return the transparent cover to its original position to avoid accidentally pressing the Power On/Off switch after you turn the server on or off.

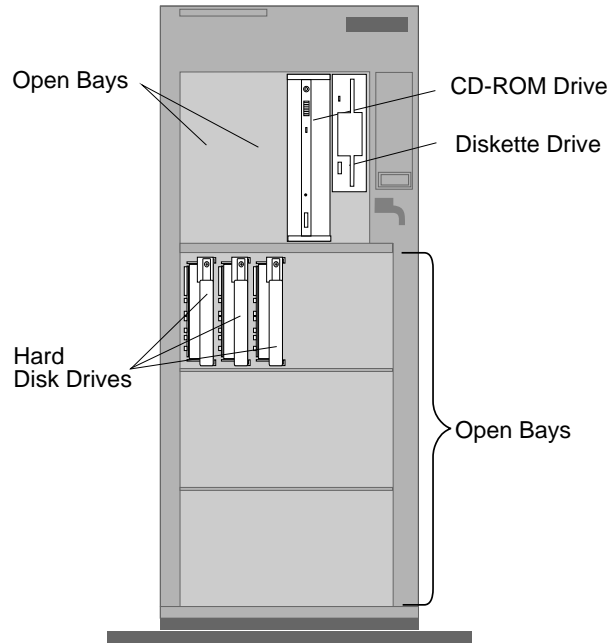


Power OK: This green indicator shows that the server power supply is working properly.



Hard Disk Drive Activity: This amber indicator shows the server hard disk drive activity.

Expansion Bays



Open Bays: Your server's special design gives you the flexibility to use combinations of 3.5-inch or 5.25-inch hard disk, tape, and rewritable optical disk drives. Your server supports up to 18 hot-swappable, 3.5-inch hard disk drives. For installation instructions and information on the types of drives that you can install in each bay, see “Installing Internal Drives” on page 212.

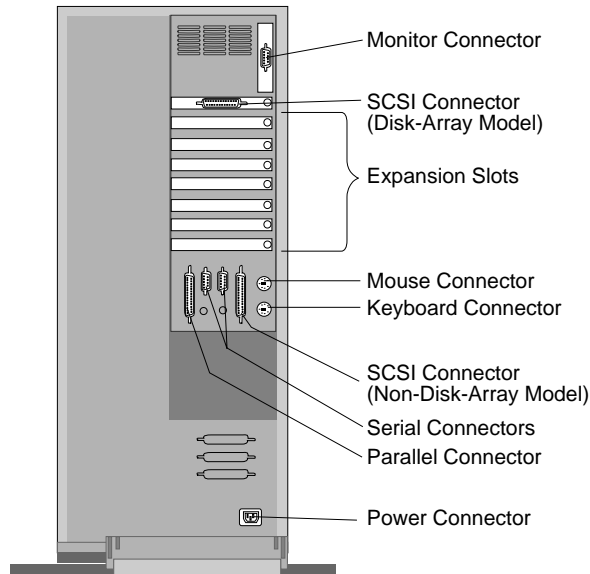
CD-ROM Drive: All models come with a SCSI CD-ROM drive.

Diskette Drive: The 3.5-inch, 1.44 MB diskette drive uses 1 MB or 2 MB diskettes.

Hard Disk Drive: The number, capacities, and locations of the hard disk drives vary, depending on your model.


Note: For the latest information on available options, contact your IBM reseller or IBM marketing representative.

Input/Output Connectors





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
1. Some models come with a preinstalled ServeRAID adapter in a PCI expansion slot.
2. Some models come with a preinstalled PeerMaster adapter in a Micro Channel expansion slot.
3. For pin assignments and other details about these connectors, see the *User's Reference*.


 **Monitor Connector:** The monitor signal cable attaches to this connector.


If your monitor has a separate signal cable, connect one end of the signal cable to the monitor. Connect the other end of the signal cable to the monitor connector on the server.

 **Mouse Connector:** The mouse cable attaches to the server through this connector. The mouse connector sometimes is called an auxiliary-device or pointing-device port.

 **Keyboard Connector:** The cable from your keyboard connects here. Align the flat side of the cable connector so that it faces the keyboard icon on the server.

 **SCSI Connector:** On a non-disk-array model, external SCSI devices attach to the server's external SCSI connector. On a disk-array model, external devices attach to the external connector on the IBM PC ServeRAID Adapter.

 **Serial Connectors:** The server has two 9-pin serial connectors (A and B). The serial signal cable for a modem or other serial device usually connects here. If you are using a 25-pin signal cable, you need a 9-pin-to-25-pin adapter cable. For port assignments, see “Configuring Devices and I/O Ports” on page 154.

 **Parallel Connector:** The server has one 25-pin parallel port. This is where the signal cable for a parallel printer or other parallel device connects to your server.

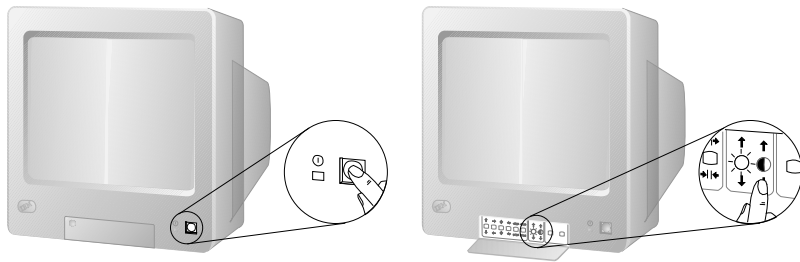
Power Connector: The server power cable connects here.

Note: Refer to the “Warranties and Notices” section of the *User's Reference* for the power cord notice and availability of IBM power cords for a specific country.

Starting the Server

1. Turn on your monitor and 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.

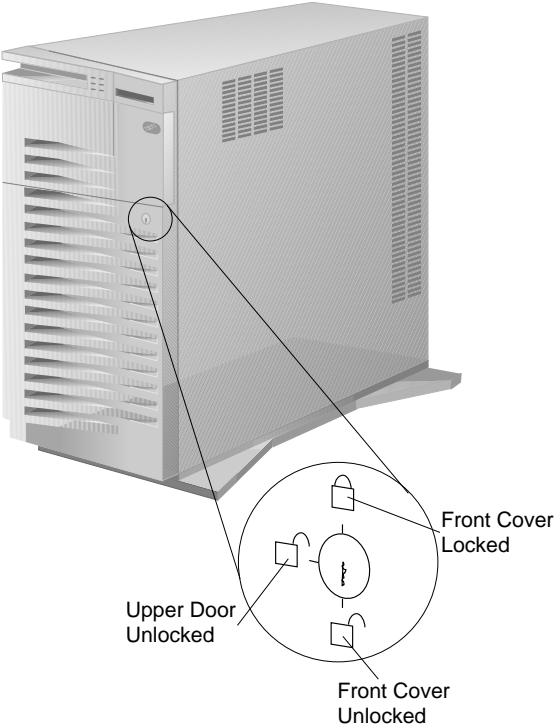


Note: The locations of the power switch and the Brightness and Contrast controls on your monitor might be different from those shown above.

2. Adjust the keyboard feet and position the keyboard for personal typing comfort.

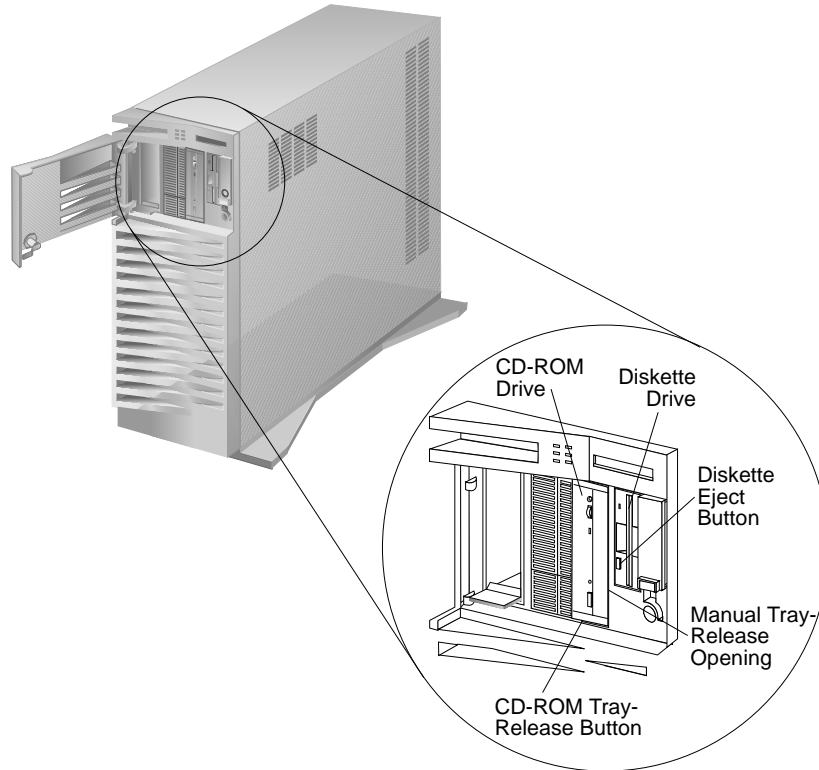


- 3. If you have not already done so, locate the key; then unlock and open the door on the front of the server (turn the key 90 degrees to the left).



Starting the Server

4. If the diskette drive contains packing material or a diskette, remove it from the drive. (Press the diskette eject button.)



5. If the server is turned on, turn it off.

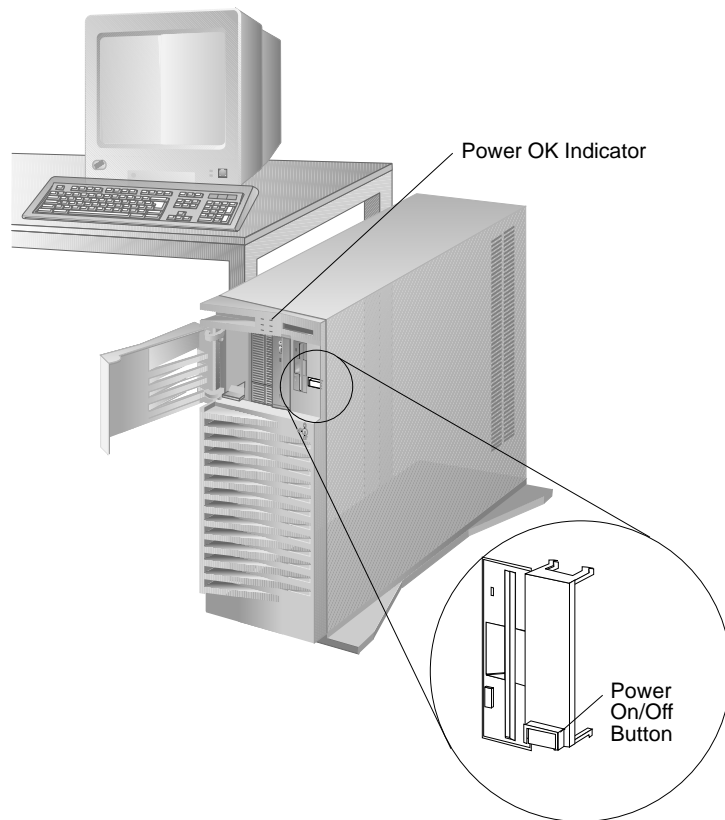
Note: The Power On/Off switch is located under a transparent cover on the right side of the server. You must lift this transparent cover to reach the Power On/Off switch.

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

7. Turn on the server. The power-on light comes on and the *power-on self-test (POST)* begins.

Note: The Power On/Off switch is located under a transparent cover on the right side of the server. You must lift this transparent cover to reach the Power On/Off switch.

To avoid accidentally pressing the Power On/Off switch after you turn the server on or off, return the transparent cover to its original position.



Starting the Server

8. Check your monitor for the results of the POST. When the test finishes, the screen displays a number that represents the amount of available server memory. The server beeps once to indicate it is working properly.

Note: If you hear more than one beep, or no beep, check to see if an error message appears. If an error message appears, or if your screen is blank, refer to Chapter 7, “Solving Problems” on page 305.

9. If no operating system is installed, you will be prompted to insert a startable (bootable) diskette or a startable CD. *Do not insert anything yet.* Review this information before proceeding further.

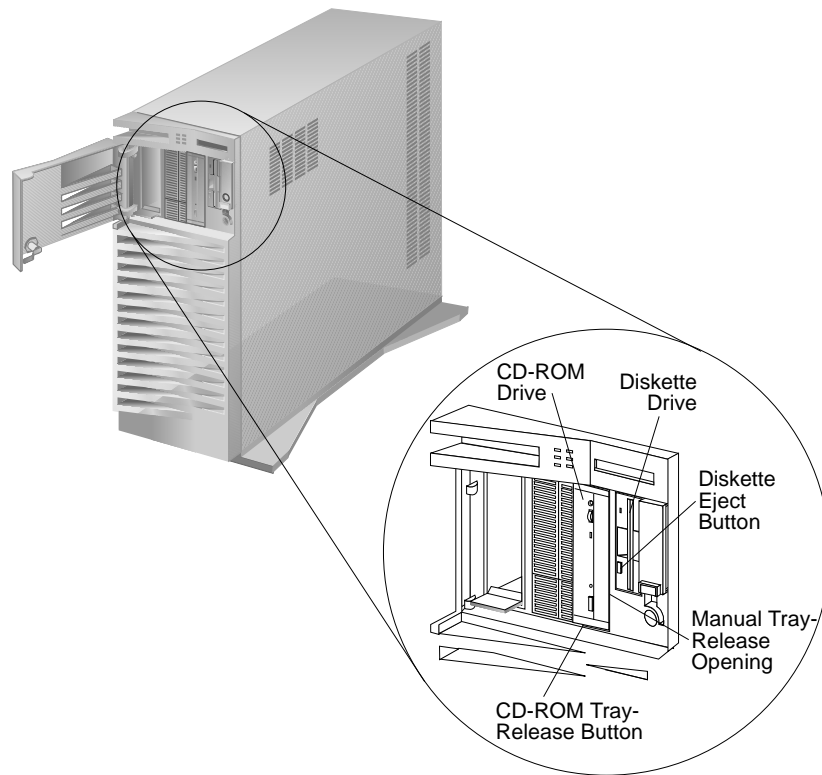
Even if you plan to install your own operating system, be sure to start the ServerGuide Main CD and review the README files provided in the **Start Here** section.

For instructions on starting ServerGuide, see “Starting ServerGuide” on page 31.

Using the CD-ROM Drive

A SCSI-2 CD-ROM drive is a standard feature on all PC Server 520 models. To use the CD-ROM drive:

1. Have the CD ready.
2. Press the CD-ROM tray-release button. The CD-ROM tray will extend out.

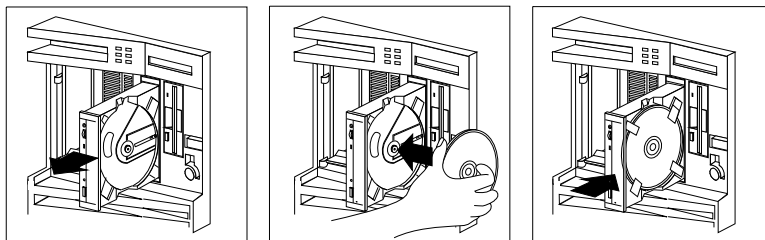


Note: If the CD-ROM tray does not extend out, insert the end of a paper clip into the manual tray release opening.

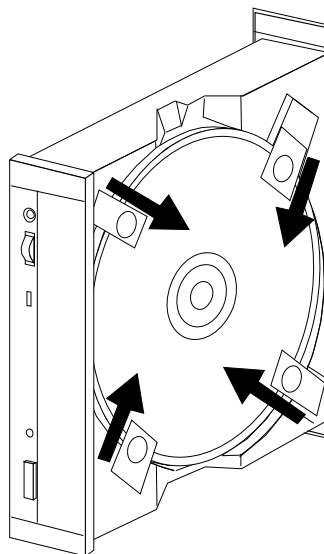
3. Locate the tabs in the corners of the tray.

Using the CD-ROM Drive

4. With the label information facing right, center and hold the CD in place on the tray.



5. Insert your fingertip or a small, blunt object such as the tip of a pen into the depression on each tab; then slide the tabs over the CD.



6. Push the CD-ROM tray-release button or gently push the tray back into the server.

Getting Help on the World Wide Web

You can access the latest information about product compatibility and configuration on the World Wide Web. This information is updated as new PC Server products are announced.

The following is a sample of the information available at <http://www.pc.ibm.com/servers/> on the World Wide Web.

- Current updates to device drivers, flash BIOS, and other code.
- A listing of products that have been tested for compatibility with IBM PC Servers.
- Certification and compatibility information about Network operating systems (NOS) and operating systems (OS).

For additional information, service, or assistance, see “Getting Help, Service, and Information” on page 375.

IBM PC Server Startup Support

The IBM PC Server Startup Support program provides comprehensive telephone assistance 24 hours a day, 7 days a week, during the first 90 days after installation of your server at no additional charge. IBM gives you direct access to trained specialists who can help you set up, install, and configure your server.*

Help is available for IBM and non-IBM network operating systems, network interface adapters, and other optional peripherals. To receive a list of the network products supported by the IBM PC Server Startup Support program, call the IBM PC Company Automated Fax System at 1-800-426-3395 in the U.S., or call 1-800-465-3299 in Canada, and ask for document number 16125.

* Response time might vary depending on the number and nature of calls received.

For more information about this program, or for help with the installation of your server:

- In the U.S., call IBM at 1-800-772-2227
- In Canada, call IBM at 1-800-565-3344
- In all other countries, contact the IBM support organization that services your area, your IBM marketing representative, or your IBM reseller.

Note: For additional information, service, or assistance, see “Getting Help, Service, and Information” on page 375.

Chapter 2. Installing Your Software

Before you install software in your server, you need to determine the hardware, software, and operating system requirements for your operating environment. You might need to use the configuration programs on an adapter's Option Diskette, such as the IBM PC ServeRAID Adapter Configuration Diskette, before you install an operating system and other software.

This chapter provides hardware and software factors that you might want to consider before selecting and installing an operating system. You can install an operating system using ServerGuide or a separately purchased off-the-shelf operating system.

This chapter also includes instructions for configuring the IBM Ethernet Quad-BT PeerMaster Server Adapter that comes in some models.

At this time, you should have unpacked your server and attached cables to it. (Refer to the Setup sheet for instructions.) See the important information about arranging your workspace for comfort and safety included in this chapter. Be sure to read the IBM ServerGuide package before you set up your server.

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Installing an Operating System

The operating system that you select allows you to optimize some of the features in your server. Your server offers dual-processor capability through a second microprocessor connector so that you can take advantage of SMP technology. You can maximize the benefits of this technology, provided you have an SMP-capable operating system, such as one of the following, installed in your server:

- OS/2 for SMP
- Microsoft Windows NT
- Novell NetWare 4.1 for SMP

Some security features are operating-system dependent, which means that if you want to use them, you must install an operating system that supports them. To find out whether an operating system supports specific security features, see the documentation that comes with the operating system.

Before You Begin

You can install an operating system from ServerGuide or from separately purchased diskettes or CDs.

- Before you install an operating system on a disk-array model, use the configuration programs on the IBM PC ServeRAID Adapter Configuration Diskette to view or change the existing disk-array configuration. Refer to Chapter 3, “Configuring the Disk Array” on page 71 for detailed instructions; then, return here.
- Before you install an operating system on a system with a PeerMaster adapter, use the configuration programs on the PeerMaster Adapter Option Diskette to view or change the existing configuration. Refer to Chapter 4, “Configuring the PeerMaster Adapter” on page 131 for detailed instructions; then, return here.
- If you have not already installed your options, do so now, before you install your operating system. Installing your options now enables ServerGuide to install the necessary device drivers during the operating system installation process. Some options might require device drivers that are not available on ServerGuide. If this occurs, follow the installation instructions that come with the option; then, return here.
- If you are installing an operating system from the ServerGuide CD, select **Start Here** and follow the instructions on the screen; then, go to “Installation Checklist” on page 68.
- If you are installing *your own* operating system:
 1. Review “Hardware Considerations” on page 23; then return here.
 2. Follow the installation instructions that come with your operating system; then, go to “Installation Checklist” on page 68.

Hardware Considerations

The following section contains information about hardware updates and modifications. Before you set up your server, install optional devices, or install your operating system and application programs, review the following information. Keep this information handy, because you might need to refer to it while setting up the server.

- If you intend to install a Taxan Ultra Pro video adapter and OS/2 Warp, install the video adapter *before* you install the OS/2 Warp operating system. This will ensure that the correct video device drivers are installed when you install the operating system.
- For disk-array models, logical drives, except the startup drive, may be any size. The startup drive must be less than 2046 MB (MB equals approximately 1 000 000 bytes) if you use the high-performance file system (HPFS), or 1024 MB if you use the file-allocation table (FAT).
- For disk array models, *data will be lost* when the RAID stripe size is changed. There is no warning message. *Before* you change the RAID stripe size, be sure to back up any data that you want to save.
- The IBM 300/1200/2400 internal modem will not transfer files larger than 2 KB (KB equals approximately 1 000 bytes) using the XModem or YModem protocols. If you install this internal modem, install another protocol.

Software Considerations

IBM and other manufacturers of operating systems, network programs, and application programs periodically make software updates available. These updates provide enhancements and corrections. To ensure that the software you install functions properly, contact the manufacturers to obtain the most current updates.

If you intend to install an IBM operating system or network programs, such as OS/2 for SMP or OS/2 LAN Server, you can obtain the most current software updates from the IBM OS/2 Technical Support Center. These software updates are called ServicePaks or corrective-service diskettes (CSDs). In the U.S. or Canada you can call the IBM OS/2 Technical Support Center at 1-800-992-4777.

For the latest information about hardware device drivers and SMP operating systems supported by your PC Server 520:

- In the U.S., call IBM at 1-800-772-2227.
- In Canada, call 1-800-565-3344.
- In all other countries, contact the IBM support organization that services your area, your IBM marketing representative, or your IBM reseller.

OS/2 Installation

You can install OS/2 for Symmetric Multiprocessing (OS/2 SMP) Version 2.11 in two ways: using the ServerGuide CDs provided with your server or using a previously purchased, off-the-shelf package of OS/2 SMP Version 2.11.

Using ServerGuide to Install OS/2 SMP

When you install OS/2 SMP Version 2.11 using the ServerGuide CDs, the required updates and device drivers install automatically. To install OS/2 SMP using ServerGuide:

- *Do not* partition or format your hard disk drives.
- Review the information provided in the ServerGuide package.
- Review the README file in the Start Here section on the ServerGuide Main CD.
- Refer to the *User's Guide* in the ServerGuide package for installation instructions.

Using the Off-the-Shelf Package to Install OS/2 SMP

If you choose *not* to use ServerGuide to install OS/2 SMP, you must obtain informational APAR II08627 (authorized program analysis report) from the IBM Personal Software Solutions Center. In the U.S., call 1-800-992-4777. In all other countries, contact the IBM support organization that services your area, your IBM marketing representative, or your IBM reseller. You will need to provide your OS/2 license information. IBM will send you the required CD, which you can use to create new installation diskettes. If you have a disk-array model, refer to the README file on the ServeRAID diskette for installation instructions.

Installing OS/2 2.11 on a Disk-Array Model

If you have a disk-array model, refer to the README file on the ServeRAID diskette for installation instructions.

Upgrading from OS/2 2.1 to OS/2 2.11

When upgrading from OS/2 2.1 to OS/2 2.11, the message SYS 0005 Access is Denied appears after you insert the Reference Diskette. When the Retry option appears, reply Yes; the upgrade will continue and complete successfully.

Novell NetWare Installation

After you install Novell NetWare 3.12, you can improve printer performance and prevent the occurrence of Lost Interrupt error messages by adding the following line to the STARTUP.NCF file:

```
set display lost interrupt alert=off
```

If you have a disk-array model, refer to the README file on the ServeRAID diskette for installation instructions.

SCO OpenServer Installation

If you are installing Santa Cruz Operation (SCO) OpenServer 5.0 in a disk-array model, you must have 3 GB for an HPFS partition. You must obtain an additional device driver, `ips`. The Boot-Time Loadable Driver is required for the ServeRAID Administration and Monitoring program in your PC Server 520.

If you are installing a SCO operating system, you might need updated device drivers for full compatibility with the latest hardware used in IBM servers. Refer to the **Start Here** section on the ServerGuide Main CD for information on how to obtain the latest device drivers that are available from SCO. To install a SCO operating system, follow the installation instructions that come with the SCO operating system. If you are installing a SCO UNIX operating system in a PC Server 520 disk-array model or a model that has multiple microprocessors, contact the IBM PC Server Startup Support group for the latest information about the SCO UNIX operating systems that your server supports.

Windows NT Installation

If you choose to install Windows NT on your PC Server, review the information in this section *before* you begin the installation process.

For installation instructions for Windows NT Version 3.5 or later, refer to the README file on the IBM PC Server Windows NT Support Diskette that comes with your server.

If you have a disk-array model, and more than one logical drive is present in a single drive configuration, and you intend to install Windows NT, install DOS on the first logical drive. Then, install Windows NT.

For installation instructions for Windows NT Version 3.5 or later, refer to the README file on the ServeRAID Configuration diskette that comes with your server.

Installing Windows NT SMP

To use Windows NT 3.51 in the SMP mode, you must install the files provided on the IBM PC Server Windows NT Support Diskette. The README file on the diskette contains the required installation instructions.

If you did not receive a PC Server Windows NT Support Diskette with your server, you can obtain a copy of the diskette from the IBM PC Server Startup Support group. To obtain a copy in the U.S., call 1-800-772-2227. In Canada, call 1-800-565-3344. In all other countries, contact the IBM support organization that services your area, your IBM marketing representative, or your IBM reseller.

Installing Windows NT with an IBM Auto LANStreamer PCI Adapter

If you want to use the PC Compatible Micro Channel HAL to configure the IBM Auto LANStreamer PCI Adapter in the single-microprocessor (uniprocessor) mode, you must obtain the Auto LANStreamer PCI Windows NT, network driver interface specification (NDIS) 3.0 Driver Diskette Version 2.6 and the updated HALMCA.DLL file from the IBM PC Server Startup Support group. In the U.S., call 1-800-772-2227. In Canada, call 1-800-565-3344. In

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

When you receive the driver diskette and the HALMCA.DLL file:

1. Use the instructions provided on the driver diskette to install the LAN adapter.
2. Copy the HALMCA.DLL file to the
C:\WINNT35\SYSTEM32\HAL.DLL directory.

Installing Windows NT with a 3Com Etherlink Adapter

If you are installing Windows NT 3.51 with a 3COM Etherlink III Parallel Tasking 16/32 Micro Channel Coax Network Adapter, you must complete the following steps.

1. Obtain the version 4.1 device driver for the 3Com adapter from the 3Com bulletin board system (BBS).
2. On the 3Com device driver diskette, copy the OEMSETUP.INF file from the NDIS\WINNT31 directory to the NDIS\WINNT35 directory.
3. Edit the OEMSETUP.INF file and remove the semicolons (;) from the groups of lines identified for Windows NT 3.5 and above.
4. Install the 3Com adapter.
5. Install the default device driver provided with Windows NT.
6. Restart the server.
7. From the Windows NT Program Manager, select the Control Panel; then select the Network Setup box.
8. In the Network Setup box, select the device driver and the update option. For the Path, enter: A:\NDIS\WINNT35
9. After the update, perform bindings; then close the Network Setup box.

Do not take the option to restart the server.

10. Start the Windows NT diagnostics. Under Tools, select Registry Editor; then scroll to:
HKEY_LOCAL_MACHINE\
System\
CurrentControlSet\
Services\
Elnk31\
Parameters
11. Change the parameter Bus Number from 0x1 to 0.
12. Close the Registry Editor and shut down the server.
13. When you restart the server, the 3Com adapter will be operational.

DOS Installation

If you are installing DOS in a disk-array model, refer to the README files on the ServeRAID diskette.

All Other Installations

If you are installing other operating systems, such as UnixWare, use the installation instructions that come with the operating system.

About ServerGuide

It is important that you read and understand the following information, whether you choose to install an operating system that is available in the ServerGuide package or you choose to install *your own* operating system.

Note: The IBM ServerGuide package contains various operating-system update programs, some of which are designed specifically for the IBM PC Server 520. Some of these updates might not be provided in existing, off-the-shelf versions of the operating systems. For this reason, if you intend to use one or more of the operating systems that are provided in the ServerGuide package, you should use ServerGuide for the installation.

You can install an operating system from ServerGuide or you can install *your own* operating system and still use many of the features available on ServerGuide. (For example, you can install NetFinity, which is a LAN systems-management program; run demonstration programs; use the performance-tuning feature; and do much more.) Take the time now to read the information that comes with the ServerGuide package; then return here.

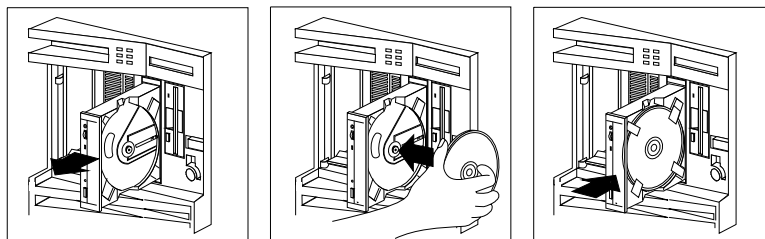
The ServerGuide CDs contain small computer system interface (SCSI) and video graphics array (VGA) device drivers that will be installed automatically if you install one of the operating systems from the ServerGuide CD package. However, if you choose to install SVGA applications or *your own* operating system, you will need to install the SCSI device drivers and the SVGA device drivers. These device drivers are on the diskettes that come with the server. Refer to the README files on the diskettes for installation instructions.

For additional considerations regarding device drivers and operating systems, be sure to read “Hardware Considerations” on page 23, “Installing an Operating System” on page 21, and “Device Drivers” on page 33.

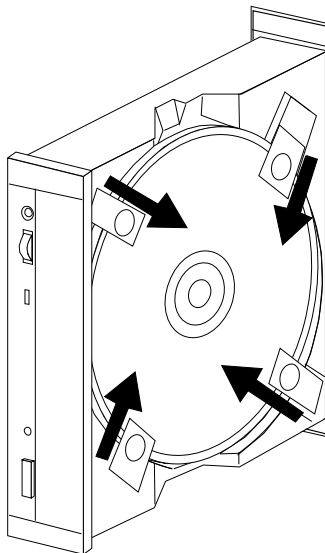
Starting ServerGuide

To start the ServerGuide Main CD:

1. If the server is not turned on, turn it on.
2. Locate the ServerGuide CD package and diskettes.
3. Press the CD-ROM tray-release button. The CD-ROM tray will extend out.
4. Locate the tabs in the corners of the tray.
5. With the label information facing right, center and hold the ServerGuide Main CD on the tray.



6. Insert your fingertip or a small, blunt object such as the tip of a pen into the depression on each tab; then slide the tab over the CD.



7. Push the CD-ROM tray back into the server.
8. Insert the ServerGuide License Diskette into the diskette drive.
9. Press the **Ctrl+Alt+Del** key sequence to restart the server.
The ServerGuide logo screen appears, followed by a language-selection screen.
10. Select a language; the Main Menu appears.
11. Select **Start Here** and review the information.

The README files in the Start Here section of the ServerGuide Main CD contain important information about ServerGuide, operating systems, and device drivers. Be sure to review the README files before you install your operating system.

Note: After using ServerGuide, verify that the date and time are correct. Use the **Date and Time** choice in the Configuration/Setup menu to make any necessary corrections.

Device Drivers

Device drivers are programs designed to support a specific type of hardware device. They provide instructions that enable the server to interact with the device, or to take advantage of a device's special feature. Not all devices require device drivers. However, the ServeRAID adapter and the PeerMaster adapter require the installation of device drivers.

Your ServeRAID Device Driver/Administration and Monitoring diskette contains device-driver files that must be installed when you use OS/2, Novell NetWare, Windows NT, and SCO UNIX. If you have a non-disk-array model, your SCSI-2 Fast/Wide PCI adapter Support Package contains device-driver files that must be installed when you use OS/2, Novell NetWare, Windows NT, and SCO UNIX.

Note: See the README file in the SCSI-2 Fast/Wide PCI adapter Support Package or on the ServeRAID Adapter Support Diskette that comes with your server for detailed instructions.

Network Adapter Device Drivers

If you are using OS/2 LAN Server and you want to install a network adapter in your PC Server 520 that does not appear as a selectable choice in the ServerGuide window box, use the following instructions:

1. Use the information and instructions provided with the ServerGuide package to install OS/2 and OS/2 LAN Server.
Note: If you want to install other products provided on ServerGuide, install them now.
2. When the list of network adapters appears in the window box, select **None**.
3. When the installation has completed, restart the server.
4. Press **Enter** to bypass the BIND error messages.

Note: If you installed NetFinity, a driver could not be found message might appear. Select **OK** to continue.

5. After the operating system loads, access MPTS (for OS/2 LAN Server 4.0) or LAPS (for OS/2 LAN Server 3.0) and configure your server with the appropriate network adapter device driver.

Note:

- MPTS = Multiple Protocol Transport Services
- LAPS = LAN Adapter Protocol Support

6. Go to the operating system prompt, then type:

```
COPY E:\G04.CMD C:\
```

7. Press **Enter**.

8. At the operating system prompt, type:

```
COPY E:\RESTART2.CMD C:\
```

9. Press **Enter**.

10. Perform a Shutdown of your server.

11. Restart your server. This will enable OS/2 LAN Server to install with the device driver configuration that you selected in step 5.

Note: All of the products that you selected during the initial installation will be reinstalled.

Hardware Device Drivers

For the latest information about hardware device drivers for the IBM PC Server 520, OS/2 for SMP 2.11, and OS/2 LAN Server 4.0:

- In the U.S. and Puerto Rico, call IBM at 1-800-772-2227
- In Canada, call IBM at 1-800-565-3344
- In all other countries, contact the IBM support organization that services your area, your IBM marketing representative, or your IBM reseller.

Note: In the United States and Canada, service is available toll-free, 24 hours a day, 7 days a week.

Installing the PeerMaster LAN Software

Some PC Server 520 models come with an IBM Ethernet Quad-BT PeerMaster Server Adapter (hereafter referred to as the PeerMaster adapter) installed as a standard feature. This section contains instructions for installing the PeerMaster LAN software provided on the IBM PeerMaster Server Adapter Option Diskette (hereafter referred to as the PeerMaster Option Diskette) that came with your server.

Before installing the LAN software, be sure your PeerMaster adapter is configured, functional, and properly cabled to your network. (For more information, see “Testing the PeerMaster Adapter” on page 146.)

Note: You must install your network operating system before you can install the PeerMaster LAN software.

To install and configure the PeerMaster LAN software:

- If you are using OS/2 LAN Server 2.x or 3.x, continue with “Installing PeerMaster Software for OS/2.”
- If you are using Novell NetWare 3.1x or 4.0x, go to “Installing PeerMaster Software for Novell NetWare” on page 36.

Installing PeerMaster Software for OS/2

The installation instructions and device drivers for OS/2 LAN Server 2.x or 3.x are on the PeerMaster Option Diskette that comes with your server. The files are in the OS2 directory.

The OS2 directory includes:

- A:\OS2\NDIS.TXT

The NDIS.TXT file contains the device driver installation instructions for the OS/2 LAN server. This file also describes all the files in the OS/2 and NETFINTY\OS2 directories.

- A:\OS2\

These files are described in the NDIS.TXT file.

Installing PeerMaster LAN Software

Be sure to print the NDIS.TXT file before you begin to install the software.

If you have the IBM NetFinity Services for OS/2 installed on your server, or if you want to install these services:

1. Follow the instructions in the NDIS.TXT file on the PeerMaster Option Diskette for installing the PeerMaster LAN software for OS/2 servers.
2. Then, continue with “Using NetFinity Services with Your PeerMaster Adapter” on page 58.

Installing PeerMaster Software for Novell NetWare

This section contains the instructions to install and configure the Novell NetWare LAN software. For more information about Novell NetWare, see the documentation that came with it.

Installation Overview

The following list provides the basic flow of the LAN software installation process. The details required to install the software begin with “Precautions, Limitations, and Guidelines” on page 37.

Note: The software that comes with your PeerMaster adapter enables multiple LAN segments to be registered with Novell NetWare as a single virtual subnetwork, hereafter called VNET. The software that creates these virtual subnetworks is a file called VNET.LAN.

- Review “Precautions, Limitations, and Guidelines” on page 37 for specific Novell NetWare information.
- Copy the LAN software onto your server's hard disk drive. Copy the files for your PeerMaster adapter from the PeerMaster Option Diskette to the DOS partition of your server. “Installing Network Device Drivers” on page 38 guides you through this process.
- Start your server and activate the Novell NetWare operating system at this time. “Starting Novell NetWare” on page 38 guides you through this process.

- Load the PeerMaster device drivers. Two drivers are provided for the PeerMaster adapter. One driver, MXMCA4BT.LAN, is the LAN device driver for the adapter. This driver enables the adapter to perform traditional adapter functions. The other driver, VNET.LAN, is the virtual network driver. This driver enables the PeerMaster adapter to operate in VNET Switch mode. “Loading the Network Device Drivers” on page 39 and “Sample AUTOEXEC.NCF Files” on page 50 guide you through this process.
- Update the Novell NetWare system files. Your PeerMaster adapter is shipped with the latest versions of several Novell NetWare Loadable Modules (NLM) files. These files include fixes required for the proper operation of your PeerMaster adapter under various versions of Novell NetWare. Copy these files directly onto the Novell NetWare partition of your server. “Updating Novell NetWare System Files” on page 43 guides you through this process.
- Modify the AUTOEXEC.NCF file, if required. Update your server startup configuration files to enable automatic loading of your PeerMaster adapter. “Loading the Network Device Drivers” on page 39 and “Sample AUTOEXEC.NCF Files” on page 50 guide you through this process.
- Read through “Unloading the Network Device Drivers” on page 44 and “Using the Novell NetWare Monitor” on page 44.

Precautions, Limitations, and Guidelines

Review this section before you begin the Novell NetWare software installation.

- All ports within a VNET must use the same frame type.
- To support various frame types across the same physical adapters, you can load VNET.LAN multiple times. When this is done, each instance must be bound to a unique network number and include the identical grouping of adapters.
- You can include a single PeerMaster adapter in multiple VNETs only if all of the VNETs in which you include it are comprised of the identical grouping of adapters.

Installing PeerMaster LAN Software

- You must configure a single PeerMaster adapter to operate exclusively either as a VNET switch or a traditional adapter. Both modes cannot be supported simultaneously by a single adapter.
- Frame types loaded for VNET.LAN must be loaded for MXMCA4BT.LAN.
- A newly loaded instance of VNET.LAN assumes control of all currently active ports on each PeerMaster adapter included in the VNET. A port is considered active after MXMCA4BT.LAN is successfully loaded with the SLOT parameter value equal to the number for that port.
- To include previously inactive ports into an existing VNET, it is necessary to unload VNET.LAN, activate the additional ports, then reload VNET.LAN. Thus, it is best to activate all ports of a PeerMaster adapter prior to loading VNET.LAN.

Installing Network Device Drivers

To install the network device drivers:

1. Insert the PeerMaster Option Diskette into drive A and change to the Novell NetWare driver directory.

```
CD A:\NETWARE
```

2. Select a target directory on the DOS partition of your server's hard disk drive, such as:

```
C:\NETWARE
```

3. Copy the contents of the driver directory on the PeerMaster Option Diskette to the target directory.

```
A:\NETWARE\*.* C:\NETWARE\*.*
```

The driver directory on your PeerMaster Option Diskette contains the Open Datalink Interface (ODI) device drivers for your adapter, the latest versions of various Novell NetWare NLM files, and several sample AUTOEXEC.NCF files.

Starting Novell NetWare

Start your Novell NetWare server at this time. If your server is running Novell NetWare 3.11:

1. Manually load the system file, LSLENH.NLM.
2. Load the file from the DOS directory into which you copied the drivers from your PeerMaster Option Diskette, as follows:

```
:LOAD C:[PATH]\LSLENH
```

The power-on-self-test (POST) results appear at driver load time. POST failures typically indicate an installation or hardware problem with the adapter. For more information on POST errors, see “PeerMaster Adapter Screen Messages” on page 344.

Loading the Network Device Drivers

Your PeerMaster adapter comes with two device drivers:

- **MXMCA4BT.LAN** This is the base device driver for your adapter. Once loaded and bound to a protocol, this driver enables your adapter to deliver the functions associated with traditional network adapter cards.
- **VNET.LAN** This device driver enables your multiport PeerMaster adapter to be bound to a protocol, such as internetwork packet exchange (IPX), as a single subnet.

This multisegment subnet is referred to as a virtual subnet, or VNET. VNETs enable PeerMaster adapters to provide high performance Ethernet switching functions transparently under Novell NetWare.

PeerMaster adapters are high-performance, multi-port LAN adapters that can also function as an Ethernet switching hub. The manner in which you load and configure the PeerMaster adapter device drivers defines the operational characteristics of the adapter. You must take special care to properly load and configure the drivers.

This section provides three examples of the load process. The first example illustrates the driver loading procedure to configure PeerMaster adapters to operate in the Traditional Adapter mode. The second example illustrates the driver loading procedure to configure PeerMaster adapters to operate in the VNET Switch mode. The third example illustrates the driver loading procedure to configure multiple PeerMaster adapters to operate in a combination of Traditional Adapter and VNET Switch modes.

Loading Procedure for Traditional Adapter Mode

Each PeerMaster port must be registered as a separate network segment to operate as a traditional network adapter. In this mode, the protocol stack treats each PeerMaster port as a separate PeerMaster adapter. This creates a configuration problem. Internally, Novell NetWare maps slot numbers to LAN segments. PeerMaster adapters, however, provide multiple segments per expansion slot. Thus, it becomes necessary to configure PeerMaster adapters using *pseudo slot numbers* to separately register the four ports on an adapter. Pseudo slot numbers are two-digit, decimal numbers, *xy*, where *x* is the expansion slot location and *y* is the adapter port in that slot. For example, a pseudo slot number of 23 represents port 3 of the adapter in expansion slot 2.

Most Significant Digit = Physical Slot Number
(Slot 1, 2, 3, and so forth)
Least Significant Digit = Port Number
(Port 1, 2, 3, 4)

The Port Number refers to one of the four Ethernet ports on the PeerMaster adapter.

When loading device drivers for PeerMaster adapters, use pseudo slot numbers in place of physical slot numbers. In all other respects, load drivers for PeerMaster adapters in the same manner as drivers for traditional, single-port adapters. If the SLOT keyword is not used on a load command, the driver presents a list of available pseudo slot numbers. Pseudo slot numbers already in use will not be included. The following is a typical load command.

```
:LOAD [PATH]MXMCA4BT.LAN SLOT=21
```

This command will cause Novell NetWare to load the driver for port 1 of the adapter physically installed in expansion slot 2.

For each adapter, you can issue a maximum of four load commands per frame type. NetWare loads the default frame type for each driver instance unless the FRAME keyword is used to request a specific frame type. The adapter is preconfigured with unique Ethernet media access control (MAC) addresses. Thus, there is no need to use the NODE keyword to create unique addresses for each

port. You can, however, override the factory-provided MAC address using the NODE keyword.

Each time you issue the load command, Novell NetWare creates a unique instance of the LAN driver. You can use the NAME keyword to bind a unique name to each instance of the driver. You can use this unique driver name when binding a specific instance of the driver to a network protocol. The following example illustrates the use of the NAME keyword.

```
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=21 NAME=SLOT21
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=22 NAME=SLOT22
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=23 NAME=SLOT23
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=24 NAME=SLOT24
```

(where *D:* is the drive and *PATH* is the directory.)

These commands cause Novell NetWare to load one instance of the LAN driver for each LAN port of the adapter physically installed in expansion slot 2. The NAME keyword associates each driver instance with a unique name, such as slot21, slot22, and so forth.

In this mode, you must bind each driver instance to a network protocol using a unique network number. The unique driver names established using the NAME keyword bind each driver instance to a protocol. The following example illustrates the bind process.

```
:BIND IPX SLOT21 NET=21
:BIND IPX SLOT22 NET=22
:BIND IPX SLOT23 NET=23
:BIND IPX SLOT24 NET=24
```

When issuing the load command, use of the NAME keyword is optional. Alternatively, you can specify the actual driver name (MXMCA4BT.LAN) in the bind command. The bind command presents you with the list of driver instances to choose from if a specific instance is not specified. Unique driver names enable the bind process to occur without manual intervention. In this manner, you can automate the process using the AUTOEXEC.NCF file.

The process for loading multiple PeerMaster adapters is identical to the process for loading a single adapter. Load successive adapters

in the same manner as the first, with the exception that the Most Significant Digit of the pseudo slot number is the expansion slot number of the adapter being loaded.

Loading Procedure for the VNET Switch Mode

This section describes the loading procedure for the VNET Switch mode. The first step is to load the PeerMaster adapter device driver once for each port, using the following commands:

```
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=21
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=22
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=23
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=24
```

(where *D:* is the drive and *PATH* is the directory.)

Next, load the virtual network driver (VNET.LAN). By default, the driver takes control of all loaded slots (active ports). This is performed as follows:

```
:LOAD [PATH]VNET.LAN
```

Finally, bind all of the ports to the protocol using a common network number, such as:

```
:BIND IPX VNET NET=2
```

You can load multiple instances of VNET.LAN to create multiple VNETs. The command line syntax for loading multiple VNETs is described in “Sample AUTOEXEC.NCF Files” on page 50.

Frame types, other than the default frame type, specified when loading MXMCA4BT.LAN must also be specified when loading VNET.LAN. The VNET.LAN load command will fail if the proper frame types are not specified. The following lines illustrate this requirement.

```
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=21  FRAME=ETHERNET_II
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=22  FRAME=ETHERNET_II
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=23  FRAME=ETHERNET_II
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=24  FRAME=ETHERNET_II
:LOAD D:\[PATH]VNET.LAN      FRAME=ETHERNET_II
```

To support packet-switching functions, PeerMaster adapters maintain an internal database containing packet-forwarding information. This table allows for 4096 entries. To prevent the overflow of this table, unused entries are aged out on a periodic basis. The default value of this aging timer is 60 seconds. If you have the need to modify the duration of the aging timer, refer to “Adjusting the Aging Timers” on page 55, for details.

Loading Combined VNETs and Traditional Networks

Various transmit and receive control blocks and buffers exist to support the PeerMaster adapter to the host bus-master interface. The number of transmit and receive packets that the interface can handle is controlled by the count of these resources. Do not adjust the count of these resources unless packets are being dropped due to lack of resources. To determine if packets have been dropped due to lack of resources, you can view the PeerMaster custom statistics using MONITOR.NLM. If you need to modify the count of these resources, see “Adjusting Transmit and Receive Resources” on page 56 for details.

Note: Specific instructions on how to create hybrid networks are provided in “Sample AUTOEXEC.NCF Files” on page 50.

Updating Novell NetWare System Files

Your PeerMaster adapter comes with the latest versions of several Novell NetWare NLM files. These files include fixes required for the proper operation of your PeerMaster adapter under various versions of Novell NetWare. Copy these files directly onto the Novell NetWare partition of your server. The following table indicates the system files to replace.

Filename	Novell NetWare 3.11	Novell NetWare 3.12	Novell NetWare 4.01
MONITOR.NLM	replace		
LSLENH.NLM	replace		
MSM.NLM			replace
MSM31X.NLM	replace	replace	
ETHERTSM.NLM	replace	replace	
PATCHMAN.NLM	replace		

You can update the system files, as follows:

1. Insert the PeerMaster Option Diskette into the diskette drive of a workstation attached to your server.
2. Compare the file dates of the NLM files on your PeerMaster Option Diskette with the dates of the same files located on the SYS:\SYSTEM directory of your server. If the specified system file does not already exist, copy it to your server. If the specified file does exist and it is an old version, replace it with the newer version provided on the PeerMaster Option Diskette.

Note: To copy a file, you might require administrator access to your server. Some files might be restricted to read-only access. You must alter the attributes of such files to successfully overwrite them.

After you copy these system files to your server, you will no longer have to manually load system files from your DOS partition.

The installation of your PeerMaster adapter is now complete.

If you have the IBM NetFinity Services for OS/2 installed on your server, or if you want to install these services, continue with “Using NetFinity Services with Your PeerMaster Adapter” on page 58.

Unloading the Network Device Drivers

Using Novell NetWare, you can unload LAN drivers after they are loaded and operational. When both MXMCA4BT.LAN and VNET.LAN are loaded, it is important to unload VNET.LAN first, then unload MXMCA4BT.LAN. When you unload either driver, all ports controlled by the driver will become unbound from the protocol stack. Specific instances of the driver can not be selectively unloaded.

Using the Novell NetWare Monitor

The Novell NetWare MONITOR.NLM provides custom statistics for VNET.LAN and MXMCA4BT.

Custom Statistics for VNET.LAN: You can display custom statistics for VNET.LAN using MONITOR.NLM. You can select a specific instance of VNET.LAN when multiple instances are loaded. A specific instance of VNET.LAN can be uniquely identified by two parameters: slot number and frame type. The following sample menu items illustrate how MONITOR.NLM prompts you to select among three instances of VNET.LAN.

```
VNET [SLOT=4100 FRAME=ETHERNET_802.2]
VNET [SLOT=0C00 FRAME=ETHERNET_802.3]
VNET [SLOT=0C00 FRAME=ETHERNET_802.2]
```

Note: Slot numbers do not correspond to either physical or pseudo slot numbers. This is because a single instance of VNET.LAN might include multiple physical adapters. For this reason, VNET.LAN slot numbers are represented as bit masks. To ensure that VNET.LAN slot numbers do not conflict with physical slot numbers, the least significant eight bits of the mask are always set to zero. The upper eight bits of the mask—bits 8 through 15—represent the physical slots 1 through 8, respectively.

The following table illustrates the relationship between VNET.LAN slot numbers and physical slot numbers.

VNET.LAN Slot Number	Physical Slot Number
100	1
200	2
400	3
800	4
1000	5
2000	6

The slot number of 2100 specifies an instance of VNET.LAN that includes the PeerMaster adapters in physical slots 6 and 1. The sample slot value of 0C00 specifies a VNET.LAN including the adapters in physical slots 3 and 4. Note that multiple instances of VNET.LAN include the adapters in physical slots 3 and 4. Instances of VNET.LAN with identical slot numbers can be uniquely selected by their respective frame types.

The following list provides the custom statistics presented by VNET.LAN for each PeerMaster adapter.

- **Learned Entry Discards**

The total number of Forwarding Database entries, which have been or would have been learned, but have been discarded due to a lack of space to store them in the Forwarding Database.

If this counter is increasing, it indicates that the Forwarding Database is regularly becoming full. If this counter has a significant value but is not increasing, it indicates that the problem has been occurring but is not persistent.

- **Peer Packets Received**

The number of packets that were sent by peer adapters and have been received from the system bus interface by this PeerMaster adapter.

A packet received from the system bus interface is counted only if it is for a protocol being processed by the local switching function.

- **Peer Packets Transmitted**

The number of packets that were sent to peer adapters that have been transmitted to the system bus interface by this PeerMaster adapter.

A packet transmitted on the system bus interface is counted only if it is for a protocol being processed by the local switching function.

- **Peer Packets Discarded**

The number of valid packets begun by peer adapters and received from the system bus interface by this PeerMaster adapter, which were discarded (filtered) by the Forwarding Process.

- Port *n* Packets Received

The number of packets that have been received by port *n* (where *n* = 1, 2, 3, or 4) from its segment.

A packet received by the port is counted only if it is for a protocol being processed by the local switching function.
- Port *n* Packets Transmitted

The number of packets that have been transmitted by port *n* (where *n* = 1, 2, 3, or 4) to its segment.

A packet transmitted to the port is counted only if it is for a protocol being processed by the local switching function.
- Port *n* Packets Discarded

The number of valid packets received by port *n* (where *n* = 1, 2, 3, or 4) from its segment which were discarded (filtered) by the switch-forwarding process.

Custom Statistics for MXMCA4BT.LAN

You can display statistics for MXMCA4BT using MONITOR.NLM. You can select a specific instance of MXMCA4BT when multiple instances are loaded. A specific instance of MXMCA4BT can be uniquely identified by two parameters: slot number and packet type. The following sample menu items illustrate how MONITOR.NLM prompts you to select among multiple instances of MXMCA4BT.

```

MXMCA4BT [SLOT=15  PACKET=ETHERNET_802.2]
MXMCA4BT [SLOT=16  PACKET=ETHERNET_802.2]
MXMCA4BT [SLOT=17  PACKET=ETHERNET_802.2]
MXMCA4BT [SLOT=18  PACKET=ETHERNET_802.2]
  
```

Slot numbers appear in hex format. Slot numbers specified when loading the driver, however, must be specified in decimal format. Therefore, you must translate slot numbers from hex to decimal when loading the drivers. The above sample represents the drivers loaded with decimal slot numbers 21, 22, 23, and 24. This corresponds to ports 1, 2, 3 and 4 on the PeerMaster adapter installed in physical slot 2.

The following custom statistics are presented on a per-port basis:

- Bytes Received: The total number of bytes that the port received from its segment.
- Unicast Packets Received: The total number of unicast packets the port received port from its segment.
- Multicast Packets Received: The total number of multicast packets that the port received from its segment.
- Broadcast Packets Received: The total number of broadcast packets that the port received from its segment.
- Discarded Received Packets: The total number of incoming packets the port was not able to receive from its segment due to lack of resources.
- Receive Errors: The total number of corrupt packets that the port received from its segment.
- Bytes Transmitted: The total number of bytes that the port transmitted to its segment.
- Unicast Packets Transmitted: The total number of unicast packets the port transmitted to its segment.
- Multicast Packets Transmitted: The total number of multicast packets that the port transmitted to its segment.
- Broadcast Packets Transmitted: The total number of broadcast packets that the port transmitted to its segment.
- Discarded Transmitted Packets: The total number of packets that the port was not able to transmit to its segment due to lack of resources.
- Transmit Packets: The total number of transmissions by the port to its segment that terminated with invalid status.
- Bus Transfer Errors: The total number of transmission errors that occurred when transferring data between peer adapters or between the host system and a PeerMaster adapter.
- Host Transfer Errors: The total number of transmission errors that occurred when transferring data between the host system and a PeerMaster adapter.

- Peer Receive Out Of Resources: The total number of packets that a PeerMaster adapter received from a peer adapter that were discarded due to insufficient resources to transmit the frame.
- Peer Transmit Out Of Resources: The total number of packets sent to peer adapters that were discarded due to insufficient resources on the peer adapters.
- Adapter Receive Out Of Resources: The total number of packets sent to the host system that were discarded due to insufficient resources on the host system.
- Adapter Transmit Out Of Resources: The total number of packets begun by the host system that were discarded by a PeerMaster adapter due to insufficient resources to transmit the packets.
- Firmware Version: The revision level of the operational firmware on the PeerMaster adapter.

Generic Statistics

When operating in VNET Switch mode, PeerMaster adapters switch received packets, as needed, to other LAN segments. This creates transmit and receive statistics that alter the traditional meaning of various generic statistic counters. The following generic counters have a unique interpretation in VNET Switch mode operation.

- Total Packets Sent: The total number of packet transmissions requested by the host ODI driver.
- Total Packets Received: The total number of packets received by the host ODI driver.
- Total Send OK Byte Count (Low/High): The total number of bytes sent by the host ODI driver.
- Total Received OK Byte Count (Low/High): The total number of bytes received by the host ODI driver.
- All Ethernet-Specific Statistical Counters: This includes all Ethernet-specific statistics, such as collisions, transmit status, receive status, and so forth. These counters contain the sum of all transmit and receive statistics resulting from both the host ODI driver and VNET Switch activities. Thus, it is possible to

observe a value of zero for “Total Packets Sent” at the same time as a nonzero value for a transmit statistic, such as “Send OK Single Collision Count.” This combination of statistics indicates that no packets were transmitted through the host driver, and that a nonzero number of VNET Switch packets for the specified port experienced single collisions.

Sample AUTOEXEC.NCF Files

You must add the following command line to your AUTOEXEC.NCF file for NetWare 3.11.

```
:LOAD [PATH]LSLENH
```

The following sample AUTOEXEC.NCF files provide information for servers that have one, two, or three PeerMaster adapters installed.

One PeerMaster Adapter: Adding the following commands to your AUTOEXEC.NCF file will cause your PeerMaster adapter to operate in the Traditional Adapter mode. In this mode, each port is bound to the protocol stack with a unique network number. Your adapter will not be able to switch packets between segments. Cross-segment traffic, if any, must be routed by your server's microprocessor.

```
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=21 NAME=SLOT21
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=22 NAME=SLOT22
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=23 NAME=SLOT23
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=24 NAME=SLOT24
```

(where *D:* is the drive and *PATH* is the directory.)

```
:BIND IPX SLOT21 NET=21
:BIND IPX SLOT22 NET=22
:BIND IPX SLOT23 NET=23
:BIND IPX SLOT24 NET=24
```

Two PeerMaster Adapters: Adding the following commands to your AUTOEXEC.NCF file will cause your PeerMaster adapters to operate in the VNET Switch mode. In this mode, all ports are bound to the protocol stack with one common network number.

Your PeerMaster adapters will switch packets between segments in this mode.

```

:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=11
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=12
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=13
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=14

:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=21
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=22
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=23
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=24

```

(where *D:* is the drive and *PATH* is the directory.)

```

# Create a VNET that globally includes all ports
# ("include" parameter is omitted).

```

```

:LOAD D:\[PATH]VNET.LAN
:BIND IPX VNET NET=2

```

Three PeerMaster Adapters: Adding the following commands to your AUTOEXEC.NCF file will cause your PeerMaster adapters to form a network that is a hybrid composed of an 8-segment virtual network (VNET) and four traditional networks. Cross-segment traffic within the 8 segments of the VNET is switched by your PeerMaster adapter. Cross-segment traffic from the VNET to a traditional network, or between traditional network segments, is routed internally by your server.

Installing PeerMaster LAN Software

```
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=11
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=12
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=13
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=14
```

(where *D:* is the drive and *PATH* is the directory.)

```
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=21      NAME=SLOT21
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=22      NAME=SLOT22
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=23      NAME=SLOT23
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=24      NAME=SLOT24
```

```
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=31
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=32
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=33
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=34
```

Create four traditional networks:

```
:BIND IPX SLOT21 NET=21
:BIND IPX SLOT22 NET=22
:BIND IPX SLOT23 NET=23
:BIND IPX SLOT24 NET=24
```

Create an eight-segment VNET consisting of adapters 1
and 3. Use the i1 and i3 keywords to include adapters
1 and 3 into the VNET:

```
:LOAD VNET.LAN i1 i3
:BIND IPX VNET NET=2
```

The preceding example illustrates a server with three PeerMaster adapters. The adapters are installed in expansion slots 1, 2, and 3. The adapters in slots 1 and 3 create an eight-segment VNET and are configured as network number 2. The adapter in slot 2 is loaded as a traditional adapter, and the four ports are each bound to the protocol with a unique network number. The protocol is configured to operate as if a total of five physical Ethernet segments exist. All ports controlled by VNET.LAN share the network number configured on the VNET.LAN bind command.

Adding the following commands to your AUTOEXEC.NCF file will cause your PeerMaster adapters to form a network that is a hybrid composed of two 4-segment virtual networks (VNETs) and four traditional networks. Cross-segment traffic within each 4-segment VNET is switched by your PeerMaster adapters. Cross-segment traffic entering or leaving a VNET, or between traditional network segments, is routed internally by your server.

The load command for the VNET.LAN driver provides keywords that request the driver to include specific adapters into the VNET. You can load the VNET.LAN driver multiple times to create multiple VNETs. The keywords to include a specific adapter into a VNET are i1, i2, ... i6. The keyword i1 indicates a request to include the adapter in physical slot 1 into the VNET being formed, i2 indicates the adapter in slot 2, and so on. You can name each VNET separately, using the NAME keyword on the load command. Each VNET, when being bound to a protocol, must be assigned a unique network number. The following example illustrates the loading of multiple VNETs.

Installing PeerMaster LAN Software

```
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=11  NAME=SLOT11
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=12  NAME=SLOT12
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=13  NAME=SLOT13
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=14  NAME=SLOT14
```

(where *D:* is the drive and *PATH* is the directory.)

```
:BIND IPX SLOT11 NET=11
:BIND IPX SLOT12 NET=12
:BIND IPX SLOT13 NET=13
:BIND IPX SLOT14 NET=14
```

```
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=21
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=22
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=23
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=24
```

```
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=31
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=32
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=33
:LOAD D:\[PATH]MXMCA4BT.LAN  SLOT=34
```

```
# Create two named VNETs (VNET2 and VNET3) using the 'i_'
# keyword to include specific adapters into each VNET:
```

```
:LOAD D:\[PATH]VNET.LAN i2 NAME=VNET2
:LOAD D:\[PATH]VNET.LAN i3 NAME=VNET3
:BIND IPX VNET2 NET=2
:BIND IPX VNET3 NET=3
```

About Novell NetWare Load-Time Error Messages

If POST completed successfully, the device driver will attempt to initialize and download the PeerMaster adapter. During this process, you might see an error message.

If POST completed unsuccessfully, the device driver will not attempt to load the adapter. If this happens, you will get an error message. If you get an error message during either process, see “Novell NetWare Load-Time Error Messages” on page 348.

Adjusting the Aging Timers

To support packet-switching functions, PeerMaster adapters maintain an internal database containing packet-forwarding information. This table can contain 4096 entries. To prevent the overflow of this table, unused entries are purged from the table on a periodic basis. Aging timers define the length of this period. Entries not accessed during the time specified are purged from the database.

Once purged, a destination address is treated as an unlearned address. Packets to unlearned destinations are sent out to all ports to ensure delivery of the data. When the PeerMaster adapter receives a response from the destination, the forwarding information table is updated and subsequent packets to that address are no longer sent out to all ports.

Thus, a long duration for the aging timer reduces traffic caused by unlearned destinations. A duration that is too long, however, results in unused entries remaining in the table for long periods of time. This might result in an overflow of the table. New destinations, which cannot be stored in the data base, are treated as unlearned traffic.

Use the AGE keyword to customize the aging timer to meet the specific needs of your network. This keyword specifies aging-timer values as follows:

```
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=11 AGE=N
:LOAD D:\[PATH]VNET.LAN AGE=N
```

Where N specifies a duration in seconds. Thus, a value of 30 specifies a duration of 30 seconds.

Note that the keyword must be specified on the load command lines for MXMCA4BT.LAN and VNET.LAN. Use the same value on both command lines.

Minimum value of N	=	1
Maximum value of N	=	65535
Default value of N	=	60

Novell NetWare Servers poll idle workstations every 15 minutes. Thus, an aging duration of 30 minutes (N=1800) would safely prevent unlearned traffic due to idle workstations. In very large networks, however, a duration of this length might result in the overflow of the forwarding data base.

Adjusting Transmit and Receive Resources

Various transmit and receive control blocks and buffers exist to support the PeerMaster adapter to the host bus-master interface. The number of transmit and receive packets that the interface can handle are controlled by the number of these resources. Increase the number of these resources only if you have determined that packets are being lost due to lack of resources.

The TXCOUNT keyword allows you to customize the number of transmit control blocks used to line up packets to the adapter, as follows:

```
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=11 TXCOUNT=nnn
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=12
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=13
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=14
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=21 TXCOUNT=nnn
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=22
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=23
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=24
:LOAD D:\[PATH]VNET.LAN TXCOUNT=nnn
```

(where *D:* is the drive and *PATH* is the directory.)

The parameter *nnn* is a 3-digit decimal number that specifies the number of control blocks. The first port that is loaded on a PeerMaster adapter sets the TXCOUNT of resources for that adapter. The TXCOUNT keyword for subsequent loads of the same adapter is ignored by the driver. The keyword must be specified on the load command lines for MXMCA4BT.LAN and VNET.LAN. The value of TXCOUNT for VNET.LAN should equal the sum of all adapters included in the VNET. For instance, the value of TXCOUNT for VNET.LAN in the above example is 40 if the values for slots 11 and 21 were each specified as 20.

Minimum value of *nnn* = 2
 Maximum value of *nnn* = 80
 Default value of *nnn* = 10

The maximum value of 80 is recommended. The actual maximum might vary as a function of the configured size of the adapter memory window and the amount of available memory on the adapter. If the requested number is greater than the driver can provide, the default value will be used. *Do not set TXCOUNT below the default value of 10.*

The RXCOUNT keyword allows you to customize the number of receive control blocks and host buffers used to receive packets from the adapter, as follows:

```

:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=11 RXCOUNT=nnn
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=12
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=13
:LOAD D:\[PATH]MXMCA4BT.LAN SLOT=14
  
```

(where *D:* is the drive and *PATH* is the directory.)

The parameter *nnn* is a 3-digit decimal number that specifies the number of control blocks and buffers. Note that the keyword is specified only on the load command line for MXMCA4BT.LAN. The first port that is loaded on a PeerMaster adapter sets the RXCOUNT of resources for that adapter. The RXCOUNT keyword for subsequent loads of the same adapter is ignored by the device driver.

Minimum value of *nnn* = 2
 Maximum value of *nnn* = 80
 Default value of *nnn* = 10

The maximum value of 80 is recommended. The actual maximum might vary as a function of the configured size of the adapter memory window and the amount of available memory on the adapter. If the requested number is greater than the driver can provide, the default value will be used. *Do not set RXCOUNT below the default value of 10.*

Using NetFinity Services with Your PeerMaster Adapter

IBM NetFinity Services is a complete network management environment that combines monitoring and management features with intuitive graphical user interfaces (GUIs). The monitoring services built into NetFinity enable LAN administrators to gather critical server, LAN and PeerMaster adapter information from the NetFinity Manager system. For your convenience, NetFinity is provided in the ServerGuide package.

NetFinity provides the following services:

- System Monitor

Charts and monitors the activity for a variety of server resources, including microprocessor, disks, and memory. Alerts can be sent to the Alert Manager when user-defined thresholds are exceeded. The following operational parameters of PeerMaster adapters and attached LAN segments are continually monitored and can be viewed over time as line graphs, as instantaneous real-time monitors, or as text monitors.

- LAN utilization

Displays the utilization of attached LAN segments in KB per second (KBps) or packets per second (pps).

- LAN switch statistics

Displays the number of packets that the switching function forwarded to a specified port for transmission onto its segment as well as the number of packets that were received by a port from its segment that was delivered to the switching function.

- Peer switch statistics

Displays the number of packets that the switching function sent to, or received from, other PeerMaster adapters across the system bus.

- Alert Manager

Receives and processes application-generated alerts. Alerts are generated when user-defined thresholds are exceeded. The types of alerts that NetFinity can provide include:

- Logging
- Notifying user
- Forwarding alert to another system
- Executing a program
- Taking an application-defined action

NetFinity sends Simple Network Management Protocol (SNMP) messages to management consoles in response to an alert.

- Remote System Manager

Enables you to access and control all NetFinity Services installed on remote systems in your network.

- Remote Session

Enables you to establish a fully active session with a remote system.

- Screen View

Enables you to take a snapshot of any remote system's current screen.

- System Information Tool

Detects and reports detailed information on the hardware and software configuration of your system.

Your PeerMaster Option Diskette includes programs that enable you to use NetFinity, if it is installed on your server, with your PeerMaster adapter.

If you have NetFinity installed on your server:

- If you are using OS/2, go to “Installing NetFinity Software for OS/2” on page 60.
- If you are using Novell NetWare, go to “Installing NetFinity Software for Novell NetWare” on page 60.

Installing NetFinity Software for OS/2

The information for installing the NetFinity programs (for the PeerMaster adapter) on your server is on your PeerMaster Option Diskette. Print and read the following file for installation instructions.

A:\OS2\NDIS.TXT

Installing NetFinity Software for Novell NetWare

This section provides information for Novell NetWare operating systems.

Note: A README file might be present in A:\NETFINTY\NETWARE if more recent installation or operation instructions exist.

The NetFinity program files on your PeerMaster Option Diskette support the following versions of Novell NetWare:

- Novell NetWare 3.1x and 4.0x

The following files are included in the NETFINTY\NETWARE directory of the PeerMaster Option Diskette that came with your server.

- MONMX4BT.NLM
This file is the NetFinity base monitor for MXMCA4BT.LAN.
- MONVNET.NLM
This file is the NetFinity base monitor for VNET.LAN.

Installing the NetFinity Program Files for Novell NetWare

The PeerMaster Option Diskette contains the NetFinity program files, which monitor the operation of your PeerMaster adapters and make that information available to your NetFinity management console. Two program files are required. MONMX4BT monitors the base operations of your PeerMaster adapter and provides Ethernet use information. MONVNET monitors the switching operations of your PeerMaster adapters.

Before installing these programs, ensure that the installation of NetFinity and your PeerMaster adapters is complete.

Assumptions:

- Your PeerMaster adapter is fully operational. *If this is not true, do not proceed.* Before continuing, ensure that it is operational.
- The NetFinity Services and Novell NetWare Server programs that came with NetFinity are installed and fully operational. You can monitor the basic operations and configuration of your server at this time. *If this is not true, do not proceed.* Before continuing, install the NetFinity Services and Novell NetWare Server programs and ensure that they are fully operational.

To install the programs on a server with Novell NetWare, follow this procedure:

1. If your server is not on, turn it on.
2. Insert the PeerMaster Option Diskette into the diskette drive of a workstation attached to your server.
3. Change the directory on your diskette drive to the directory where the NetFinity programs are located.

```
CD A:\NETFINTY\NETWARE
```

4. Change the directory on your network drive to the directory where the programs that came with NetFinity are installed, for example:

```
CD F:\NETFINTY
```

5. Copy the programs for your PeerMaster adapter onto your server, for example:

```
copy A:*. NLM F:
```

6. Restart the server to load the programs.

Now, you can monitor the functions of your PeerMaster adapter from your NetFinity console.

Monitoring your PeerMaster Adapter

The PeerMaster adapter programs expand the capability of the NetFinity Services installed on your server. This section describes these services. For information about the basic operation of NetFinity, refer to the documentation that came with it.

The Remote System Manager on your NetFinity Manager system allows you to monitor the configuration and operation of remote systems that have been discovered by NetFinity. If your PeerMaster server has not been discovered by NetFinity, perform the following steps:

1. From the Remote System Manager screen, select **Add Group**.
2. Select **Discover System**.

After communication with your PeerMaster server is established, an icon (graphic symbol) will appear for your new server.

3. Double-click on the icon for your server.

After adding the System Manager, you can use all the services on your PeerMaster adapter.

To display hardware configuration information about the PeerMaster adapter installed in your server:

1. Select **System Information**.
2. Select **Adapter Information**.

The first time you use this feature, you will be prompted to insert the PeerMaster Option Diskette into the diskette drive of the NetFinity management system. NetFinity will copy the adapter configuration (ADF) file for the PeerMaster adapter onto the local hard disk for future reference.

Additional System Monitors

The System Monitor Service allows you to monitor the statistical data gathered by the programs provided with your PeerMaster

adapter. Expansion slot numbers are used to select a specific adapter to monitor. Pseudo slot numbers are used to select a specific port to monitor. Pseudo slot numbers are expressed as two-digit, decimal numbers, xy , where x is the expansion-slot location of the target adapter and y is the target port on the adapter. For example, a pseudo slot number of 23 represents port 3 of the adapter in the expansion slot 2.

The following monitor windows are currently provided:

- Slot xy LAN Utilization (pps)
- Slot xy LAN Utilization (KBps)
- Slot xy LAN Switch In (pps)
- Slot xy LAN Switch Out (pps)
- Slot x Peer Switch In (pps)
- Slot x Peer Switch Out (pps)

LAN Utilization

In either VNET Switch or Traditional Adapter mode, each active port on your PeerMaster adapter is attached to a separate LAN segment. The port receives data from the segment in a random manner. Each port can provide information on the actual use of the LAN segment onto which it is attached. This information is provided in packets per second (pps) and kilobytes per second (KBps).

LAN Switch In

When the switching function on your PeerMaster adapter is active, this counter displays the number of packets forwarded to another LAN segment that the switching function accepted from the specified port.

LAN Switch Out

When the switching function on your PeerMaster adapter is active, this counter displays the number of packets that the switching function forwarded to the specified port for transmission onto its segment.

Peer Switch In

When the switching function on your PeerMaster adapter is active, this counter displays the number of packets forwarded to local ports for transmission onto their segments that the switching function received from other PeerMaster adapters.

Peer Switch Out

When the switching function on your PeerMaster adapter is active, this counter displays the number of packets forwarded to other PeerMaster adapters for transmission onto segments controlled by other PeerMaster adapters that the switching function received from local ports.

Arranging Your Workspace

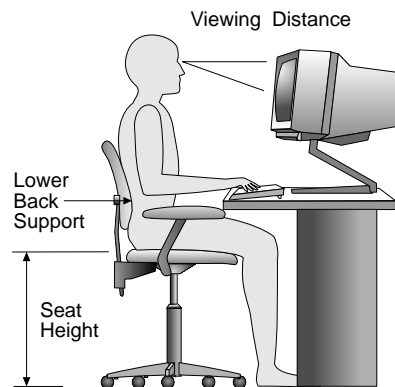
To get the most from your server, arrange both the equipment you use and your work area to suit your needs and the kind of work you do. Your comfort is of foremost importance, but light sources, air circulation, and the location of electrical outlets also can affect the way you arrange your workspace.

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,

Arranging Your Workspace

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, 51 mm (2 in.) 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 cord directly into an electrical outlet.
- 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, refer to the *User's Reference*.

Installation Checklist

Important

Be sure to maintain at least 51 mm (2 in.) of space at the rear of the server to allow the server's cooling system to work properly. Blocking the air vents can cause overheating, which might result in a malfunction or permanent damage.

Your server hardware is set up, and you are ready to learn about your server. The order in which you do these tasks is up to you. Use the following checklist as a guide.

Learn about your server and the system utility programs

Your server comes with utility programs to help you configure your server and troubleshoot problems.

If your server is a disk-array model, read and become familiar with Chapter 3, “Configuring the Disk Array” on page 71. Follow the instructions to back up your disk-array configuration information. If your server comes with a PeerMaster adapter, read and become familiar with Chapter 4, “Configuring the PeerMaster Adapter” on page 131.

Record your identification numbers

Your server has important identification information that you will need if you have it serviced. Refer to “Record the Identification Numbers” on page 383, and record and retain this information. Be sure to record your ServerGuide License Diskette serial number in that section.

Install options

If you decided earlier to delay installing your options, you might want to complete these installations now. Refer to Chapter 6, “Installing Options” on page 175 for installation instructions.

Complete setting up your PC Server 520

If you need to set passwords or drive-startup sequences, or do other system setup tasks, use the procedures in Chapter 5, “Configuring Your Server” on page 147.

 Install SVGA and SCSI device drivers

If you installed SVGA applications, or if you did not install one of the operating systems from the ServerGuide CD package, get the SVGA and the SCSI device driver diskettes that come with your server and install these device drivers now. If your server came with a preinstalled PeerMaster or ServeRAID adapter, install the device drivers from the appropriate diskette.

These diskettes contain README files to help you install device drivers and complete your installation. Be sure to review the README files *before* you install the device drivers.

 Install option files and ServeRAID monitoring programs

Some options that you install might come with a diskette that contains device drivers, configuration files, or test programs. To install these files (after your operating system is installed), follow the instructions that come with the diskettes.

 Install application programs

To install application programs, follow the instructions supplied with each application program.

 Review your *User's Reference*

The *User's Reference* contains information about the hardware and software features and expansion capabilities of your server. This book also contains information about the microprocessors, memory, data-storage devices, video subsystems, input and output (I/O) ports, SCSI subsystem, and security. For your convenience, the *User's Reference* also includes a glossary and product warranty information.

Installation Checklist

Chapter 3. Configuring the Disk Array

The information in this chapter applies only to models that have an IBM PC ServeRAID Adapter installed. This chapter provides step-by-step procedures to perform the tasks necessary to configure, add, change, or delete one or more disk arrays. In addition, this chapter outlines procedures for some of the more common disk-array configuration and maintenance tasks.

After you complete the instructions in this chapter, you must install an operating system. Review the software and operating system-considerations in “Installing an Operating System” on page 21; then, follow the instructions in your operating system-documentation.

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Before You Begin

- Familiarize yourself with the information contained in this chapter and the RAID (redundant array of independent disks) information in the *User's Reference*.
- Verify the disk-array configuration. The hard disk drives in your disk-array model come configured as one logical drive.
 - To view the disk-array configuration, go to “Viewing the ServeRAID Configuration” on page 84.
 - To create a disk array, go to “Creating a Disk Array” on page 85.
- Backup the disk-array configuration. See “Backing Up Your Disk-Array Configuration” on page 116.

After you configure the disk array, you can complete setup by installing your operating system (from the ServerGuide compact disc that comes with your server or from the diskettes that come with your operating system). Before you install an operating system, refer to the README file in **Start Here** on the ServerGuide Main CD. To install your operating system from the ServerGuide CD, refer to “Starting ServerGuide” on page 31 for instructions.

Device Drivers

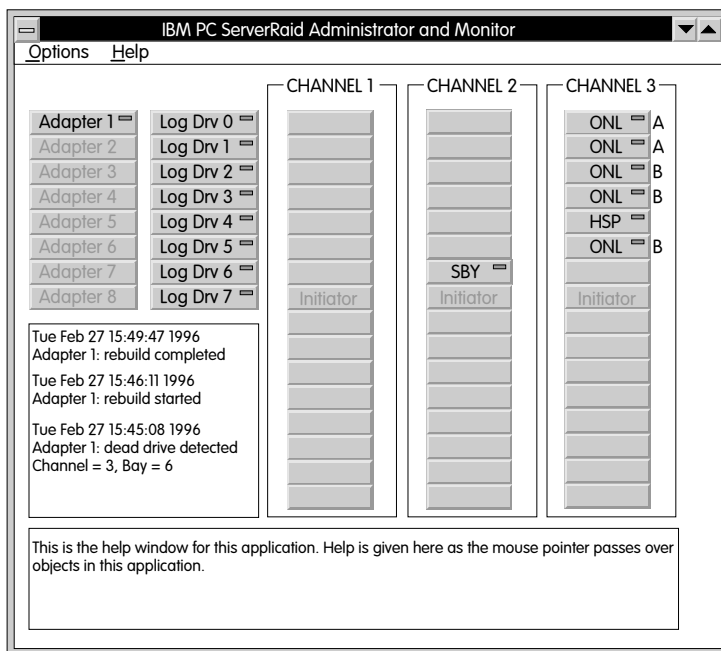
The ServeRAID adapter requires the installation of device drivers. See the README file on the Device Driver/Administration and Monitoring diskette for detailed instructions.

If you install an operating system from the ServerGuide CD, the device drivers will be installed automatically. However, if you install your operating system from diskettes, you will need to install the device drivers. See the README file on the Device Driver/Administration and Monitoring diskette for installation instructions.

Administration and Monitoring Utilities

The Administration and Monitoring program contains RAID monitoring utility programs for several operating systems that your ServeRAID adapter supports. You can monitor your ServeRAID configuration program in the local and remote systems by using these programs.

The following is an example of an Administration and Monitoring program screen. Your screen might look different.



Monitoring the Adapter Status in a Local System

The Device Driver/Administration Monitoring Program diskette provides monitoring programs that you can use to perform disk-array maintenance tasks. Because the monitoring programs reside on top of your operating system, you do not need to restart the server. Instead, you can perform tasks such as the following from your active operating system desktop:

- Select the adapter that you want to monitor.
- View information about drives connected to the adapter, and change the drive state.
- Reassign a drive to replace a defunct drive.

Some operating systems provide additional features, such as adding and deleting a logical drive. Refer to the README file on the Device Driver/Administration and Monitoring diskette for specific information and installation instructions.

Monitoring Adapter Status from a Remote System

The ServeRAID Administration and Monitoring programs support the Client/Server environment using TCP/IP on a variety of platforms. The server programs run on the system containing a ServeRAID adapter and is supported on a number of operating systems. See the README file on the Device Driver/Administration and Monitoring diskette for more information. The Client program runs in various Windows environments:

- Windows NT Server Version 3.51
- Windows NT Workstation Version 3.51
- Windows 95

The Client program includes many of the functions contained in the ServeRAID configuration program. Because it resides on top of your operating system, you do not need to restart the server to add and remove capacity dynamically when creating or deleting an array. You can start the Administration and Monitoring program from your active operating system desktop.

RAID Technology

This monitoring program allows you to view the ServeRAID configuration and associated devices, reassign a drive to replace a defunct drive, create a logical drive, create an array, and delete an array.

In addition, in an array that contains only one logical drive, and the total number of logical drives in all arrays is less than 7, you can change the logical drive RAID level from level 0 to level 5 (or level 5 to level 0).

See the README file on the Device Driver/Administration and Monitoring diskette for instructions on installing and using this monitoring utility.

RAID Technology

RAID is the technology of grouping several hard disk drives in a server into an *array* that can be defined as a single logical drive. This *logical* drive then appears to the operating system as a single *physical* drive. This grouping technique greatly enhances logical-drive capacity and performance. In addition, if one of the hard-disk drives fails (becomes defunct) the system continues to run, with no operator intervention required, at reduced performance. You can replace the defunct drive without turning off the server (*hot-swap*). For more information about hot-swappable hard disk drives, see "Installing a Drive in Bank C" on page 235.

Hard Disk Drive Capacities

With a server, it is important to understand the implications of hard disk drive capacities and how they influence the way you create disk arrays.

Although the drives in the disk array can be of different capacities (for example, 1 GB or 2 GB), they are treated in the disk array configuration as if they all have the capacity of the smallest disk drive. Therefore, if you have four drives of 1 GB, 1 GB, 1 GB, and 2 GB grouped in one disk array, the total capacity of the array is 1 GB times 4, or 4 GB (instead of the 5 GB physically available).

Notes:

1. The total capacity of the array without protection would be 4 GB. With RAID level 5, the usable data capacity would be 3 GB.
2. 1 GB is approximately 1 000 000 000 bytes.

Additional Storage Capacity

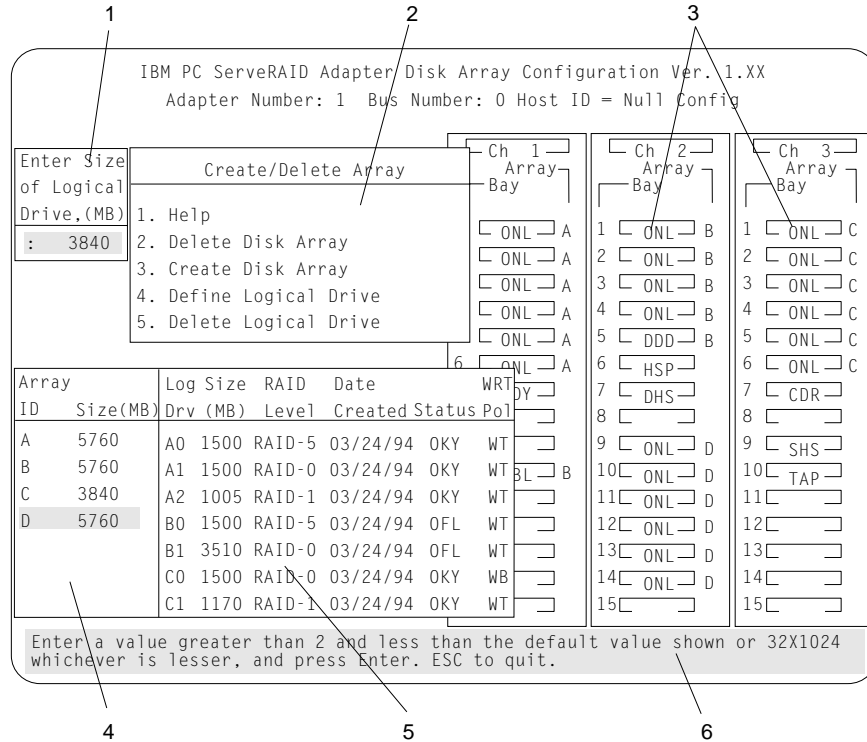
With the Administration and Monitoring program Remote Monitor, you can dynamically add capacity to your server by defining additional arrays and logical drives (when your operating system supports this). When you use the Remote Monitor, you do not have to restart the server to create an array.

When you add hard disk drives to your server, you must configure a new disk array before you can use the drives. You can either reconfigure the existing disk array to include the capacity offered with the added drives, or group the added drives into their own array (see “Creating a Disk Array” on page 85). You also can create an array with only one drive.

The ServeRAID Configuration Program Screens

When you configure your disk array, or even just view its configuration, you will be using the IBM ServeRAID configuration program on the IBM PC ServeRAID Adapter Configuration Diskette (also called the ServeRAID Adapter Configuration Diskette). The following figure is a compilation of many of the IBM ServeRAID

Controller Disk Array Configuration (also called the ServeRAID configuration program) screens. The list that follows the figure gives explanations of the numbered areas of the figure.



1. This area displays pop-ups that apply to the current menu. For example, a pop-up allows you to select the logical drive size by entering the size in megabytes; or, to accept the default value shown. Another pop-up allows you to select the RAID level you want to assign to the logical drive you are defining. When you need to confirm an action, the Confirm pop-up appears in this area.
2. You can select any of the choices that appear on the menus.
3. The Bay/Array selection list shows 15 bays for each of the adapter's three channels. For each bay that contains a drive, the list indicates the state of the physical drive and the array in which the drive is grouped. For example, in the illustration, the

drive in Channel 2, Bay 1, has a drive status of **ONL** and is a part of Array B. Selections are made from this list to determine which bays (hard disk drives) are in your arrays.

Notes:

- The Bay/Array area on the screen does not reflect the physical configuration of the server. In your server, the default numbering for the hard disk drive bays in each bank is 1 through 6 (from left to right). See “Installing Internal Drives” on page 212 to see the physical location of the hard disk drives.
- The IDs for the hot-swappable drives are set by the backplanes. This allows you to define the IDs as low (0 to 5) or high (8 to 13). See “Setting Backplane SCSI ID Jumpers (J12)” on page 274 for information on setting the jumpers on the backplanes.

One channel on the ServeRAID adapter can support two daisy-chained banks of bays. The SCSI ID jumpers on the backplanes must be set to avoid SCSI ID conflicts.

- The Bay Number corresponds to the SCSI ID of the device plus 1. When the SCSI IDs are set to high, the hard disk drive with SCSI ID 8 is installed in the leftmost bay; its status displays in Bay Number 9.
4. The Array list indicates the array ID and the size (in megabytes) of the array. When a drive is being rebuilt, this area, along with the Logical Drive list area, shows the progression of the rebuilding process.
 5. The Logical Drive list identifies the logical drive (for example, A1), including its size, the RAID level, date of creation, and its write policy.

The status of the logical drive also is shown. **OKY** means that no problem conditions are associated with the drive. **CRT** means that you must replace the defunct drive and do a rebuild operation. (You will have received a message telling you what has happened to the drive.) **OFL** means that the logical drive is irrecoverable; the data in that drive is lost.

Starting the ServeRAID Configuration Program

When a drive is being rebuilt, this area, along with the Array list area, shows the progression of the rebuilding process.

During an initialization process, the Write Policy area displays the percent initialized; during a synchronization process, it displays the percent synchronized.

6. The information area tells you the action you can perform on this screen or pop-up.

Starting the ServeRAID Configuration Program

You can use the Administration and Monitoring program or the ServeRAID configuration program to perform ServeRAID configuration tasks.

You can dynamically view or change the configuration of your server by using the Administration and Monitoring program from your active operating system desktop. This means that you do not have to restart the server. Refer to the README file on the Device Driver/Administration and Monitoring diskette for instructions for your operating system.

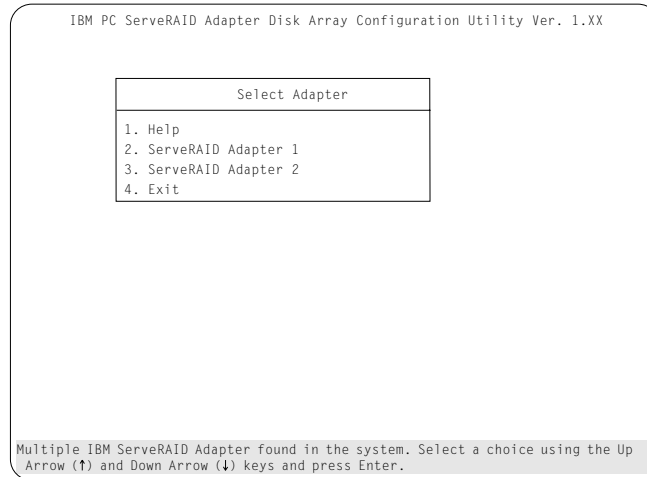
To start the ServeRAID configuration program from the ServeRAID Configuration diskette, insert the diskette into the primary diskette drive and turn on the system. If the system already is turned on, press **Ctrl+Alt+Del**.

During the power-on self test (POST), the ServeRAID adapter checks the configuration information on the adapter and on the hard disk drives connected to it.

- If POST does not detect problems or changes, the Main Menu appears. See “The ServeRAID Adapter Main Menu” on page 81.
- If POST detects any change in the adapter configuration, a configuration error message displays. See “ServeRAID Adapter POST and Setup Messages” on page 338.
- If POST detects an adapter hardware problem, an error message displays. See “ServeRAID Adapter Status and Error Messages” on page 342.

The ServeRAID Adapter Main Menu

If you have more than one ServeRAID adapter installed in your server, you will get an adapter selection screen similar to the following before the Main Menu appears.

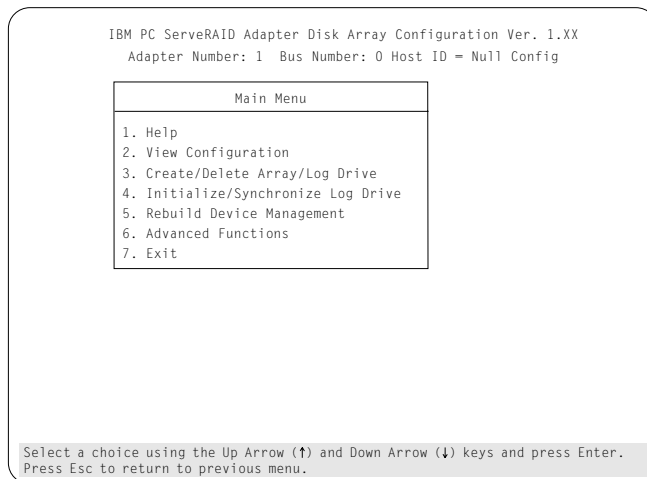


Notes:

1. The version numbers on your screens might be different. Some menus might differ slightly, depending on the version that comes with your server.
2. The primary diskette drive is the first diskette drive that your system tries to start from.

Starting the ServeRAID Configuration Program

You can select **Help** from any menu. To return to the previous screen or to the previous work area of a screen, press **Esc**. To select a menu item, press the number of the item or use the Up Arrow (↑) key or Down Arrow (↓) key to highlight the item, then press **Enter**.



The Main Menu contains the following choices:

- **Help:** Select this choice when you need additional information.
- **View Configuration:** Select this choice to see the existing disk array configuration.
- **Create/Delete Array/Log Drive:** Select this choice to select the drives for an array you want to create, or to delete an existing array. This choice also allows you to define and delete a logical drive.

Whenever you make changes to the disk-array configuration and select **Exit**, the Confirm pop-up window will appear. You must select **Yes** to save and activate the changes.

- **Initialize/Synchronize Log Drive:** Select this choice after creating an array:
 - **Initialize Logical Drive:** You *must* select this choice to set the logical drive to a predetermined value. Any data existing on the drive is overwritten with zeros.

You can choose to initialize more than one logical drive at a time. You can interrupt the initialization process at any time by pressing **Esc**. Then, you can either restart the initialization process by pressing **Enter**, or you can end the process by pressing **Esc** again.
 - **Synchronize Logical Drive:** You *must* select this choice to recompute and rewrite the parity data on the selected drive for RAID level 5 before storing data. This selection does not alter data on the drive.

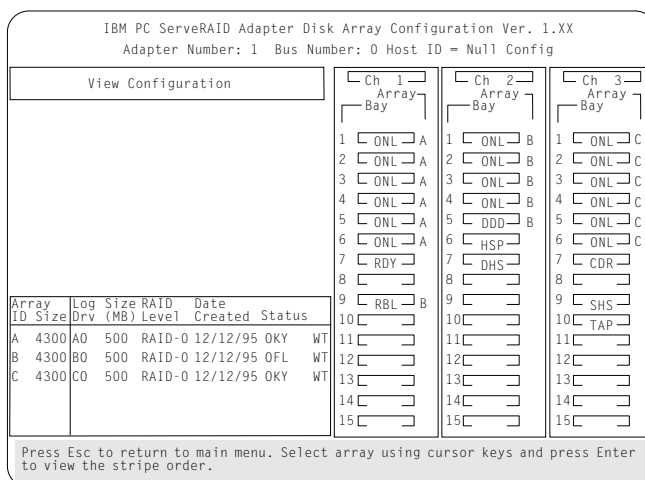
Note: It is good practice to synchronize logical drives with RAID level 1 and 5 weekly.
- **Rebuild/Device Management:** Select this choice to rebuild logical drives. The rebuild operation is supported only for RAID levels 1 and 5. You also use this option to define or change the state of a drive, display drive information, and clear the device error table.
- **Advanced Functions:** Select this choice to change the write policy (the way data is written to the drive), to save your configuration information to a diskette, to restore it from a diskette, or to change ServeRAID parameters. This choice also allows you to perform a low-level format on a hard disk and run the RAID subsystems diagnostics. You can initialize the adapter configuration, which resets the configuration values to the factory defaults. You can also synchronize the primary and backup copies of the adapter configuration information.
- **Exit:** Select this choice to leave the Main Menu.

Viewing the ServeRAID Configuration

Before creating or changing a disk array, you can look at the current configuration with the Administration and Monitoring program or the ServeRAID configuration program. By using the Administration and Monitoring program, you can dynamically view the configuration from your active operating system desktop. Refer to the README file on the Device Driver/Administration and Monitoring diskette.

To view the disk-array configuration from the ServeRAID configuration program:

1. Start the server using the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **View Configuration**. The current disk-array configuration information appears on the screen.
3. Press **Enter** to see the stripe order in the Bay/Array list. In the following example, data for the A array is striped across Channel 1, from bay 1, then bay 2, and so on, through bay 6.



4. Press any key to return to the View Configuration screen.
5. Press **Esc** to return to the Main Menu.

Performing Common Tasks

The Create/Delete Array menu of the ServeRAID configuration program contains the more common tasks for configuring disk arrays. Procedures to complete these tasks are contained in this section as follows:

- “Creating a Disk Array”
- “Defining Logical Drives” on page 87
- “Deleting a Disk Array” on page 93
- “Deleting a Logical Drive” on page 95
- “Defining the State of a Drive” on page 102
- “Redefining Space in an Array” on page 96

Creating a Disk Array

You can create disk arrays from your existing drives. Later, you can add storage capacity to your server without disturbing existing data by installing additional hard disk drives and creating additional arrays. You can use the Administration and Monitoring program or the ServeRAID configuration program to create a disk-array.

You can dynamically add capacity to your server (when your operating system supports this) by using the Administration and Monitoring program to add or create an array. By using the Administration and Monitoring program from your active operating system desktop, you do not have to restart the server. Refer to the README file on the Device Driver/Administration and Monitoring diskette for instructions for your operating system.

To create a disk array using the ServeRAID configuration program:

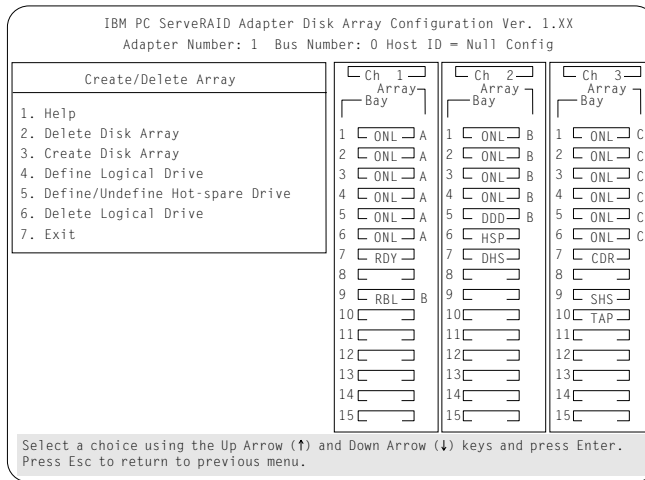
1. Start the server using the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).

Note: To create an array using hard disks in an existing array, refer to “Redefining Space in an Array” on page 96.

2. Select **Create/Delete Array/Log Drive** from the Main Menu.

3. Select **Create Disk Array** from the Create/Delete Array menu.

The cursor becomes active in the Bay/Array selection list.



Note: Carefully determine which drives you want to include in the array before beginning the selection process. 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 Array menu) and then begin again.

4. Select each drive you want in the array by using the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the drive and then pressing **Enter**. As you select each drive, the status will change from **RDY** (Ready) to **ONL** (Online).
5. When you have selected all the drives you want to include in the array, press **Esc**. The cursor will become active in the menu.

Note: When the stripe unit size is 8 K or 16 K, the maximum number of drives in an array is 16. When the stripe unit size is 32 K or 64 K, the maximum number of drives in an array is 8.

6. If you have drives you did not use in this array and you want to create another array, you can do one of the following:
 - Define the logical drive or drives for this array; then create another array and its logical drives. See “Defining Logical Drives.”
 - Create another array now by repeating steps 2 through 5 in this procedure; then define logical drives for both arrays.
- Note:* You must define at least one logical drive for each created array before you can exit from the ServeRAID configuration program.

Defining Logical Drives

After you have created an array, you must define a logical drive. You can use the Administration and Monitoring program or the ServeRAID configuration program. When you use the Administration and Monitoring program from your active operating system desktop, you do not have to restart the server. Refer to the README file on the Device Driver/Administration and Monitoring diskette for instructions for your operating system. (You cannot leave the ServeRAID configuration program until you define the logical drives for any created arrays.)

To define a logical drive:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Define Logical Drive** from the Create/Delete Array menu. The following screen appears; the cursor is active in the Bay/Array list.

Performing Common Tasks

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

Enter Size of Logical Drive.(MB)	Ch 1 Array Bay	Ch 2 Array Bay	Ch 3 Array Bay
: 3840	1 [ONL] A	1 [ONL] B	1 [ONL] C
	2 [ONL] A	2 [ONL] B	2 [ONL] C
	3 [ONL] A	3 [ONL] B	3 [ONL] C
	4 [ONL] A	4 [ONL] B	4 [ONL] C
	5 [DDD] A	5 [ONL] B	5 [ONL] C
	6 [ONL] A	6 [ONL] B	6 [ONL] C
	7 [HSP] A	7 [CDR] B	7 [CDR] C
	8 [DHS] A	8 [] B	8 [] C
		9 [ONL] D	9 [SHS] D
		10 [ONL] D	10 [TAP] D
		11 [ONL] D	11 [] D
		12 [ONL] D	12 [] D
		13 [ONL] D	13 [] D
		14 [ONL] D	14 [] D
		15 [] D	15 [] D

Array ID	Size(MB)	Log Size Drv (MB)	RAID Level	Date Created	Status	WRT Pol
A	5760	A0	RAID-5	03/24/94	OKY	WT
B	5760	A1	RAID-0	03/24/94	OKY	WT
C	3840	A2	RAID-1	03/24/94	OKY	WT
D	5760	B0	RAID-5	03/24/94	OFL	WT
		B1	RAID-0	03/24/94	OFL	WT
		C0	RAID-0	03/24/94	OKY	WB
		C1	RAID-1	03/24/94	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.

- Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the array you want to define; then press **Enter**. The Select RAID Level pop-up window appears, and the cursor is active in the window.

Note: The system 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.

If you have only two hard disk drives in the array, the Select RAID Level pop-up window appears, but RAID level 5 is not selectable because you need at least three hard disk drives in an array to assign RAID level 5 to one of the logical drives. You can define more than one logical drive for your array. The maximum number of logical drives you can define is eight; the maximum number of physical drives in an array is 8 or 16, depending on the stripe unit size.

Notes:

- If you are planning to change RAID levels using the Administration and Monitoring program, the maximum number of logical drives that can be defined is 7. The RAID conversion procedure requires one free logical drive.

- When the stripe unit size is 8 K or 16 K, the maximum number of drives in an array is 16. When the stripe unit size is 32 K or 64 K, the maximum number of drives in an array is 8.
4. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the RAID level you want to assign to these logical drives; then press **Enter**.

Note: Because the level you assign can influence the space needed for the drive, you must assign a RAID level before you enter the size of the logical drive.

The Logical Drive list contains the logical drive ID, the size of each logical drive, the RAID level you assigned to that logical drive, and the date that the logical drive was created.

The status of the logical drive also is shown. **OKY** means that all is well with the drive. **CRT** means that you must replace the hard disk drive or rebuild the logical drive. (You will have received a message during system startup telling you what has happened to the drive.) **OFL** means that the logical drive is irrecoverable; the data on that drive is lost.

If this is the first logical drive to be defined, the Logical Drive Size pop-up window shows the space in the array that is available for logical drives.

If other logical drives have been defined, the Allocation Table appears, showing the logical drive sizes already created, and the amount of free space available.

5. Type the size, in megabytes, that you want for the logical drive; then press **Enter**. A pop-up window appears, asking you to confirm your action.

Information about the new logical drive appears in the Logical Drive list.

Note: The size appearing in the Logical Drive list might be different from the size you typed. The size of a logical drive is determined by a number of factors, but basically the size must be divisible by the number of drives in the array.

Consider the following scenarios:

Scenario 1:

The array consists of three 1 GB drives. You assign RAID level 0 (which uses all the drives in the array with no parity storage), and type 1000MB. The number in the Size (MB) field will be 999, which is the number closest to and lower than 1000 that is divisible by 3.

Scenario 2:

The array consists of three 1 GB drives. You assign RAID level 1, which provides a disk mirroring that stripes data across all drives in the array. Because the data is mirrored, the capacity of the logical drive is 50 per cent of the physical capacity of the hard disk drives grouped in the array. Type 1000MB; the number in the Size (MB) field will be 999. The physical capacity used is 2000 MB, twice that of the logical drive size. The number that is closest to or lower than 2000 is divisible by 3 is 1998. The logical drive size is 999, which is 50% of the physical capacity.

Scenario 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 1000MB, the number in the Size (MB) field remains 1000 because it is divisible by 2 (drives), which is the space available for data.

If you do not use the entire array for this logical drive, you can create another by assigning either the same or a different RAID level for an additional logical drive. You can have as many as eight logical drives among eight disk arrays.

6. To return to the Create/Delete Array menu, press **Esc**. To define more logical drives, repeat steps 1 through 5 of this procedure.
7. To leave this screen, select **Exit** or press **Esc**. A pop-up window appears asking you to confirm your action.
8. To save your changes, select **Yes**. To maintain the disk-array configuration that was in place before you made changes, select **No**.

9. To ensure that your server operates correctly, you must select **Initialize Logical Drive**. This sets the drive to a predetermined state. The initialization process overwrites any data on the drive with zeros.
 - a. Select **Initialize/Synchronize Log Drive** from the Main Menu; then select **Initialize Logical Drive**.
 - b. Select the logical drives you want to initialize from the Logical Drive list by pressing the Spacebar (the selected drives will appear highlighted). To start the initialization, press **Enter**. A pop-up window appears, asking you to confirm your action.

Attention: If you select **Yes** in the Confirm pop-up window, information in the logical drive will be overwritten with zeros.
 - c. Select **Yes** to confirm that you want to initialize this logical drive.

The initialization process begins, and you can see its progress in the **Pct. Int.** (Percent Initialized) column of the Logical Drive list.
 - d. To stop the initialization at any time, press **Esc**. Then press **Esc** again to return to the menu, or press **Enter** to continue initializing the drive.
 - e. If you defined the drive as RAID level 5, select **Initialize/Synchronize Log Drive** from the Main Menu; then, select **Synchronize Logical Drive** before storing data.
10. To back up the disk-array configuration to diskette, you will need a 3.5-inch formatted diskette. To back up the disk-array configuration:
 - a. Select **Advanced Functions** from the Main Menu.
 - b. Select **Backup config. to diskette**.

Follow the instructions on the screen. A pop-up window shows the default file name of CONFIG. You can change the file name by typing over the default. The Backup program will assign a file-name extension of *.ips*.

Defining a Hot-Spare Drive

You can use the Administration and Monitoring program or the ServeRAID configuration program to define a hot-spare drive. By using the Administration and Monitoring program from your active operating system desktop, you do not have to restart the server. Refer to the README file on the Device Driver/Administration and Monitoring diskette for instructions for your operating system.

You can define a hot-spare drive from the Create/Delete Array/Log. Drive menu or the Rebuild/Device Management menu (see “Defining the State of a Drive” on page 102).

To define a drive as a hot-spare drive from the **Create/Delete Array/Log. Drive** menu:

1. Start the server using the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Create/Delete Array/Log. Drive** from the Main Menu.

The following screen appears.

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

Create/Delete Array	Ch 1 Array Bay	Ch 2 Array Bay	Ch 3 Array Bay
1. Help	1 <input type="text" value="ONL"/> A	1 <input type="text" value="ONL"/> B	1 <input type="text" value="ONL"/> C
2. Delete Disk Array	2 <input type="text" value="ONL"/> A	2 <input type="text" value="ONL"/> B	2 <input type="text" value="ONL"/> C
3. Create Disk Array	3 <input type="text" value="ONL"/> A	3 <input type="text" value="ONL"/> B	3 <input type="text" value="ONL"/> C
4. Define Logical Drive	4 <input type="text" value="ONL"/> A	4 <input type="text" value="ONL"/> B	4 <input type="text" value="ONL"/> C
5. Define/Undefine Hot-spare Drive	5 <input type="text" value="ONL"/> A	5 <input type="text" value="DDD"/> B	5 <input type="text" value="ONL"/> C
6. Delete Logical Drive	6 <input type="text" value="ONL"/> A	6 <input type="text" value="HSP"/> B	6 <input type="text" value="ONL"/> C
7. Exit	7 <input type="text" value="RDY"/> A	7 <input type="text" value="DHS"/> B	7 <input type="text" value="CDR"/> C
	8 <input type="text" value=""/> A	8 <input type="text" value=""/> B	8 <input type="text" value=""/> C
	9 <input type="text" value="RBL"/> B	9 <input type="text" value=""/> B	9 <input type="text" value="SHS"/> C
	10 <input type="text" value=""/> A	10 <input type="text" value=""/> B	10 <input type="text" value="TAP"/> C
	11 <input type="text" value=""/> A	11 <input type="text" value=""/> B	11 <input type="text" value=""/> C
	12 <input type="text" value=""/> A	12 <input type="text" value=""/> B	12 <input type="text" value=""/> C
	13 <input type="text" value=""/> A	13 <input type="text" value=""/> B	13 <input type="text" value=""/> C
	14 <input type="text" value=""/> A	14 <input type="text" value=""/> B	14 <input type="text" value=""/> C
	15 <input type="text" value=""/> A	15 <input type="text" value=""/> B	15 <input type="text" value=""/> C

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

3. Select **Define/Undefined Hot-spare Drive**. The cursor will become active in the Bay/Array selection list.
4. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the **RDY** (Ready) drive you want to define as the hot spare; then press **Enter**. The **RDY** changes to **HSP** (Hot Spare). You can press **Enter** again to toggle between **HSP** and **RDY**.
5. Press **Esc** when you have finished. The cursor will become active in the **Create/Delete Array/Log. Drive**
6. If you want to create a disk array, go to “Creating a Disk Array” on page 85.
7. If you are finished:
 - a. Select **Exit** or press **Esc**. A pop-up window will appear asking you to confirm your change.
Note: The changes you make are not saved until you confirm them by selecting **Yes** in the Confirm pop-up window.
 - b. Select **No** if you do not want the drive you selected to be a hot spare; select **Yes** to define it as a hot-spare drive.
 - c. Back up the disk-array configuration information to diskette. Refer to “Backing Up Your Disk-Array Configuration” on page 116 for instructions.

Deleting a Disk Array

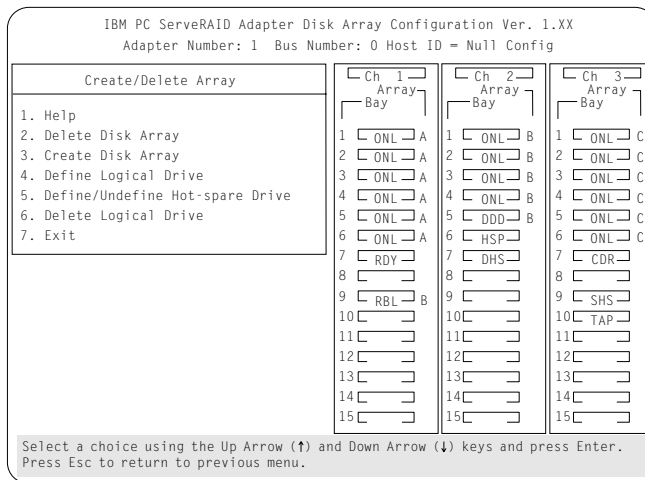
Attention: All the data and programs in the array are lost during this procedure. Before proceeding, back up any data and programs that you want to save.

To delete a disk array:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Create/Delete Array/Log Drive** from the Main Menu.
3. Select **Delete Disk Array** from the Create/Delete Array menu. The cursor will be active in the Array list.
4. Select the array that you want to delete.

Attention: All the data and programs in the array will be lost during this procedure.

5. Press **Del**. The Confirm pop-up window appears.



6. If you do not want to delete the array, select **No**. To delete the array, select **Yes**.

Notes:

- To use hard disks from the existing array when creating a new array, you must confirm the deletion of the existing array.
- In some operating systems, deleting an array and associated logical drives might change the drive letters assigned to the existing drives.

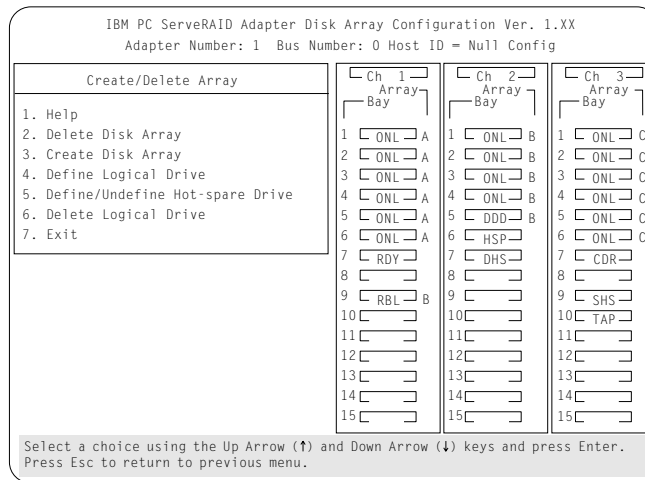
If a defunct drive is still in a bay, the status shows a Defunct Hot-spare (DHS) drive. You can select **Rebuild/Device Management**, then reset the drive state by selecting **Set Device State** (see “Defining the State of a Drive” on page 102 for more information). If the drive is good, set the drive state to Hot-Spare (**HSP**); then, select the drive again and set the drive to **Ready (RDY)**. If the drive is defective, replace it with a good drive; then set the new drive state to **Ready (RDY)**.

Deleting a Logical Drive

You can use the Administration and Monitoring program or the ServeRAID configuration program to delete a logical drive. By using the Administration and Monitoring program from your active operating system desktop, you do not have to restart the server. Refer to the README file on the Device Driver/Administration and Monitoring diskette for instructions for your operating system.

To delete a logical drive from the ServeRAID configuration program:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Create/Delete Array/Log Drive** from the Main Menu.



3. Select **Delete Logical Drive** from the Create/Delete Array menu and press **Enter**.
4. Press the Up Arrow (↑) or Down Arrow (↓) key to highlight the logical drive that you want to delete.
5. Press **Del**. The Confirm pop-up window appears.
6. If you do not want to delete the logical drive, select **No**. To delete the logical drive, select **Yes**.
7. Select **Exit** or **Esc** to return to the main menu.

Note: In some operating systems, deleting an array and associated logical drives might change the drive letters assigned to the existing drives.

Redefining Space in an Array

You can redefine space in a disk array in a number of ways. For example, you can combine a number of small logical drives to create a larger one, or you can redefine the existing logical drive into several smaller drives. Also, you can install additional hard disk drives and create a larger logical drive than was possible with the existing storage capacity.

One method to redefine space in an array is to change the RAID level assigned to a logical drive. For example, if you assigned RAID level 1 to a logical drive and then decided you needed the capacity offered with RAID level 5, you can use this procedure to replace the existing logical drive with a logical drive assigned the new RAID level.

To redefine the space in a disk array, first you must delete the array. In all cases, when you delete an array, all the data and programs in the array are lost.

If you have data and programs that you want to save, they must be backed up and then restored. You might want to use a high-speed backup device, such as a tape drive, for that purpose.

To redefine the space in an array:

Note: You need a 3.5-inch, formatted diskette to backup the configuration file, as described in this procedure.

1. Back up all data and programs in the array.
2. If needed, install additional hard disk drives.

See “Hard Disk Drive Capacities” on page 77 for information about drive sizes.

Attention: In all cases, when you delete an array, all the data and programs in the array are lost.

3. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
4. Delete the existing array:
 - a. Select **Create/Delete Array/Log Drive** from the Main Menu.
 - b. Select **Delete Disk Array**. The cursor will be active in the Bay/Array selection list.
 - c. Select the array that you want to delete.
 - d. Press **Del**. The Confirm pop-up window appears.

Attention: All the data in the array will be lost during this procedure. Be sure to back up all data and programs that you want to save.
 - e. If you do not want to delete the array, select **No**. To delete the array, select **Yes**.

Note: To use the hard disks from the existing array when creating a new array, you must confirm the deletion of the existing array. After you make your selection, the Confirm pop-up window will disappear, and the cursor will be active in the menu.
5. If you want to define a hot spare drive, refer to “Defining the State of a Drive” on page 102 for step-by-step instructions.
6. Create a new disk array and define logical drives.

See “Creating a Disk Array” on page 85 for instructions on creating a disk array and defining logical drives.
7. After you have established the new array and logical drive or drives, select **Initialize/Synchronize Log Drive** from the Main Menu; then select **Initialize Logical Drive** to prepare the drives in the array to receive data. This sets the drive to a predetermined state. Any data existing in the drive is overwritten with zeros.
8. If you defined the drive as RAID level 5, select **Initialize/Synchronize Log Drive** from the Main Menu; then, select **Synchronize Logical Drive** before storing data. Once synchronization starts, it cannot be interrupted until the operation is complete.

9. Insert a 3.5-inch formatted diskette in the primary diskette drive, select **Advanced Functions** from the Main Menu; then select **Backup config. to diskette**. Follow the instructions on the screen.
10. Exit the ServeRAID configuration program by pressing **Esc** or selecting **Exit** from the Main Menu. A pop-up window will appear asking you to confirm your action.
11. Reinstall your operating system and device drivers, then restore your data and programs.

Drive Maintenance

The following section provides information about the status indicators for logical and hard disk drives, and the results of a hard disk drive failure. It also contains procedures for defining the state of a hard disk drive and replacing defunct drives.

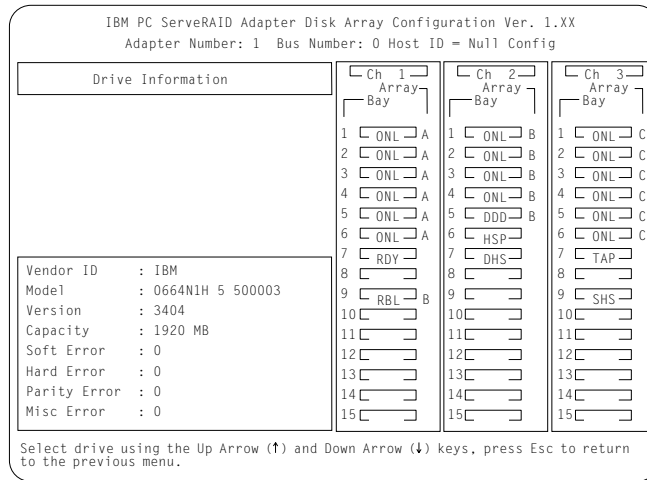
Obtaining Drive Status

To see the ID, capacity, type of errors that occurred, and other information about each of the hard disk drives attached to the ServeRAID adapter, you can use the Administration and Monitoring program or the ServeRAID configuration program. When you use the Administration and Monitoring program from your active operating system desktop, you do not have to restart the server. Refer to the README file on the Device Driver/Administration and Monitoring diskette for instructions for your operating system.

To obtain drive information from the ServeRAID configuration program:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Rebuild/Device Management** from the Main Menu.
3. Select **Display Drive Information** from the Rebuild/Device Management menu. The cursor becomes active in the Bay/Array selection list.

- Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight each of the drives in the Bay/Array selection list. As a drive is highlighted, the drive information appears.



- **Soft Errors** displays the number of SCSI Check Conditions Returned from the Drive status messages (except Unit Attention messages) since the Device Error Table was last cleared.
 - **Hard Errors** displays the number of SCSI I/O processor errors or Predictive Failure Analysis (PFA errors) that occurred on the drive since the Device Error Table was last cleared.
 - **Parity Errors** displays the number of parity errors that occurred on the SCSI bus since the Device Error Table was last cleared.
 - **Misc Errors** displays the number of other errors (such as selection timeout, unexpected bus free, or SCSI phase error) that have occurred on the drive since the Device Error Table was last cleared.
- Press **Esc** to return to the previous menu.

Notes:

- The status of the hard disk drive determines the status of the logical drives in the array in which the hard disk is grouped.
- The device error table, located in the ServeRAID adapter NVRAM, collects statistics on the number and type of errors that occurred on all hard disk drives attached to the ServeRAID adapter.

After correcting a problem with the disk array, you might want to clear the table, so that any subsequent errors can be identified quickly. Select **Erase Device Error Table** from the Rebuild/Device Management menu.

Bay/Array Selection List

The physical devices connected to each Channel are defined in the Bay/Array selection list as follows:

Status Meaning

CDR	A CD-ROM drive is installed.
DDD	A drive in the Online (ONL) or Rebuild (RBL) state has become defunct; it does not respond to commands.
DHS	A hot spare or standby hot spare drive enters the Defunct Hot-spare (DHS) state if it fails to respond to the adapter commands.
EMP	No device is present in the bay. This state is represented on the screen with blanks or dashes (- - -).
HSP	A hot-spare drive is a hard disk drive that is defined for automatic use when a similar drive fails. The drive capacity of the replacement HSP drive must be equal to or greater than the capacity of the drive being replaced. You must have at least four hard disk drives if you want a hot spare and RAID level 5.
ONL	The drive is online and part of an array.

- RBL** The drive is being rebuilt. A physical hard drive can enter the RBL state if:
- A good working drive replaces a defunct (DDD) drive that is part of the critical logical drive. At the end of a successful rebuild, the state of the physical drive becomes online (ONL), and the state of the corresponding logical drives changes to OKY.
 - An online drive that is part of a logical drive becomes defunct (DDD) and an HSP or SHS drive with the same or greater capacity is available. The state of the hot-spare drive becomes RBL during the rebuild. When the rebuild completes successfully, the state changes to ONL; the former hot-spare drive is now part of the logical drive.
 - A Ready (RDY) or Standby (SBY) drive replaces a defunct (DDD) drive that is part of the critical logical drives. The state of the RDY or SBY drive becomes RBL during the rebuild. At the end of a successful rebuild, the state of the drive becomes online (ONL); the drive is now part of the logical drive.

For more information on rebuilding a drive, see “Rebuilding a Logical Drive” on page 109.

- RDY** The ready drive is recognized by the adapter and is available for definition. A RDY drive becomes EMP when the drive is physically removed from the bay.
- SBY** A standby drive is a hard disk drive that has been spun down. Devices such as tape drives and CD-ROM drives are considered to be in a Standby state.
- SHS** A standby hot-spare is a hot spare drive that has been spun down. If a drive becomes defunct and no suitable Hot-Spare drive is available, a Standby Hot-Spare of the appropriate size spins up, and enters the Rebuild process. You must have at least four hard disk drives if you want a standby hot spare and RAID level 5.
- TAP** A tape drive is installed.

Logical Drive States

The state of the logical drive is determined by the state of the physical drives. Replacing a defunct drive with a good drive changes the state of the logical drive from offline (OFL) to critical (CRT) or good (OKY). When a defunct drive is replaced in a critical logical drive, the data is rebuilt in the replaced drive, before the state of the logical drive changes to OKY.

Status	Meaning
---------------	----------------

OKY	The drive is in a good functional state.
------------	--

FRE	The drive is not defined.
------------	---------------------------

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

CRT	A logical drive that is defined as RAID level 1 or 5 contains a defunct physical drive. A critical (CRT) logical drive is accessible despite a physical drive failure.
------------	--

Note: If the logical drive is critical, you must rebuild the defunct drive.

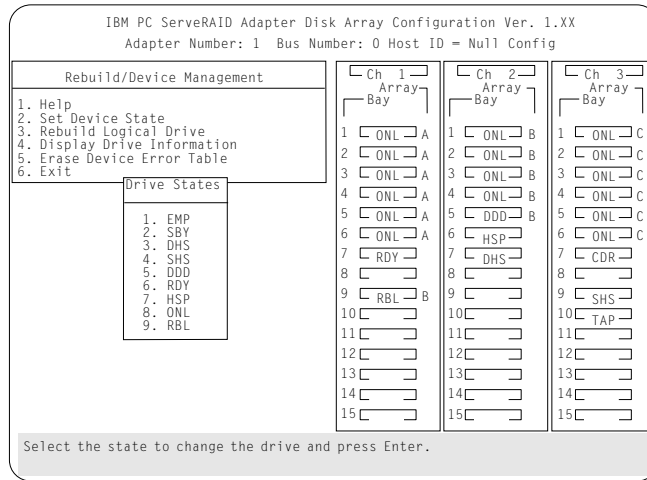
Defining the State of a Drive

To define the state of a physical hard disk drive attached to the ServeRAID adapter, you can use the Administration and Monitoring program or the ServeRAID configuration program. By using the Administration and Monitoring program from your active operating system desktop, you do not have to restart the server. Refer to the README file on the Device Driver/Administration and Monitoring diskette for instructions for your operating system.

To define the state of a drive from the ServeRAID configuration program:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Rebuild/Device Management** from the Main Menu.

3. Select **Set Device State**. The cursor will become active in the Bay/Array selection list.



4. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the appropriate drive; then, press **Enter**. The Drive States pop-up window appears, listing all hard disk drive states.
5. Highlight the appropriate drive state and press **Enter**. The cursor will become active in the Bay/Array selection list, and will display the new state.

The numbers shown on the left in the Bay/Array selection list area in the previous figure are the bay numbers. See “Bay/Array Selection List” on page 100 for an explanation of the bay numbers.

6. If you want to create a disk array, go to “Creating a Disk Array” on page 85.
7. If you are finished:
 - a. Select **Exit** or press **Esc**. A pop-up window will appear asking you to confirm your change.

Note: The changes you make are not saved until you confirm them by selecting **Yes** in the Confirm pop-up window.
 - b. Select **No** if you do not want the drive you selected to use the new drive state. Select **Yes** to accept the new drive state.
 - c. Back up the disk-array configuration information to diskette. Refer to “Backing Up Your Disk-Array Configuration” on page 116 for instructions.

Results of a Hard Disk Drive Failure

Depending on the circumstances, a drive failure can result in several possible situations.

Scenario 1:

- Only one hard disk drive fails.
- A hot-spare drive is defined that is the same size or larger than the failed drive.

The hot spare will take over immediately.

Note: Any logical drives with RAID level 0 are blocked during the Rebuild process, and remain blocked until unblocked. The ServeRAID configuration program automatically unblocks all drives at the end of the rebuild operation.

Scenario 2:

- Only one hard disk drive fails.
- A hot-spare drive is not defined or is smaller than the failed drive.
- The logical drives in the array are assigned RAID levels 0, 1, 5, or a combination of these levels.

All data in logical drives assigned RAID level 0 will be lost. In this array, the logical drives that are assigned RAID level 1 or 5 will be in Critical (CRT) state. The logical drives assigned RAID level 0 will be in the Offline (OFL) state.

Scenario 3:

If more than one drive in an array fails, all the data is lost in all of the logical drives of the array. For this reason, it is important that you replace and rebuild a defunct drive as soon as possible.

Logical and Hard Disk Drive Status Indications

The status of the hard disk drive determines the status of the logical drives in the array in which the hard disk is grouped.

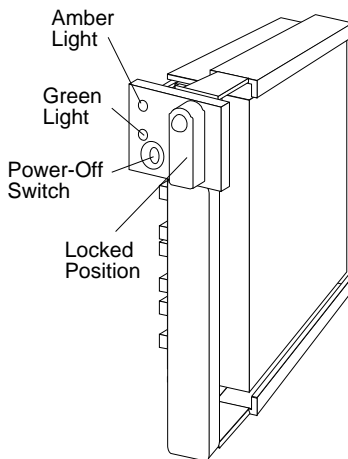
- A single hard disk drive failure, (indicated by a **DDD** status in the Bay/Array selection list), generates a **CRT** status for the array's logical drives that are assigned levels 1 and 5. Data in logical drives with a **CRT** is not lost. You must replace the one defunct hard disk drive promptly, and perform a Rebuild operation. If two hard disk drives were to fail, all of the data in the array would be lost.

After you install a new hard disk drive, the Replace process changes the drive status from **DDD** to **RBL** if the array contains a **CRT** logical drive. After the Rebuild process, the hard disk drive status changes from **RBL** to **ONL**.

- A multiple hard disk drive failure causes logical drives in that array that to have an Offline (OFL) status. This means that data is lost in all the logical drives in that array, regardless of which RAID level is assigned.

Replacing a Faulty Drive

Note: The LEDs on the hard disk drive tray provide information about the status of the drive.



The following table summarizes the LED states and their meanings.

Green	Amber	Description
On	Off	Drive tray is powered on; the hard disk drive is inactive; and the drive should <i>not</i> be removed.
Blinking	Off	The hard disk drive is inactive. The hot-swap drive can be removed safely.
On	On or Blinking	The hard disk drive is in use, and should <i>not</i> be removed.
Off	Off	The drive is defective, or no power is being supplied to the drive. The hot-swap drive can be removed safely.

Check the drive for damage. If the drive is not damaged, check the position of the drive. If it is not inserted correctly, reposition the drive. Verify that the drive is positioned correctly.

If you are using one of the Administration and Monitoring programs provided with your disk-array model, you can use it to identify the defunct drive and designate a drive to replace the defunct drive without restarting the server. Refer to the README file on the Device Driver/Administration and Monitoring diskette for instructions on your operating system.

Do the following steps to replace a faulty drive using the ServeRAID configuration program:

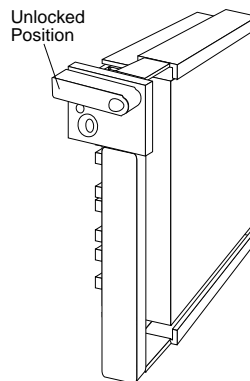
1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).

If the drive failed while the system was powered down, a message identifying the defunct drive appears the next time the system is powered on.

2. Physically replace the drive or assign a hot-spare or other appropriate drive as a replacement:

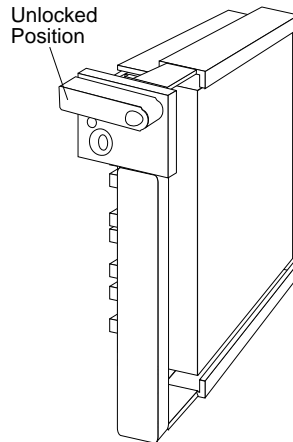
Attention: Removing the wrong hard disk drive can cause loss of all data in the array.

3. If you are assigning a hot-spare or another appropriate drive to replace the defunct drive, go to “Rebuilding a Logical Drive” on page 109. If you are physically replacing the hard disk drive, go to step 4.
4. Press the power-off switch on the drive tray. When the green LED begins to blink, it is safe to remove the drive.
5. Unlock the drive by turning the knob clockwise 90 degrees.

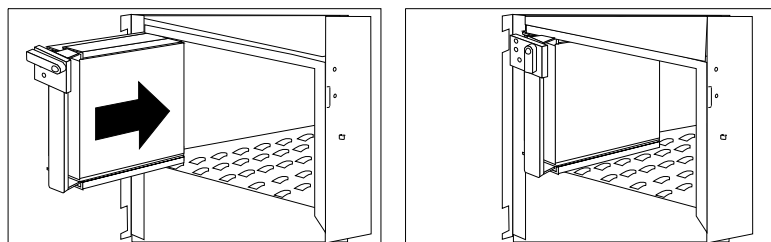


Drive Maintenance

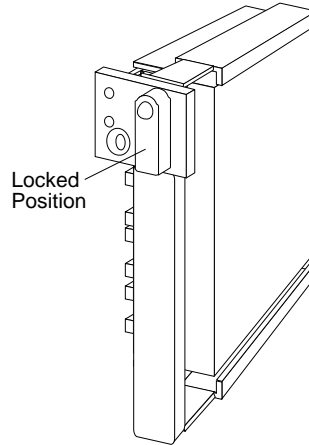
6. Disconnect the drive from the connector on the backplane, by grasping the handle on the drive tray and pulling the drive out of the server. Store the drive in a safe place.
7. Install the hard disk drive:
 - a. Move the tray knob to the unlocked position.



- b. Position the drive tray assembly vertically, with the connector facing the rear of the server.
 - c. Align the side of the tray with the raised guides on the bottom of the bay. (Note the arrows pointing towards the backs of the bays.)



- d. Slide the drive tray to the rear of the bay until it connects to the backplane. Be sure it is connected properly to the backplane.
- e. Move the tray knob to the locked position.



Note: The green light on the front of the drive tray illuminates, indicating that the drive was installed correctly.

8. Go to “Rebuilding a Logical Drive.”

Rebuilding a Logical Drive

Review this section before you rebuild a logical drive.

- If the logical drive is critical, you must rebuild the defunct drive.
- Data in a logical drive assigned RAID level 0 is lost during a rebuild. If you backed up your drive before the drive failed, you can restore the data to this drive.

Drive Maintenance

- If a physical drive being rebuilt contains logical drives defined as RAID level 1 or 5 and a logical drive at RAID level 0, the RAID level 0 drive is blocked to external access during the rebuild.
 - If you initiated the rebuild through the Administration and Monitoring program, you must unblock the RAID level 0 drive when the rebuild is complete.
 - If you initiated the rebuild through the ServeRAID configuration program and the rebuild was interrupted, drives with RAID Level 0 can be automatically unblocked when you restart the server.
- Only one rebuild operation can take place at a time.
- The drive being rebuilt must be the same size or larger than the failed drive.
- If multiple hot-spare drives are available, the adapter searches all bays on each channel for a hot-spare drive of the appropriate size; the first one found enters the Rebuild state.
- Under the following circumstances, a Rebuild operation can be completed quickly:
 - The defunct (DDD) drive was *not* defective.
 - The drive is in the same bay.
 - No write operations or configuration changes that require rebuilding data in the drive have occurred since the hard disk drive entered the DDD state.

If you are using one of the Administration and Monitoring programs provided with your disk-array model, you can use it to identify the defunct drive and designate a drive to replace the defunct drive without restarting the server. Refer to the README file on the Device Driver/Administration and Monitoring diskette for instructions on your operating system.

To replace a faulty drive using the ServeRAID configuration program:

1. Start the ServeRAID configuration program. When the *Following drives not responding* prompt appears, press **F5** to continue loading the ServeRAID configuration program.
2. Select **Rebuild/Device Management** from the Main Menu.
3. Select **Rebuild Drive** from the Rebuild/Device Management menu. The cursor becomes active in the Bay/Array list.
4. Select the replacement drive that you want to use for the rebuild operation. A pop-up window appears.
 - Select **Same Location** if you physically replaced a hard disk drive in the same bay.
 - Select **New Location** to assign a hard disk drive in a new location. You will be prompted to select the drive that you want.

Information and status messages about each stage of the rebuilding process appears on the screen.

5. When the rebuilding process is completed, press **Esc** to return to the Main Menu. The new configuration will be saved automatically.
6. Backup the new configuration (see “Backing Up Your Disk-Array Configuration” on page 116).
7. Select **Exit** to end the ServeRAID configuration program.
8. Remove the diskette and press **Ctrl+Alt+Del** to restart the system.

Resetting the Adapter Configuration

The RAID configuration information stored in the adapter NVRAM is critical to reliable operation of the disk-array. Therefore, to protect the integrity of the configuration information, copies of the configuration information are stored in the adapter EEPROM and on each hard disk drive in a Rebuild or Online state that is defined in the adapter NVRAM configuration. Each time the configuration information is changed, all corresponding copies are updated.

Resetting the Adapter Configuration

During POST, if the configuration information in the adapter NVRAM, EEPROM, and hard disk drive does not match, an error message appears. You can view each configuration to determine which you want to use.

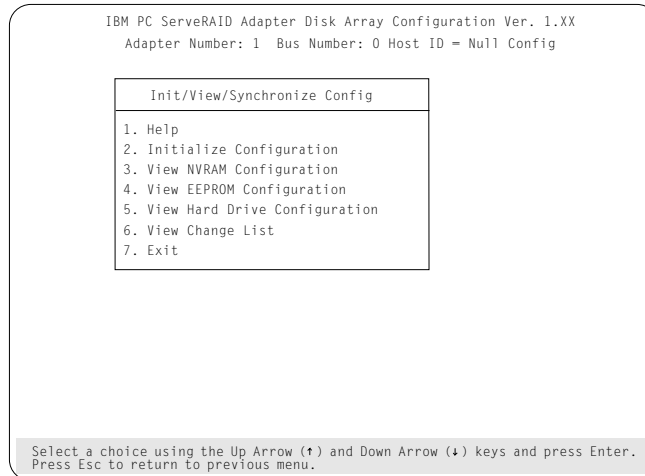
The Init/View/Synchronize Configuration menu enables you to view or reset the following parameters:

- **Initialize Configuration** restores the factory default settings, and resets all functional, connected, hard disk drives to the Ready (RDY) state.
- **View NVRAM Configuration** displays the current configuration settings for the adapter's NVRAM.
- **View EEPROM Configuration** displays the current configuration settings for the adapter's EEPROM.
- **View Hard Drive Configuration** displays the current configuration settings for the selected hard disk drive that is in the online (ONL) or rebuild (RBL) state.
- **View Change List** displays the configuration conflicts that the ServeRAID adapter reported since the last time the server was powered on or restarted. For more information, see “Viewing Configuration Changes” on page 113.

To initialize, reset, or view the adapter configuration:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Advanced Functions** from the Main Menu.
3. Select **Init/View/Synchronize Config**.

4. Select your choice from the next menu; then press **Enter**.



5. Follow the instructions on the screen.

Viewing Configuration Changes

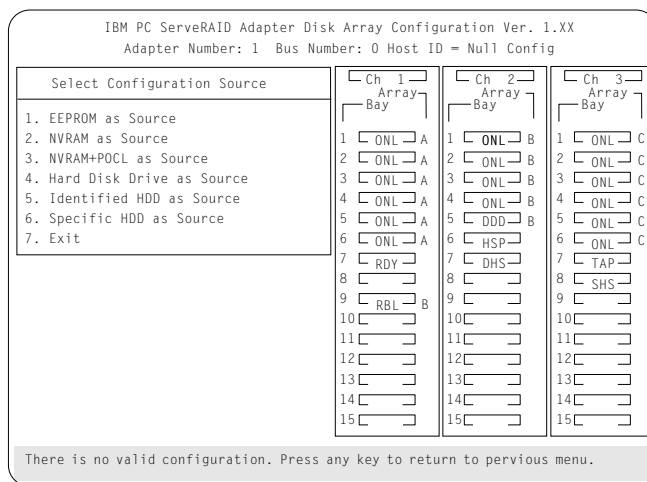
This option allows you to view the configuration changes that might have occurred since the last time the server was powered on or restarted.

- **View Power-on Change List** displays any drives that have changed states since the last time the server was powered on or restarted.
- **View Wrong SCSI ID List** provides a list of hard disk drives that were found at a different SCSI ID location than the last time the server was powered on or restarted.
- **View Unidentified Drive List** provides a list of hard disk drives that have an identifier that does 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 as the server serial number or any string, up to 12 characters. (See “Changing the ServeRAID Adapter Parameters” on page 124 for more information.)

Synchronizing the Adapter Configuration

When the configuration information in the adapter NVRAM, EEPROM, and hard disk drives does not match, you can select one source, and copy the selected configuration information to the other locations. This menu provides options to synchronize this configuration information.



- **EEPROM as Source** copies configuration information from the adapter EEPROM to NVRAM and to all hard disk drives in a Rebuild or Online state that are defined in the adapter EEPROM configuration.
- **NVRAM as Source** copies the configuration information from NVRAM to the adapter EEPROM and to all hard disk drives in a Rebuild or Online state defined in the NVRAM configuration.
- **NVRAM and POCL as Source** updates information from the power-on change list with the information in NVRAM. This information is then copied to the adapter EEPROM and to all hard disk drives in a Rebuild or Online state that are defined in the NVRAM configuration.
- **Hard Disk Drives as Source** retrieves configuration information from hard disk drives. The configuration information is then copied to the adapter NVRAM and EEPROM.

- **Identified HDD as Source** updates the configuration information with stored configuration information on a hard disk drive that matches the identifiers stored in the NVRAM. The updated configuration information is then copied to NVRAM, the adapter EEPROM, and the hard disk drives configured in an array.
- **Specific HDD as Source** retrieves the configuration information with stored configuration information on the hard disk drive that you select. The updated configuration information is then copied to NVRAM, EEPROM, and configured hard disk drives.

Running RAID Subsystem Diagnostic Tests

The ServeRAID Subsystem Diagnostic program provides several utility programs that allow you to test the ServeRAID adapter and the devices connected to it.

To run the RAID diagnostic utility programs, do the following steps:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Advanced Functions** from the Main Menu.
3. Select **IBM RAID Subsystem Diagnostic**.
4. Select the diagnostic test that you want to run and press **Enter**:
 - **Run Adapter Self-test** runs diagnostic tests on the ServeRAID adapter.
 - **SCSI Device Self-test** runs diagnostic tests on the SCSI devices attached to the ServeRAID adapter.
 - **Drive Media Test** verifies that all sectors on a hard disk drive can be accessed. 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” on page 120.
5. Follow the instructions on the screen.

Additional Disk-Array Tasks

This section contains procedures for performing additional, less common, disk-array tasks. You can select several utility programs:

- Back up configuration to diskette
- Restore configuration to diskette
- Change the write policy
- Change the RAID parameters
- Format a drive
- Obtain drive status
- Change the ServeRAID adapter parameters

Attention notices appear throughout this section to alert you about potential loss of data. Similar warning messages appear on the screens for these procedures. Read these warnings carefully before answering yes to the confirmation requests.

Backing Up Your Disk-Array Configuration

The ServeRAID adapter maintains a record of the disk-array configuration information in its nonvolatile RAM (NVRAM) and electrically erasable programmable read-only memory (EEPROM) module. The disk-array configuration is *vital information*. To protect this information, back up the information to diskette as soon as you have completed your tasks.

To back up the disk-array configuration information to diskette:

Note: You need a blank, formatted, 3.5-inch diskette.

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 80).
3. Select **Advanced Functions** from the Main Menu.
4. Select **Backup config. to diskette**.
5. Remove the ServeRAID Adapter Configuration Diskette from the drive and insert the blank diskette.
6. Follow the instructions on the screen.

Restoring the Disk-Array Configuration

To restore the disk-array configuration information in the ServeRAID adapter, use the ServeRAID Adapter Configuration Diskette and an up-to-date Disk Array Configuration Backup diskette.

Note: Because dynamic changes in the configuration of your disk array occur due to hot-spare drive replacement or other drive maintenance activity, the configuration backup information on the diskette might be different from that in the adapter. 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 80).
2. Select **Advanced Functions** from the Main Menu.
3. Select **Restore config. from diskette**.
4. Follow the instructions on the screen.

Changing the Write Policy

When you configure a logical drive, the RAID adapter automatically sets the write policy to *write-through* (WT) mode, where the completion status is sent *after* the data is written to the hard disk drive. Under certain workloads, you can improve performance by changing this write policy to *write-back* (WB) mode, where the completion status is sent *after* the data is copied to adapter cache memory, but *before* the data is actually written to the hard disk drive.

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

Additional Disk-Array Tasks

If you change the write policy to write-back, wait at least 10 seconds after your last operation before you turn off the server. It takes that long for the system to move the data from the adapter cache memory to the hard disk drive. Failure to follow this practice can result in lost data.

To change the write policy:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Advanced Functions** from the Main Menu.
3. Select **Change Write Policy** from the Advanced Functions menu. The cursor will be active in the Logical Drive list.
4. Select the logical drive whose write policy you want to change. A screen similar to the following appears:

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

Advanced Functions

1. Help
2. Backup config. to Diskette
3. Restore config. from Diskette
4. Change Write Policy
5. Change RAID Parameters
6. IBM RAID Subsystem Diagnostics
7. Init/View/Synchronize Config
8. Display/Change Adapter Params
9. Exit

Array ID	Log Size	RAID Level	Date	Status	Wrt Pol
A	4300	A0 100	RAID-0 12/13/95	OKY	WT
B	4300	A1 500	RAID-1 12/13/95	OKY	WT
C	4300	A1 500	RAID-1 12/13/95	OKY	WT

Select logical drive and press Enter to toggle the write policy.

Note: Your information might be different from that shown in this screen.

The Logical Drive list contains the logical drive ID, the size in megabytes of each logical drive, the RAID level you assigned to that logical drive, and the date you created it.

The status of the logical drive is also shown. **OKY** means that no problem conditions are associated with the drive; **CRT**

means that you must replace the hard disk drive and rebuild the logical drive. (You will have received a message telling you what has happened to the drive.) **OFL** means that the logical drive is irrecoverable; the data in that drive is lost.

5. Locate the **Wrt pol** (Write Policy) field in the Logical Drive list.
The write policy is shown as either **WT** (write-through, which is the default setting) or **WB** (write-back).
6. Select the logical drive whose write policy you want to change.
Attention: If you change the write policy to write-back, wait at least 10 seconds after your last operation before you turn off the server. 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.
Notice that **WT** changes to **WB**. You can press **Enter** to alternate between **WT** and **WB**.
8. When you have made your choice, press **Esc** to return to the Advanced Functions menu.
9. Select **Exit**. The Confirm pop-up window appears asking you to confirm your action.
10. To return the setting to its original state, select **No**. To save your changes, select **Yes**.
11. Back up the disk-array configuration information to diskette. Refer to “Backing Up Your Disk-Array Configuration” on page 116 for more information.

Formatting Drives

You can perform a low-level format on drives with **RDY** (Ready), **EMP** (Empty), **SBY** (Standby), **SHS** (Standby Hot-Spare), or **HSP** (Hot-spare) state.

Note: The **Format Drive** choice on the IBM RAID Subsystems Diagnostics menu provides a low-level format. If you install a new hard disk drive that requires a standard format, use the Format command provided by your operating system.

The ServeRAID configuration program provides the Format program so that you can perform a low-level format on a drive controlled by the ServeRAID adapter.

To perform a low-level format:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Advanced Functions** from the Main Menu.
3. Select **IBM RAID Subsystems Diagnostics** from the Advanced Functions menu.

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**. The low-level format program starts.
5. Follow the instructions on the screen.

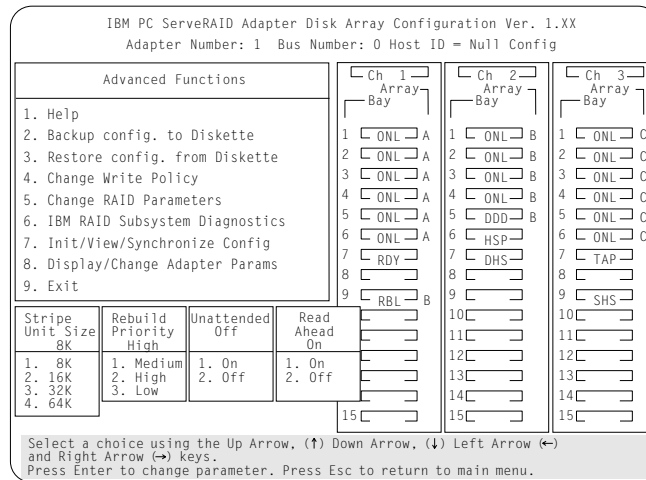
You can perform a low-level format on one drive at a time.

Note: If formatting is interrupted, the drive being formatted might display as an Empty state (- - -) or blank in the Bay/Array selection list. Select the drive, and format it again.

Changing the RAID Parameters

To change the RAID parameters:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Advanced Functions** from the Main Menu.
3. Select **Change RAID Parameters**.



The default settings are:

- Stripe unit size — 8K

Attention: Once the stripe unit is chosen and data is stored in the logical drives, the stripe unit cannot be changed without destroying data in the logical drives.

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 the stripe unit such that the stripe-unit size is close to the size of the system I/O request. The default is set to 8 K data bytes.

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

Additional Disk-Array Tasks

size is 32 K or 64 K, the maximum number of drives in an array is 8.

- **Rebuild Priority — High**

Rebuild priority can be set to high, medium, or low. When the rebuild request is set to high, the rebuild I/O request gets high priority in the execution order.

When the rebuild request is set to medium in a heavily loaded system (with a medium rate of system I/O requests), the medium-priority rebuild can reduce the disk rebuild time at the expense of degraded handling of I/O requests.

When the rebuild priority is set to low, in a moderate to heavily loaded system, low rebuild priority will increase the disk rebuild time but provides better system performance.

Note: Rebuild priority can be changed without affecting data in the logical drives.

- **Unattended Mode — Off**

You can enable the adapter to accept changes in the configuration without user input. Unattended mode is useful when the server operates remotely. See “Unattended Mode of Operation” on page 123 for more information.

When Unattended Mode is On, and a hard disk drive is found in a location other than the one defined in the adapter configuration, the program pauses briefly for user input, then, automatically rearranges the configuration information to correct the logical drive configuration. Unattended mode also clears any locked stripes and any blocked drives.

When Unattended Mode is Off, the program waits for user input.

- Read ahead — On

Normally, the ServeRAID adapter transfers data from disk to its local cache in steps of stripe-unit size. This provides excellent overall performance when workloads tend to be sequential. However, if the workload is random and system I/O requests are smaller than stripe-unit size, reading ahead to the end of the stripe unit will result in a wasted SCSI bus bandwidth and wasted disk utilization. When read-ahead is set to Off, the size of data transfer from the disk to local cache is equal to the system I/O request size, and no read-ahead to the end of the stripe unit is performed.

Notes:

1. The read-ahead setting can be changed without destroying data in a logical drive.
2. When the configuration is saved on a diskette, the RAID parameters are saved also.

Unattended Mode of Operation

You can enable the adapter to accept changes in the configuration without user input. When this mode is enabled (see “Changing the RAID Parameters” on page 121 for information), the adapter pauses briefly to permit a user to override the default action; then the adapter makes the necessary changes. Unattended mode also clears any locked stripes and any blocked logical drives. This mode is useful when the server operates remotely.

The adapter “chooses” an action that is equivalent to pressing one of the following function key:

F5: The server continues the startup operation after identifying the drive that is defunct. For example, an HSP drive failed to respond during POST. Startup continues without the HSP drive; its drive state will display as DHS.

F6: When a drive has been removed from the server, for example, for maintenance or security, and was returned, but in a different bay, the adapter adjusts the configuration to the drive's new location.

F7: An adapter with stored configuration information that does not match that of the configured drives present, imports the configuration information from the drives.

The ServeRAID adapter assigns the following priorities to the function keys:

If this action/key is available	Priority of actions
F7	F7, F6, F5
F6	F6, F5
F5	F5

Changing the ServeRAID Adapter Parameters

Display/Change Adapter Parameters allows you to view and change the adapter's configuration parameters.

To display or change the adapter parameters:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 80).
2. Select **Advanced Functions** from the Main Menu.
3. Select **Display/Change Adapter Params** and press **Enter**. The following screen appears.

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

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Select option for which to set BIOS compatability bit.

- **Display/Adapter Status** allows you to view the status of the adapter.
- **Change Adapter Host/SCSI ID** allows you to change the adapter SCSI ID and the SCSI transfer rate. You can also define the host configuration ID as any 12 characters. In addition, you can change the number of drives in a group that will startup simultaneously, and set the start-up delay in seconds between groups of drives.
- **Set BIOS Compatibility Mapping** allows you to set the BIOS mapping to 2 GB or 8 GB.

Additional Disk-Array Tasks

- **Set Channel => Bank Mapping** allows you to specify which bank is connected to each of the internal Channels on the ServeRAID adapter. The following table shows the default mapping.

Bank	Default connection
C	Channel 3
D	Channel 2
E	Channel 1

You can also specify the setting of the SCSI ID backplane jumper. This mapping is critical for the correct operation of the Administration and Monitoring program, which uses the settings to identify drives, control power to specific drives, and operate the SCSI LEDs.

For example, suppose you daisy-chained banks D and E, connecting the input connector on bank D to Channel 2 on the adapter. The SCSI ID backplane jumper on bank E is set to HI. (See “Setting Backplane SCSI ID Jumpers (J12)” on page 274.) In this configuration, Channel 1 is available for external devices. Set the Bank Mapping as shown:

Channel	Low ID	High ID
Channel 1		
Channel 2	D	E
Channel 3	C	

4. Follow the instructions on the screen.

Using the Mini-Configuration Program

The Mini-Configuration program is a quick way to display the adapter settings, and to perform a limited set of the configuration functions without using the IBM PC ServeRAID Adapter Configuration Diskette.

To access the ServeRAID adapter Mini-Configuration program:

1. Turn on the server, or, if the system is on, press **Ctrl+Alt+Del**.
2. Press **Ctrl+I** immediately when the Mini-Configuration prompt appears on the screen.
3. Press **Enter**.

If you have more than one ServeRAID adapter installed, you will get an adapter selection screen; otherwise, the Main Menu appears.

- **View Adapter Status** displays the current status of the ServeRAID adapter. (See “Viewing the Adapter Status” on page 128 for information.)
 - **View Configuration** to see the current configuration information for the ServeRAID adapter. (See “Viewing Configuration Information” on page 129 for information.)
 - **Advanced Functions** resets the adapter, initializes the configuration, and imports the configuration from drives. (See “Using Advanced Configuration Functions” on page 129 for information.)
4. Select a menu item, press the number of the item or use the Up Arrow (↑) key or Down Arrow (↓) key to highlight the item, then press **Enter**.
 5. Follow the instructions on the screen.
 6. Select **Exit** to leave the Main Menu.

Viewing the Adapter Status

The **View Adapter Status** choice allows you to view the status of the adapter's disk array.

The menu contains the following fields:

- **Unattend** displays the on/off state of Unattended Mode.
- **Boot Block Version** displays the current version number of the Boot Block.
- **Code Block Version** displays the current version number of the firmware on the adapter.
- **Rebuild Rate** displays the speed of rebuild. (See “Changing the RAID Parameters” on page 121.)
- **No. of DDD Drv.** displays the number of defunct drives.
- **No. of OFL Drv.** displays the number of offline logical drives.
- **No. of CRT Drv.** displays the number of critical logical drives.
- **Cfg. Updates** displays the number of times that the configuration has been updated.
- **Flash Pgms** displays the number of times that the firmware flash/EEPROM has been updated.
- **Logical Drive with Bad/Blocked Stripe** identifies any logical drive that has bad stripes, as well as logical drives that are in the blocked state.

Viewing Configuration Information

The **View Configuration** choice allows you to view the number and size of logical drives installed. It also displays the RAID level, current state, stripe size, write policy, read ahead status, and the creation date for each logical drive.

IBM PC ServeRAID Adapter Disk Array Mini-Configuration Ver. 1.XX

View Adapter Configuration Information
 No: 1 Bus: 0 Slot: 14

Logical Drive	Size (MB)	RAID Level	Current State	Stripe Size	Wrt Pol	Read Ahead	Date Created mm/dd/xx
0	100	5	OKY	8K	WT	NO	01/18/96
1	100	5	OKY	8K	WT	NO	01/18/96
2	100	5	OKY	8K	WT	NO	01/18/96
3	100	5	OKY	8K	WB	NO	01/18/96
4	100	5	OKY	8K	WB	NO	01/18/96
5	99	1	OKY	8K	WT	NO	01/18/96
6	200	5	OKY	8K	WT	NO	01/18/96
7	300	1	OKY	8K	WT	NO	01/18/96

Press any key to continue

Using Advanced Configuration Functions

The **Advanced Functions** choice allows you to reset the ServeRAID adapter, initialize the configuration, and import the configuration from drives.

- **Reset the Adapter** resets the adapter configuration values to the factory defaults.
- **Initialize Configuration** restores the factory default settings and sets all functional, connected hard disk drive states to the Ready (RDY) state.
- **Import Configuration from Drives** reads the configuration information from the drives and copies it to NVRAM and the EEPROM modules on the adapter.

Using the Mini-Configuration Program

Chapter 4. Configuring the PeerMaster Adapter

Some PC Server 520 models come with an IBM Ethernet Quad-BT PeerMaster Server Adapter installed as a standard feature. This chapter contains instructions for configuring, cabling, and testing the PeerMaster adapter. You must configure, cable, and test the PeerMaster adapter before you install your network operating system and the PeerMaster LAN software.

This chapter contains:

Choosing a Mode of Operation	132
Traditional Adapter Mode	132
VNET Switch Mode	133
Examples of Configurations	134
Running the Configuration Program	141
Attaching Network Cables to Your Adapter	145
Testing the PeerMaster Adapter	146

Choosing a Mode of Operation

You can configure your PeerMaster adapter to operate in either of two modes: the Traditional Adapter mode or the VNET Switch mode. Use the Traditional Adapter mode when you expect little or no cross-subnetwork traffic. (Subnetwork is also called *subnet*.) Use the VNET Switch mode when you need to build subnets to provide cross-segment traffic. Choose the mode of operation and configuration that fits the needs of your network. Both modes of operation are described in this section; examples of configurations begin on page “Examples of Configurations” on page 134.

Traditional Adapter Mode

When the PeerMaster adapter is functioning in this mode, the drivers for your adapter register each individual LAN segment with the network operating system (NOS) as a unique subnet. Thus, your NOS views your adapter as four separate adapters. Therefore, you must configure each network segment with a unique network number.

All cross-subnet traffic must be routed. Routing can be performed internally by the server itself, or externally by a local router. Internal routing is the least expensive alternative, but impairs server responsiveness by involving the server in frame forwarding. External routers provide high-performance frame forwarding without impacting the server. However, they are cumbersome, expensive, and difficult to configure and manage.

Following are guidelines for using the Traditional Adapter mode:

- Do not externally join (using bridges, switches, or concentrators) ports of adapters.
- You can configure as many nodes as you need; the adapter places no limit on the number of nodes per port.
- Ensure that each port is bound to the protocol with a unique network number.

VNET Switch Mode

When the adapter is operating in this mode, multiple LAN segments are registered with the NOS as a single subnet, called a *VNET*. VNETs are multisegment virtual subnets.

VNETs are made possible by a layer of virtual network software that binds to multiple instances of the adapter LAN driver and registers them with the NOS as a single subnet. Multiple PeerMaster adapters can be configured to interoperate in various ways, such as:

- Traditional subnets
- One large VNET
- Multiple independent VNETs
- Any combination of VNETs and traditional subnets

All physical segments within a VNET are configured to the same network number. Cross-segment traffic within a VNET is switched by your adapter instead of by your server, allowing the server to be more productive. The server is shielded from the task of routing, which enables the creation of powerful switched, multi-segment, high-bandwidth workgroups or departments. External internetworking devices are not required to provide communication between segments with a VNET.

Following are guidelines for using the VNET Switch mode:

- Do not externally join (using bridges, switches, or concentrators) ports of adapters that comprise a VNET.
- You can configure as many nodes as you need; the adapter places no limit on the number of nodes per port.
- Ensure that all ports in a VNET are bound to the protocol (by way of VNET) with a common network number.

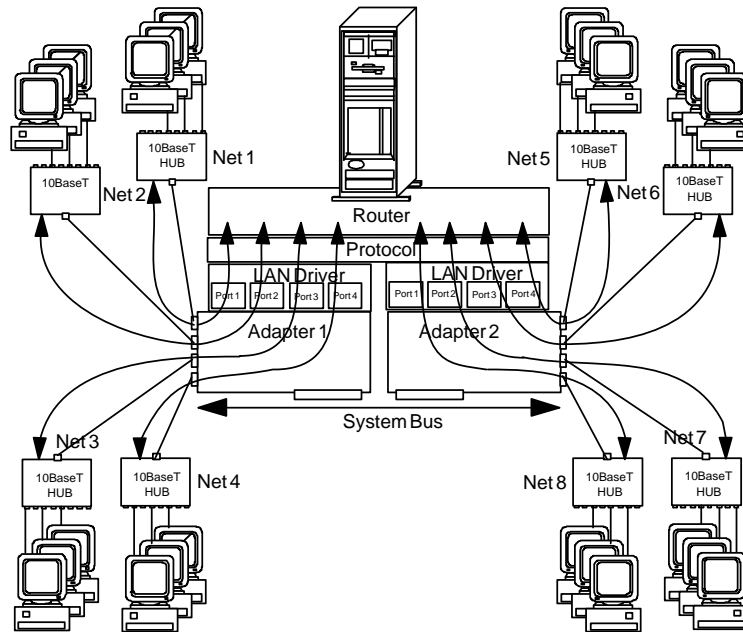
Examples of Configurations

You can use PeerMaster adapters to create a variety of network configurations. The following examples illustrate some basic network configurations that you can create. Use these examples as guidelines to determine the best configuration for your needs.

This section describes the following configurations:

- Traditional Adapter mode:
 - An 8-port network with two PeerMaster adapters configured in the Traditional Adapter mode
- VNET Switch mode:
 - An 8-port network with two PeerMaster adapters configured in the VNET Switch mode
 - An 8-port network with two PeerMaster adapters, each configured as an independent VNET
 - An 8-port network with two PeerMaster adapters, one configured in the VNET Switch mode and the other in the Traditional Adapter mode

Traditional Adapter Mode Configuration



This illustration shows:

- A server with two PeerMaster adapters configured in the Traditional Adapter mode.
The network protocol views each LAN segment as a separate subnet with its own network number. Clients on all ports have direct access to the server.
- A configuration of eight separate network numbers.
- Curved arrows illustrating the basic flow of cross-subnet traffic.
The server-based router accepts and forwards all frames that require routing between subnets.

Choosing a Mode of Operation

- Software layers illustrated above the adapters indicating software that is required to route traffic internally, running on the server.

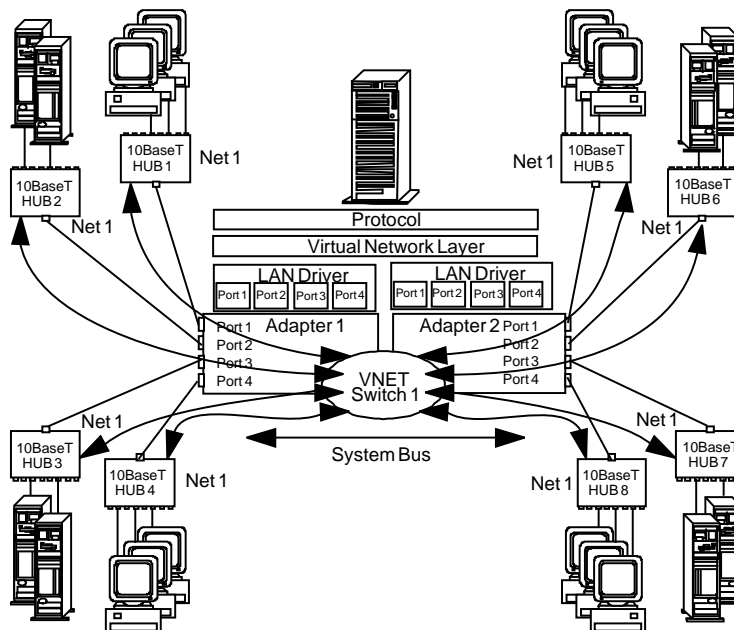
Cross-subnet traffic, such as traffic from Net 1 to Net 2, must be forwarded by a router. The router can be internal to the server or an external stand-alone device.

The advantage of the Traditional Adapter mode is that a router restricts cross-subnet traffic to only those data packets that are uniquely addressed to the target network. The disadvantage of this mode is that server responsiveness might be heavily impaired due to the burden of packet routing. This mode should be used only when little or no cross-subnet traffic is expected.

VNET Switch Mode Configurations

This section describes three configurations using VNET switch mode.

Configuration 1



This illustration shows:

- Two PeerMaster adapters (Adapter 1 and Adapter 2) forming a single VNET.

In this configuration, the adapter provides the functions of a high-performance network adapter combined with the power of an Ethernet switching hub.

- All segments configured as Network number 1 (Net 1).
- Curved arrows indicating the flow of data across ports connected by the VNET switch.

Choosing a Mode of Operation

The VNET switch performs all cross-segment traffic and, therefore, server responsiveness is not impaired by heavy cross-segment traffic.

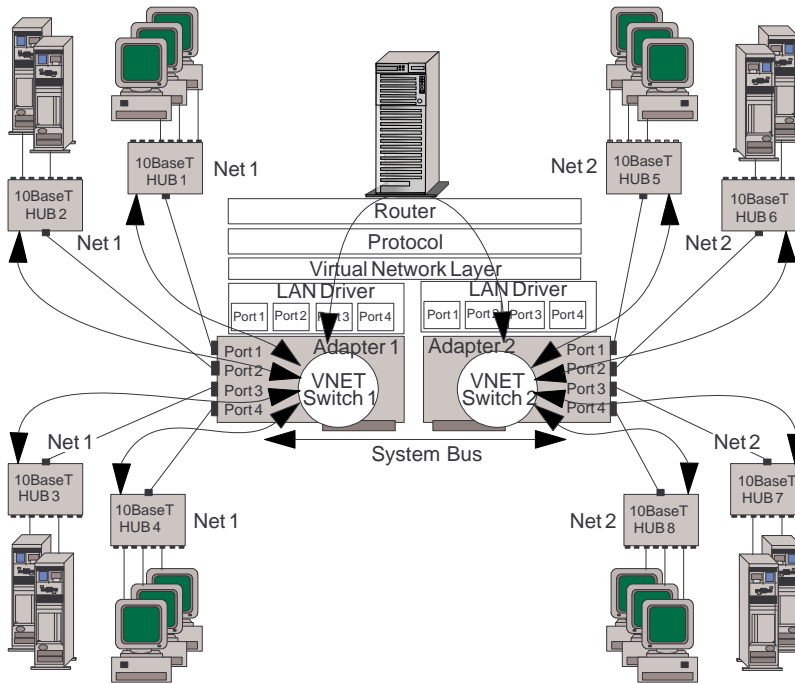
The adapters perform two types of frame switching: port-to-port and peer-to-peer.

Port-to-port Occurs when the source and destination ports both reside on the same adapter. For example, the adapter forwards data packets between ports 1 and 2 of adapter 1.

Port-to-port switching is completely transparent to the server microprocessor.

Peer-to-peer Occurs when the source and destination ports reside on separate adapters. Peer-to-peer switching is accomplished through peer data transfers across the Micro Channel bus. For example, the adapters forward data packets between port 1 of adapter 1 and port 1 of adapter 2.

Configuration 2



This illustration shows:

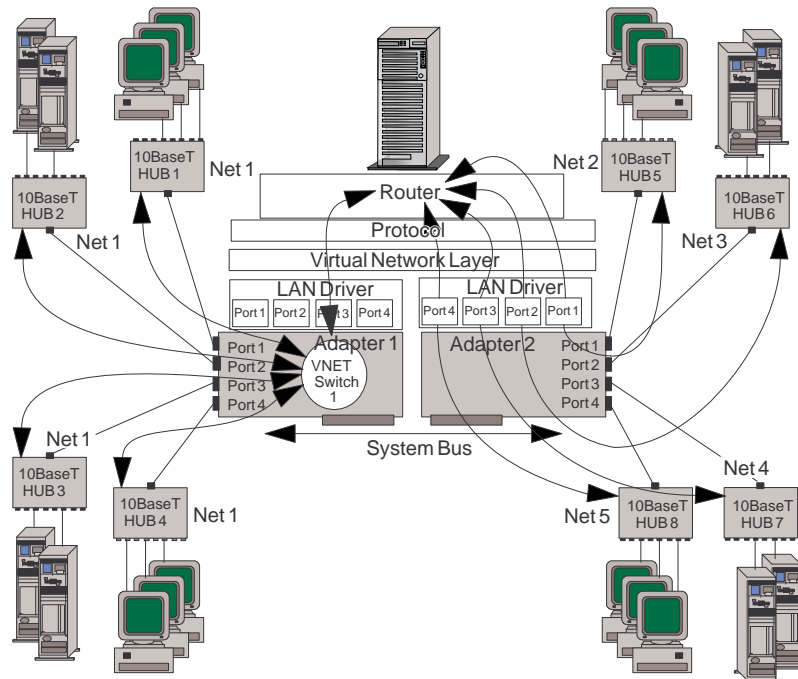
- A configuration of two network numbers (Net 1 and Net 2).
- An 8-port network with two PeerMaster adapters (Adapter 1 and Adapter 2), each configured as an independent VNET (two VNETs).
- The curved arrow that passes through the LAN drivers, protocol stacks, and router in the server represents the connection between the two subnets (Net 1 and Net 2). Cross-subnet traffic, such as traffic from Net 1 to Net 2, must be forwarded by a router. The router can be internal to the server or an external stand-alone device.

Each VNET can represent a separate department or workgroup. The four switched ports within each VNET provide a multisegment workgroup environment. Isolating the two VNETs by way of the

Choosing a Mode of Operation

server-based router allows you to create a separation between the two departments. You can configure the router to permit restricted traffic to pass between the departments.

Configuration 3: Use this configuration only when you expect little or no cross-VNET traffic.



This illustration shows:

- A five-subnet network (Net 1, Net 2, Net 3, Net 4, and Net 5) configured as one four-segment VNET (VNET1) on Adapter 1 and four traditional networks on Adapter 2.
- A network using PeerMaster adapters.
- Cross-subnet traffic, such as traffic from Net 1 to Net 2, must be forwarded by a router. The router can be internal to the server or an external stand-alone device.

This VNET can represent a large department while the traditional networks can represent small workgroups. You can configure the router to restrict traffic between departments.

Running the Configuration Program

The Automatic Configuration program on the Reference Diskette automatically sets the parameters for the PeerMaster adapter to their default values. You can use the Set/View Micro Channel Configuration program on the Reference Diskette to view the default settings or to manually configure the PeerMaster Adapter. You can avoid conflicts with your current setup by using the Automatic Configuration program.

If the default settings are acceptable for your environment, continue with “Attaching Network Cables to Your Adapter” on page 145. However, if you have a specific reason for manually configuring your adapter, you can use the following instructions.

To manually configure your adapter:

1. Insert the Reference Diskette in the primary diskette drive (usually drive A).
2. Turn on the server.
3. When the Main Menu appears, select **Set/View Micro Channel Configuration**.
4. Use the arrow keys to select the appropriate adapter and slot.

The configuration parameters will appear. Although default values are selected for you, you can change them. The configuration program will alert you to selections that result in system conflicts. Be sure to resolve any system conflicts before you exit the program.

Note: After you configure the PeerMaster adapter, continue with “Attaching Network Cables to Your Adapter” on page 145.

You can configure the following:

- Device I/O Address
- Interrupt Level

Running the Configuration Program

- Primary Arbitration Level
- Streaming Data
- Selected Feedback Return
- Address and Data Parity
- First Shared Storage Window Location

Device I/O Address

The Device I/O Address selects the system bus I/O address of the adapter. The adapter will not operate normally if the selected value results in a system conflict. You can select from the following addresses:

1C00H-1C1FH
3C00H-3C1FH
5C00H-5C1FH
7C00H-7C1FH
9C00H-9C1FH
BC00H-BC1FH
DC00H-DC1FH
FC00H-FC1FH

Interrupt Level

The interrupt level is the prioritized interrupt request line on which the adapter interrupts the system. The highest to lowest interrupt priorities are: Level 3, Level 4, then Level 5. The interrupt level can be shared with another adapter.

Primary Arbitration Level

This field is the primary arbitration level for the adapter bus master direct memory access (DMA) transfers. An arbitration level of 1 has the highest priority; increasing levels have corresponding decreased priority. You can select from 14 arbitration levels:

Level E Lowest priority
Level D
Level C
 :

Level 3
Level 2

Level 1 Highest priority

Streaming Data

This field enables or disables the Streaming Data feature of the adapter as both a bus master and a subordinate. The default state of this field is disabled, which causes the adapter to use the basic data transfer procedures. When enabled, the streaming data procedure is supported. You can select one of the following: Enabled or Disabled.

Selected Feedback Return

This field enables or disables the checking and reporting of loss of selected feedback return by the bus master of the adapter. The default state of this field is disabled. You can select one of the following: Enabled or Disabled.

Address and Data Parity

This field enables or disables the address and data parity checking and generation by the adapter. The default state of this field is disabled. You can select one of the following: Enabled or Disabled.

First Shared Storage Window Location

There are two independent windows into the random access memory (RAM) on the adapter. This is the first window that is located in the read-only memory (ROM) or RAM area. The size of this window can be either 8 KB or 16 KB. You can select from the following windows:

DE000H-DFFFFH:	8 KB Window
DC000H-DDFFFFH:	8 KB Window
DA000H-DBFFFFH:	8 KB Window
D8000H-D9FFFFH:	8 KB Window
D6000H-D7FFFFH:	8 KB Window
D4000H-D5FFFFH:	8 KB Window
D2000H-D3FFFFH:	8 KB Window
D0000H-D1FFFFH:	8 KB Window
CE000H-CFFFFH:	8 KB Window
CC000H-CDFFFFH:	8 KB Window
CA000H-CBFFFFH:	8 KB Window

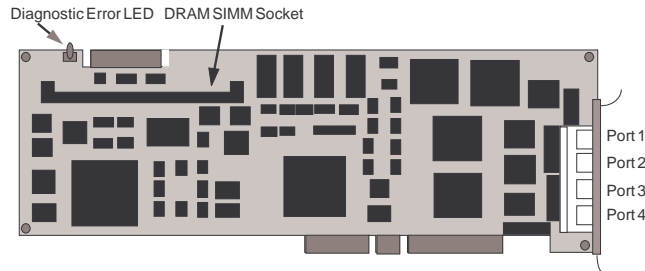
Running the Configuration Program

C8000H-C9FFFH:	8 KB Window
C6000H-C7FFFH:	8 KB Window
C4000H-C5FFFH:	8 KB Window
C2000H-C3FFFH:	8 KB Window
C0000H-C1FFFH:	8 KB Window
DC000H-DFFFFH:	16 KB Window
D8000H-DBFFFH:	16 KB Window
D4000H-D7FFFH:	16 KB Window
D0000H-D3FFFH:	16 KB Window
CC000H-CFFFFH:	16 KB Window
C8000H-CBFFFH:	16 KB Window
C4000H-C7FFFH:	16 KB Window
C0000H-C3FFFH:	16 KB Window

Note: The second window is used for peer data transfers. The setup program automatically selects this window above the 1 MB boundary in Micro Channel address space.

Attaching Network Cables to Your Adapter

The following illustration shows the location of the four Ethernet connectors on the PeerMaster adapter. The top connector on the adapter is port 1; the bottom connector is port 4.



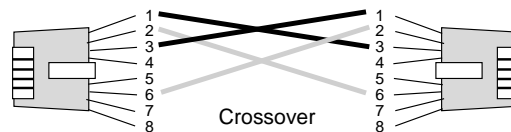
Attention: Ensure that you do not externally join ports of adapters (using bridges, switches, or concentrators).

You can connect two types of network cables to the PeerMaster adapter: straight-through and crossover.

Use straight-through cables when connecting your adapter to an external 10Base-T concentrator hub.



Use crossover cables to directly connect your PeerMaster adapter to another 10Base-T device, such as a workstation, server, or another adapter. Crossover cables create *dedicated segments*. A dedicated segment is two point-to-point devices connected to a dedicated link.



Continue with “Testing the PeerMaster Adapter” on page 146.

Testing the PeerMaster Adapter

Before installing your LAN software, verify the proper configuration and operation of your PeerMaster adapter by running the adapter test program. See “Testing the Computer” on page 167 for information on testing adapters.

To run the test program:

1. Insert the Reference Diskette in the primary diskette drive (usually drive A).
2. Turn on the server.
3. When the Main Menu appears, select **Test the computer**.
4. Select **Option diagnostics**; then press **Enter**. When prompted, remove the Reference Diskette and insert the Micro Channel Diagnostic Diskette.
5. Follow the instructions that appear on the screen.

The results appear as follows:

- If the diagnostic test is successful, you will get a message that the tests are completed.
- If the test is not successful, a dialog box will display an error message and an error number. See “Diagnostic and Setup Error Messages” on page 344 for a list of error numbers and possible corrective actions. You might have a hardware failure of your PeerMaster adapter, an installation error, or a system conflict.

When the diagnostic program successfully completes, your adapter is properly configured and operational. Continue with “Installing the PeerMaster LAN Software” on page 35.

Chapter 5. Configuring Your Server

This chapter provides information about each of the configuration and utility programs that come with your server, as well as instructions that tell you when and how to use them.

The Configuration/Setup utility programs are stored in BIOS (basic input/output system) in your server. With these programs, you can set the system date and time, define input and output device parameters, and define system security.

The PC Server 520 Reference Diskette and the PC Server 520 Diagnostic Diskettes that come with the server provide additional configuration and diagnostic support for the system board, disk drives, and other system components. The PC Server 520 Micro Channel Diagnostic Diskette supports the Micro Channel adapters.

This chapter contains:

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Micro Channel Configuration	152
Product Data	153
Configuring Devices and I/O Ports	154
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Reference and Diagnostic Diskettes	163
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Resolving Hardware Configuration Conflicts	169
Resolving Software Configuration Conflicts	170
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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 variety of devices and programs you install.

Your server has the flexibility and power to support several types of adapters. This flexibility lets you choose from among thousands of adapters and devices that comply with the following standards:

- Peripheral Component Interconnect (PCI)
- Micro Channel Architecture
- SCSI

In general, the greater the number and variety of hardware devices and software programs you install in your server, the more you will have to interact with your server and your devices to correctly configure your system.

Three hardware configuration utility programs come with your server:

- Configuration/Setup
- SCSISelect
- System programs on the Reference and Diagnostic Diskettes

In addition, some models come with the following configuration programs:

- ServeRAID
- PeerMaster

The built-in Configuration/Setup utility program configures system board functions, such as serial and parallel port assignments and the startup sequence for drives that you install. It also allows you to set passwords for starting up and accessing the Configuration/Setup utility program.

The built-in SCSI-2 utility program (SCSISelect Utility program) allows you to configure the SCSI devices that you install in your server. You can use SCSISelect to change default values, resolve

configuration conflicts, and perform a low-level format on a SCSI hard disk drive in a non-disk-array model.

The PC Server 520 Reference and Diagnostic Diskettes provide additional support for configuration and diagnostic activities. The Reference Diskette provides options for backing up and restoring the system diskettes, copying option diskettes, configuring Micro Channel adapters, and testing the computer. The PC Server System Board Diagnostic Diskette provides diagnostic tests for the system board, disk drives, and other system components. The PC Server Micro Channel Diagnostic Diskette provides diagnostic tests for Micro Channel adapters.

Before installing a new device or program, read the documentation shipped with it. Reading the instructions helps you determine the steps required for installation and configuration. The following table provides a preview of the actions that might be required to configure your server.

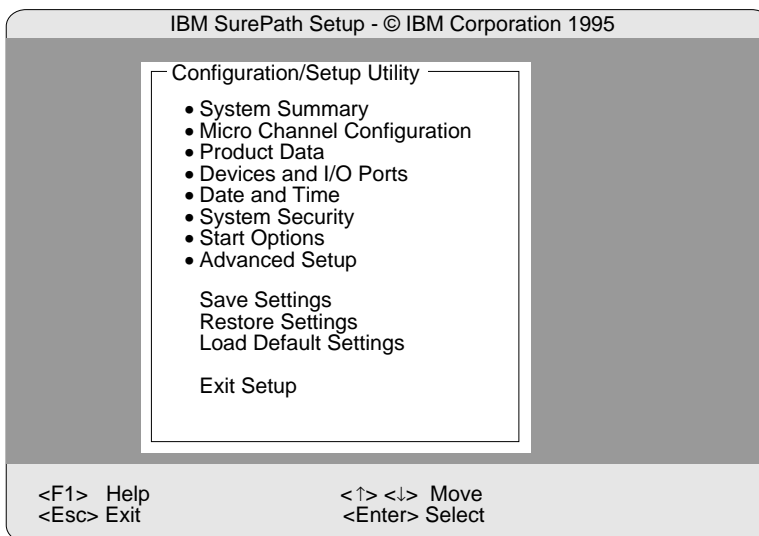
1. Run the Configuration/Setup utility program and record the current configuration settings.
2. Set jumpers or switches on the device.
See the device installation instructions.
3. Install the device in the server.
See Chapter 6, "Installing Options" on page 175.
4. Start the Reference Diskette and:
 - a. Record the current settings.
 - b. Install any adapter description files (.ADF).
5. Install software programs.
See the installation instructions shipped with the software.
6. Resolve configuration conflicts.
See "Configuration Conflicts" on page 168.

Using the Configuration/Setup Utility

The built-in Configuration/Setup utility program provides a convenient method to configure various system features. In most cases, the server will operate using the default settings.

Always run the Configuration/Setup utility program if you have added or removed any hardware option, or if you receive an error message instructing you to do so. Review this chapter and the information shipped with the device before making changes. Also, record the current settings (see Table 5 on page 385) before making any changes.

The following menu appears when you start the Configuration/Setup utility program.



Note: Depending on the level of password protection, a limited version of the menu might appear. See “Password Overview” on page 155 for more information.

In most cases, the server will operate using the default settings, and you need to change the settings only to resolve configuration conflicts or to enable or change device function (for example, defining diskette types).

You can advance through the screens by pressing the Page Up (PgUp) or Page Down (PgDn) key. Use the Up Arrow (↑) or Down Arrow (↓) key to move through the items on the screen. To change a setting, highlight the item you want to change, then use the Right Arrow (→) or Left Arrow keys (←) to view the choices.

Press **F1** for on-line Help information on each selection.

Starting the Configuration/Setup Utility Program

Note: If a configuration error occurs, a prompt appears before the operating system starts (see “Configuration Conflicts” on page 168).

To access the Configuration/Setup utility program:

1. Turn on the server and watch the screen.

Note: The Power On/Off switch is located under a transparent cover on the right side of the server. Therefore, before you can turn the server on or off, you must lift this transparent cover to reach the Power On/Off switch.

To avoid accidentally pressing the Power On/Off switch after you turn the server on or off, return the transparent cover to its original position.

2. When the message Press F1 to enter Configuration/Setup appears, press **F1**.
3. Follow the instructions on the screen to view or change the configuration.

4. Select **Exit Setup** and press **Enter**.

If you changed any settings, the utility program prompts you to confirm the changes. When you press **Enter**, the system restarts.

You must *correctly* exit from the Configuration/Setup utility program to save the configuration information. Press **Esc** or move the cursor to the **Exit Setup** option on the menu bar.

System Summary

Select **System Summary** to view information about the system, including the type and speed of the microprocessor, amount of memory, and the number of disk drives connected to the server.

Changes that you make on other menus are reflected on this summary screen. You cannot edit any of the fields.

Note: The PC Server 520 comes with Error Correction Code on SIMM (EOS) memory. EOS memory appears to the system setup program as parity memory. However, EOS offers increased data protection by detecting and correcting single bit memory errors.

The System Summary choice appears on the full Configuration/Setup menu, and also on the limited Configuration/Setup user's menu.

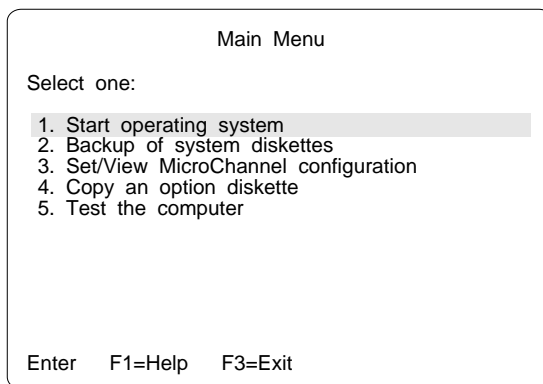
Micro Channel Configuration

Select **Micro Channel Configuration** to view or change the configuration of Micro Channel devices.

The Micro Channel Configuration screen appears, displaying the status of adapters in the Micro Channel slots.

To configure a Micro Channel adapter, or to change configuration settings on a Micro Channel adapter, the system prompts you to insert the Reference Diskette.

The system programs Main Menu appears, and displays the following choices.



The Set/View Micro Channel Configuration utility program allows you to work with the configuration information for Micro Channel adapters. See “Using the System Diskettes” on page 164 for additional instructions.

Press **F3** to return to the Configuration/Setup menu without changing the Micro Channel adapter configuration.

Micro Channel adapters and some other options are shipped with an Option Diskette. This diskette has files that the server uses to recognize the new option and set it up to operate correctly.

The Micro Channel Configuration choice appears only on the full Configuration/Setup menu.

Product Data

Select **Product Data** to view specific information about your PC Server 520, 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 EEPROM and BIOS.

Changes that you make on other menus are reflected on this summary screen. You cannot edit any of the fields.

The Product Data choice appears on the full Configuration/Setup menu, and also on the limited Configuration/Setup user's menu.

Configuring Devices and I/O Ports

You can view or change the assignments for devices and ports. Some programs and devices require specific assignments. Review the documentation that comes with the device for more information.

To view or change the assignments for devices, video, and serial or parallel ports:

1. Turn on the system. When the **F1** prompt appears, press **F1**. The Configuration/Setup Utility menu appears.
2. Select **Devices and I/O Ports**.
3. Use the Up Arrow (↑) key or the Down Arrow (↓) key to highlight the assignment that you want to change. Use the Left Arrow (←) and Right Arrow (→) keys to scroll through the list of available choices and make a selection. If the assignment conflicts with another assignment, an asterisk appears next to the conflicting setting. You must change one of the conflicting settings to a value that does not conflict.
4. When you complete all changes to the menu, press **Esc** to return to the Configuration/Setup menu.

Assigning Serial Ports

Your system comes with two 9-pin serial ports. You can add serial ports by installing a serial adapter in one of the expansion slots.

Software recognizes serial ports from their serial-port assignments. No two serial ports can have the same serial-port assignment. This normally is handled by the Configuration/Setup utility program, but you might have special hardware or software that requires you to change these assignments.

You can set either serial port as Serial 1 through Serial 4.

Configuring Video Options

Your server supports a wide assortment of monitors. Because characteristics of monitor types vary, you should review the documentation that came with the monitor to determine the monitor type and refresh rate.

Select **Video Setup**, then use the Left Arrow (←) and Right Arrow (→) keys to advance through the list of available choices and make your selection.

Date and Time

Select **Date and Time** to change or set values for the system date and time. You use this option to set the real-time clock in the server.

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 **Month/Day/Year**.

Select **Date and Time**, then use the Left Arrow (←) and Right Arrow (→) keys 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 menu.

Defining System Security

To control access to your server, you can implement several of the security measures described in your *User's Reference*, including defining two levels of password protection, securing diskette access, and a system owner's name that displays during startup.

Note: The default values for all security-related data fields are given in Table 5 on page 385.

Password Overview

Your server provides both a power-on password and an administrator password.

The server displays the Enter password prompt when:

- You enter Configuration/Setup utility program
- You start the server from a diskette
- An administrator password is the only password set

Using the Configuration/Setup Utility

- A power-on password is the only password and the password prompt is set to **On**
- Both an administrator and power-on password are set and the password prompt is set to **On**

The server does not display a password prompt when:

- Neither a power-on or administrator password is set
- A power-on password is the only password, the password prompt is set to **OFF** and the server is not being started from a diskette.

In this case, the server starts, but the keyboard is locked. The keyboard can be unlocked by entering the power-on password.

The passwords do not appear on the screen as you type them. When you enter the correct password, OK appears on the screen. If you enter the wrong password, Incorrect password appears on the screen, and Enter password is again displayed. After three incorrect attempts, you must turn off the server and start again.

Note: You do not need to enter a password when you start the system using the IBM ServeRAID Adapter Configuration Diskette.

The following table summarizes the levels of security with the different levels of password protection.

Type of Password	Results
No password set	<ul style="list-style-type: none"> No password required to start system. User can access all choices on the Configuration/Setup menu and can start the Reference Diskette.
Power-on password only	<ul style="list-style-type: none"> User must enter password to complete the system startup. Power-on password provides access to all choices on the Configuration/Setup menu and to the Reference Diskette.
Administrator password	<ul style="list-style-type: none"> User must enter password to complete the system startup. Administrator password provides access to all choices on the Configuration/Setup menu and to the Reference Diskette.
Administrator <i>and</i> power-on password	<p>User can enter either password to complete the system startup.</p> <ul style="list-style-type: none"> Administrator password provides access to the Reference Diskette and to all choices on the Configuration/Setup menu. Administrator password menu can enable the power-on password user to change the power-on password. Power-on password provides access to a limited set of choices on the Configuration/Setup menu, and provides no access to the Reference Diskette.

Note: You do not need to enter a password when you start the system using the IBM ServeRAID Adapter Configuration Diskette.

Setting an Administrator Password

The administrator password (sometimes called the supervisor password) allows you to control who has access to some features of the server, including the Configuration/Setup utility program. If an administrator password is set, you must enter it to display the complete menu for the Configuration/Setup utility program. Otherwise, a limited version of the Configuration/Setup utility program menu appears.

Notes:

- To control access to the server, the administrator and power-on passwords should be different. The system displays a warning message if you attempt to set the

administrator password to a previously set power-on password.

2. Before you set an administrator password, you must set the administrator password jumper to the change position. (For instructions, see “Setting the Administrator Password Jumper” on page 286.)
3. Only someone that knows the administrator password can change the administrator password.

Attention: If an administrator password is set and then forgotten, it cannot be overridden or removed. You must place a service call to regain access to your server.

To set an administrator password:

1. Select **Administrator Password** on the System Security screen; then press **Enter**.

The **Administrator Password** screen appears.

2. Type the password in the **Enter Administrator Password** data field.
3. Verify that you typed the correct password. If you did not type the correct password, press **Esc**, and type the correct password.
4. Repeat steps 2 through 3 for the **Enter Administrator Password Again** data field.
5. Select **Set or Change Administrator Password** to save the new password; then press **Enter**. The system prompts you to change the administrator password jumper to the locked position after changing the password. (For instructions, see “Setting the Administrator Password Jumper” on page 286.)

The password becomes effective immediately after you select **Set or Change Administrator Password**.

You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for your administrator password. Keep a record of your password in a secure place.

To delete an administrator password:

1. Select **Administrator Password** on the System Security menu; then press **Enter**.
The **Administrator Password** screen appears.
2. Select **Delete Administrator Password**; then press **Enter**.
3. A confirmation window appears. Press **Enter** to delete the administrator password. Press **Esc** to cancel the request and return to the System Security menu.

To enable a user to change the power-on password:

1. Select **Administrator Password** on 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 menu. The System Security menu contains the **Power-on Password** choice.

Setting a Power-on Password

When a power-on password is set, you must enter a password each time you start the system.

If you forget the power-on password, and an administrator password has been set, use the administrator password at the power-on prompt; then start the Configuration/Setup utility program and change the power-on password. If no administrator password has been set, you must remove the battery before you can set a new password. For instructions, see “Removing an Unknown Power-On Password” on page 284.

To set a power-on password:

1. Select **Power-on Password** on the System Security menu; then press **Enter**.

The **Power-on Password** screen appears.

2. Type the password in the **Enter Power-on password** data field.
3. Verify that you typed the correct password. If you did not type the correct password, press **Esc**, and type the correct password.
4. Repeat steps 2 through 3 for the **Enter Power-on Password Again** data field.
5. Select **Set or Change Power-on Password** to save the new password.

You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for your power-on password. Keep a record of your password in a secure place.

To delete a power-on password:

1. Select **Power-on Password** on 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.

Defining a System Owner's Name

When you specify a system owner's name, that name will be displayed each time that your server is started. If the administrator password is enabled, only the administrator can set, change, or delete the system owner's name.

1. Select **System Owners Name** on the System Security screen, and press **Enter**.

The **System Owners Name** screen appears.

2. Type the name in the **Enter System Owners Name String** data field.
3. Press the Down Arrow (↓) key to select the **Set or Change System Owners Name** data field.
4. Press **Enter** to set the name or change a previously defined name.

You can use any combination of up to 15 characters and spaces in your system owner's name.

To delete the system owner's name, select **Delete Stored System Owners Name** and press **Enter**.

Restricting Access to Diskette Drives

The setting for the **Secure Diskette Drives** option controls who has access to the diskettes (user and administrator, or administrator only). Your server comes with this feature set to **Enable**, so that both the user and administrator have access to diskette drives.

To change this setting so that the access to the diskette drives is disabled, select the System Security menu option and then select **Secure Diskette Drives**. Press the Left Arrow (←) or Right Arrow (→) key to toggle the entry to **Disable** in the **Diskette Drive Access** data field. If the administrator password is enabled, only the administrator can change this setting.

Defining the Start Options

Start options take effect when you start your server.

You can select keyboard operating characteristics, such as the keyboard speed. You can also specify whether the keyboard number lock starts on or off.

The server uses a startup sequence to determine the diskette drive, hard disk drive, or network adapter from which the operating system will be loaded. You can specify up to four devices in the **Startup Device** data fields. For example, you can define a startup sequence that checks for a startable diskette in the primary diskette drive, then checks a hard disk drive in bank C.

You can enable your server to run without checking for the presence or state of a monitor, keyboard, or diskette drive. The devices are disabled after the power-on self test (POST) completes and the operating system has loaded. This allows you to enter a password and update the Configuration/Setup utility program in keyboardless operations, and to start the system programs from the Reference Diskette in disketteless operations.

You can select the tests that your server runs at startup. This includes the SureTest BIOS test tool and a virus detection test. In addition, you can also choose whether to run the power-on self test (POST) in enhanced or quick mode.

Select **Start Options**, then use the Left Arrow (←) and Right Arrow (→) keys to advance through each data field.

The **Start Options** choice appears only on the full Configuration/Setup menu.

Advanced Setup

Select **Advanced Setup** to change values for advanced hardware features such as cache control and ROM shadowing. A warning message appears when you select this choice, to alert you that the system might malfunction if these options are configured incorrectly. Follow the instructions on the screen carefully.

Select **Advanced Setup**, then use the Left Arrow (←) and Right Arrow (→) keys to advance through each data field.

After replacing an L2 cache kit, you must enable the cache using the **Cache Control** choice on this menu.

To change PCI Interrupt settings to fixed values, select **PCI Interrupt Configuration** from the Advanced Setup menu.

The **Advanced Setup** choice appears only on the full Configuration/Setup menu.

Reference and Diagnostic Diskettes

The Reference Diskette and Diagnostic Diskettes, which come with your system, contain a copy of the system programs. Collectively, these diskettes are referred to as the *System Diskettes*.

The System Diskettes normally are used under the following conditions:

- To configure and test Micro Channel adapters
- To test system hardware

Using the System Diskettes

Note: Always use the backup copy of the system diskettes when configuring and troubleshooting your server.

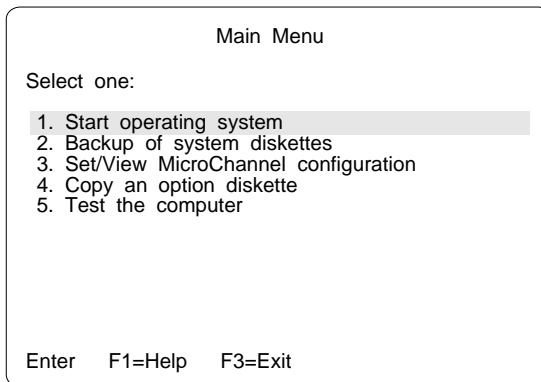
To start the System Diskettes:

1. Insert the backup copy of the Reference Diskette into the primary diskette drive.
2. Turn on the system. Or, if the system is turned on, insert the Reference Diskette and press **Ctrl+Alt+Del**.

The system begins the power-on self test. If a power-on or administrator password is set, the system prompts to enter it.

Note: If an administrator password is set, you *must* enter it to access the Reference and Diagnostic Diskettes.

After a few moments, the system programs Main Menu appears, and displays the following choices.



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

You can get help about any selection by highlighting it and pressing F1. The active keys are shown at the bottom of the screen.

When you finish making changes:

1. Press **F3** to exit without saving the changes.
2. Press **Enter** to save the changes. You are prompted to restart the computer so that the changes will take effect.

You can get online help for each task by pressing F1.

Starting the operating system

To start the operating system:

1. Select **Start operating system** from the Main Menu, and then follow the instructions on the screen.
2. When prompted, remove the Reference Diskette; then press **Enter** to restart the computer from a diskette or hard disk drive.

The server restarts.

Backing Up System Diskettes

Select **Backup of system diskettes** from the Main Menu to backup the System Diskettes or to restore the configuration information from the System Diskettes. This is useful in case the battery fails or a change that you made to the configuration information causes a problem and you need to change it back to its previous setting.

Note: Store the original system diskettes in a safe place. Always use the backup copies when configuring and troubleshooting your server.

The system prompts you to switch the diskettes and label the diskette.

Note: You will need to have a formatted diskette for each system diskette that you copy.

Setting Micro Channel Configuration

Select **Set/View Micro Channel Configuration** from the Main Menu to view, change, backup, or restore system configuration of Micro Channel adapters. Follow the instructions on the screen.

The following figure shows a Micro Channel configuration screen.

```
Change Configuration

Slot 1 - IBM Ethernet Adapter/A
Adapter Media Type Selection ..... [Autosense]
System Interrupt Level ..... [Interrupt]
Micro Channel I/O Address ..... [IC00-ICFF]
Streaming Date Select ..... [Enabled]
Fairness ..... [Fairness ON]
Arbitration Level ..... [Level 5]
Parity Enable/Monitor Feedback ..... [Parity OFF/Monitor OFF]
Slot 2 ..... [Empty]
Slot 3 ..... [Empty]
Slot 4 ..... [Empty]
Slot 5 ..... [Empty]

F1=Help F3=Exit F5=Previous F6=Next F7=Bkwd F8=Fwd
F10=Save
```

Press **F3** to return to the Main Menu.

Copying an Option Diskette

Some options come with a diskette that includes test and configuration information. Select **Copy an option diskette** from the Main Menu to copy this information to the system diskettes.

To copy an option diskette:

1. Select **Copy an option diskette** from the Main Menu, and follow the instructions on the screen.
2. Remove the option diskette from the diskette drive.
3. Repeat the preceding steps until all option diskettes have been copied.
4. Press **Esc** to return to the Main Menu.

Testing the Computer

The Test the computer utility program tests the system board and installed options.

To verify that your server is working correctly:

1. Select **Test the computer** from the Main Menu.
2. To test the system board, disk drives, video, and other system components, select **System board diagnostics**; then press **Enter**. When prompted, remove the Reference Diskette and insert the System Board Diagnostic Diskette. Follow the instructions on the screen.
3. To test Micro Channel adapters, select **Option diagnostics**; then press **Enter**. When prompted, remove the Reference Diskette and insert the Micro Channel Diagnostic Diskette.
4. When all tests are completed, the system prompts you to remove the Diagnostic Diskette and press **Enter** to restart the system.

To get help information about any of the diagnostic tests, press **F1**.

For more information about testing the server, see “Testing the System” on page 312.

Configuration Conflicts

The resources used by your server consist of interrupt request levels (IRQs), direct memory access channels (DMAs), I/O ports (for example, serial and parallel), and memory. This information is useful when a resource configuration conflict occurs.

Conflicts in the configuration occur if:

- An installed device 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 *COM 1* to two different serial ports).
- An installed software program requires the same resource as a hardware device (for example, an expanded memory specification (EMS) device driver that uses the address required by the SVGA video controller).

The steps required to resolve a configuration error are determined by the number and variety of hardware devices and software programs 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 only the system hardware. The program does not consider the requirements of the operating system or the application programs. See “Resolving Software Configuration Conflicts” on page 170 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 the resources that are used by the system board functions. Record the current settings before making any changes. (See “Starting the Configuration/Setup Utility Program” on page 151 for instructions.)
2. Determine which adapter or device is causing the error.
3. Change configuration resource allocations. Use the built-in Configuration/Setup utility program to view or change system board resource allocations.
4. Change adapter jumpers or switches. Jumpers and switches define the system resources that a device uses. 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.
5. Change system board jumpers or switches. See “Preparing to Install Options” on page 181, to remove the cover. Then refer to the system-board diagram inside your server.
6. Remove the device or adapter. Some configurations are not supported (for example, you cannot operate the server with two PCI SVGA adapters installed). If you must remove an adapter, see “Removing Adapters” on page 208.

Resolving Software Configuration Conflicts

The memory-address space and interrupt levels (IRQs) used by some hardware options might conflict with addresses defined for use through application programs or the 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.

You can resolve conflicts by changing either the software or the hardware configuration.

Note: Start the Configuration/Setup utility program to view the addresses used by your system board functions.

Changing the Software Configuration

The best way to resolve memory-address conflicts is to change the addresses used by the application program or the device driver. This can be done by using the Configuration/Setup utility program.

If a device driver is causing a memory-address conflict, refer to your operating-system documentation or the documentation supplied with the device drivers.

Interrupts

When you assign interrupt levels, remember that high interrupt level devices have the lowest priority in the processing queue. For best performance results, assign a low interrupt level to a high performance device. For example, you might assign interrupt level 10 to an Ethernet PCI LAN adapter.

When you assign a very high interrupt to a high performance device, performance can be adversely affected.

Note: Interrupt Level 12 is reserved for the mouse.

Using the SCSISelect Utility Program

The SCSI-2 controller has a built-in menu-driven configuration utility program that allows you to view and change SCSI settings.

You can use the SCSISelect Utility program to:

- Change the default values
- Verify and change configuration conflicts
- Format a new SCSI hard disk

Starting the SCSISelect Utility Program

You can access this program when you start the server. The SCSISelect prompt appears after the IBM PC Server screen appears briefly and then disappears. Press **Ctrl+A** immediately after the SCSISelect prompt appears.

Use the Up Arrow (↑) or Down Arrow (↓) key to move the highlight bar to the various menu choices. Press **Esc** to return to the previous menu. Also, you can press F5 to switch between color and monochrome modes (if your monitor permits). To change the current settings of the items displayed in the menus, follow the directions on the screen.

SCSISelect Utility Program Options

The following options are displayed on the SCSISelect Utility program menu:

- Configure/View Host Adapter Settings
- SCSI Disk Utilities

Configure/View Host Adapter Settings

To view or change the SCSI-2 controller settings, select **Configure/View Host Adapter Settings** and follow the directions on the screen. Refer to the following table for information on the choices on this menu.

SCSI Controller Settings	Description
Host Adapter SCSI ID	Changes the SCSI ID of the SCSI-2 controller from its default value of 7.
SCSI Parity Checking	Enables or disables parity checking on the SCSI-2 adapter or controller. The default value is <i>Enabled</i> .
Host Adapter SCSI Termination	Configures SCSI-2 adapter or controller termination. The default value is <i>Low On / High On</i> .
SCSI Device Configuration	Configures SCSI device parameters. Before you can make updates, you must know the ID of the device whose parameters you want to configure.
Advanced Configuration Options	Allows you to view or change the settings for advanced configuration options. These include: <ul style="list-style-type: none">• Startable CD-ROM drive. When set to <i>On</i>, the CD-ROM drive can be included as a startup device (see “Defining the Start Options” on page 162 for more information). For this option to take effect, you must insert a startable CD in the CD-ROM drive.• Init13 Extensions. When set to <i>On</i>, these BIOS extensions are enabled.

SCSI Disk Utilities

To see the IDs that are assigned to each SCSI device or format a drive, select **SCSI Disk Utilities** from the SCSISelect Utility program menu.

To use the utility program, select a drive from the list. Read the screens carefully before making a selection.

Using the Low-Level Format Program

On non-disk array models, you can format your hard disk using the *Low-Level Format* feature of the SCSISelect Utility program.

Depending on the hard disk capacity, the Low-Level Format program could take up to two hours.

Note: For disk-array models, you must use the programs provided on the ServeRAID Adapter Configuration Diskette to format your hard disk drives. Refer to Chapter 3, “Configuring the Disk Array” on page 71 for instructions.

When To Use the Low-Level Format Program

Use the Low-Level Format program:

- When you are installing software that requires a low-level format
- When you get recurring messages from the diagnostic tests directing you to run the Low-Level Format program on the hard disk
- As a last resort before replacing a failing hard disk drive

Note: For information about backing up all of your files, see your operating-system documentation.

Starting the Low-Level Format Program

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

1. If the hard disk is working, make a backup copy of all the files and programs on the hard disk.
2. Select **Format disk** from the SCSISelect Disk Utilities menu; then follow the instructions on the screen.

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

3. To install an operating system, refer to the README file in **Start Here** on the ServerGuide Main CD.

Using the SCSISelect Utility Program

Chapter 6. Installing Options

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. If you have several internal options to install, these instructions enable you to add them all at one time.

This chapter contains:

Before You Begin	177
Moving the Server	178
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Before You Begin

- If your server is a disk-array model, you must configure your server after you install hard disk drives, as described in “Installing Internal Drives” on page 212. In this case, follow the instructions in Chapter 3, “Configuring the Disk Array” on page 71 after installing the drives. Return here to install your remaining options. See “Using the System Diskettes” on page 164 for additional details about configuration.
- Become familiar with the safety and handling guidelines specified under “Safety Information” on page ix, “Electrical Safety” on page 179, and “Handling Static-Sensitive Devices” on page 180. These guidelines will help you work safely while working with your server or options.
- Make sure you have an adequate number of properly grounded electrical outlets for your server, monitor, and any other options you intend to install.
- Place your server in a location that is dry. Rain or spilled liquids might damage your server.
- Leave about 51 mm (2 in.) of space around the front and rear of the server to allow the server cooling system to work properly.
- 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.
- If you are replacing a faulty part and your server is covered by a warranty, you should save the part that you replace. Place the part in the static-protective package and store in a safe place. Refer to the warranty or your IBM reseller or IBM marketing representative for additional instructions.

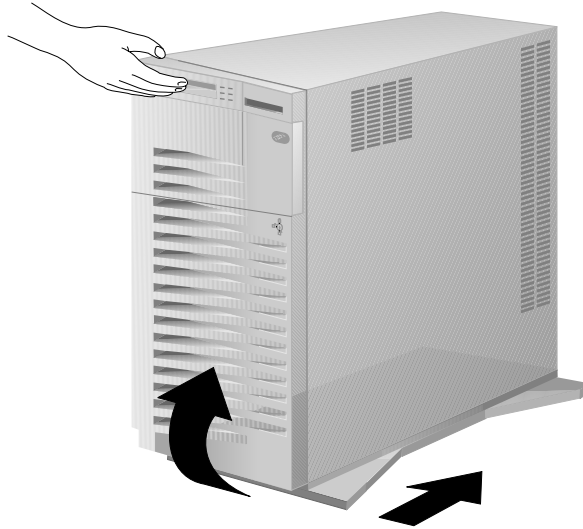
Moving the Server



CAUTION:

Due to the weight of the server, do not attempt to lift the server by yourself. To avoid risking possible injury, get another person to help you.

When the server is in the normal upright position, move it by lifting up on the handle and rolling it forward or backward as shown. (A roller is built into the rear of the server base.)



Electrical Safety



CAUTION:

Electrical current from power, telephone, and communication cables can be hazardous. To avoid any shock hazard, disconnect all power cords and cables as described in the following information.

For your safety, always do the following *before* removing the cover:

1. Turn off the server and any attached devices, such as printers, monitors, and external drives.

Notes:

- 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.
 - The Power On/Off switch is located under a transparent cover on the right side of the server. You must lift this transparent cover to reach the Power On/Off switch and turn the server on or off.
2. Unplug all the power cords from electrical outlets.
 3. Disconnect all communication cables from external receptacles.
 4. 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.



CAUTION:

Never remove the cover on the power supply. If you have a problem with the power supply, have your system serviced.

Handling Static-Sensitive Devices

Static electricity, although harmless to you, can seriously damage computer components or options.

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 computer components, take these precautions to avoid damage from static electricity:

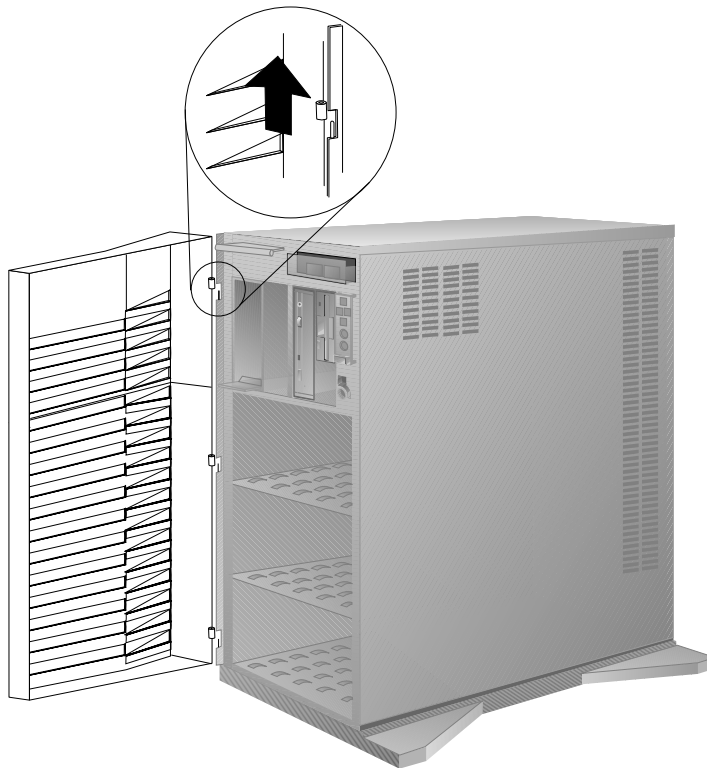
- Limit your movement. Movement can cause static electricity to build up around you.
- Always handle components carefully. Handle adapters, the memory riser card, and memory-module kits by the edges. Never touch any exposed circuitry.
- Prevent others from touching components.
- When you are installing 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.

Preparing to Install Options

Before you begin:

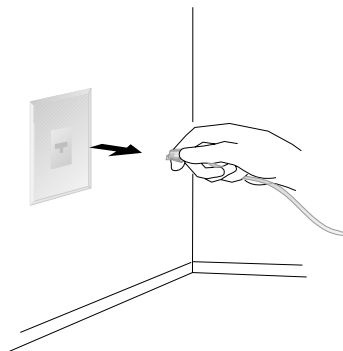
Be sure you have read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.

1. Unlock the door.
2. If you are installing other options in the server:
 - a. Rotate the key 180 degrees to the left.
 - b. Swing the front cover to the left.
 - c. If necessary, remove the cover by lifting it up and off the hinge pins; then, store the cover in a safe place.



Preparing to Install Options

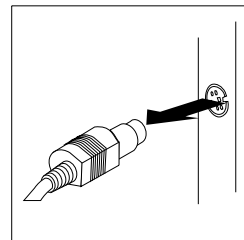
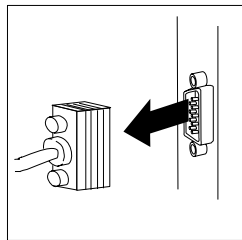
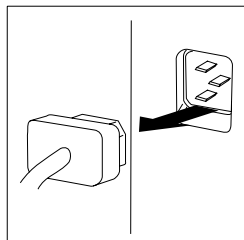
3. Remove all media (diskettes, CDs, optical discs, or tapes) from the drives; then turn off the server and all attached options.
4. If you have a modem or fax machine attached to the server, disconnect the telephone line from the wall outlet.



5. Unplug all power cords (cables) from electrical outlets.

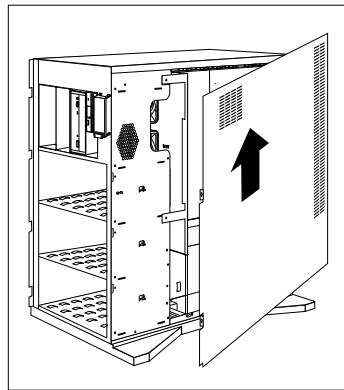
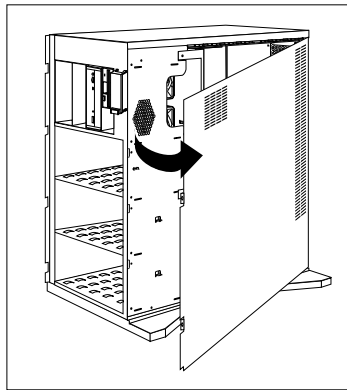
Note the locations of the following; then disconnect them from the back of the server:

- Power cord
- Monitor cable
- Keyboard cable
- Any other cables and cords



Preparing to Install Options

6. If you did not already do so during setup, remove the cardboard packing material from the server.
7. Remove the side cover.
 - a. Pivot the side cover away from the front of the server.
 - b. Remove the cover by lifting it up and off the hinges. Store it in a safe place.



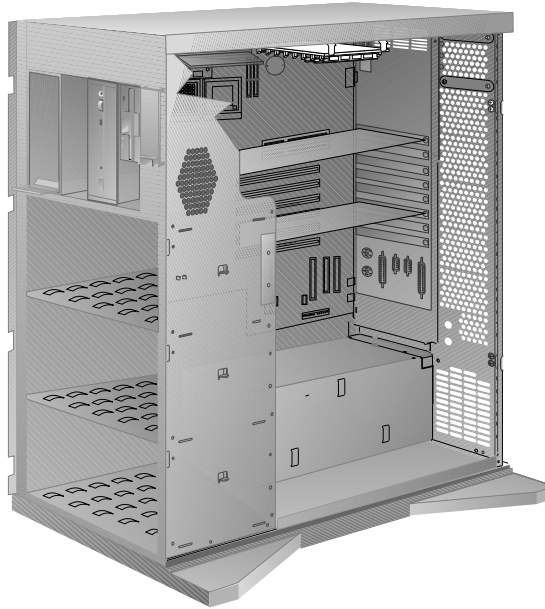
What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 186.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Removing an adapter? — Go to “Removing Adapters” on page 208.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 212.
- Installing a hot-swappable drive? — Go to “Installing a Drive in Bank C” on page 235.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Replacing the battery? — Go to “Replacing the Battery” on page 268.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 272.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.
- Installing or removing a security feature? — Go to “Security Procedures” on page 283.

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 *memory-module kits*.

Your server uses 72-pin, Error Correction Code on SIMM (EOS), single inline, memory modules to increase system memory. EOS provides increased system reliability by detecting single-bit memory errors and correcting them in real time, without reducing system performance.



You install memory-module kits into connectors on a memory riser card inside the server. The memory riser card that comes with your server contains at least two 16 MB memory-module kits preinstalled in bank 0. You can replace these memory-module kits with larger capacity memory-module kits to increase the server memory. You can also increase server memory by installing additional memory-module kits on the memory riser card.

The kits *must* be installed in pairs of the same size, type, and speed. You can install up to 256 MB of EOS in your server. The memory-module kit sizes available for your server are 16 MB and 32 MB. The available speed for these kits is 70 ns.

Notes:

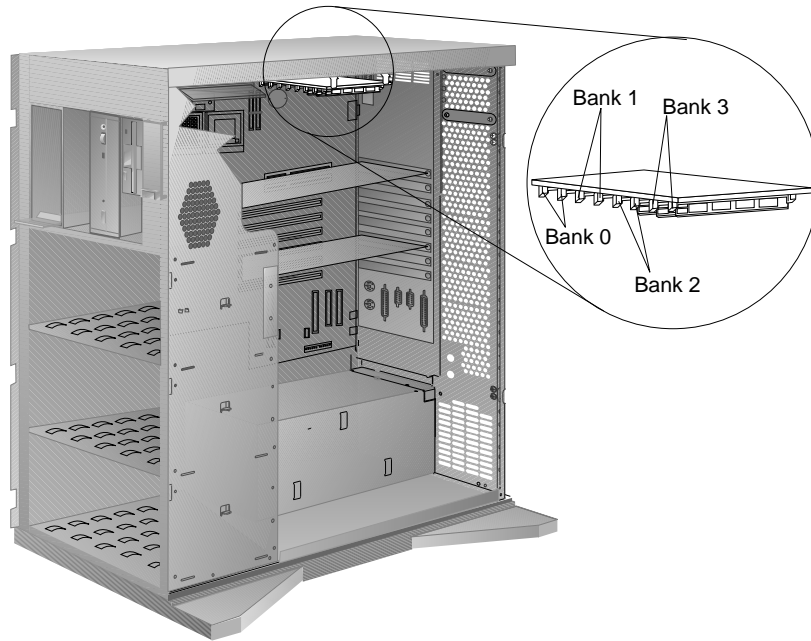
- Parity memory-module kits are supported in the PC Server 520 but *must not* be used in combination with EOS memory-module kits.
- The PC Server 520 does not support memory expansion adapters.

Before you begin, be sure you have:

- Read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.
- Removed the server side cover (see “Preparing to Install Options” on page 181).

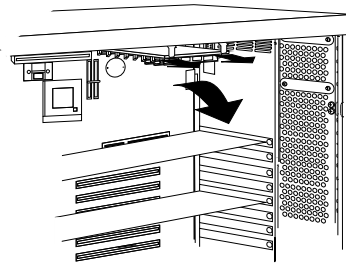
When you are instructed to install the kits (in step 3 on page 189), install them in pairs of adjacent memory connectors, with no vacant memory connectors in between. Each pair of connectors is a *bank*. The memory riser card has four banks: 0, 1, 2, and 3. Your server comes with at least two memory-module kits installed in bank 0, the bank located nearest to the memory riser card connector. Install additional memory-module kits in bank 1, and then continue with banks 2 and 3, in that order. If you need to install kits of a different size in bank 0, remove the preinstalled kits as described in “Removing Memory-Module Kits” on page 192, and install two other kits as described in this section.

Installing Memory-Module Kits

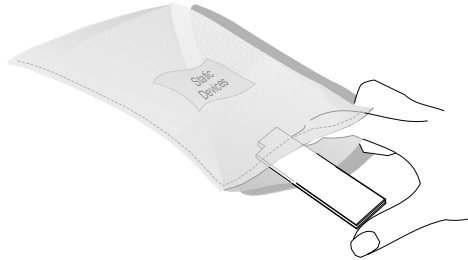


As a minimum, your server requires memory modules of the same size in bank 0. When you install memory-module kits in any given bank, both of the kits must be the same size and type.

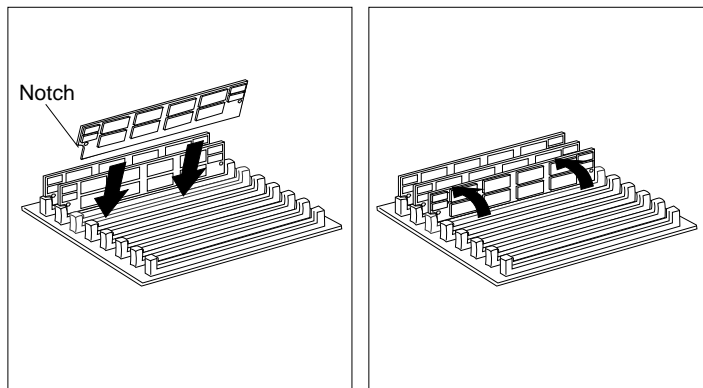
1. Remove the memory riser card from the support brackets:
 - a. Gently pull the clasps away from the memory riser card.
 - b. Press down on the memory riser card at an angle until it is free from the pegs on the support bracket.



- c. Pull the memory riser card out at that angle, and place it on a flat nonconductive surface with the memory-module kits facing up, and the connector facing away from you.
2. Touch the static-protective package to any unpainted metal surface on the server. Then remove the memory-module kit from the package.



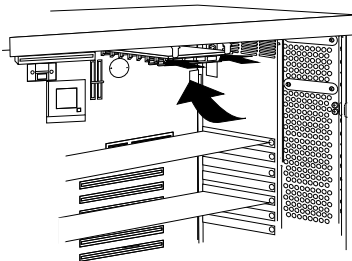
3. Install the memory-module kit:
 - a. Turn the kit so that the notched end is on the left.
 - b. Hold the kit angled toward you at a 45-degree angle, then insert the kit into the connector.
 - c. Pivot the kit away from you until it snaps into place.
 - d. Repeat these steps for each kit that you install.



Note: You must install the memory-module kits in pairs of the same size.

Installing Memory-Module Kits

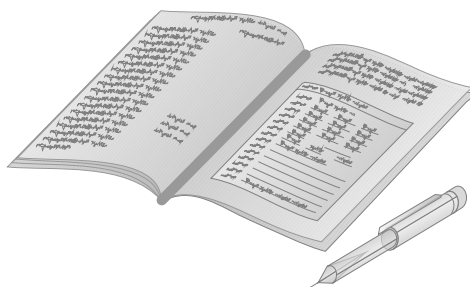
4. Replace the memory riser card:
 - a. Hold the memory riser card at an angle just over the pegs on the support brackets; then slide the memory riser card into the connector.



- b. Gently press the memory riser card onto the pegs.
 - c. Press the clasps over the edge of the memory riser card.

Note: Adding or removing memory-module kits changes the configuration information in the server. When you restart the server, the system displays POST error 164. Start the Configuration/Setup utility program and select **Save the New Settings**.

5. Go to Table 5 on page 385 to record the size of the memory-module kits and the connectors into which they are installed; then return here to determine your next step.



What to do next?

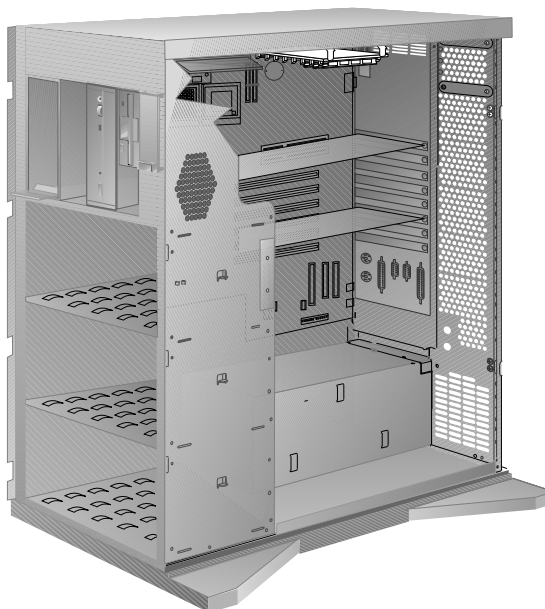
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 192.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Removing an adapter? — Go to “Removing Adapters” on page 208.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 212.
- Installing a hot-swappable drive?
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Replacing the battery? — Go to “Replacing the Battery” on page 268.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 272.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.
- Installing or removing a security feature? — Go to “Security Procedures” on page 283.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

Removing Memory-Module Kits

Before you begin, be sure you have:

- Read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.
- Removed the server side cover (see “Preparing to Install Options” on page 181).

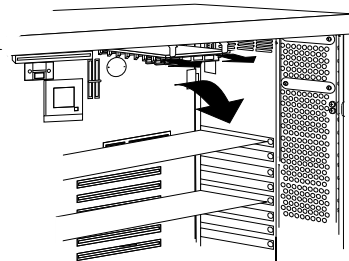
Note: Adding or removing memory-module kits changes the configuration information in the server. When you restart the server, the system displays POST error 164. Start the Configuration/Setup utility program and select **Save the New Settings**.



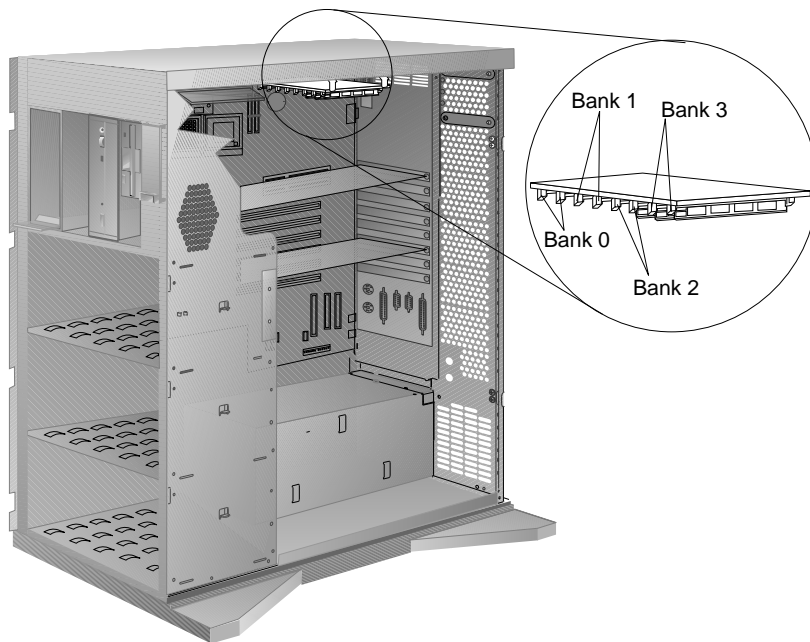
To remove memory-module kits from the server:

1. Remove the memory riser card from the support brackets:
 - a. Gently pull the clasps away from the memory riser card.

- b. Press down on the memory riser card at an angle until it is free from the pegs.



- c. Pull the memory riser card out at that angle, and place it on a flat nonconductive surface with the memory-module kits facing up, and the connector facing away from you.

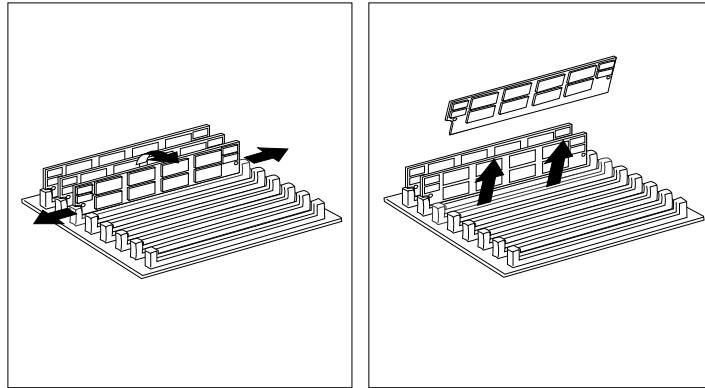


Removing Memory-Module Kits

2. Determine which memory-module kits you want to remove.

Note: You must remove the memory-module kits in pairs, starting with the kits installed in the two connectors farthest away from the system board (bank 3). Remember that the memory-module kits must be positioned in pairs of adjacent memory connectors, with no vacant memory connectors in between.

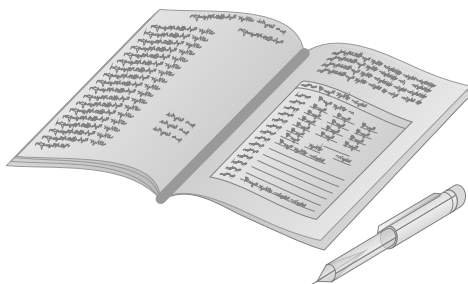
3. Remove the memory-module kit:
 - a. Gently press the two retainers on the connector outward.
 - b. Pivot the kit away from the connector and lift it out.



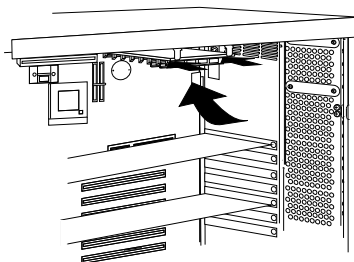
4. Store any memory-module kits you are no longer using in a static-protective package. Make a note of the kit size and speed for future reference.



5. If you are not installing memory-module kits in the empty connectors, go to Table 5 on page 385 to update the memory information; then go to step 7.



6. If you are installing memory-module kits in the empty connectors, go to step 3 on page 189.
7. Replace the memory riser card in the connector.
 - a. Hold the memory riser card at an angle just over the pegs on the support bracket; then slide the memory riser card into the connector.



- b. Gently press the memory riser card onto the pegs.
 - c. Press the clasps over the edge of the memory riser card.

What to do next?

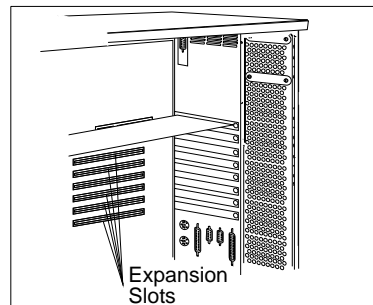
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 186.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Removing an adapter? — Go to “Removing Adapters” on page 208.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 212.
- Installing a hot-swappable drive?
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Replacing the battery? — Go to “Replacing the Battery” on page 268.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 272.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

Installing Adapters

Adding an adapter, such as audio, communication, or specialized graphics, extends the capabilities and power of your server. Your server has eight *expansion slots* for connecting up to six Micro Channel and two PCI adapters. You can install Micro Channel adapters designed for 16-bit or 32-bit expansion slots. (Your *User's Reference* contains more details about Micro Channel and PCI adapters.)

Notes:

1. Memory adapters cannot be installed in your server, because it does not support channel memory. Instead, you can add memory to your server by using memory-module kits. See “Installing Memory-Module Kits” on page 186.
2. If you are installing Type 5 adapters, you might need to reposition the adapter support bracket. See “Before Installing Type 5 Adapters” on page 204.



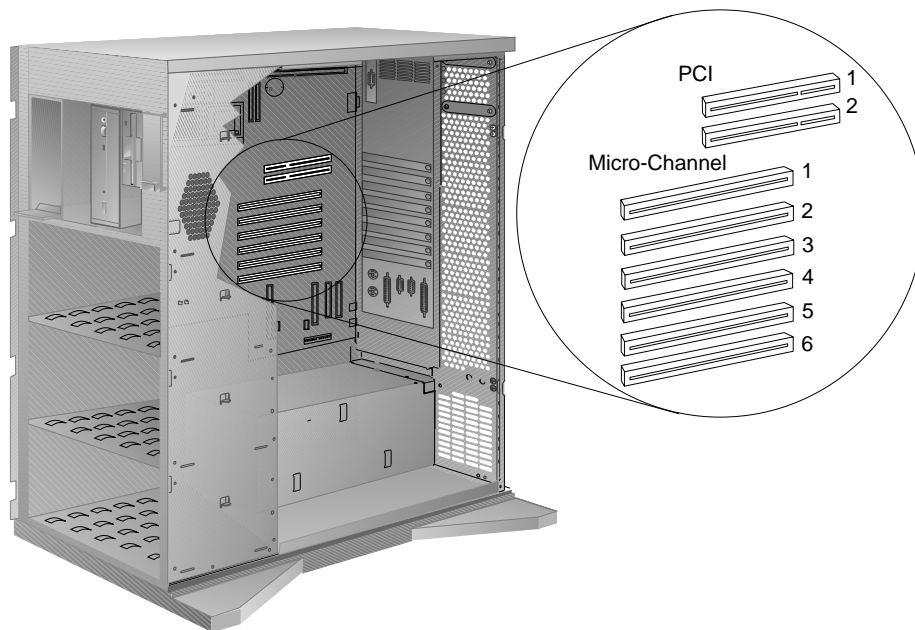
Before you begin, be sure you have:

- Read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.
- Read the instructions that come with the adapter.
- Removed the server side cover (see “Preparing to Install Options” on page 181).

Considerations

Two types of adapters are available for your PC Server 520:

- Micro Channel adapters
- PCI adapters



Attention: To avoid possible damage to adapters and server components, be sure that the adapters you install do not touch each other or the components (such as the microprocessor) inside the server.

For example, if the adapter you are installing physically touches the microprocessor or another component, select a different expansion slot that can adequately accommodate the adapter's size.

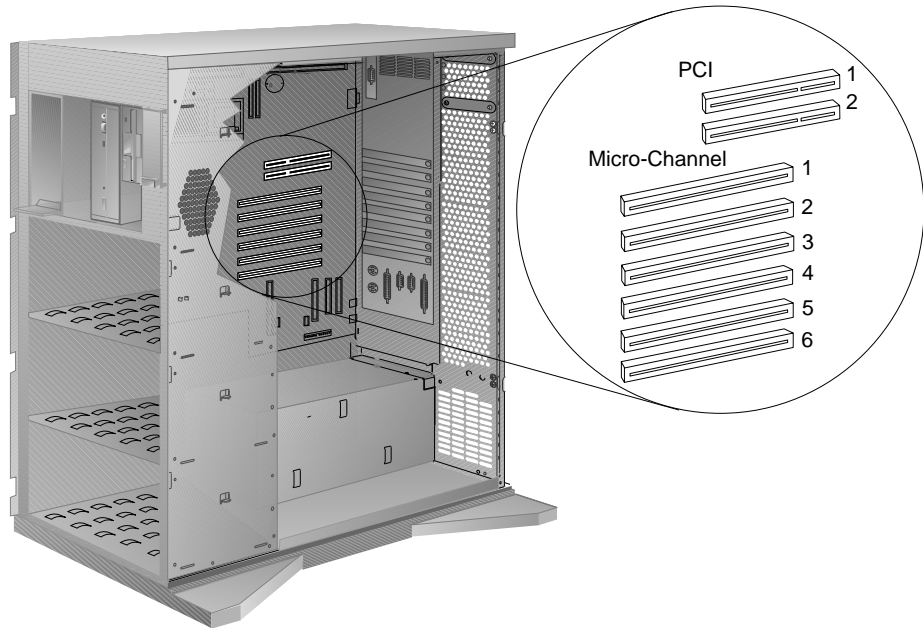
- Review the documentation that comes with the adapter and follow those instructions in addition to the instructions given in this chapter. If you need to change the switch or jumper settings on your adapter, follow the instructions that come with the adapter.

- You can install Micro Channel adapters in Micro Channel adapter slots 1–6. Type 5 Micro Channel adapters can be installed in Micro Channel adapter expansion slots 5 and 6 only.
- After you install a Micro Channel adapter, you must configure it. (For instructions, see “Reference and Diagnostic Diskettes” on page 163.)
- You can install PCI adapters in PCI slots only.
- Your server has an integrated video connector on the system board. You can install a PCI video adapter in either PCI expansion slot, or install a Micro Channel video adapter in any open Micro Channel slot.
- Cables, such as SCSI and system status cables, are attached to some adapters. You might need to disconnect these cables before you can add another adapter.
- Some models come with a preinstalled network adapter.

Installation Procedure

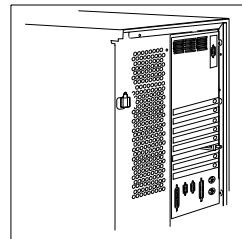
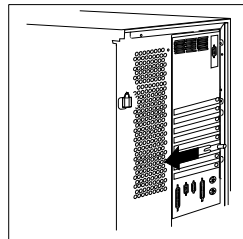
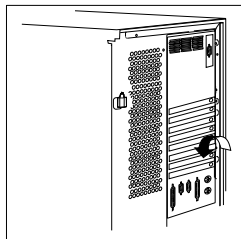
1. If any of the adapters in the server are connected to cables, you might need to disconnect the cables. Note carefully where each cable is connected before you remove it.
2. Determine which expansion slot you will use for the adapter.

Check the instructions that come with the adapter for any requirements or restrictions. If there are no restrictions other than those listed in “Considerations” on page 198, you can use any empty Micro Channel or PCI expansion slot.



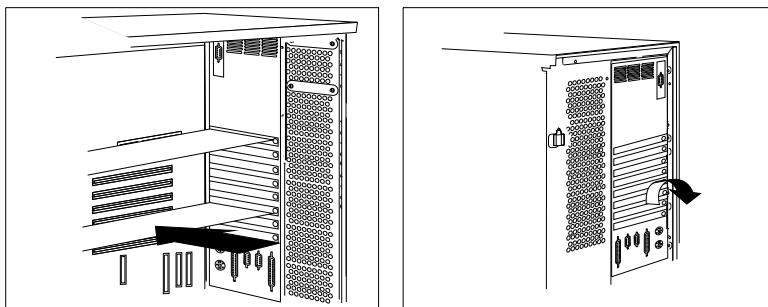
Note: Some models come with a preinstalled network adapter, a ServeRAID adapter, or a preinstalled PeerMaster adapter.

3. Remove the expansion-slot cover.
 - a. Loosen and remove the screw on the expansion-slot cover, located on the outside back of the server.
 - b. Slide the expansion-slot cover out of the server.
 - c. Store it in a safe place for future use.



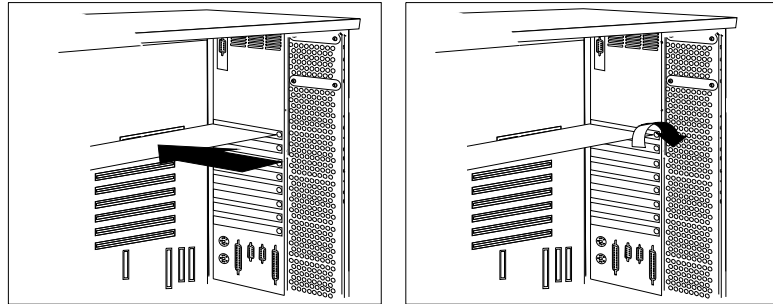
Installing Adapters

4. If you are installing a Micro Channel adapter:
 - a. Lift the card guide snap and insert the edge of the adapter in the grooved opening; then, align the adapter with the expansion slot.
 - b. Support the server with one hand, and slide the adapter straight into the expansion slot with the other hand. Press the adapter *firmly* into the expansion slot.

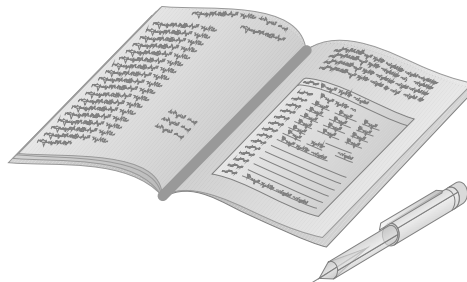


- c. Tighten the screw on the side of the expansion slot on the outside back of the server.
 - d. Go to step 6 on page 203.
5. If you are installing a PCI adapter:
 - a. Remove the the expansion-slot screw on the rear of the server.
 - b. Insert the adapter into the server at a 45-degree angle; then align it with the expansion slot.
 - c. Support the server with one hand, and slide the adapter straight into the expansion slot with the other hand. Press the adapter *firmly* into the expansion slot.
 - d. Insert the expansion-slot screw through the adapter support bracket and into the screw hole that is located above the expansion slot. (This keeps the adapter from sliding out of the slot.)

- e. Tighten the expansion-slot screw.



6. Go to Table 7 on page 387 to write the adapter name next to the slot into which it is installed; then, return here to determine your next step.



7. If you removed any cables in step 1 on page 200, reconnect them to the original positions.

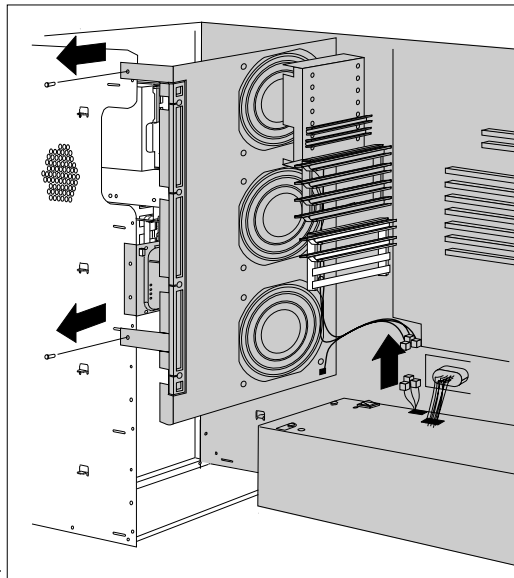
Before Installing Type 5 Adapters

The PC Server 520 supports Type 5 adapters in Micro Channel expansion slots 5 and 6. However, because Type 5 adapters are longer and wider than standard Micro Channel adapters, the adapter support bracket must be repositioned.

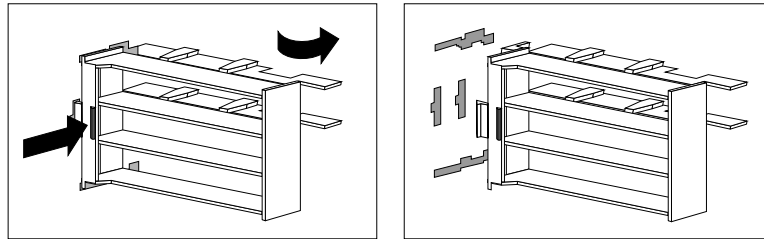
If your server came with a PeerMaster adapter, the bracket has already been repositioned. If the two Micro Channel adapter support brackets are vertically aligned, you must reposition the lower bracket.

1. Remove the fan assembly:
 - a. Disconnect the three fan assembly cables from the power supply.

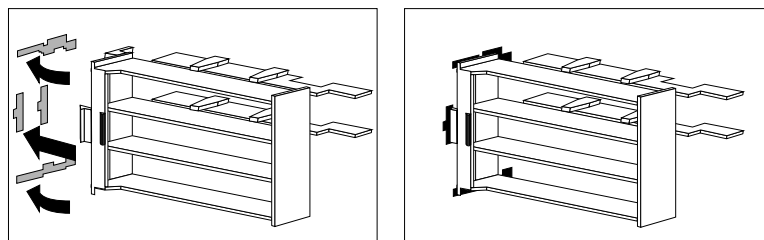
Attention: To avoid damage and ensure proper server operation, handle the fan assembly carefully.
 - b. Remove the two screws that hold the fan assembly in place.
 - c. Remove the fan assembly by pulling it up and out.



2. Press the raised area in the middle of the bracket; then, press the bracket toward the rear of the server and lift out. You might need a screwdriver to release the bracket from the server.

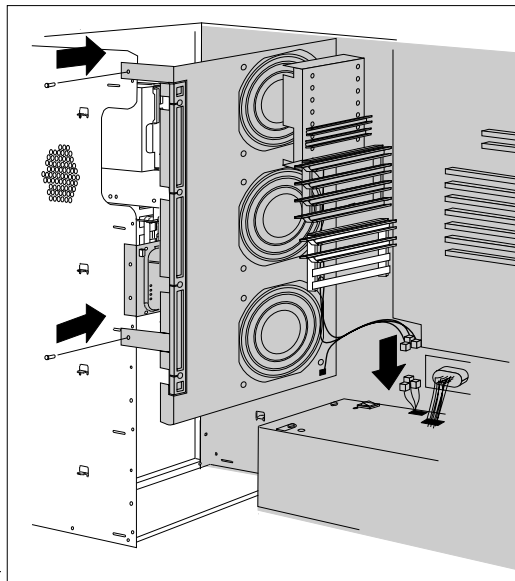


3. Reposition the card guides on the adapter support bracket:
 - a. Lift the tabs on the top of the top card guide to release it from the bracket.
 - b. Align the card guide tabs with the slots closest to the front of the bracket. The card guide will extend beyond the bracket.
 - c. Hook the tabs on the bottom edge of the card guide on the flange on the back of the bracket; then press the card guide forward until it snaps into place.
4. Holding the bracket at an angle, insert the tabs on the back of the card guide into the slots closer to the front of the server.
5. Press the bracket to the right until it snaps into place.



Installing Adapters

- Carefully reinstall the fan assembly with the two screws that you removed in step 1b on page 204.



- Reconnect the fan assembly cables.

What to do next?

- Configuring a Micro Channel adapter? — go to “Micro Channel Configuration” on page 152.
- Removing an adapter? — Go to “Removing Adapters” on page 208.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 212.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Replacing the battery? — Go to “Replacing the Battery” on page 268.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 272.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.
- Installing or removing a security feature? — Go to “Security Procedures” on page 283.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

Removing Adapters

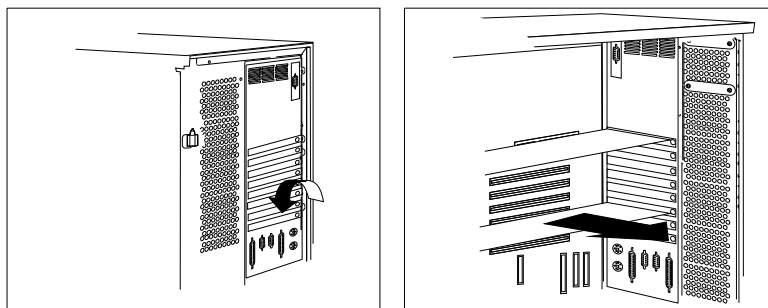
Before you begin, be sure you have:

- Read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.
- Removed the server side cover (see “Preparing to Install Options” on page 181).



1. If any of the adapters in the server are connected to cables, you might need to disconnect the cables. Note carefully where each cable is connected before you remove it.
2. Note the slot number of the adapter that are removing.
3. On the back of the server, loosen the thumbscrew for the adapter that you are removing.

4. Remove the adapter:
 - a. Note the slot number of the adapter you are removing.
 - b. Loosen and remove the screw on the adapter, located on the outside back of the server.
 - c. If any internal cables are attached to the adapter, disconnect them.
 - d. Deflect the card guide snap to release the front end of the adapter.
 - e. Support the server with one hand, and with the other hand, pull the adapter out of the slot.



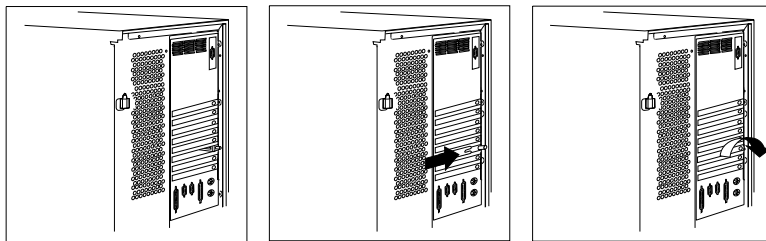
5. If you are installing another adapter in this expansion slot, see “Installing Adapters” on page 197 for instructions.

If you are not installing another adapter in this expansion slot, reinstall the expansion-slot cover:

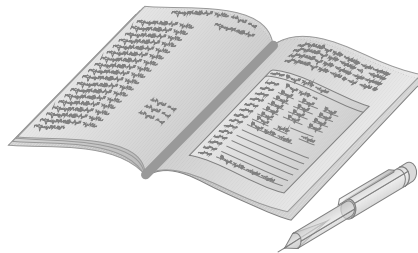
- a. Locate the expansion-slot cover that you removed when you installed the adapter.
- b. Slide the cover over the open expansion slot.

Removing Adapters

- c. Tighten the expansion-slot screw.



6. Go to Table 5 on page 385 and delete the name of the adapter you removed; then return here to determine your next step.



7. When you finish removing and adding adapters, reconnect any cables that you removed in step 1 on page 208 to their original positions.

What to do next?

- Configuring after removing a Micro Channel adapter? — go to “Micro Channel Configuration” on page 152.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 186.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 192.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 212.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Replacing the battery? — Go to “Replacing the Battery” on page 268.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 272.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.
- Installing or removing a security feature? — Go to “Security Procedures” on page 283.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

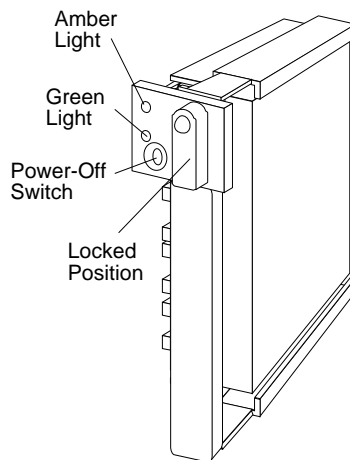
Installing Internal Drives

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

- Diskette
- Hard disk
- Rewritable optical disc
- Tape

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-swap* drives.

The hot-swap drive tray III for your PC Server 520 has a small switch that stops the movement of the disk drive. The tray also provides two LEDs (one green and one amber) to indicate the current state of the drive and tray.



The following table summarizes the LED states on your hot-swap tray and their meanings.

Green	Amber	Description
On	Off	Drive tray is powered on; the hard disk drive is inactive; and the drive should <i>not</i> be removed.
Blinking	Off	The hard disk drive is inactive. The hot-swap drive can be removed safely.
On	On or Blinking	The hard disk drive is in use, and should <i>not</i> be removed.
Off	Off	The drive is defective, or no power is being supplied to the drive. The hot-swap drive can be removed safely.

Each hot-swap drive that you plan to install must have a hot-swap drive tray III attached. Trays are available for two drive types: narrow and wide. The narrow tray supports 8-bit drives; the wide tray supports 16-bit drives. Select the appropriate drive trays for your hot-swap drives. If necessary, contact your IBM reseller or IBM marketing representative to purchase the types of drive trays that you need.

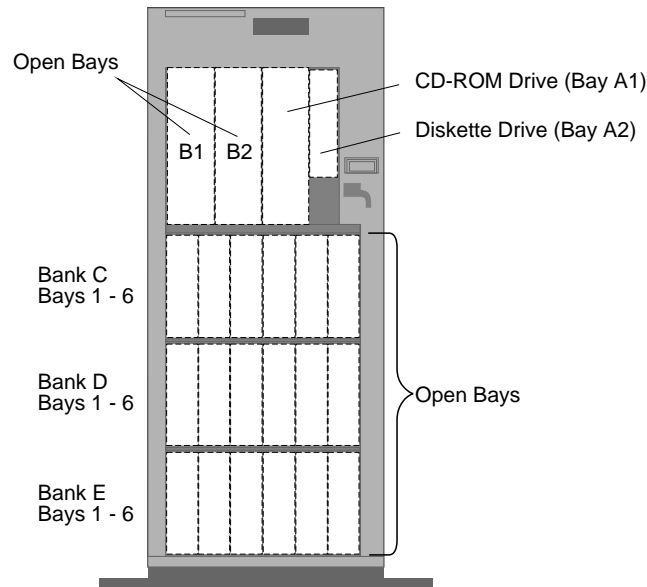
Internal Drive Bays

Internal drives are installed in *bays*. A diskette drive and a CD-ROM drive are preinstalled in bay A in all models. A removable CD storage compartment is shipped in bay B1. You can install two drives in bay B. You can install hot-swap drives in banks C, D, and E only. Banks C, D, and E each contain six bays; each bank can support up to six drives. The number of preinstalled hard disk drives in bank C varies according to the model that you purchased. You can install up to six drives in bank D and up to six drives in bank E.

Note: The bank letter-designations are located on both vertical rails on the front of the server. The bay-slot numbers are located on the top of bank C and the bottom of bank E.

In a disk-array model, you can use the SCSI output connector (*daisy-chain* connector) on the backplanes to serially link two adjacent backplanes in banks C, D, and E. When you connect two banks serially, each bank supports up to three half-high drives or six slim-high drives. When backplanes are daisy chained, you can control the hard disk drives in the banks with a single channel on the ServeRAID adapter. This allows you to support six half-high drives or 12 slim-high drives on a single channel.

A *cover plate* (sometimes called a *drive bezel* or *face plate*) covers the front of bay B2 only. If you install a drive that uses removable media (diskette, optical disc, or tape), you might need to remove or change this plate.



- Bay A comes with one SCSI CD-ROM drive and one 3.5-inch, 1.44 MB diskette drive. Bay A supports one 5.25-inch and one 3.5-inch, half-high diskette interface device.
- Bay B supports:
 - One 5.25-inch full-high, removable-media or non-removable-media device, or
 - One 5.25-inch half-high, non-removable-media device and one 3.5 inch, half-high removable-media device, or
 - Two 3.5-inch or two 5.25-inch, slim-high or half-high removable-media devices

Notes:

1. Unless you install an additional SCSI cable, only one of the devices that is installed in bay B can be a SCSI device.
2. The system board in your server supports a maximum of two diskette-interface devices. Therefore, only one of the devices that is installed in bay B can be a diskette drive.

- You cannot install hot-swap drives in bay B.
- Your server supports eighteen 3.5-inch, slim-high, hot-swap hard disk drives, or nine 3.5-inch, half-high hard disk drives in the bottom three banks (C, D, and E).

Banks C, D, and E can accommodate six slim-high, hot-swap hard disk drives, or three half-high drives, or a combination of both drive sizes. If you use a combination, remember that one half-high drive uses the equivalent space of two slim-high drives.

- If you install drives in bank D or E, you must remove the fan assembly on the rear of the server, install a direct access storage device (DASD) *backplane* in bank D or E, and add power and internal SCSI cables. You must also have an additional power supply, such as an optional 220-watt power supply or the IBM PC Server 780W Redundant Power Option, installed by your IBM service technician. (Instructions on removing the fan assembly and installing a backplane are given in “Installing a Drive in Bank D” on page 240.)

You might need to install an additional SCSI-2 adapter. (Instructions are given in “Installing Adapters” on page 197.)

- Each backplane has six connectors, to support up to six hard disk drives.
- An address jumper is located on the rear of each backplane. Set the jumper as described in “Setting the Backplane Address Jumper (J2)” on page 273.
- A SCSI ID jumper (J12) is located on the rear of each backplane. When you daisy-chain two backplanes, you must set the jumpers on these backplanes as described in “Setting Backplane SCSI ID Jumpers (J12)” on page 274.
- If you are installing a drive in a hot-swap tray that has jumpers (for example, ID jumper), remove the jumper pin block from the drive.

- To install 16-bit devices, you need a 16-bit cable (and a 8-bit to 16-bit SCSI Internal Converter if you want to connect the CD-ROM drive to the 16-bit cable). To order cables and a converter, contact your IBM reseller or IBM marketing representative. See “SCSI Drives” on page 218 for additional information.
- The IBM 3.5-inch rewritable optical disc drive requires a special mounting bracket. Contact your IBM reseller or IBM marketing representative for more information.

Attention: Before you remove a drive, back up all data.

The following table shows the widths, types, and maximum heights for the drives that you can install in each bay.

Bay or Bank	Drive Width	Drive Type	Drive Height
A	3.5-inch 5.25-inch	Diskette CD-ROM drive	Half-high
B	3.5-inch or 5.25-inch	Hard disk ¹ , diskette ² , removable media ³	Half-high Full-high
C, D, E	3.5-inch	Hard disk, hot-swappable, removable media ³	Slim-high Half-high
<p><i>Notes:</i></p> <ol style="list-style-type: none"> 1. If a hard disk drive is preinstalled, it is the startup (or boot) drive. 2. Or a drive that connects to the diskette cable. 3. Removable media include CD-ROMs, optical discs, and tapes. 			

Table 1. Maximum Allowable Drive Sizes

Table 2 on page 218 summarizes the additional hardware that is needed to install some server options.

<i>Table 2. Required Hardware for PC Server 520</i>	
Option	Required accessories
Internal, non-hot-swap drives (bay B)	<ul style="list-style-type: none"> • 8-bit or 16-bit drive, slim-high, half-high, or full-high • SCSI-2 cables <ul style="list-style-type: none"> – 4-drop non-hot-swap cable – 2-drop B-bay daisy-chain cable
Hot-swap backplane III	<ul style="list-style-type: none"> • Short internal SCSI-2 cable¹ <ul style="list-style-type: none"> – 2-drop B-bay daisy-chain cable (to bank C or bank D) – Daisy-chain cable to connect banks D and E, or banks C and D² • Long internal SCSI-2 cable, to connect to back panel
Hot-swap drives	<ul style="list-style-type: none"> • 8-bit or 16-bit drive • 8-bit or 16-bit hot-swap drive tray III • SCSI-2 cables <ul style="list-style-type: none"> – Backplane to back panel – Backplane to backplane (daisy chain) • Hot-swap backplane III, if installing hot-swap drives in bank D or bank E³
<p><i>Notes:</i></p> <ol style="list-style-type: none"> 1. You can daisy-chain backplanes only in disk-array models. 2. You cannot connect bank C to both bay B and bank D. 3. Bank C comes with a hot-swap backplane III. 	

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-2 connector.

Note: Any information about SCSI drives also applies to other SCSI devices, such as scanners and printers.

The server comes with three SCSI-2 connectors on the system board. Some models come with an IBM PC ServeRAID Adapter, which provides additional SCSI-2 connectors. The number of preinstalled SCSI hard disk drives varies according to model.

If you install additional SCSI devices in a non-disk-array model, you must set a unique identification (ID) for each SCSI device that you connect to the integrated SCSI-2 connector. This enables the SCSI-2 controller to identify the devices and ensure that different devices do not attempt to transfer data at the same time.

The SCSI ID address jumper (J12), a pin block with four pairs of pins, is located on the rear of the backplanes in banks C, D, and E. When two backplanes are daisy-chained in your disk-array model, the first backplane address jumper (for example, Bank C) must be set to LO, defining the SCSI IDs as 0 through 5. The second backplane (in this example, bank D), must be set to HI, defining the SCSI IDs as 8 through 13. (See “Setting Backplane SCSI ID Jumpers (J12)” on page 274.)

The order in which the server scans the SCSI devices is based on the SCSI IDs. The scanning sequence proceeds from 0 to the highest-numbered SCSI ID.

The SCSI ID for the preinstalled CD-ROM drive in bay A1 is set to 6, and the SCSI ID for the SCSI-2 controller is set to 7. Your server automatically sets SCSI IDs for hot-swap drives. If you need to set SCSI IDs for SCSI devices, refer to the instructions that come with these devices.

Note: Any information about SCSI drives also applies to other SCSI devices, such as scanners and printers.

For non-disk-array models:

- Fast/Wide (16-bit) devices support SCSI IDs 0 to 15
- Narrow (8-bit) devices support SCSI IDs 0 to 7

For disk-array models:

- The external channel connector supports SCSI IDs 0 to 15
- The internal channel connectors support SCSI IDs 0 to 15

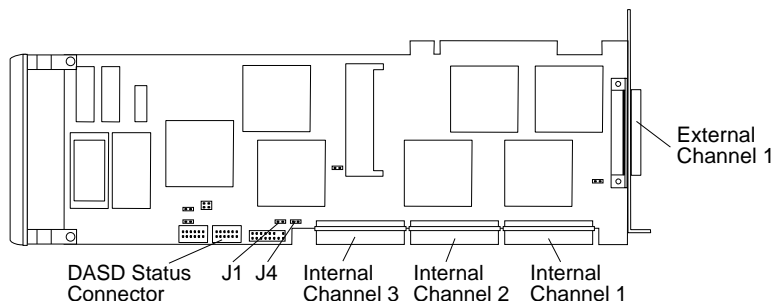
Installing Internal Drives

The processing sequence for SCSI devices is set through SCSISelect (see “Configure/View Host Adapter Settings” on page 172 for more information). The sequence proceeds from lowest SCSI ID to the highest (0 to 6, then 8 to 15).

Refer to the instructions that come with the SCSI devices for information about setting a SCSI ID.

The integrated SCSI-2 controller in your server has two internal connectors and one external connector. On non-disk-array models, one internal connector is used for an 8-bit cable; the other internal connector is used for a 16-bit cable. Non-disk-array models that come with a preinstalled hard disk drive use a 16-bit internal connector. (The system board drawing in “Installed Device Records” on page 384 shows the location of these connectors.)

On the disk-array models, the ServeRAID adapter provides three internal connectors for 16-bit cables.



Note: To keep the external channel available for use on the ServeRAID adapter, use Channel 2 or Channel 3 first, when you connect internal SCSI devices.

On all models, the external connector is for a 16-bit cable.

The integrated SCSI-2 controller supports a total of seven 8-bit or fifteen 16-bit SCSI devices. On the ServeRAID adapter, each of the channels supports a total of fifteen 16-bit SCSI devices, for a total of 45 devices.

Notes:

1. Only one of the 16-bit SCSI-2 connectors on the system board can be used when you are using the external SCSI-2 connector.
2. Only two of the internal 16-bit SCSI-2 connectors on the ServeRAID adapter can be used when you are using the adapter's external SCSI-2 connector.
3. If you plan to install both internal and external SCSI devices, you must follow the instructions given in "Connecting External Options" on page 293 in addition to the instructions in this section.
4. If you connect devices to the internal or external integrated SCSI connectors in a disk-array model, the server might attempt to start from these non-disk-array devices. Refer to your operating system documentation.

Termination (Internal SCSI Devices)

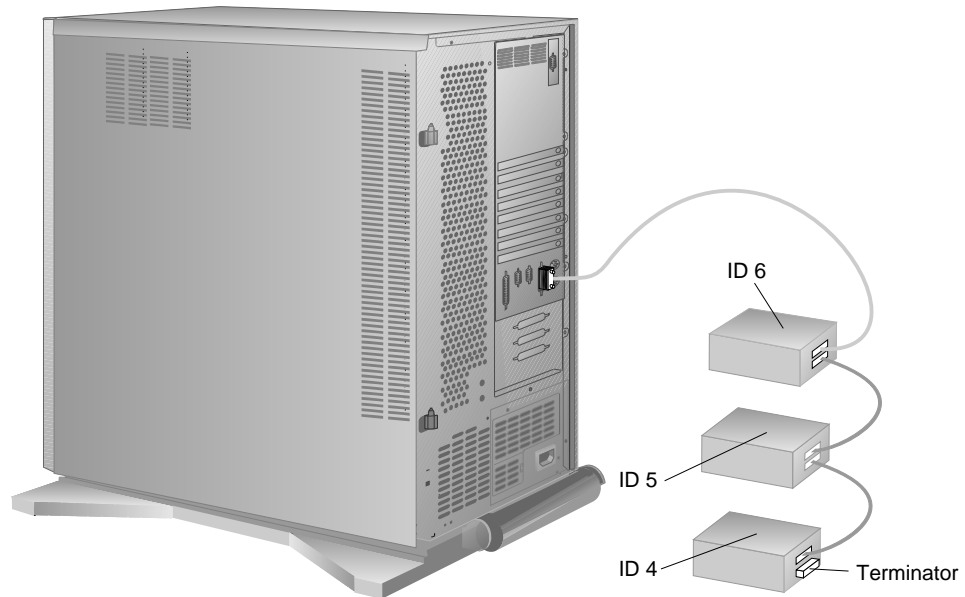
The devices at both ends of the SCSI bus must be terminated. If you attach SCSI devices (internal or external), you must terminate the last device in the chain.

When SCSI devices are chained, both ends of the chain (cable) require a *terminator*. The purpose of these terminators is to ensure that the quality of the signal is maintained throughout the SCSI chain. If you attach SCSI devices (internal or external), you must terminate the last device in the chain, or the end of the cable must be terminated.

Note: All of the preinstalled hot-swappable drives in your server have automatic termination.

If you attach internal SCSI devices to one of the SCSI-2 internal connectors in a non-disk-array model, you must terminate the last internal device on the bus (cable) and disable the termination on the other devices connected to the internal SCSI controller. The SCSI-2 controller is already terminated.

Installing Internal Drives



Notes:

- A 16-bit cable connects the hard disk drive to the SCSI-2 controller. A 16-bit to 8-bit SCSI Internal Converter is used to connect the CD-ROM drive to the 16-bit cable. The external SCSI-2 connector requires a 68-pin external cable connector.
- A CD-ROM drive is installed in bay A2. In non-disk-array models that do not come with a hard disk drive, the CD-ROM drive is terminated.

If you install a 16-bit device, you must purchase a 16-bit cable and a 16-bit to 8-bit SCSI Internal Converter to connect the CD-ROM drive to the 16-bit cable.

Refer to the instructions that come with the SCSI device for more information about termination. Refer to the *User's Reference* for additional information about your server's SCSI subsystem.

Preinstallation Steps (All Bays)

Before you install drives in your PC Server 520, verify that you have all of the cables, drive trays, 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. Refer to the following table.

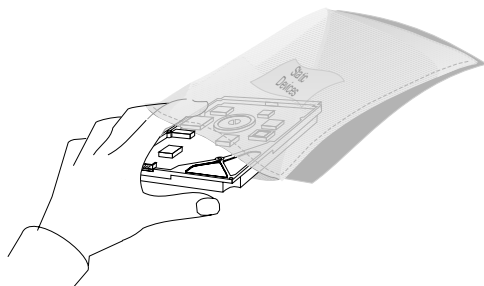
Required activity	Bay B	Bank C	Bank D	Bank E
Preinstallation activities				
Purchase hot-swap hard-disk drive III	No	Yes	Yes	Yes
Purchase hot-swap-drive trays	No	Yes	Yes	Yes
Purchase and install backplane before installing first hot-swap drive	Not applicable	No ¹	Yes	Yes
Purchase another power supply and have it installed	No	No	Yes	Yes ²
Installation activities				
Remove fan assembly to attach cables before first use	Yes	No ³	Yes	Yes
<p><i>Notes:</i></p> <ol style="list-style-type: none"> 1. Bank C comes with a preinstalled hot-swap backplane III. 2. An IBM service technician can install a 220-watt power supply or 780-watt power supply (if not previously installed). 3. Bank C comes with a SCSI-2 cable that connects the SCSI-2 input connector on the backplane to the SCSI-2 connector on the system board or ServeRAID adapter. 				

Before you begin, be sure you have:

- Read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.
- Read the documentation that comes with the internal drive.
- Removed the server side cover (see “Preparing to Install Options” on page 181).

Installing Internal Drives

1. Choose the bay in which you want to install the drive. (See Table 1 on page 217 for the drive types and sizes available for each bay in your server.)
2. Touch the static-protective bag containing the drive to any unpainted metal surface on the server; then remove the drive from the bag.



3. Check the instructions that come with the drive, or contact your IBM reseller or IBM marketing representative to see if you need to set any switches or jumpers on the drive, or if you need to attach a tray to the drive.

Notes:

- The SCSI ID on the CD-ROM is preset to 6.
- Automatic SCSI ID settings apply only to hot-swappable hard disk drives installed in banks C, D, and E. Therefore, if you install a SCSI drive in bay B of disk-array models, you must set a SCSI ID for that drive.

What to do next?

- Installing a drive in bay B? — Go to “Installing a Drive in Bay B” on page 225.
- Installing a hot-swappable drive in bank C, D, or E? — Go to “Installing a Drive in Bank C” on page 235.

Installing a Drive in Bay B

Before you begin:

Be sure you have removed the server side cover and prepared the drive for installation (see “Preparing to Install Options” on page 181 and “Preinstallation Steps (All Bays)” on page 223).

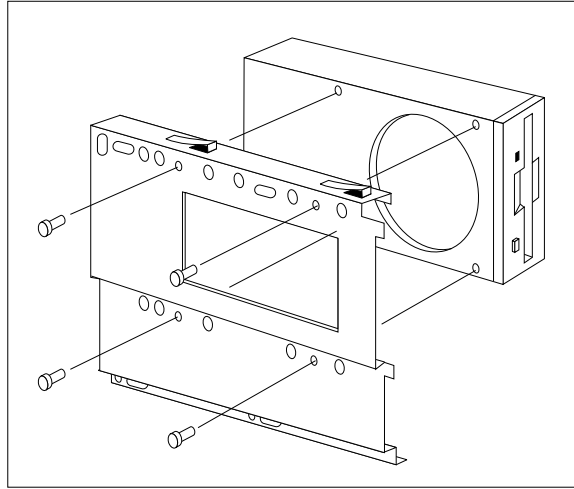
The SCSI cabling that comes with your server supports a maximum of seven internal SCSI drives (including those in bay B and bank C, and the CD-ROM drive in bay A).

If you are installing a SCSI drive in bay B, and bank C contains six drives, you must either install an additional SCSI cable, or remove a drive from bank C as described in “Removing a Drive from Bank C, D, or E” on page 264. When you remove a drive from bank C, start with the drive in bay 6, that is, remove the drive that is at the end of the scanning order.

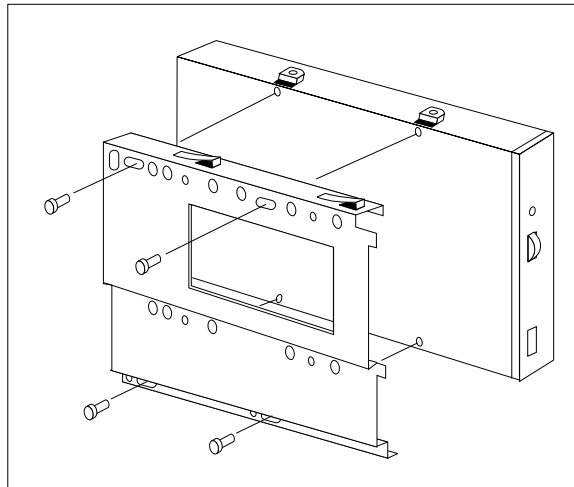
You can connect the drives in bay B to bank C or bank D. However, when you install slow devices such as tape drives in bay B, performance of the drives in bank C or D is affected. You might choose to connect these devices to a separate SCSI-2 adapter.

Installing Internal Drives

1. Each drive you install in bay B must have a tray like that shown below. An extra tray is shipped in bay B1. If your drive came with a different tray, remove it and install the IBM tray.

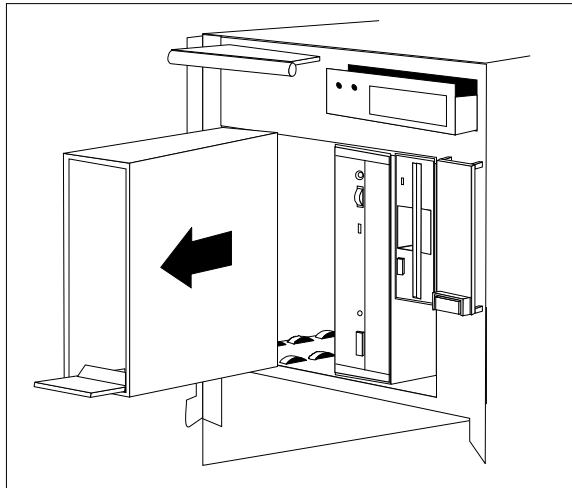
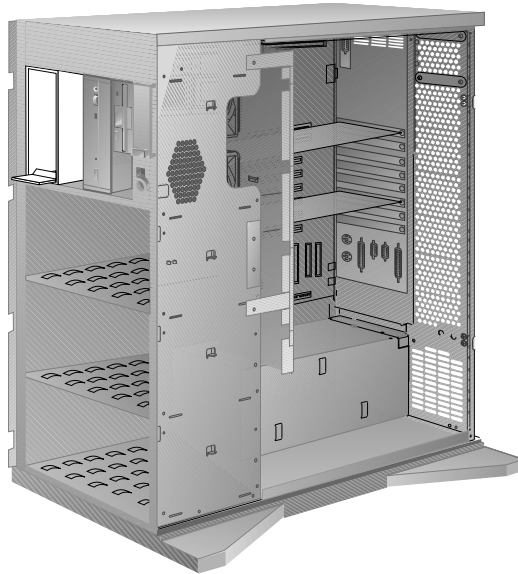


3.5-inch drive



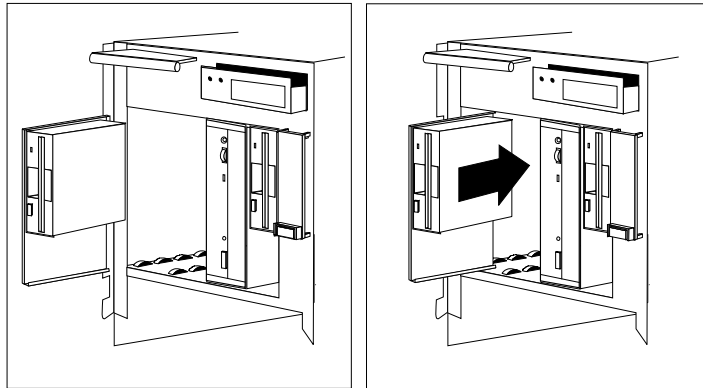
5.25-inch drive

2. If you are installing a drive in bay B1, remove the CD storage compartment.



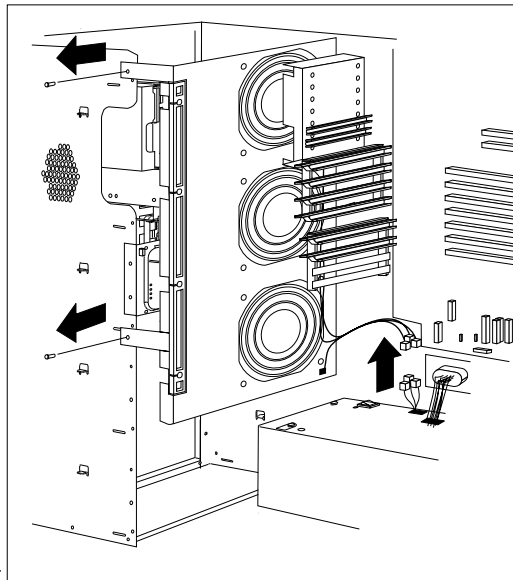
Installing Internal Drives

3. Install the drive:
 - a. Position the drive vertically, with the connectors facing the rear of the server.
 - b. Align the drive with the guides on the bottom of the bay and slide it to the rear of the bay until it stops.



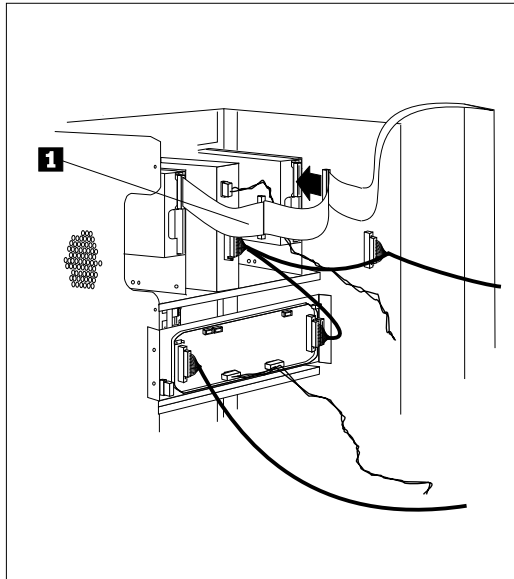
4. Slide the diskette drive and the CD-ROM drive forward. If you do not have enough room to connect the cables to the new drive, remove the fan assembly:
 - a. Disconnect the three fan assembly cables from the power supply.

Attention: To avoid damage and ensure proper server operation, handle the fan assembly carefully.
 - b. Remove the two screws that hold the fan assembly in place.
 - c. Remove the fan assembly by pulling it up and out.

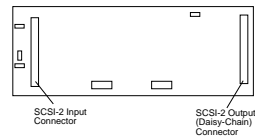


Installing Internal Drives

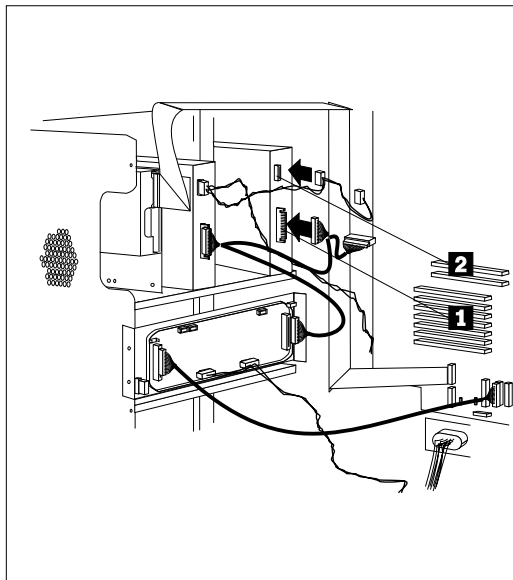
5. Connect the cables:
 - a. If you are installing a diskette drive, locate the flat cable behind bay A **1**. The cable has two available diskette drive connectors. The diskette drive in bay A is already attached to the diskette drive cable. Attach the appropriate connector to your drive.



- b. If you are installing a SCSI drive, locate the drive's SCSI connector **1**; then, connect the SCSI cable.
- c. If you are connecting the drive in bay B to bank C or D in the server, attach the end of the SCSI cable to the daisy-chain connector on the backplane.

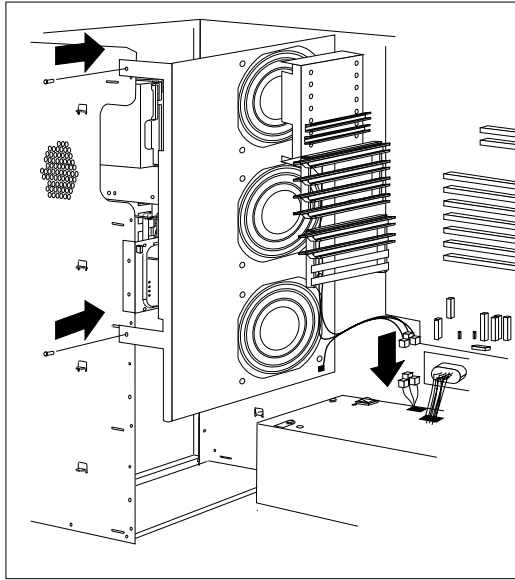


- d. Attach the power cable connector to the 4-pin connector on the drive **2**.

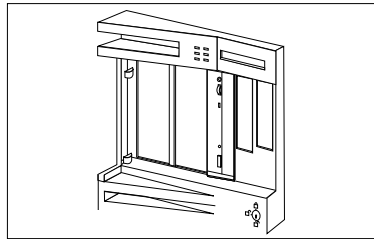
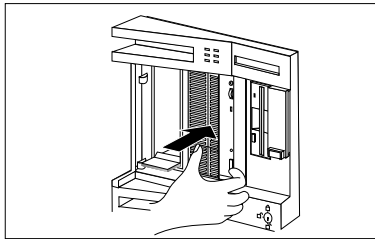


6. If you removed the fan assembly, reinstall it with the two screws you removed in step 4 on page 229.

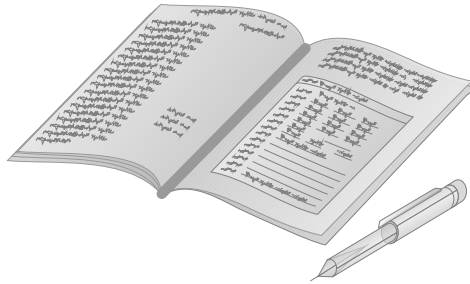
Reconnect the fan assembly cables.



7. If you installed a removable-media drive in bay B2, remove the cover plate from the front cover. A cover plate (complete drive bezel) is in place in the server's front cover, which you removed earlier. Remove the cover plate by pushing it, gently, out of the front cover.



8. Go to Table 8 on page 390 to record the drive location and SCSI ID, if applicable (diskette-interface devices do not require a SCSI ID); then return here to determine your next step.



What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 186.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 192.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Removing an adapter? — Go to “Removing Adapters” on page 208.
- Installing an internal drive in bank C? — Go to “Installing a Drive in Bank C” on page 235.
- Installing an internal drive in bank D? — Go to “Installing a Drive in Bank D” on page 240.
- Installing an internal drive in bank E? — Go to “Installing a Drive in Bank E” on page 252.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Replacing the battery? — Go to “Replacing the Battery” on page 268.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.

Installing Internal Drives

- Installing or removing a security feature? — Go to “Security Procedures” on page 283.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

Installing a Drive in Bank C

Before you begin, be sure that you have

- Removed the server side cover (see “Preparing to Install Options” on page 181)
- Prepared the drive for installation (see “Preinstallation Steps (All Bays)” on page 223).
- Ensured that the backplane address jumper J2 is set to “C.”

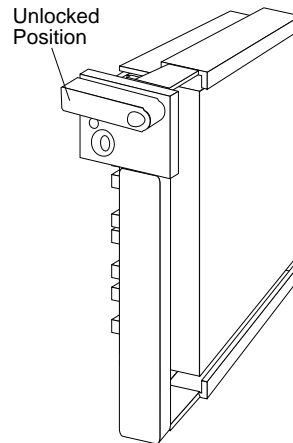
Notes:

- Banks C, D, and E support hot-swappable drives only.
- You do not have to turn off the server to install additional hot-swappable drives in bank C.
Attention: Before you hot-swap a drive, make sure it is defective. If you partially or completely remove a good drive instead of a defective one, your server might lose valuable data.
- If you have a SCSI drive in bay B, you can have up to five drives in bank C that are connected to the same SCSI cable. If there is no SCSI drive in bay B, you can have up to six drives in bank C.
- If your server is a disk-array model, you must reconfigure your disk arrays after installing hard disk drives. See Chapter 3, “Configuring the Disk Array” on page 71 for details.

Installing Internal Drives

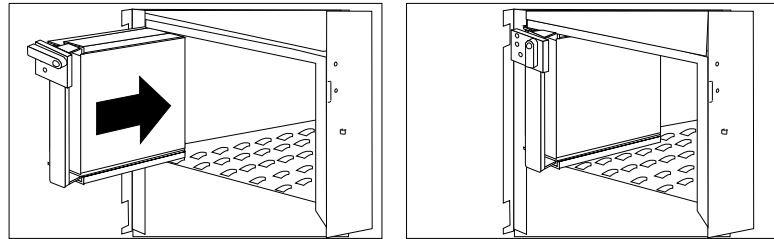
To install a drive in bank C:

1. Each drive you plan to install in bank C and connect to a hot-swap backplane III must have a hot-swap drive tray III attached. If your drive has a different tray attached, remove it and attach the appropriate hot-swap drive tray III to your drive. Follow the instructions given in the kit that contains the hot-swappable-drive tray.
2. Install the hard disk drive:
 - a. Move the tray knob to the unlocked position.

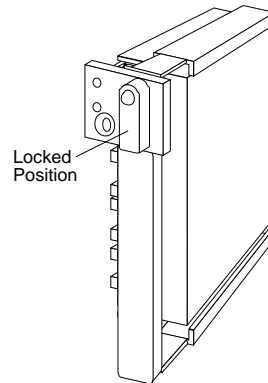


- b. Position the drive tray assembly vertically, with the connector facing the rear of the server.

- c. Align the side of the tray with the raised guides on the bottom of the bay. (Note the arrows pointing toward the backs of the bays.)
- d. Slide the tray to the rear of the bay until it stops. Be sure it is connected properly to the backplane.

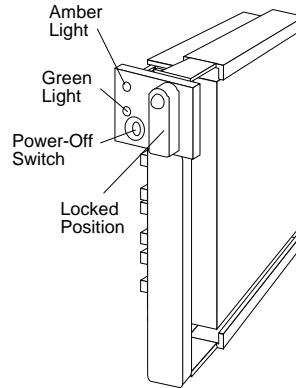


- e. Move the tray's knob to the locked position.

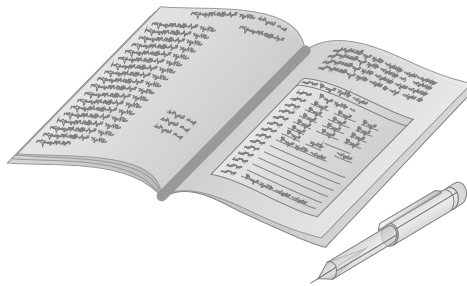


Installing Internal Drives

Note: If you turned on the server before installing the drive, the green light on the front of the drive tray illuminates, indicating that the drive was installed correctly.



3. Go to Table 8 on page 390 to record the drive location and the SCSI ID that your server assigned to the drive; then return here to determine your next step.



Note: If your server is a disk-array model, you must reconfigure your disk arrays after installing hard disk drives. See Chapter 3, “Configuring the Disk Array” on page 71 for details.

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 186.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 192.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Removing an adapter? — Go to “Removing Adapters” on page 208.
- Installing an internal drive in bay B? — Go to “Installing a Drive in Bay B” on page 225.
- Installing an internal drive in bank D? — Go to “Installing a Drive in Bank D” on page 240.
- Installing an internal drive in bank E? — Go to “Installing a Drive in Bank E” on page 252.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Replacing the battery? — Go to “Replacing the Battery” on page 268.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.
- Installing or removing a security feature? — Go to “Security Procedures” on page 283.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

Installing a Drive in Bank D

Before you begin, be sure you have:

- Purchased a hot-swap drive tray III for each hot-swappable drive that you plan to install, and prepared the drive for installation.
- Opened the front cover (see “Preparing to Install Options” on page 181 and “Preinstallation Steps (All Bays)” on page 223). If you are installing or removing backplanes, cables, the fan assembly, and adapters, also remove the side cover.
- Contacted an IBM reseller or IBM marketing representative to order an additional 220-watt power supply for you, or replace the existing power supply with an IBM PC Server 780W Redundant Power Option. Contact an IBM service technician to install the power supply.
- Purchased a hot-swap backplane to be installed at the rear of bank D, as described in step 4 on page 242. (To order the backplane, contact your IBM reseller or IBM marketing representative.)
- Ensured that the backplane address jumper J2 is set to “D.”
- Removed the cardboard packing material from bank D.

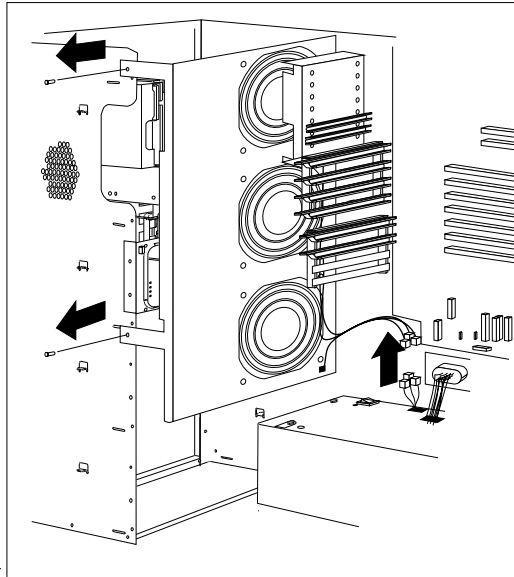
Notes:

- For non-disk-array models, you might need to install an additional SCSI-2 adapter. To order, contact your IBM reseller or IBM marketing representative.
- In a disk-array model, banks C and D or D and E can be daisy chained or linked together into a single SCSI-2 channel using the “daisy chain option” cable. However, the SCSI ID jumper (J12) on one backplane must be set to HI. (See the table under “Setting Backplane SCSI ID Jumpers (J12)” on page 274.)
- You can install up to three half-high drives or six slim-high drives in each of banks C, D, and E.

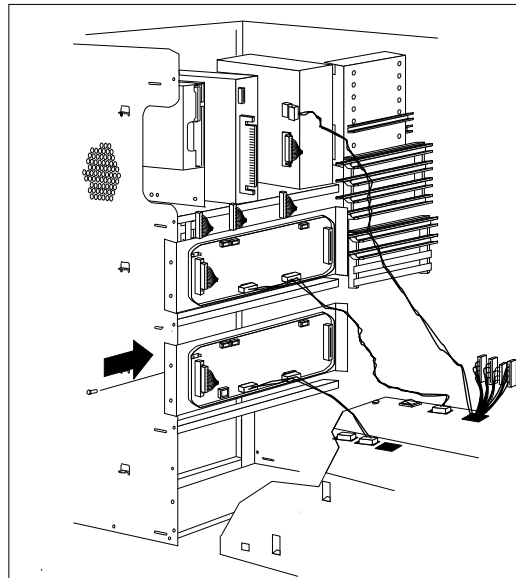
- Banks C, D, and E support hot-swappable drives only.
- If you have a SCSI drive in bay B, you can have up to five drives in bank D that are connected to the same SCSI cable. If there is no SCSI drive in bay B, you can install up to six drives in bank D.
- After the backplane is installed, you do not have to turn off the server to install hot-swappable drives in bank D. However, you must turn off the server when performing the steps that involve installing or removing backplanes, cables, the fan assembly, and adapters.

If the fan assembly is installed, you must remove it before you can install the backplane in the rear of bank D.

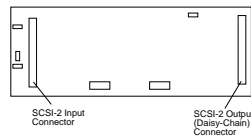
1. Disconnect the fan assembly cable from the fan bracket.
Attention: To avoid damage and ensure proper server operation, handle the fan assembly carefully.
2. Remove the two screws that hold the fan assembly in place.
3. Remove the fan assembly by pulling it up and out.



4. Install a backplane at the rear of bank D:
 - a. Make sure that the address jumper on the back of the backplane is set to D (see “Setting the Backplane Address Jumper (J2)” on page 273).
 - b. Align the top screw hole on the left side of the backplane with the top screw hole on the left side of bank D, making sure the bumps on the backplane line up with the holes on the frame of the server.
 - c. Secure the backplane with one screw.



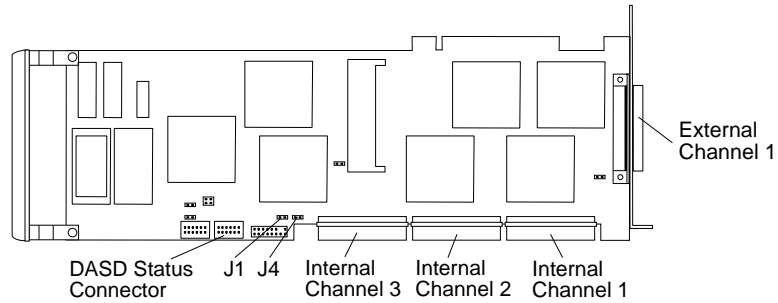
The SCSI-2 cable connectors on the rear of the backplane are shown in the following illustration. The SCSI ID address jumper (J12) on the backplane determines the SCSI IDs for the hot-swap drives in Bank D.



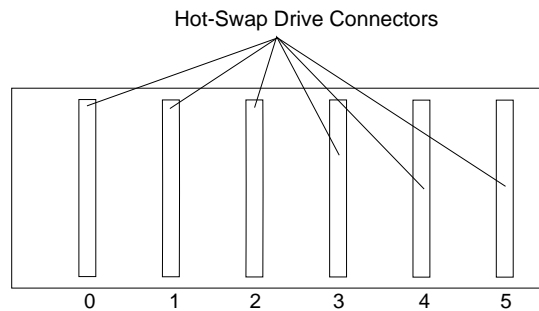
5. Install a power cable that connects the backplane to the additional power supply.
6. If your server is a disk-array model, go to step 10 on page 245 for cabling instructions. If your server is a non-disk-array model, continue with step 7 on page 244.

7. If your server is a non-disk-array model, you might need to install an additional SCSI-2 adapter. If this is the case, see “Installing Adapters” on page 197 for installation instructions; otherwise, continue with step 8.
8. Refer to the following information help you connect the cables properly.
 - **Example 1:** In the original cable routing in a non-disk-array model, a cable connects the CD-ROM drive to the SCSI-2 output connector on the bank C backplane. The SCSI-2 input connector on the bank C backplane connects to the internal 16-bit SCSI-2 connector on the system board. A DASD status cable (also known as a system status cable) connects the adapter to the backplane in bank C.
 - **Example 2:** A backplane is installed in bank D in a non-disk-array model; a SCSI-2 adapter is installed in a PCI slot. A SCSI cable connects the CD-ROM drive to the SCSI-2 output connector on the bank C backplane. A SCSI cable connects the SCSI-2 input connector on the bank C backplane to the internal 16-bit SCSI-2 connector on the system board. A cable connects the SCSI-2 input connector on the bank D backplane to an internal 16-bit SCSI-2 connector on the adapter. In this example, you can also connect external devices to the external connectors on the SCSI-2 adapter and the server. A DASD status cable (also known as a system status cable) connects the adapter to the backplanes in banks C and D.
9. Go to step 13 on page 247.

10. If your server is a disk-array model, an IBM PC ServeRAID Adapter is installed in a PCI expansion slot. Cables link the DASD status and SCSI-2 connectors on the adapter to the backplane in bank D. By default, the SCSI cable connects the SCSI-2 input connector on the bank C backplane to the Channel 3 connector on the adapter.



The following figure shows the default SCSI IDs for the hot-swap drive connectors on the backplane.

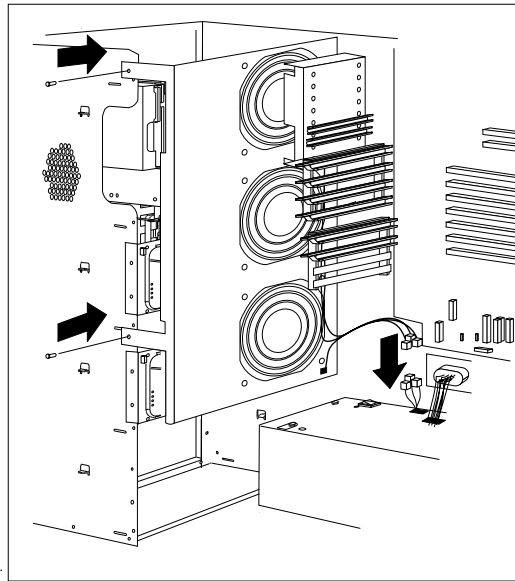


11. If you are connecting bank C serially to bank D in the server (daisy-chaining banks C and D), attach a SCSI-2 cable from the daisy-chain connector on bank C to the SCSI-2 input connector on bank D.

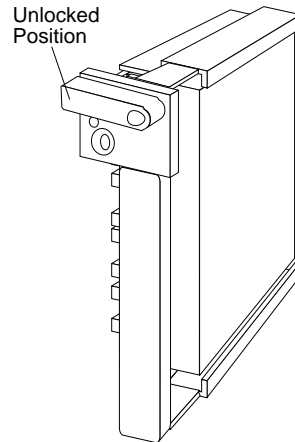
Notes:

- Bank C can connect to either bay B or to the backplane in bank D. If bank C is connected to bay B, it cannot be connected to bank D.
 - When you daisy chain two banks in a disk-array model, you *must* start the ServeRAID configuration program and specify which channel the banks are connected to. You must also define the SCSI IDs for each bank as LO or HI. (See “Changing the ServeRAID Adapter Parameters” on page 124 for more information.)
12. Refer to the following information for help in connecting the cables properly in a disk-array model.
 - **Example 1:** In the original cable routing in a disk-array model, the backplane in bank C is cabled to Channel 3 on a ServeRAID adapter. A DASD status cable (also known as a system status cable) connects the adapter to the backplane.
 - **Example 2:** A SCSI cable connects the adapter Channel 3 to the backplane in bank C; a second SCSI cable connects Channel 2 to the backplane in bank D. The external connector on Channel 1 is available for connecting external devices. A DASD status cable (also known as a system status cable) connects the adapter to the backplanes in banks C and D.
 - **Example 3:** A SCSI cable connects the CD-ROM drive to the system board. A daisy-chain cable connects the input connector on the bank D backplane to the output connector on the bank C backplane. A SCSI cable connects the input connector on the bank C backplane to Channel 3 on the ServeRAID adapter. A DASD status cable (also known as a system status cable) connects the adapter to the backplanes in banks C and D. Channel 1 on the ServeRAID adapter is available for connecting external devices.

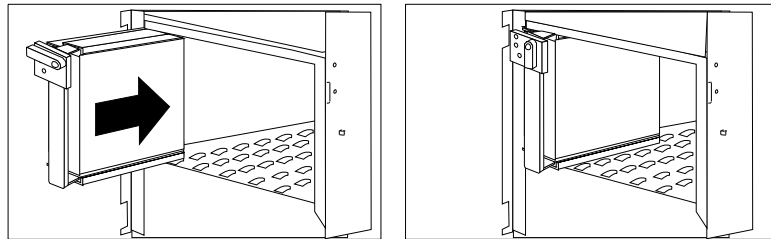
13. Each drive you plan to install in bank D must have a hot-swap-drive tray attached. If your drive comes with a different tray, remove it and attach the appropriate hot-swap-drive tray to your drive. Follow the instructions given in the kit that contains the hot-swap-drive tray.
14. Reinstall the fan assembly you removed in step 3 on page 241.
15. Reinstall the fan assembly screws you removed in step 2 on page 241.
16. Reconnect the fan assembly cables that you disconnected in step 1 on page 241.



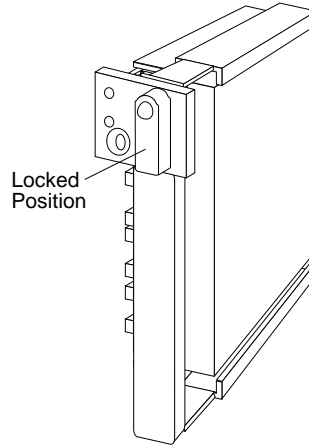
17. Install the hard disk drive in bank D:
 - a. Move the tray knob to the unlocked position.



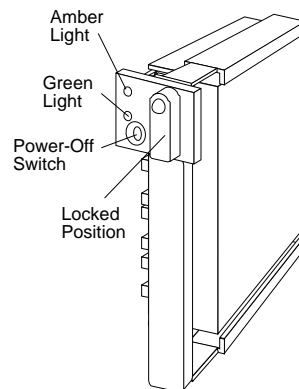
- b. Position the drive tray assembly vertically, with the connector facing the rear of the server.
 - c. Align the side of the tray with the raised guides on the bottom of the bay. (Note the arrows pointing towards the backs of the bays.)



- d. Slide the drive tray to the rear of the bay until it connects to the backplane. Be sure it is connected properly to the backplane.
- e. Move the tray knob to the locked position.

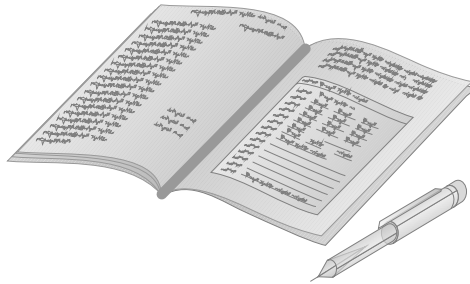


Note: If you turned on the server before installing the drive, the green light on the front of the drive tray illuminates, indicating that the drive was installed correctly.



Installing Internal Drives

18. Go to Table 8 on page 390 to record the drive location and the SCSI ID that your server assigned to the drive (see “SCSI Drives” on page 218 for details); then return here to determine your next step.



Note: If your server is a disk-array model, you must reconfigure your disk arrays after installing hard disk drives. See Chapter 3, “Configuring the Disk Array” on page 71 for details.

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 186.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 192.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Removing an adapter? — Go to “Removing Adapters” on page 208.
- Installing an internal drive in bay B? — Go to “Installing a Drive in Bay B” on page 225.
- Installing an internal drive in bank C? — Go to “Installing a Drive in Bank C” on page 235.
- Installing an internal drive in bank E? — Go to “Installing a Drive in Bank E” on page 252.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.
- Replacing the battery? — Go to “Replacing the Battery” on page 268.
- Installing or removing a security feature? — Go to “Security Procedures” on page 283.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

Installing a Drive in Bank E

Before you begin, be sure you have:

- Purchased a hot-swap drive tray III for each hot-swappable drive that you plan to install, and prepared the drive for installation.
- Opened the front cover (see “Preparing to Install Options” on page 181 and “Preinstallation Steps (All Bays)” on page 223). If you are installing or removing backplanes, cables, the fan assembly, and adapters, also remove the side cover.
- Removed the cardboard packing material from bank E.
- Contacted your IBM service technician to have another power supply installed if it has not already been installed for bank D.
- Purchased a hot-swap backplane to be installed at the rear of bank E, as described in step 4 on page 242. (To order the backplane, contact your IBM reseller or IBM marketing representative.)
- Ensured that the backplane address jumper J2 is set to “E” (see “Setting the Backplane Address Jumper (J2)” on page 273).

Notes:

- Banks C, D, and E support hot-swappable drives only. (To order the backplane, contact your IBM reseller or IBM marketing representative.)
- If your server is a disk-array model and you have drives installed in banks C and D, and also have drives attached to the external SCSI-2 connector, you must install an additional SCSI-2 adapter. If your server is a non-disk-array model, you might need to install an additional SCSI-2 adapter. (See “Installing Adapters” on page 197 for instructions.)

Refer to the documentation that comes with the adapter for the channel identification of the internal and external connectors.

- You can install up to three half-high drives or six slim-high drives each of banks C, D, and E.
- Banks C and D or D and E can be daisy chained or linked together into a single SCSI-2 bus using the “daisy chain option” cable. However, the SCSI ID jumper (J12) on one backplane must be set to HI. (See the table under “Setting Backplane SCSI ID Jumpers (J12)” on page 274.)
- After the backplane is completely installed, you do not have to turn off the server to install hot-swappable drives in bank E. However, you must turn off the server when performing the steps that involve installing or removing adapters, backplanes, cables, and the fan assembly.

To install a drive in bank E:

1. If required for your server, install an additional SCSI-2 adapter in one of the empty expansion slots (see “Installing Adapters” on page 197).

If the fan assembly is installed, you must remove it before you can install the backplane at the rear of bank E.

2. Disconnect the fan assembly cables from the fan bracket.

Attention: To avoid damage and ensure proper server operation, handle the fan assembly carefully.

Remove the two screws that hold the fan assembly in place.

Remove the fan assembly. (See steps 1 through 3 on page 241).

3. Make sure that the address jumper on the back of the backplane is set to E (see “Setting the Backplane Address Jumper (J2)” on page 273).

Note: When you daisy chain two banks in a disk-array model, you *must* start the ServeRAID configuration program and specify which channel the banks are connected to. You must also define the SCSI IDs for each bank as LO or HI. (See “Changing the ServeRAID Adapter Parameters” on page 124 for more information.)

4. Install the backplane at the rear of bank E (see step 4 on page 242).
5. Install a power cable that connects the backplane to the additional power supply.
6. Connect a SCSI cable from the SCSI-2 adapter to the new backplane.

Use one of the following examples to help you route the cables properly. See step 12 on page 246 for additional examples.

- **Example 1:** A non-disk-array model contains drives in bay B, and banks C, D, and E.

A 16-bit SCSI cable connects the drive in Bay B to the CD-ROM drive, then to the output connector on the backplane in bank C. An internal SCSI cable connects the input connector on the backplane in bank C to the internal 16-bit SCSI-2 connector on the system board. Internal SCSI cables connect the SCSI-2 input connectors on the backplanes in bank D and bank E to SCSI-2 adapters. A DASD status cable (also known as a system status cable) connects to the backplanes in banks C, D, and E.

Note: In this example, the external connectors on the system board and the adapters are available for use.

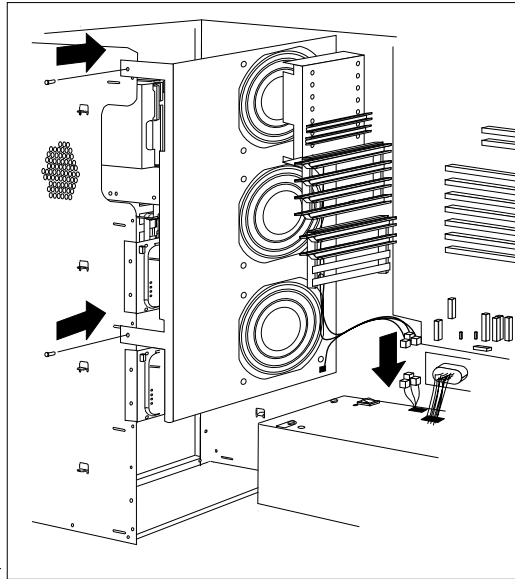
- **Example 2:** A disk-array model uses separate SCSI cables to connect from the ServeRAID adapter in a PCI expansion slot to banks C, D, and E. The DASD status cable (also known as a system status cable) connects the adapter to the backplane in bank C, and continues to the DASD status connector on the backplanes in bank D and bank E.

In this example, you cannot connect external devices to the Channel 1 connector on the ServeRAID adapter. Instead, you must install a second ServeRAID adapter to support external devices.

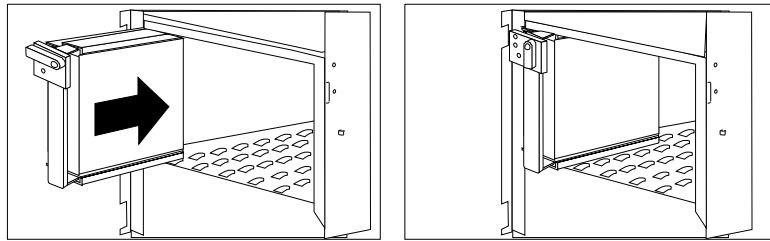
- **Example 3:** A cable connects the CD-ROM drive and a tape drive installed in bay B of a disk-array model to the output connector on the bank C backplane. A cable connects the input connector on the bank C backplane to Channel 3 on the ServeRAID adapter. A daisy-chain cable connects the input connector on the bank D backplane to the output connector on the bank E backplane. A SCSI cable connects the input connector on the bank E backplane to Channel 2 on the ServeRAID adapter. Banks D and E contain three half-high drives each; the backplane in bank E is set to HI. The DASD status cable connects the adapter to the backplane in bank C, and continues to the DASD status connector on the backplanes in bank D and bank E.

Installing Internal Drives

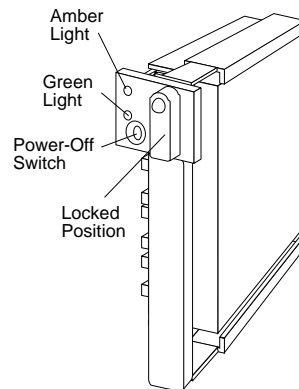
7. Reinstall the fan assembly you removed in step 2 on page 253.
8. Reinstall the screws you removed in step 2 on page 253.
9. Reconnect the fan assembly cables that you disconnected in step 2 on page 253.



10. Each drive you plan to install in bank E must have a hot-swap-drive tray attached. If your drive comes with a different tray, remove it and attach the appropriate hot-swap-drive tray to your drive. Follow the instructions in the kit that contains the hot-swap-drive tray.
11. Install the hard disk drive in bank E (see step 17 on page 248 for sequence).

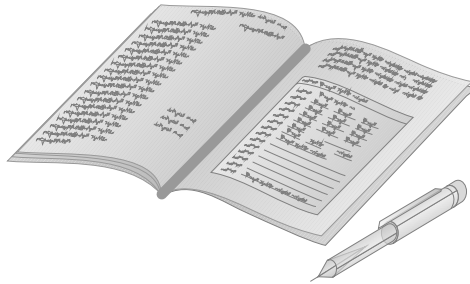


Note: If you turned on the server before installing the drive, the green light on the front of the drive tray illuminates, indicating that the drive is installed correctly.



Installing Internal Drives

12. Go to Table 8 on page 390 to record the drive location and the SCSI ID that your server assigned to the drive (see “SCSI Drives” on page 218 for details); then return here to determine your next step.



Note: If your server is a disk-array model, you must reconfigure your disk arrays after installing hard disk drives. See Chapter 3, “Configuring the Disk Array” on page 71 for details.

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 186.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 192.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Removing an adapter? — Go to “Removing Adapters” on page 208.
- Installing an internal drive in bay B? — Go to “Installing a Drive in Bay B” on page 225.
- Installing an internal drive in bank C? — Go to “Installing a Drive in Bank C” on page 235.
- Installing an internal drive in bank D? — Go to “Installing a Drive in Bank D” on page 240.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Replacing the battery? — Go to “Replacing the Battery” on page 268.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.
- Installing or removing a security feature? — Go to “Security Procedures” on page 283.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

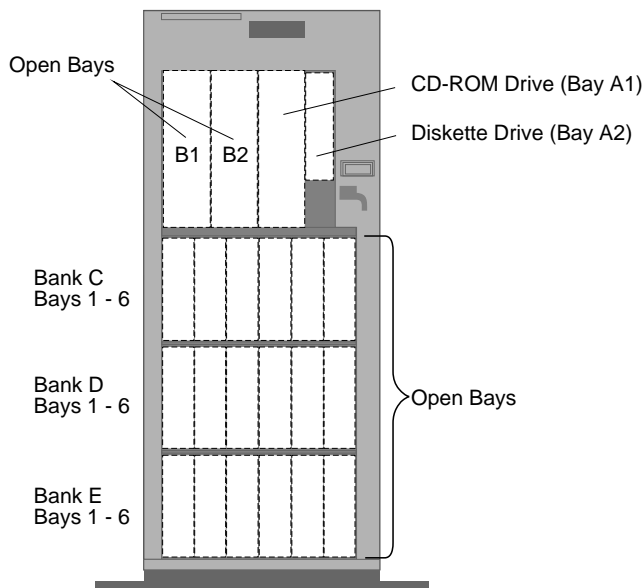
Removing Internal Drives

Before you begin, be sure you have:

- Read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.
- Removed the server side cover (see “Preparing to Install Options” on page 181).
- Determined the correct location of a failed hard disk drive, if your server is a disk-array model, and your system indicates that a drive is defective (bank C, D, or E only). See page 264 for details.

To remove a drive from bay B, go to “Removing a Drive from Bay B” on page 261.

To remove a drive from bank C, D, or E, go to “Removing a Drive from Bank C, D, or E” on page 264.

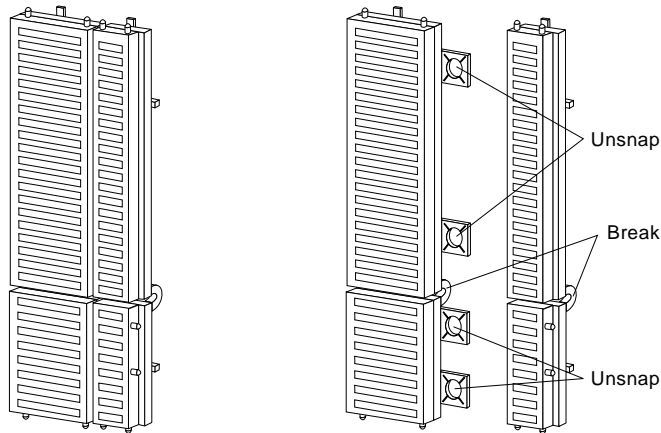


Removing a Drive from Bay B

Note: To locate bay B, see the illustration in “Removing Internal Drives” on page 260.

To remove a drive from bay B, do the following steps:

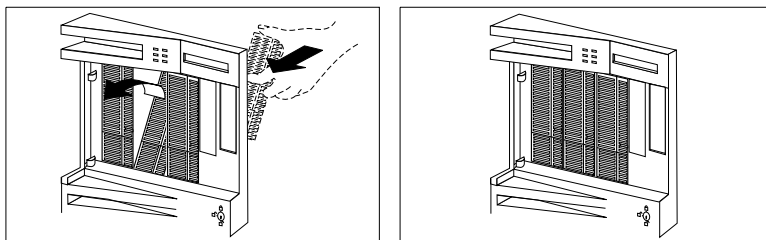
1. Find the drive you plan to remove.
2. Slide the drive halfway out of the front of the bay.
3. Disconnect the appropriate cables from the back of the drive.
4. Remove the drive from the bay. Store the drive in a safe place.
5. If you are not installing another removable media drive in the bay, replace the cover plate. A cover plate (complete bezel) was removed from the server front cover when you installed the drive.
 - a. You can adjust the size of the cover plate as shown in the following illustration.



Complete Bezel

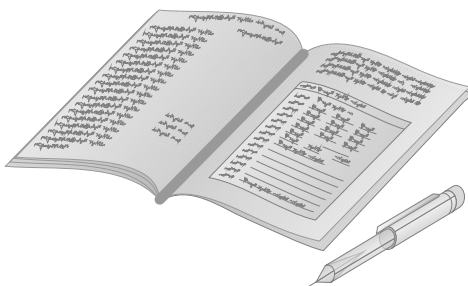
Removing Internal Drives

- b. Insert the cover plate by pushing it, gently, into the front cover.



6. What to do next?

- If you are removing another internal drive from bay B, return to step 1 on page 261.
 - If you are installing another internal drive in bay B, go to step 1 on page 224.
 - If you are removing an internal drive from bank C, D, or E, go to “Removing a Drive from Bank C, D, or E” on page 264.
 - If you are not installing or removing another internal drive, continue with the next step.
7. Go to Table 8 on page 390 and update the drive information; then return here to determine your next step.



What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 186.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 192.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Removing an adapter? — Go to “Removing Adapters” on page 208.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 212.
- Removing an internal drive from bank C, D, or E? — Go to “Removing a Drive from Bank C, D, or E” on page 264.
- Replacing the battery? — Go to “Replacing the Battery” on page 268.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.
- Installing or removing a security feature? — Go to “Security Procedures” on page 283.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

Removing a Drive from Bank C, D, or E

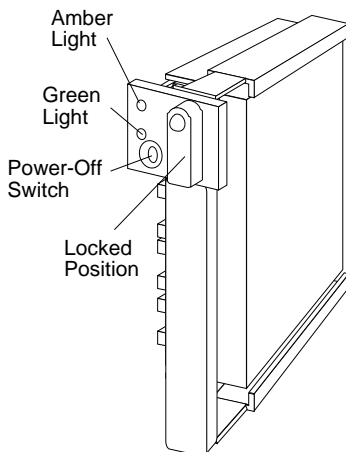
Notes:

- To locate banks C, D, and E, see the illustration in “Removing Internal Drives” on page 260.
- You do not have to turn off the server to remove a drive from banks C, D, or E.

Hot-swap drives have two lights on the front of the tray that contains the drive. If the drive has a good electrical connection upon installation, the green light illuminates.

The following table summarizes the LED states and their meanings.

Green	Amber	Description
On	Off	Drive tray is powered on; the hard disk drive is inactive; and the drive should <i>not</i> be removed.
Blinking	Off	The hard disk drive is inactive. The hot-swap drive can be removed safely.
On	On or Blinking	The hard disk drive is in use, and should <i>not</i> be removed.
Off	Off	The drive is defective, or no power is being supplied to the drive. The hot-swap drive can be removed safely.



Attention: Before you hot-swap a drive, make sure it is defective. If you partially or completely remove a good drive instead of a defective one, your server might lose valuable data.

Thoroughly review the information displayed on your server monitor to determine the location of the failed drive.

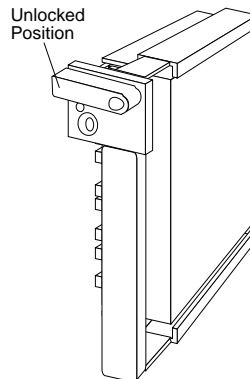
If you partially or completely remove a good drive instead of the defective one, your server might lose valuable data. This situation is especially relevant if your server is a disk-array model and you assigned RAID level 1 or 5 to the logical drives in your disk array. However, the RAID controller can rebuild the data you need, provided that certain conditions are met. See “Starting the ServeRAID Configuration Program” on page 80 for further details.

To remove a drive from bank C, D, or E, do the following steps:

1. Find the defective drive you plan to remove.
2. Ensure that you have selected the correct drive for removal by verifying that the light on the tray's knob is blinking or not illuminated.

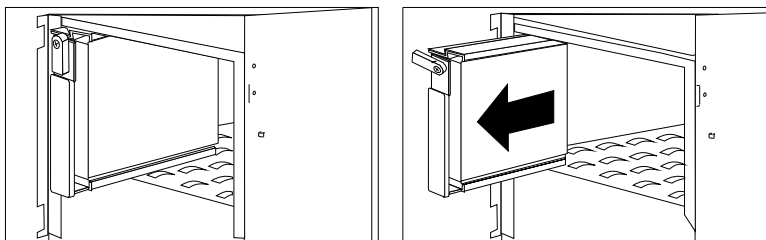
Attention: Before you hot-swap a drive, make sure it is defective. If you partially or completely remove a good drive instead of a defective one, your server might lose valuable data.

3. Press the power-off switch on the drive tray. When the green LED begins to blink, it is safe to remove the drive.
4. Unlock the drive by turning the knob clockwise 90 degrees.



Removing Internal Drives

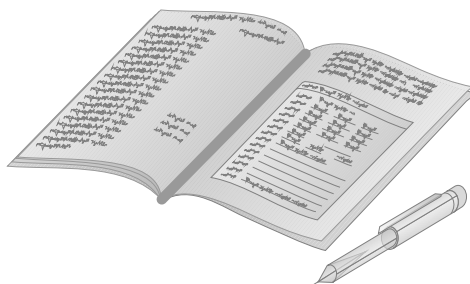
5. Disconnect the drive from the connector on the backplane, by grasping the handle on the drive tray and pulling the drive out of the server. Store the drive in a safe place.



Note: If your server is a disk-array model, you must reconfigure your disk arrays after removing hard disk drives. See “Starting the ServeRAID Configuration Program” on page 80 for details.

6. What to do next?
 - If you are removing another internal drive, return to step 1 on page 265.
 - If you are installing another internal drive in bank C, D, or E, slide the drive vertically into the target bay until it connects to the backplane, and move the knob on the drive tray to the locked position. If you need details about installing an internal drive, go to step 1 on page 224.
 - If you are not installing or removing another internal drive, continue with the next step.

7. Go to Table 8 on page 390 and update the drive information; then return here to determine your next step.



What to do next?

- Installing another internal drive? — Go to step 1 on page 224.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 186.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 192.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Removing an adapter? — Go to “Removing Adapters” on page 208.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 272.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.
- Installing a security feature? — Go to “Security Procedures” on page 283.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

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, be sure to adhere to the following instructions.



CAUTION:

This product contains a lithium battery. The lithium battery presents a fire, explosion, or severe burn risk if handled incorrectly.

When replacing the battery, use only IBM Part Number 33F8354 or an equivalent type lithium battery recommended by the manufacturer of the battery currently installed in your server. Dispose of the battery as required by local ordinances or regulations and the manufacturer's instructions.

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.

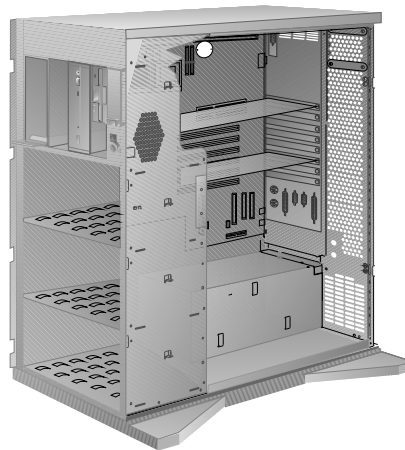
Before you begin, be sure you have:

- Read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.
- Followed any special handling and installation instructions supplied with the replacement battery.
- Removed the server side cover (see “Preparing to Install Options” on page 181).

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

To replace the battery:

1. Remove the memory riser card from the support brackets:
 - a. Gently pull the clasps away from the memory riser card.
 - b. Press down on the memory riser card at an angle until it is free from the pegs on the support bracket.
 - c. Pull the memory riser card out at that angle, and place it on a flat nonconductive surface with the memory-module kits facing up.
2. Locate the battery on the system board.



Replacing the Battery

3. 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 front 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.
4. 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.
5. Replace the memory riser card:
 - a. Hold the memory riser card at an angle just over the pegs on the support brackets; then slide the memory riser card into the connector.
 - b. Gently press the memory riser card onto the pegs.
 - c. Press the clasps over the edge of the memory riser card.
6. Reinstall the server covers and complete the installation (see “Completing the Installation” on page 289).
7. 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 155.
 - To reset the power-on password, go to “Setting a Power-on Password” on page 159.
 - To reconfigure your system, follow the instructions given in “Using the System Diskettes” on page 164 (all models).

What to do next?

- Setting the administrator password jumper? — Go to “Setting the Administrator Password Jumper” on page 286.
- Installing a U-bolt? — Go to “Installing a U-Bolt” on page 288.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

Changing Jumper Settings

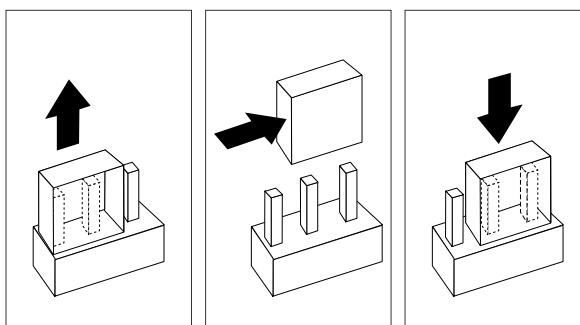
The system board and the system-board jumper settings for your model appear on a label inside your server. These values are preset. If you need to change them, follow the instructions given below. You will see the label when you remove the server side cover. (To remove the side cover, go to “Preparing to Install Options” on page 181.)

You might also need to change jumper settings on other devices, including adapters and backplanes. Refer to the documentation that comes with the device for specific information about the appropriate jumper settings.

How to Set Jumpers

A jumper covers pins on a pin block. The jumper setting depends on which pins are covered. For example, on the three-pin administrator password jumper, you cover the left and center pins to set the change state.

Jumper positions are indicated on the system board with the jumper location identifier, for example J15, and the 0 or 1 symbol. The following illustration shows the jumper on a pin block being moved from position 0 to position 1. The orientation and labels for the jumpers on your system board might be different from those shown here.



To change a jumper setting:

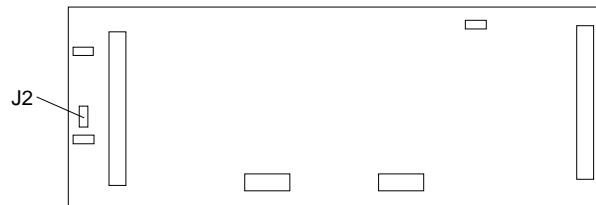
1. Lift the jumper straight up off the pin block.

- Slide the jumper down over the correct pins.

Setting the Backplane Address Jumper (J2)

A pin block with three pairs of pins is located on the rear of each backplane in banks C, D, and E. If more than one backplane is installed in your server, each backplane address jumper must have a unique setting. This setting identifies the backplane's location within the server and ensures proper server operation.

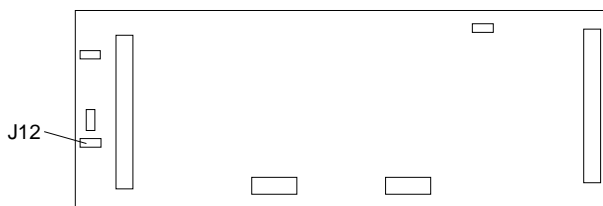
Locate the address jumper on the back of the backplane as shown in the following figure; then read the table below to determine the setting for your configuration.



Jumper Position	Description
E	Address for a backplane installed in Bank E
D	Address for a backplane installed in Bank D
C	Address for a backplane installed in Bank C

Setting Backplane SCSI ID Jumpers (J12)

The SCSI ID address jumper, a pin block with four pairs of pins (J12), is located on the rear of the backplanes in banks C, D, and E. The default, no jumper installed, sets the addresses to LO.



Each of the 16-bit SCSI connectors on the ServeRAID adapter and on the system board supports up to 15 devices. Thus, each supports SCSI IDs of 0 through 14.

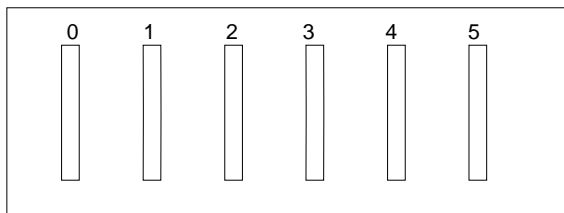
When you daisy-chain two backplanes in a disk-array model, one backplane address jumper (for example, Bank C) must be set to LO, defining the SCSI IDs as 0 through 5. The backplane that is daisy-chained to Bank C (in this example, bank D) must be set to HI, defining the SCSI IDs as 8 through 13.

The following table summarizes the jumper settings for the SCSI ID jumper (J12).

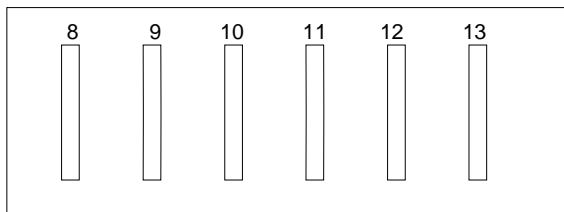
Jumper Position	Description
J12 ● ● ● ● LO ● ● ● ● 1 3 5 7 2 4 6 8	No jumper installed, sets SCSI IDs to low, starting from 0 (bay 1) to 5 (bay 6). This is the default setting for Bank C.
J12 ● ● ● ● HI ● ■ ● ● 1 3 5 7 2 4 6 8	Sets SCSI IDs to high, starting from 8 (bay 1) to 13 (bay 6). Use this setting when you daisy-chain two banks, or when your configuration requires you to define some of the hot-swap drives with high IDs.

For example, suppose you install three half-high drives in both banks D and E of a disk-array model. Each half-high drive occupies two bays in the bank, thus covering two of the connectors on the backplane. The drive tray connects to the leftmost of the two connectors. Before you connect the banks with a daisy-chain cable, you must set the SCSI ID jumper (J12) on bank E to HI.

The following illustrations show the SCSI connectors, viewed from the front of the server. The jumper on backplane D is set to LO, the default. The half-high drives in bank D will have their SCSI IDs set to 0, 2, and 4.



The jumper on backplane E is set to HI. The half-high drives in Bank E will have their SCSI IDs set to 8, 10, and 12.



Note: When you view configuration screens for the ServeRAID adapter, remember that the Bay Number in the Bay/Array selection list corresponds to the SCSI ID number plus 1. Thus, a hard disk drive with SCSI ID 8 is found in the leftmost drive bay; the drive state is shown in Bay 9.

SCSI devices may also have jumpers. The jumpers on the devices must be removed when the devices are placed in hot-swap trays. For more information, see “SCSI Drives” on page 218.

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 186.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 192.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Removing an adapter? —Go to “Removing Adapters” on page 208.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 212.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 277.
- Installing a security feature? —Go to “Security Procedures” on page 283.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

Installing a Microprocessor

You can install a second microprocessor in your PC Server 520. This microprocessor works with the Pentium microprocessor of the same speed that is in your PC Server 520.

After installing the second microprocessor, your PC Server 520 can operate as an SMP server. With symmetric multiprocessing, certain operating systems and application programs can distribute the processing load between the two microprocessors. This enhances performance for applications such as database transactions, graphics or CAD (computer-aided design) programs, and modeling or simulation programs.

Before you begin, be sure you have:

- Read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.
- Removed the server side cover (see “Preparing to Install Options” on page 181).
- Obtained one of the following operating systems (optional) at the specified release level:
 - IBM OS/2 for Symmetrical Multiprocessing Version 2.11 (OS/2 2.11 for SMP) or later
 - Microsoft Windows NT 3.5 or later
 - Novell NetWare 4.1 for SMP
- Located the documentation supplied with your computer and operating system

Notes:

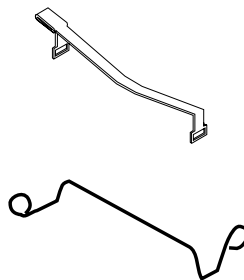
- Install the microprocessor before you install OS/2 2.11 for SMP. If you have already installed OS/2 2.11 for SMP, you must add the statement PSD=OS2APIC.PSD to the CONFIG.SYS file or reinstall OS/2 2.11 for SMP.
- The illustrations in this procedure might be slightly different from your hardware.

Installing a Microprocessor

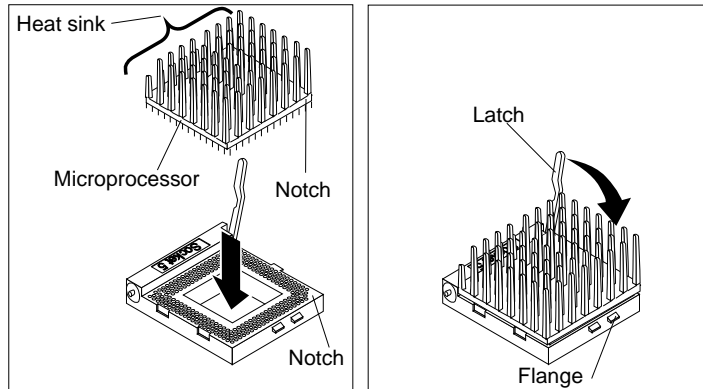
1. Refer to the printed system-board label inside your server to locate the secondary microprocessor socket. Your server comes with a microprocessor preinstalled in the primary socket. Therefore, you will install the new microprocessor in the secondary socket (also known as an upgrade socket).
2. Remove the microprocessor from the static-protective bag. Locate the notch (beveled corner) on the microprocessor.
3. Lift the latch on the socket.
4. Carefully align the notch (beveled corner) of the microprocessor with the notch (beveled corner) on the socket.
5. Center the microprocessor over the socket.
6. Carefully put the microprocessor into place. Ensure the pins on the microprocessor align with the holes in the socket.

Important: Do not force the pins into the socket. If you feel any resistance, remove the microprocessor and check the orientation and alignment.

7. Note the heat-sink clip that comes with the microprocessor and match it to one of the following figures.
 - If it is the top clip, go to step 8 on page 279.
 - If it is the bottom clip, go to step 12 on page 280.

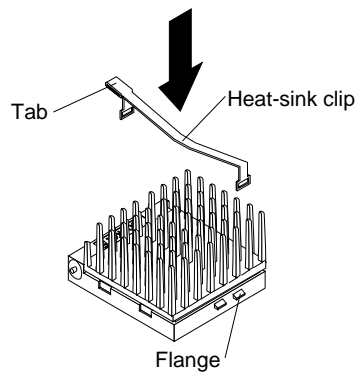


8. Move the latch downward until the microprocessor is completely locked into the socket. Make sure the latch is in the fully closed position.



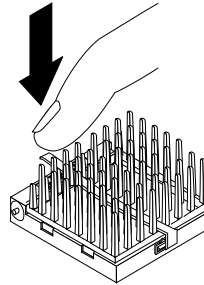
9. Position the heat-sink clip over the flange, as shown.

Note: Make sure that the tab on the heat-sink clip faces away from the middle of the two sockets.

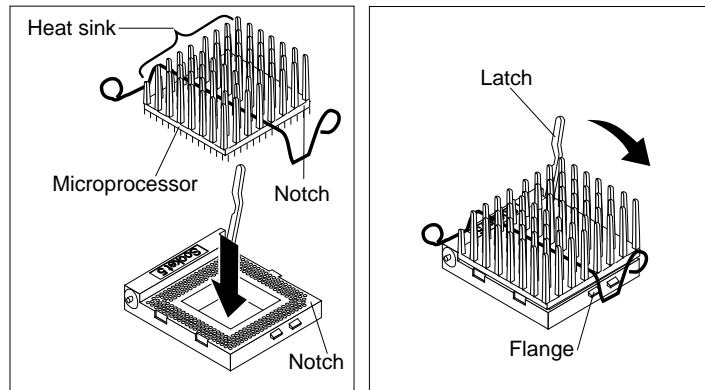


Installing a Microprocessor

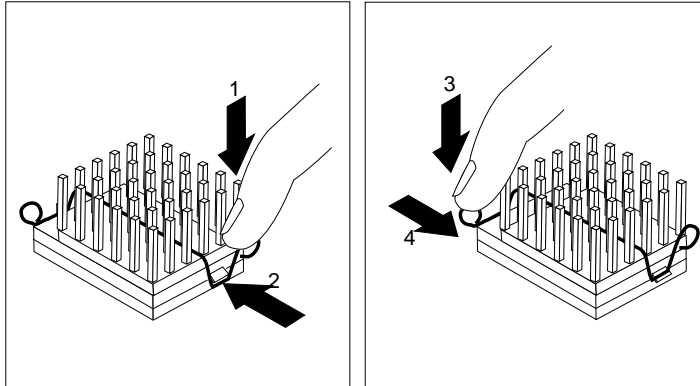
- Clip one end of the heat-sink clip over the flange. Then, place the clip over the top of the heat sink and press down until it is secure on both sides of the socket.



- Go to step 14 on page 281.
- Move the latch downward until the microprocessor is completely locked into the socket. Make sure the latch is in the fully closed position.



13. Push down on one of the rounded ends of the heat-sink clip **1** until it catches under the flange **2**. Then, do the same to the other end of the heat-sink clip **3** to lock the microprocessor into position **4**.



14. Go to Table 5 on page 385 to record the microprocessor information; then return here to determine your next step.

Note: Because you installed a new microprocessor in your server, you might want to upgrade your operating system. Install one of the operating systems that is listed at the beginning of this section. Follow the instructions in your operating system-documentation and review the software and operating system-considerations in Chapter 2, “Installing Your Software” on page 19.

What to do next?

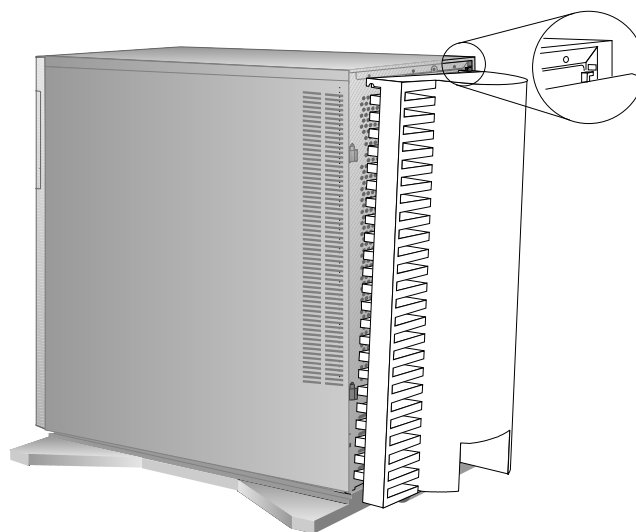
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 186.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 192.
- Installing an adapter? — Go to “Installing Adapters” on page 197.
- Removing an adapter? — Go to “Removing Adapters” on page 208.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 212.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 260.
- Replacing the battery? — Go to “Replacing the Battery” on page 268.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 272.
- Installing or removing a security feature? — Go to “Security Procedures” on page 283.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

Security Procedures

Your server is equipped with security features to help prevent theft or unauthorized use of your server. Your *User's Reference* contains a complete explanation of these features. To use or change some of these features, you need to remove the server side cover and make some changes inside your server.

Security-Cover Option

For additional security, you might want to control access to the cables and cable connectors on your server. The optional PC Server Security Cover restricts cable access while creating a sleek, streamlined profile. Your *User's Reference* describes this optional feature. Installation instructions are in a separate booklet that comes with the security cover. If you want to purchase this option, contact your IBM reseller or IBM marketing representative for additional information.



LogicLock

LogicLock features, the advanced security features that come with your server, include tamper-evident switches. This feature provides a message to alert you of attempts to open the server cover without a key. Other features are operating-system dependent, which means that if you want to use them, you must use an operating system that supports them. (To find out whether your operating system supports a particular security feature, see the documentation that came with the operating system.) Your *User's Reference* describes this security feature.

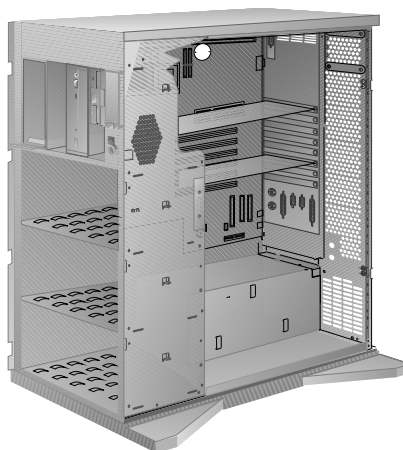
Removing an Unknown Power-On Password

Before you begin, be sure you have:

- Read the information about the power-on password in “Using the System Diskettes” on page 164.
- Read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.
- Removed the server side cover (see “Preparing to Install Options” on page 181).

Attention: If you use these instructions to remove an unknown power-on password, remember to set a new password after you complete the installation. (See “Setting a Power-on Password” on page 159 and “Completing the Installation” on page 289 for instructions.)

1. Remove the battery from the server as described in “Replacing the Battery” on page 268.



Notes:

- a. Wait approximately 15 minutes before reinstalling the battery.
- b. After you remove and reinstall the battery, you must reconfigure your system and reset the system date and time.

What to do next?

- Setting a new power-on password? — Go to “Setting a Power-on Password” on page 159.
- Setting the administrator password jumper? — Go to “Setting the Administrator Password Jumper” on page 286.
- Installing a U-bolt? — Go to “Installing a U-Bolt” on page 288.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

Setting the Administrator Password Jumper

The system board and the system-board jumper settings for your model appear on a label inside your server. You will see the label when you remove the side cover.

The administrator password jumper has two positions:

- In position 1 (called the *locked state*), an administrator password *cannot* be set, changed, or removed.
- In position 0 (called the *change state*), an administrator password *can* be set, changed, or removed.

Jumper positions are indicated by the 0 or 1 symbol printed on the system board next to the jumper with the jumper location identifier J15.

The default setting for this jumper is position 1, the locked state.

Before you begin, be sure you have:

- Read the information about the administrator password (also known as the privileged-access or supervisor password) in “Using the System Diskettes” on page 164.
- Read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.
- Removed the server side cover (see “Preparing to Install Options” on page 181).

Attention: You cannot erase or override a forgotten administrator password. If you forget the administrator password, you must replace the system board.

1. Locate the 3-pin administrator password jumper. The jumper connector is labeled J15. (The jumper covers two of three pins on a pin block and might be positioned to the left or to the right.)

2. To change the jumper setting:
 - a. Lift the jumper straight up off the pin block.
 - b. Align the holes in the bottom of the jumper with the center pin and the pin that was not covered previously.
 - c. Slide the jumper down over these pins.
3. Set the jumper to the desired position:
 - To set the administrator password to the *change* state, move the jumper to position 0.
 - To set the administrator password to the *locked* state, move the jumper to position 1.

What to do next?

- Setting a new administrator password? — Reinstall the cover as described under “Completing the Installation” on page 289; then go to the instructions in “Defining System Security” on page 155.
- Adding or changing a power-on password? — Go to “Setting a Power-on Password” on page 159.
- Installing a U-bolt? — Go to “Installing a U-Bolt” on page 288.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 289.
- Installing an external option? — Go to “Connecting External Options” on page 293.

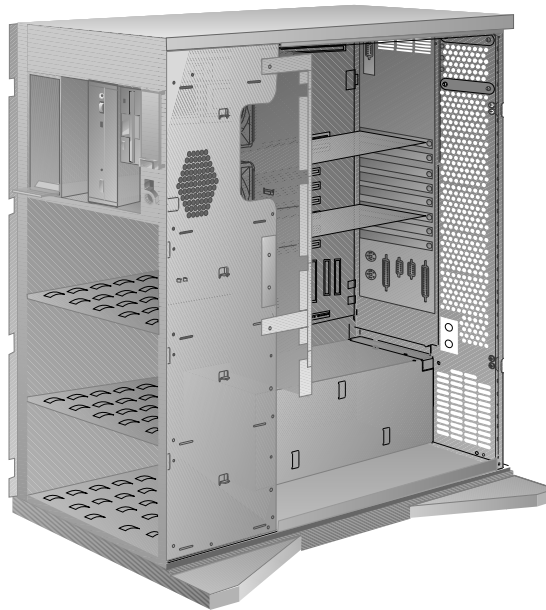
Installing a U-Bolt

Before you begin, be sure you have:

- A 19 mm (3/4 in.) U-bolt or wire rope (similar to National Manufacturing No. 3230, STK No. 176-735).
- A security cable.
- A lock, such as a combination lock or padlock.
- Read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.
- Removed the server side cover (see “Preparing to Install Options” on page 181).

1. Install the U-bolt:

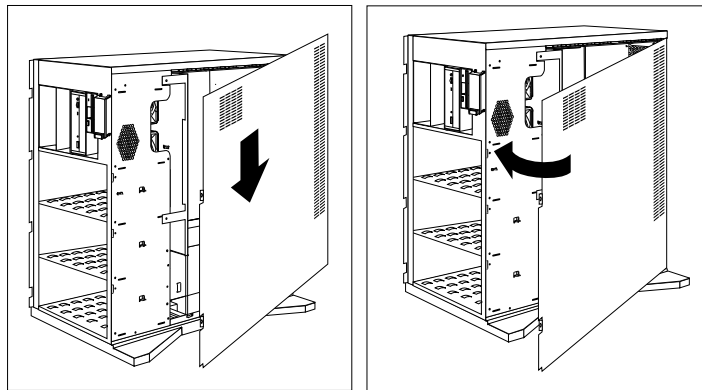
- a. Locate the two holes for the U-bolt in the rear panel of the server.



- b. Insert the U-bolt through the holes and secure it in place with the nuts.
2. Reinstall the server covers, and attach the cables (see “Completing the Installation”).
3. Insert the security cable through the U-bolt. Loop the cable around (or through) an object from which it cannot be removed; then fasten the cable ends together with the lock.

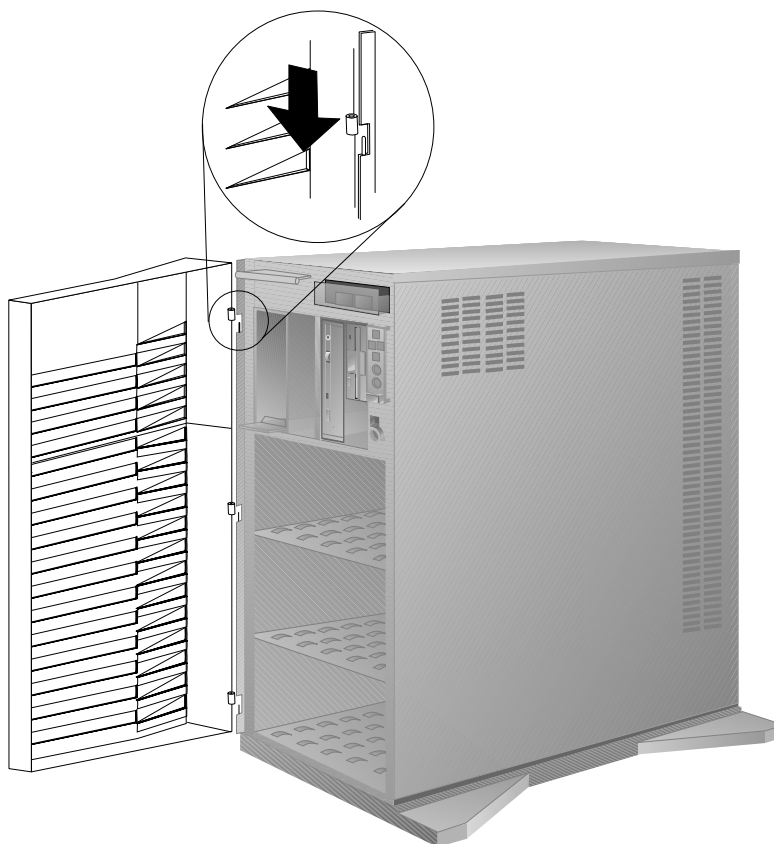
Completing the Installation

1. Replace the side cover:
 - a. Align the pins on the rear of the side cover with the two hinges on the rear of the server. Open the side cover to a 90-degree angle.
 - b. Slide the side cover down.
 - c. Push the side cover to close it.



Completing the Installation

2. If you removed the front cover, reinstall it:



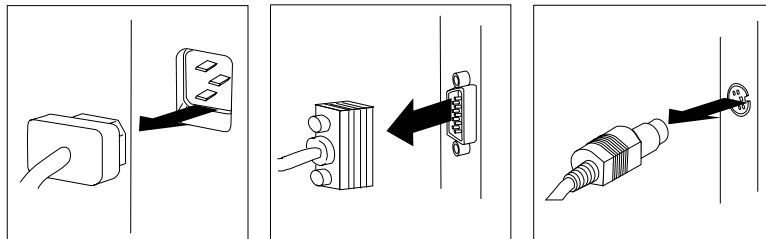
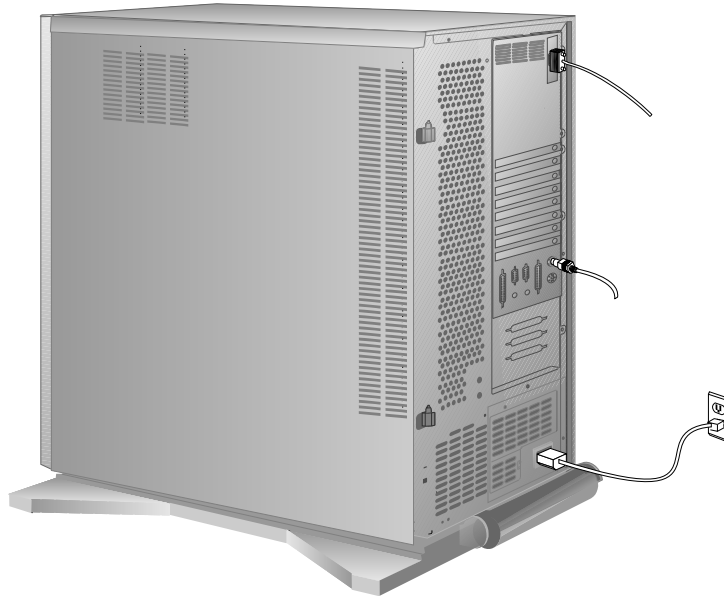
- a. Align the hinges on the front cover with the pins on the server.
 - b. Slide the door down.
3. Close and lock the door.

Note: Before closing the front cover, verify that the side cover is installed correctly. If the side cover is not properly installed, the front cover will not align correctly when you attempt to close it.

Attention: Be sure to maintain a clearance of at least 51 mm (2 inches) on all sides of the server to allow for air circulation.

4. Connect all cables to the back of the server, then plug all power cords into properly grounded electrical outlets.

Note: 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.



Completing the Installation

What to do next?

- Connecting external options? — Go to “Connecting External Options” on page 293.
- No external options to connect? — Go to “Updating System Programs” on page 299.

Connecting External Options

Before you begin:

Be sure you have read “Electrical Safety” on page 179 and “Handling Static-Sensitive Devices” on page 180.

Your PC Server 520 supports external devices, that is, devices that connect to the connectors on the back of the server. These external options include SCSI-2 drives and storage enclosures, printers, modems, and other serial and parallel devices.

The information in this section supplements the instructions that come with the external option. Use the instructions that come with the option to prepare it for installation.

Adding a Hot-Swap Storage Expansion Enclosure

The IBM PC Server Enterprise Expansion Enclosure is one of several SCSI storage enclosures that you can attach to the external SCSI-2 connector on your server. Contact your IBM reseller or IBM marketing representative for additional information.



Adding External SCSI Devices

Notes:

1. If you plan to install both internal and external SCSI devices, you must follow the instructions given in “SCSI Drives” on page 218 in addition to the instructions in this section. Read “SCSI Drives,” and then return here.
2. You cannot use both 16-bit SCSI-2 connectors on the system board to support internal SCSI devices, and also use the external connector at the same time.

If you plan to install external SCSI devices, you must order an additional SCSI cable. That is, to use external devices with the PC Server 520, you must connect them to the external SCSI-2 connector, using a SCSI cable. This SCSI cable must have the proper connector for the SCSI-2 external connector on one end, and the proper connector for the first external device on the other end. To select and order the correct SCSI cables for use with external devices, contact your IBM reseller or IBM marketing representative.

The SCSI-2 adapter for disk-array models has three channels; each channel supports up to 15 devices. If you are not using all three channels for internal devices, the adapter can support up to 15 external devices by using the external SCSI-2 connector on Channel 1. When you connect external devices to this connector, you can use only Channel 2 and Channel 3 on the adapter for internal devices.

The SCSI-2 connectors on the system board can support a total of 15 devices. If your server has seven internal devices, the SCSI-2 external connector can support up to seven external devices.

Table 3 shows the maximum cable lengths for connecting SCSI devices, based on data-transmission rates.

Note: The maximum cable length for an external cable is determined by subtracting the length of the internal cable being used from the maximum length of SCSI cable that can be used based on the speed of the data transfer.

5 MB Per Second or Slower Data Transmission Rates
<p><i>Note:</i> Maximum cable length – internal cable length = external cable length.</p> <ul style="list-style-type: none"> • Maximum Length of SCSI cable = 6 meters (19.7 ft.) Length of 4-drop, SCSI narrow cable = 1 meter (3.3 ft.) Length of 7-drop, SCSI Fast/Wide cable = 1.5 meters (4.9 ft.) • When a narrow internal cable is used, the maximum length of the SCSI external cable = 5 meters (16.4 ft.) 6 meters – 1 meter = 5 meters, or 19.7 ft. – 3.3 ft. = 16.4 ft. • When a Fast/Wide internal cable is used, the maximum length of the SCSI external cable = 4.5 meters (14.8 ft.) 6 meters – 1.5 meters = 4.5 meters, or 19.7 ft. – 4.9 ft. = 14.8 ft.
Greater Than 5 MB Per Second Data Transmission Rate
<p><i>Note:</i> Maximum cable length – internal cable length = external cable length.</p> <ul style="list-style-type: none"> • Maximum Length of SCSI cable = 3 meters (9.8 ft.) Length of 4-drop, SCSI narrow cable = 1 meter (3.3 ft.) Length of 7-drop, SCSI Fast/Wide cable = 1.5 meters (4.9 ft.) • When a narrow internal cable is used, the maximum length of the SCSI external cable = 2 meters (6.5 ft.) 3 meters – 1 meter = 2 meters, or 9.8 ft. – 3.3 ft. = 6.5 ft. • When a Fast/Wide internal cable is used, the maximum length of the SCSI external cable = 1.5 meters (4.9 ft.) 3 meters – 1.5 meters = 1.5 meters, or 9.8 ft. – 4.9 ft. = 4.9 ft.

Table 3. Maximum External SCSI Cable Lengths

Setting SCSI IDs for External Devices

The external SCSI-2 connector on the system board and the external channel connector on the IBM PC ServeRAID Adapter support SCSI IDs from 0 through 15. Each device attached to the external connector must have a unique SCSI ID. For example, you can have a SCSI ID of 0 on a device attached to the Channel 1 connector and a SCSI ID of 0 on a device attached to the Channel 2 connector of the same IBM PC ServeRAID Adapter. However, you cannot have a SCSI ID of 0 on two devices attached to the Channel 2 connector.

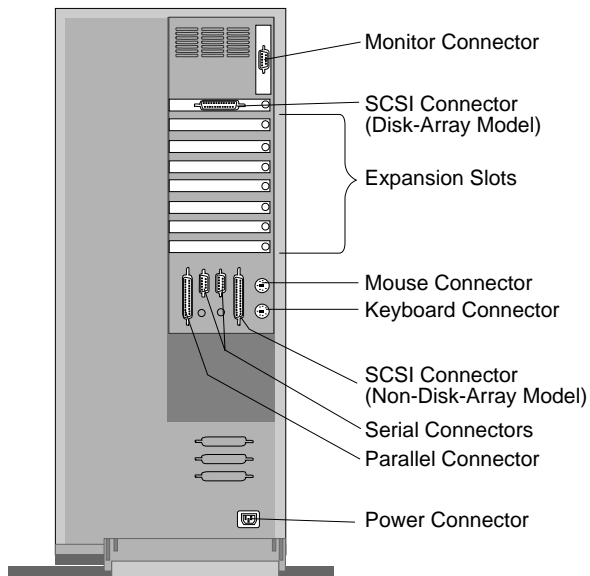
The default ID for the SCSI-2 controller is 7. The ID for the preinstalled CD-ROM drive in bay A1 is 6. Therefore, do not set the SCSI IDs for external devices to these values or to the values that you use for other internal devices. (See “SCSI Drives” on page 218 for additional SCSI IDs.) Refer to the instructions that come with the SCSI devices for more information about setting a SCSI ID.

Note: Read the README file on the IBM PC ServeRAID Adapter Configuration Option Diskette for updated information. Select **Option Diskette** from the first menu screen.

Adding External Options

To add an external option:

1. Turn off the server and all attached devices.
2. Follow the instructions that come with the option to connect it to the server; then, go to “What to do next?” on page 298 to determine your next step.



What to do next?

- Device drivers to install? See the instructions that come with the option to determine if device drivers are required, and, if so, how to install them.
- Go to “Updating System Programs” on page 299 to see if you need to update the system programs.
- If you do not need to install any device drivers or update the system programs, your server is ready to use.

Updating System Programs

Before you begin, be sure you have:

- Installed the server covers, cables, and power cords (see “Completing the Installation” on page 289).
- Connected all of your external options (see “Connecting External Options” on page 293).

When you install or remove an internal option or external SCSI device, you might need to update some system programs. See “Using the System Diskettes” on page 164 for detailed information about the system programs. Some updating requirements might include:

- Running the automatic configuration program
- Copying an Option Diskette (required only if an Option Diskette comes with the option)
- Backing up the changed programs
- Installing device drivers (required only if the option has device drivers)
- Following the instructions that come with an adapter developer diskette (ADD) and the adapter

Notes:

- All system programs are located on a Reference Diskette that comes with your server. Be sure to make a backup copy of the Reference Diskette onto another diskette.

Store the original Reference Diskette in a safe place, and use the backup copy of the system diskettes when configuring and troubleshooting your server.

- If you used the Configuration/Setup or SCSISelect utility programs to make changes to your server configuration, be sure you have a record of any customized settings *before* you do the following steps. *If you run the Configuration/Setup utility program, you must restore the settings.*

- Follow the instructions given under “Updating the System Diskettes.”

Updating the System Diskettes

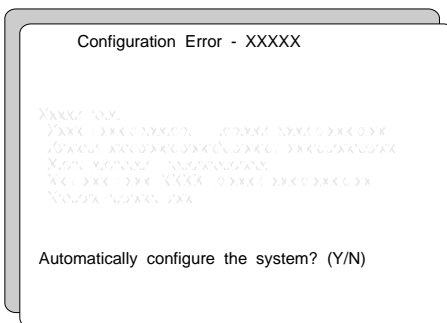
To update the system programs on the System Diskettes:

1. Remove all media from the drives; then turn on all external devices.
2. Insert the backup copy of the Reference Diskette. Then turn on the server.

Note: The Power On/Off switch is located under a transparent cover on the right side of the server. Therefore, before you can turn the server on or off, you must lift this transparent cover to reach the Power On/Off switch.

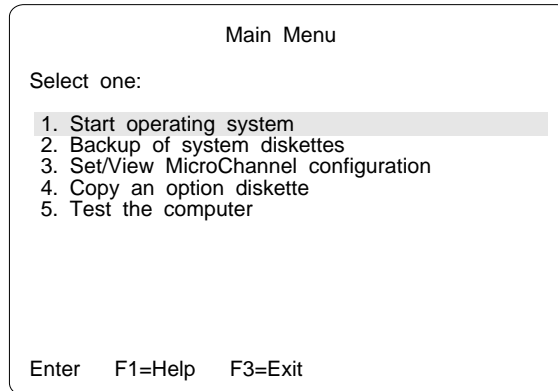
To avoid accidentally pressing the Power On/Off switch after you turn the server on or off, return the transparent cover to its original position.

After a few moments, a configuration message appears on the screen. This is normal because you changed the server configuration when you added or removed options. (If you do not get the message, check for loose connections on the options you just installed.)



3. If you do not have any Option Diskettes to copy, press **Y** (for Yes) to start the Automatic Configuration program. When the program is completed, go to step 8 on page 303.

4. If you have Option Diskettes to copy, press **N** (for No) to skip the Automatic Configuration program; then continue with the next step.
5. When the Main Menu appears:



- a. Select **Copy an option diskette** and follow the instructions on the screen.
- b. Remove the Option Diskette from the diskette drive.
- c. Repeat this step until you have copied all of your Option Diskettes.

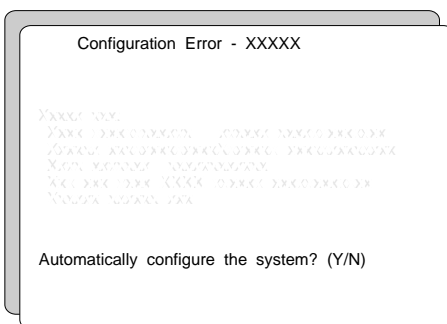
Updating System Programs

6. Update your configuration information:

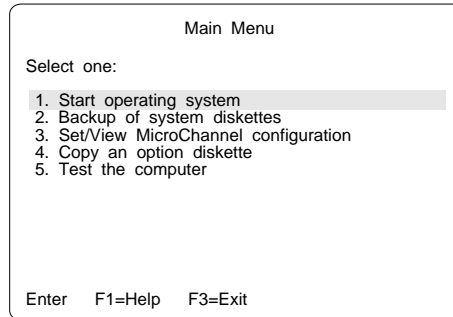
Press **Ctrl+Alt+Del**; then release the keys.

After a few moments, a configuration message appears on the screen. This is normal because you changed the server configuration when you added or removed options.

7. Press **Y** (for Yes) to automatically update the configuration information. In a few moments, a message appears on the screen indicating that the process is complete.



8. Back up the configuration information:
 - a. When the Automatic Configuration is complete, the Reference Diskette restarts the system. The IBM Logo screen appears.
 - b. Press **Enter** to go to the Main Menu.



- c. From the Main Menu, select **Backup of system diskettes** and follow the instructions on the screen.

The updated configuration information will be copied to the backup copy of the Reference Diskette.

9. Remove the backup copy of the Reference Diskette from the drive.

Press **Enter** to restart the system. Complete any other instructions specific to your options.

Notes:

- After copying all the Option Diskettes and backing up the configuration information, remember to write protect the backup copy of the Reference Diskette. Locate the switch on the left side of the backup copy of the Reference Diskette, and then push the switch down to prevent overwriting the information stored on the diskette.
- If you are configuring your system for the first time, you will be prompted to install an operating system upon completion of step 9. Refer to Chapter 2, “Installing Your Software” on page 19, and your operating-system documentation for instructions for installing your operating system.
- For information regarding system configuration requirements and backup procedures:
 - On a disk-array model, see Chapter 3, “Configuring the Disk Array” on page 71 and “Using the System Diskettes” on page 164. If you installed hard disk drives, you must configure each newly installed hard disk drive as a hot-spare drive or as part of a disk array. See “Defining the State of a Drive” on page 102 or “Creating a Disk Array” on page 85 for instructions.
 - On a non-disk-array model, see “Using the System Diskettes” on page 164.
 - If you installed options during setup and have updated your configuration, return to Chapter 2, “Installing Your Software” on page 19 and complete the setup and installation procedures.

System problems can be caused by the hardware, the software, or a user error. (An example of a user error is pressing the wrong key.) You might be able to solve the problem yourself or provide helpful information to a service technician.

You can check the hardware by using the test programs and the information in this chapter. If the hardware is OK, and you have not made an error, you might have a software problem. If you suspect that you have a software problem, refer to the information that came with that software package.



CAUTION:

You could injure yourself if you attempt to lift or move an object that is too heavy for you. Always get another person to help you. Be careful when moving or changing the position of the system and its attached devices.

This chapter contains information to help you solve some of the simpler problems you might have with your IBM PC Server 520. If you encounter more complex technical problems, see “Getting Help, Service, and Information” on page 375.

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Getting Started

If you are not familiar with the diagnostic tools and system programs, continue reading the following sections. If you are familiar with these topics, select the appropriate instructions from the list below:

- To interpret an error message (for example, you have a **165** on the screen), go to “Error Messages” on page 326.
- For more information about a hardware failure (for example, keys on the keyboard not working) or a screen prompt, go to “Troubleshooting” on page 357.

Diagnostic Tools Overview

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

- Power-on self-test (POST)
- POST beep codes
- Test programs
- Error messages
- Troubleshooting charts
- Option Diskettes

Power-On Self-Test (POST)

Each time you turn on the system, it performs a series of tests that check the operation of the system and some options. This series of tests is called the *power-on self-test*, or *POST*. POST does the following:

- Checks some basic system-board operations
- Checks the memory operation
- Compares the current system configuration with the stored system configuration information
- Starts the video operation
- Verifies that the diskette drive is working
- Verifies that the hard disk drive is working

While the memory is being tested, the amount of available memory and the KB OK message appear on the screen. These numbers advance as the system progresses through POST. If POST finishes without detecting any problems, a single beep sounds and the first screen of your operating system or application program appears.

If POST detects a problem, an error message appears on your screen. A single problem might cause several error messages to appear. When you correct the cause of the first error message, the other error messages probably will not appear on the screen the next time you turn on the system.

POST Beep Codes

POST generates a beeping sound to indicate successful completion of POST or to indicate that the tests detect an error.

One beep and the appearance of text on the monitor indicates successful completion of the POST. More than one beep indicates that POST detects an error.

For more information on beep codes, see “Beep Codes” on page 364.

Test Programs

The System Board Diagnostic Diskette contains the QAPlus/PRO test programs, developed by DiagSoft, Inc. for IBM. These programs are the primary method of testing the system board, memory, disk drives, and many other options that you install in the IBM PC Server 520. The test programs on the Micro Channel Diagnostic Diskette test any Micro Channel adapters that you install.

These programs require minimal interaction from you. You can use them to test the IBM components of the system and some external devices. The amount of time required to test all components depends on the number of components. The more optional adapters and devices you have attached to your system, the longer the testing takes.

If you cannot determine whether a problem is caused by the hardware or by the software, you can run the test programs to confirm that the hardware is working correctly.

The programs on the System Board Diagnostic Diskette include the following:

- Diagnostic Tests

The diagnostic tests identify most problems associated with the major components of your system. These programs test the system board, hard disk drives, diskette drives, CD-ROM drives, RAM, serial and parallel ports, video controller, printer, keyboard, and mouse.

Test options let you run groups of tests in a batch, specify parameters to use for each test (for example, video modes, port addresses, and so on), specify the number of passes you want to run (one to continuous), log the test results to a text format file, and save all test settings for future use.

These test programs also allow you to view the server's configuration information. For example, you can view the IRQ and DMA assignments, memory usage, device drivers, and so on.

- Utility Programs

The System Board Diagnostic Diskette also contains utility programs, such as an ASCII text editor and a diskette format program.

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 a trained service technician. Hardware error messages that appear on the screen can be text, numeric, or both.

Messages generated by your software — the operating system or application programs— generally are text messages, but they also can be numeric. Basically, there are four types of error messages. These include POST error messages, diagnostic error messages, POST beep codes, and software-generated messages.

POST Error Messages

POST error messages appear when, during startup, POST finds problems with the hardware or detects a change in the hardware configuration. See “POST Error Message Table” on page 327 for a list of these error messages.

POST Beep Codes

POST beep codes are sounds emitted from the speaker to report the results of POST. One beep indicates POST completed successfully. Multiple beeps indicate that POST found a problem. “Beep Codes” on page 364 provides a list of the beep error codes.

Diagnostic Error Messages

Diagnostic error messages appear when a test program finds a problem with a hardware option. Normally, these messages are text, but they can be numeric. The test programs will generate one of the following return codes:

- | | |
|--------------------|---|
| 0 | A return code of “0” indicates that the device passed its test. |
| 1 | A return code of “1” indicates that the device failed its test. |
| 2 or higher | A return code of “2” or higher indicates that the test stopped. |

Software-Generated Error Messages

These messages appear if a problem or conflict is found by an application program, the operating system, or both. For an explanation of these messages, refer to the information that came with your software package.

ServeRAID Adapter Messages

These messages apply to disk-array models that have the IBM PC ServeRAID Adapter. The messages are listed in alphabetic order in “ServeRAID Adapter Messages” on page 338.

Troubleshooting Charts

The troubleshooting charts given in “Troubleshooting Charts” on page 357 list symptoms of problems (for example, perhaps the symptom is “the mouse is not working”), as well as steps to correct the problems.

Option Diskettes

An optional device or adapter might come with a diskette. Option Diskettes usually contain diagnostic files or configuration files that the system needs to recognize and activate the option.

If your optional device or adapter came with an Option Diskette, you might need to install some configuration files or diagnostic files. See Chapter 5, “Configuring Your Server” on page 147 for instructions on installing the configuration files or see “Installing Additional Test Programs” on page 367 for installing diagnostic files.

Testing the System

The Test the Computer program provides access to two test programs for your system: the Advanced Diagnostics programs and the Micro Channel Diagnostics. These test programs are designed to test IBM products only. Non-IBM products tested with these programs might present misleading error messages or unexpected system responses. If you want to test a non-IBM product, refer to the information that came with that product.

Note: You might have to install a wrap connector on your active parallel port to obtain accurate parallel-port test results. If you do not have a wrap connector, contact your IBM reseller or IBM marketing representative.

This section includes procedures for starting the Test the Computer program and starting the diagnostic programs. In addition, this section includes useful information about navigating through the test programs, as well as procedures for starting and stopping them. These programs are designed to test the IBM PC Server 520.

The Main Menu of the System Board Diagnostic Diskette

The Main Menu is the starting point for all of the diagnostic tests.

It contains the following choices:

- **Diagnostics:** When you select this choice from the Main Menu, the Diagnostics Menu appears. The Diagnostics Menu contains the following selections:
 - **Quick Check** automatically checks the hardware configuration and builds a group of tests based on the configuration check. The diagnostic program then runs the tests for each of the devices or modules found during the configuration check. Upon completion of the Quick Check, you are prompted to: Press any key to continue. Pressing any key at that point brings you back to the Diagnostics Menu.
 - **Module Tests** allow you to more rigorously test an individual module (or device such as a diskette drive) or specify a group of tests for several modules. In addition, you can specify how many times to run an individual test and how the test program should note and log any errors it finds. See “Using the Module Tests” on page 321 for more information about running the module tests.
 - **Options** allow you to set or change defaults that affect the reporting, error logging, and presentation of the error information. For more information about the options available, see “Test Options” on page 323.
- **System Info:** When you select this choice from the Main Menu, the System Info Menu appears. The System Info Menu allows you to view the server's hardware and software configuration information. For example, you can view the IRQ and DMA assignments memory usage, address and attribute information for device drivers, and so on.
- **Reports:** When you select this choice from the Main Menu, the Reports Menu appears. The Reports Menu allows you to print the system information.
- **Utilities:** When you select this choice from the Main Menu, the Utilities Menu appears. The Utilities Menu provides access to

additional programs on the System Board Diagnostic Diskette. These utility programs include: RAM Chip Locator, File Editor, Format Diskette, and Hard Disk Utilities. For more information about the File Editor, see “Using the File Editor” on page 370.

- **Exit:** Select this choice to exit from the System Board Diagnostic Diskette.

Program Navigation

You can maneuver within the test programs by typing the first letter of a menu choice, using the function keys, or using command-line options.

Using the Function Keys

You can use the following keys to maneuver within the test programs:

Enter	Selects an item, runs the test module, or runs the test.
Down Arrow (↓)	Moves the cursor down.
Up Arrow (↑)	Moves the cursor up.
F1	Displays the appropriate Help information. Use the Up Arrow (↑) or Down Arrow (↓) key to scroll through the 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.
Esc	Returns to the previous menu.
Tab	Moves the highlight bar (or cursor) to the test group (or moves to parameters).
Spacebar	Toggles modules on or off (or toggles tests on or off).
F2	Displays current test results log.

- F10** Displays the Local Menu when the Module Tests Menu is displayed or from individual Test Group test screens. Local Menu includes the following selections:
- Test Options serves as a shortcut to accessing and changing the test options without having to back up through menus.
 - Single Test moves from the **Module Test Menu** to the relevant Test Group window for test selection.
 - Next and Previous LUN changes from one Logical Unit Number (LUN) or device to another (for example, HD1 to HD2, or Base Memory to Extended Memory).
- + Displays next logical unit number (only used in the Test Module menu and Test Group screens).
- Displays previous logical unit number (only used in the Test Module menu and Test Group screens).

Using the Command Line Options

The following Command Line Options allow you to define specific conditions for running the diagnostic programs at startup time.

At the operating system prompt, type QAPRO /XXX (where /XXX represents one of the following from the list below); then press

Enter:

/B&W	The /B&W option forces the program to load in black and white (monochrome) mode.
/LOG=file	The /LOG=file option directs the test programs to start using a specified Error Log file.
/INT10	The /INT10 option forces the test programs to use the Basic Input/Output System (BIOS) for screen writes.
/OXXX	The /OXXX option, where XXX=test group, omits the designated test group from testing. (See /IXXX for a list of valid test groups.)
/OALL	The /OALL option omits all test groups from testing. (See /IXXX for more information.)
/IXXX	The /IXXX option, where XXX=test group, includes the designated test group. When used in conjunction with the /OALL option, you can specify the tests that you want to include. These options are helpful if you have insufficient memory available to load all of the test programs simultaneously, or if you want to test specific test groups.

The valid test groups are:

LPT	Parallel port
COM	Serial ports
HDU	Hard disk (IDE only)
FDU	Diskette drive
VID	Video
MBD	System board
KBD	Keyboard
PDV	Pointing device or mouse

MEM Memory
SCU SCSI
CDR CD-ROM
SYS System information/Utilities

You can include this option multiple times. For example, to run the keyboard, SCSI, and CD-ROM test groups, type:

QAPRO.EXE /OALL /IKBD /ISCU /ICDR

/USRCONFIG=*file* The **/USERCONFIG=***file* option tells the test programs to look for a user diagnostic configuration file other than the default USERDIAG.CFG.

/SCRIPT=*file*[**R**] The **/SCRIPT=***file*[**R**] option with the [**R**] runs the selected script.

Note: You can use a “-” instead of a “/” as the command line switch.

IntruderAlert

Each time you start the system board diagnostic programs, IntruderAlert checks for damage to the System Board Diagnostic Diskette. If a virus or program alteration is detected, the diagnostic programs will not load.

To suspend IntruderAlert and continue loading the diagnostic programs, press **Esc**.

Starting the Test Programs

To start the diagnostic tests:

Note: Use your backup copy of the System Board Diagnostic Diskette or Micro Channel Diagnostic Diskette when you run the diagnostic programs.

1. Insert the Reference Diskette into the primary diskette drive (usually drive A).
2. Turn on the system. Or, if the system is turned on already, insert the Reference Diskette and press **Ctrl+Alt+Del**. After a few moments, the system programs Main Menu appears.
3. Start the system programs, if you have not already done so.
4. Select **Test the computer**; then press **Enter**.
 - a. To test Micro Channel adapters, Select **Option diagnostics** from the Test the Computer menu; then press **Enter**. A message prompts you to remove the Reference Diskette and insert the Micro Channel Diagnostic Diskette into the primary diskette drive. Follow the instructions on the screen.
 - b. To test the system board and system components, go to step 5.
5. Select **System board diagnostics** from the Test the Computer menu; then press **Enter**.
6. Insert the System Board Diagnostic Diskette into the primary diskette drive.

The IBM PC Server logo appears on your screen followed by the system running POST. When POST completes, QAPLus/PRO for IBM appears on your screen.
7. Press any key to continue. The Welcome window appears.
8. Press any key to continue.

Note: IntruderAlert starts and runs automatically after you press any key. If IntruderAlert detects a problem with the System Board Diagnostic Diskette, it will

automatically stop further testing. See “IntruderAlert” on page 317 for more information.

9. Press **Enter**.

Several analysis programs start and run automatically. When they complete, the Main Menu appears.

10. Use the **Up Arrow** (↑) or **Down Arrow** (↓) key to move the highlight bar to your desired Main Menu selection.

11. Press **Enter**.

Note: To stop running a specific test or stop testing after you have started a test, press **Esc** while the test is running. The test pauses at the first possible opportunity, and the Skip/Abort Test Menu appears.

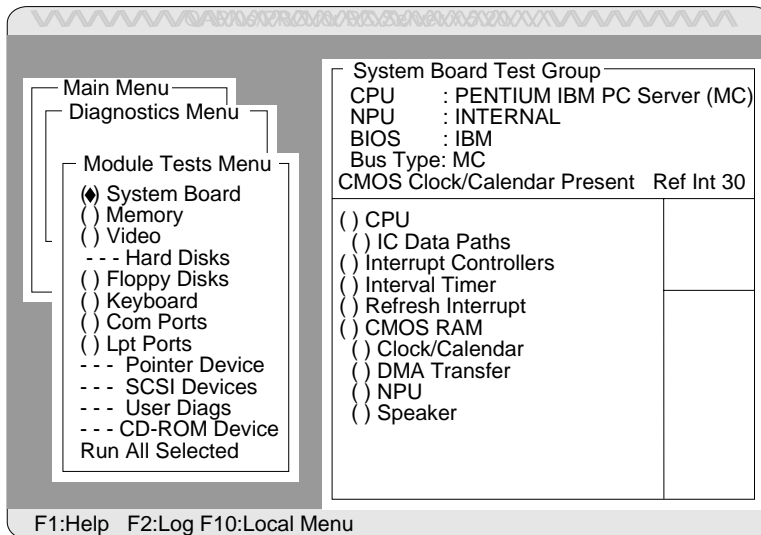
The Test Group Window

When you select Quick Tests or Module Tests from the Diagnostic Menu, a Test Group window appears. (For Module Tests, if you press Tab, the window expands to a full screen.) The Test Group window shows the attributes, parameters, and selected tests of the corresponding Test Group. The diamond “◆” mark indicates a module or device selected for testing.

Starting the Test Programs

Test Group Specifications: In the upper portion of the Test Group window are the specifications for the related test group.

The following illustration is an example of the Test Group Window when the System Board is selected from the Module Tests Menu.



Using the Module Tests

To start the Module Tests from the Main Menu of the System Board Diagnostic Diskette:

1. Start the diagnostic programs. If you do not know how to do this, see “Starting the Test Programs” on page 318.
2. Select **Diagnostic** from the Main Menu, then press **Enter**.
3. Select **Module Tests**, then press **Enter**. Use the **Up Arrow** (↑) or **Down Arrow** (↓) key to move the highlight bar from one selection to the next within the Module Tests menu.
4. To select or deselect a test, use the Spacebar (the Spacebar toggles your selection on or off). When you have selected a test, a ♦ appears next to the selection.

Attention: An (*) directly adjacent to an item indicates that running that test might damage your data. Make sure to back up all of your data *before* running the tests.

5. If you want to run all of the selected tests, you can do so by moving the highlight bar to the last choice, **Run All Selected Modules**, then pressing **Enter**. If you want to run each test, one at a time, press **Enter** at the highlight bar of the desired selection.
6. When you are done, press **Esc** to return to the Test Group window.

Note: As you move the highlight bar up or down the selection menu, the Test Group window to the right changes to correspond to the highlighted module.

Changing Selected Tests in Test Groups

To add or remove a test from a Test Group:

1. In the Module Tests Menu, use the **Up Arrow** (↑) or **Down Arrow** (↓) key to move the highlight bar to your selection.
2. Press **Tab** to move into the expanded Test Group window.
3. Move the highlight bar to the test you want to select or deselect.
4. Press the Spacebar at the highlighted test to toggle between select (indicated by a “◆”) and deselect.

Attention: An (*) directly adjacent to an item indicates that running that test might damage your data. Make sure to back up all of your data *before* running the tests.

5. Press **Enter**.

Creating Test Scripts

Scripting allows you to select specific groups of tests, testing parameters, and options. You can then save your selections for later use as a test *script*.

To set up a test script:

1. Select **Diagnostics** from the Main Menu; then press **Enter**.
2. Select **Module Tests**; then press **Enter**.
3. Select the test groups and specific tests.
4. Select **Save Script** (the last item on the Options Menu).
5. Type in a file name. The test program automatically adds the extension “QA.”
6. To load and run the test program with this test setting, type:
QAPRO /SCRIPT-*Filename*,R and then, press **Enter**.

Note: Adding the “,R” runs the tests listed in the named Test Script. If this is omitted, the diagnostic program loads only the program with the test settings as previously saved in the chosen Script File.

Test Options

Each option that appears on the Options Menu is briefly described below.

- **Halt on Error:** The default is **No**. If you select **Yes**, you can resume testing after a halt by pressing any key. If you select **No**, any error detected is logged (only if you enabled the Test Log) and the program continues testing without halting.
- **Beep on Error:** The default is **No**. If you select **Yes**, a beep sounds whenever the test program detects an error.
- **Lap Count:** This option allows you to set the number of times to run each group of tests. The default setting is 1. You can enter a number from 0 to 10. The looping is controlled on a block basis, not on an individual test basis. Therefore, if you select tests A, B, and C and the Lap Count is set to 3, the test sequence is ABC/ABC/ABC.
- **Pause Control:** You can choose to have the test programs pause between test modules and wait for you to press any key to continue. Also, you can choose to have the test program wait for a user response to indicate if the video tests pass. The default setting is **Pause Between**. The available choices are **Pause Between** and **No Pause**. If you choose **No Pause**, the test programs continue testing without a pause from one video test to the next, and from one test module to the next.
- **Test Log:** Allows you to select whether or not to do logging. You can select one of the following five choices:
 - No Logging
 - COM1
 - LPT1
 - ASCII
 - .DBF

No Logging is the only selection that turns off Test Log. The other four selections enable Test Logging.

Starting the Test Programs

When Test Log starts, the test programs create a log with the following information:

- The date and time the log was opened
- The start and end times of each module tested and for each test selected for that module
- The results of testing
- The date and time the log was closed

Disabling the Test Log writes the date and time to the Test Log along with a message that the log was closed. Any Test Log is automatically closed upon exiting the program.

If you enable Test Log, the hardware configuration is automatically entered at the beginning of the log.

If you select **ASCII File**, the test programs prompt you to type in the name of the Test Log file. The test programs automatically assign the extension **.LOG** to the file if you do not specify a file-name extension. The file is stored in ASCII text format. You can then examine the file with most word processors and text editors at a later time.

If you select **.DBF File**, the test programs prompt you to fill in the information on an Open DBF File screen. This creates a new file or opens an existing data base compatible file to insert new information on the current test machine. The Machine Type, Serial Number, and Work Center lines identify the system that is being tested.

Note: If you plan to run hard disk tests and to do test logging, do the test logging on a drive other than the drive to be tested. If you log to a drive that is to be tested, the logging is disabled for the remainder of the test cycle.

- **Test Log Mode:** This choice determines the amount of data to be logged after you select COM1, LPT1, ASCII, or .DBF. The available options are LogAll or LogFail. LogAll logs all test information. LogFail logs only failures.
- **Log Message Queue:** Pressing F2 allows you to examine the test results to date via a Log Message Queue. This information is generated whether or not you select a Test Log. It does not, however, allow you to examine previous Test Logs.
- **Save Script:**
See “Creating Test Scripts” on page 322 for a more detailed description of scripting.

Option Diskettes

An optional device or adapter might come with a diskette. If it does, the system needs the files on the diskette so that it can recognize and activate that specific option. You can tell the purpose of the files by their file-name extensions:

File-Name Extension	File Purpose
ADF	Configuration files
DGS	Diagnostic Files
PEP	Message Files

Follow the instructions that came with the option. Different instructions apply depending on whether the Option Diskette is startable or not startable.

Some adapter manufacturers supply an adapter developer diskette. Procedures vary with these diskettes. Use the instructions provided with the adapter developer diskette.

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 these error messages should be performed by a trained service technician.

Types of Messages

System problems can result in two types of error messages — POST and diagnostic:

- POST error messages appear when, during startup, POST finds problems with the hardware or detects a change in the hardware configuration.
- Diagnostic error messages appear when the Test the Computer program or Diagnostic program finds a problem with hardware.

Messages generated by your software—the operating system or application programs—generally are text messages, but they also can be numeric. Information about these messages is not included in this handbook. For information about these error messages, refer to the documentation that comes with your software.

Multiple Messages

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


POST Error Message Table

The following table shows error messages that might appear on the screen during the power-on self-test (POST).

Notes:

1. The actions for some of the messages require you to start the system programs. (For instructions, see “Using the System Diskettes” on page 164.)
2. The actions for some of the messages require you to start the Configuration/Setup utility program. (For instructions, see “Starting the Configuration/Setup Utility Program” on page 151.)
3. If a password prompt appears with a POST message, type the administrator or power-on password; then press **Enter**.

POST Message	Description
101 102 106	A failure occurred during testing of the system board and microprocessor. <i>Action:</i> Turn off the system, wait 30 seconds, then turn it back on. If the error message reappears, have the system serviced.
114	An adapter ROM (read-only memory) error occurred. <i>Action:</i> Start the system programs and run the Test the Computer program to determine the cause of the problem and the action to take. If the error message reappears, have the system serviced.
151	The real time clock has failed. <i>Action:</i> Start the system programs and run the Test the Computer program to determine the cause of the problem and the action to take.

POST Message	Description
161	<p>The real-time clock battery has failed.</p> <p></p> <p>CAUTION: The lithium battery (IBM part number 33F8354) presents a fire, explosion, or severe burn risk. Do not recharge it, disassemble it, heat it, incinerate it, or expose its cell contents to water. Dispose of the battery as required by local ordinances or regulations.</p> <p><i>Action:</i> Call for service, or replace the battery yourself (see “Replacing the Battery” on page 268 for assistance).</p>
162	<p>POST found a configuration data error.</p> <p><i>Action:</i> Turn off the system and make sure all attached devices are turned on; then turn on the system.</p> <ul style="list-style-type: none">• If you have changed the configuration (for example, added or removed an option), enter Configuration/Setup to clear the configuration errors.• If you have not changed the configuration, start the system programs and run the Test the Computer program to determine the cause of the problem and the action to take.
163	<p>Time of day has not been set.</p> <p><i>Action:</i> Start the Configuration/Setup utility program; then select Date and time to set the correct date and time. Until the system is serviced, it can be used, but any application programs that use the date and time will be affected.</p>
164	<p>A change in the memory configuration occurred. Installing memory, incorrectly installing memory, or removing memory can cause this problem. It also can occur if a defective memory module is disabled.</p> <p><i>Note:</i> The system can be used with decreased memory capacity.</p> <p><i>Action:</i></p> <ul style="list-style-type: none">• If you have just installed memory, see “Installing Memory-Module Kits” on page 186 to verify that the new memory is correct for your system. Then start the system programs and run the Test the Computer program to identify the location of the problem memory module.• If you have not just installed memory, have the system serviced.

POST Message	Description
165	<p>A change in the Micro Channel adapter configuration occurred. This error generally occurs under one or more of the following conditions:</p> <ul style="list-style-type: none"> • A new Micro Channel adapter was installed and the system was not reconfigured. • One or more Micro Channel adapters were removed. • One or more Micro Channel adapters were moved to a different slot. • A Micro Channel adapter is failing and is no longer recognized by the system as being installed. <p><i>Action:</i></p> <ul style="list-style-type: none"> • If you just added, removed, or changed the location of an adapter, start the server and select Yes to run the Automatic Configuration program. Enter the Configuration/Setup utility program. If you installed a Micro Channel adapter, select Micro Channel Configuration, and follow the instructions on the screen. <p>If an adapter description file (ADF) is missing, the Configuration/Setup utility program identifies the slot number of the unidentified adapter. In that case, you will be prompted to insert the Option Diskette.</p> <p><i>Note:</i> Some adapters have an <i>additional</i> diskette containing the required ADF file.</p> <ul style="list-style-type: none"> • If you did not add, remove, or change the location of an adapter, an adapter probably failed. Have the system serviced.
175	<p>A hardware error occurred.</p> <p><i>Action:</i> Have the system serviced.</p>
176	<p>The system cover or the security cover (if you have one) has been removed without a key being used.</p> <p><i>Action:</i> If an administrator password is set, you must enter the password to clear the latch.</p>
177 178	<p>A hardware error occurred.</p> <p><i>Action:</i> Have the system serviced.</p>
184	<p>The power-on password information stored in your system was corrupted.</p> <p><i>Action:</i> Restore the power-on password.</p> <p>Start the Configuration/Setup utility program and select System Security; then select Power-on Password to set a new power-on password.</p>

Error Messages

POST Message	Description
185	<p>The stored information about the drive-startup sequence has been corrupted.</p> <p><i>Action:</i> Restore the startup sequence.</p> <p>Start the Configuration/Setup utility program; then select Start Options.</p>
186	<p>A system board or security hardware error occurred.</p> <p><i>Action:</i> Have the system serviced.</p>
189	<p>An attempt has been made to access the system with invalid passwords.</p> <p><i>Action:</i> Enter the administrator password, if one has been set. The error is cleared when you exit from the Configuration/Setup utility program.</p>
201	<p>A failure occurred during memory testing. This error can be caused by incorrectly installed memory, a failing memory module, or a system-board failure.</p> <p><i>Action:</i></p> <ul style="list-style-type: none">• If you have just installed memory, see “Installing Memory-Module Kits” on page 186 to verify that the new memory is correct for your system. Then start the system programs and select System board diagnostics from the Test the Computer utility program menu to identify the location of the problem memory module.• If you have not just installed memory, have the system serviced. <p><i>Note:</i> Refer to “Installing Memory-Module Kits” on page 186 to determine which modules are supported in your system.</p> <ul style="list-style-type: none">• Replace the failing memory module. If the error reoccurs, replace the memory module pair. If the problem remains, have the system serviced.
229	<p>A failure occurred during cache memory testing.</p> <p><i>Action:</i> Have the system serviced.</p>

POST Message	Description
301	<p>An error occurred during testing of the keyboard and its controller.</p> <p><i>Action:</i></p> <ul style="list-style-type: none">• Make sure that nothing is resting on the keyboard and pressing a key.• Verify that the keyboard cable is connected correctly to the keyboard and to the correct port on the system.• If you have just connected a new mouse or other pointing device, turn the system off and disconnect that device. Wait at least 5 seconds; then turn on the system. If the error message goes away, replace the device. <p>If the error message remains, have the system, keyboard, and cable serviced.</p>
303	<p>A failure occurred while testing the keyboard controller.</p> <p><i>Action:</i> Have the system serviced.</p>
604	<p>A diskette drive failed.</p> <p><i>Action:</i> Remove the failing diskette drive. If the problem remains, have the system serviced.</p>
662	<p>A change has occurred to the configuration of the diskette drive.</p> <p><i>Action:</i> Start the Configuration/Setup utility program; then select Devices and I/O Ports. Verify the number and type of diskette drives. If the problem persists, have the system serviced.</p>
762	<p>A fault has occurred on the system board.</p> <p><i>Action:</i> Have the system serviced.</p>

Error Messages

POST Message	Description
962	<p>An error occurred during testing of the parallel port on the system-board.</p> <p><i>Action:</i> If you have a parallel printer or other parallel device attached to your system, verify that the parallel cable is connected correctly. If it is, use the following procedure:</p> <ol style="list-style-type: none">1. Turn off the system.2. Disconnect the parallel cable from the parallel port.3. Turn on the system. <p>If the POST error message does not reappear, either the parallel cable or the device is probably failing.</p> <p>See the information that came with the parallel device for additional testing information.</p> <p>If the POST error message reappears, have the system serviced.</p>
1162	<p>An error occurred during testing of serial port 1 or serial port 2 on the system board.</p> <p><i>Action:</i> If you have a modem, serial printer, or other serial device attached to your system, verify that the serial cable is connected correctly. If it is, use the following procedure:</p> <ol style="list-style-type: none">1. Turn off the system.2. Disconnect the serial cable from the failing serial port.3. Turn on the system. <p>If the POST error message does not reappear, either the serial cable or the device is probably failing.</p> <p>See the information that came with the serial device for additional testing information.</p> <p>If the POST error message reappears, have the system serviced.</p>
1801	<p>No more room for PCI option ROM.</p> <p><i>Action:</i> Remove the failing PCI or Micro Channel adapter or Remove or manually reconfigure the Micro Channel adapters until the problem disappears. If the problem persists, have the system serviced.</p>
1802	<p>No more I/O space available for PCI adapters.</p> <p><i>Action:</i> Remove the failing PCI or Micro Channel adapter, or remove or manually reconfigure the Micro Channel adapters until the problem disappears. If the problem persists, have the system serviced.</p>

POST Message	Description
1803	<p>No more memory (above 1 MB) is available for PCI adapters.</p> <p><i>Action:</i> Remove the failing PCI or Micro Channel adapter, or remove or manually reconfigure the Micro Channel adapters until the problem disappears. If the problem persists, have the system serviced.</p>
1804	<p>No more memory (below 1 MB) is available for PCI adapters.</p> <p><i>Action:</i> Remove the failing PCI or Micro Channel adapter, or remove or manually reconfigure the Micro Channel adapters until the problem disappears. If the problem persists, have the system serviced.</p>
1805	<p>PCI option ROM checksum error.</p> <p><i>Action:</i> Remove the failing PCI adapter. If the problem persists, have the system serviced.</p>
1962	<p>No valid boot devices found. The system cannot find the startup drive or operating system.</p> <p><i>Action:</i> Be sure that the drive you want to start from is in the startup sequence.</p> <ol style="list-style-type: none"> 1. Select Start Options from the Configuration/Setup 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? <ul style="list-style-type: none"> 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 system. 3. Is an operating system installed? <ul style="list-style-type: none"> Yes Turn off the system. Go to step 4. No Install the operating system in your system; then turn off the system. 4. Wait at least 5 seconds; then turn on the system. During system startup, watch for messages indicating a hardware problem. <p>If the same error message appears, have the system serviced.</p>

Error Messages

POST Message	Description
2462	<p>An error occurred during testing of the video controller. This error can be caused by a failing monitor, system board, or video adapter.</p> <p><i>Action:</i> Verify that the monitor is connected correctly to the video adapter or video connector. If it is, have the monitor and system serviced.</p> <p><i>Note:</i> Some video adapters come with an additional diagnostic diskette. If you installed a video adapter that came with an additional diagnostic package, refer to the information in that package.</p>
8601 8603	<p>An error occurred during testing of the pointing device (for example, a mouse or track ball) and pointing device controller. This error can be caused by the pointing device or by a failing system board.</p> <p><i>Note:</i> This error also can occur if electrical power was lost for a very brief period and then restored. In this case, turn off the system for at least 5 seconds; then turn it on.</p> <p><i>Action:</i> Ensure the keyboard and pointing device are attached to the correct ports. If they are attached correctly, use the following procedure:</p> <ol style="list-style-type: none">1. Turn off the system.2. Disconnect the pointing device from the system.3. Turn on the system. <p>If the error message does not reappear, the pointing device is probably failing. See the documentation that came with the pointing device for additional testing information. If the problem remains, have the pointing device serviced.</p> <p>If the error message reappears, start the system programs and run the Test the Computer program to determine the cause of the problem and the action to take. If the problem remains, have the system serviced.</p>
I9990301	<p>An error occurred while reading the fixed boot sector.</p>
Other Numbers	<p>The power-on self-test (POST) routine found an error.</p> <p><i>Action:</i> Follow the instructions on the screen.</p>

Diagnostic Error Message Table

The following table shows the hardware option related to the error messages that might appear on the screen when you run the Advanced Diagnostic program with the related option.

If one of these messages appears and your software does not require the use of the failing option, you can continue to use your system. However, you must have your system and related option serviced.

Note: The following table should be used for reference, because some error messages are not included and some options are not listed. The options that might not be listed are non-IBM hardware options and IBM hardware options that were released after this handbook was written.

When “X” is used, it can be any alphanumeric character.

Message	Related Option
0012XXXX	Dual Async Adapter/A
0046XXXX	Multiport/2 Adapter
0075XXXX	Monitor Adapter or System Board
0096XXXX	SCSI Adapter (with cache)
0100XXXX	Multiprotocol Adapter/A
0101XXXX	Modem Adapter/A
0106XXXX	Ethernet Network Adapter
0109XXXX	ActionMedia Adapter/A
0112XXXX	SCSI Adapter (without cache)
0141XXXX	Real-Time Interface Coprocessor Portmaster Adapter/A
0152XXXX	XGA Monitor Adapter/A
0164XXXX	120 MB Internal Tape Drive
0165XXXX	6157 Tape-Attachment Adapter/Drive
0166XXXX	Token-Ring Network Adapter/A
0167XXXX	Token-Ring Network Adapter/A
200XXXX	Image Adapter/A
0206XXXX	SCSI-2 Fast/Wide Adapter/A
0208XXXX	Undetermined device type
0209XXXX	SCSI Direct Access Removable Media or other than 512-Byte Blocks
0210XXXX	SCSI Hard Disk
0211XXXX	2.3 GB SCSI Tape Drive
0212XXXX	SCSI Printer

Error Messages

Message	Related Option
0213XXXX	SCSI Processor
0215XXXX	SCSI CD-ROM Drive
0216XXXX	SCSI Scanner
0217XXXX	Rewritable Optical Drive
0218XXXX	SCSI Changer
0219XXXX	SCSI Communications
0243XXXX	XGA-2 Adapter Video
0258XXXX	XGA-2 System Board Video
0259XXXX	SVGA Adapter
0270XXXX	IBM RAID Controller
0271XXXX	RAID Hard Disk Drive

SCSI Messages

If your server has at least one hard disk drive, review the following information before having the system serviced.

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

SCSI Messages	Description
All	<p>One or more of the following might be causing the problem.</p> <ul style="list-style-type: none"> • A failing SCSI device (adapter, drive, controller) • An improper SCSI configuration • Duplicate SCSI IDs in the same SCSI chain • An improperly installed SCSI terminator • A defective SCSI terminator • An improperly installed cable • A defective cable <p><i>Action:</i> Verify that:</p> <ul style="list-style-type: none"> • The external SCSI devices are turned on. External SCSI devices must be turned on before the system. • The cables for all external SCSI devices are connected correctly. • The last device in each SCSI chain is terminated correctly. (See “SCSI Drives” on page 218 for more SCSI chain information.) • The SCSI devices are configured correctly. <p>When you daisy chain two banks in a disk-array model, you <i>must</i> start the ServeRAID configuration program and specify which channel the banks are connected to. You must also define the SCSI IDs for each bank as LO or HI. (See “Changing the ServeRAID Adapter Parameters” on page 124 for more information.)</p> <p>If the above are correct, run the diagnostics for additional information about the failing device. If the error recurs, have the system serviced.</p>

ServeRAID Adapter Messages

This section lists the ServeRAID diagnostic and run-time error messages that might appear during startup of a PC Server 520 disk-array model.

The ServeRAID adapter contains a device-error table that collects statistics on the number and type of errors that occur on a selected hard disk drive. After correcting a problem with the disk array, you should clear the table so that you can identify any subsequent errors quickly. For more information, see “Obtaining Drive Status” on page 98.

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

The ServeRAID adapter 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 “Changing the ServeRAID Adapter Parameters” on page 124 for information on assigning a host ID.)

ServeRAID Adapter POST and Setup Messages

During POST, the ServeRAID adapter 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 adapter requires your input, a list of function keys will appear below the message.

New Drive Installed

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

```
(old state: new state ch: bay)
```

This is an information message. No action is required.

Configured Drives are Missing

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

```
old state: new state: ch: bay
```

where *old state* is the configured state of the drive, *new state* is the state that the ServeRAID adapter will assign to the drive, *ch* and *bay* are the channel and 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)
```

Two choices will follow this message:

- F4** Retry. Select this key after correcting a problem. For example, select retry after you turn on the external storage enclosure that contains the hard disk drive.
- F5** Select this key to accept the new state that the ServeRAID adapter will assign to the drive. For example, the adapter will assign the drive a state of defunct or empty.

You can also select 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 adapter will assign the drive a state of defunct, but the server can complete startup. However, the array will remain in Critical mode and the potential for data loss will exist until you replace and rebuild the defunct drive. To prevent the loss of data, replace and rebuild the defunct drive in a timely manner.

Configured Drives Are Not in the Configured Location

When the ServeRAID adapter detects that a previously configured drive is present, but the drive is in a new location, the following message appears:

```
(old ch: old bay: > new ch: new bay)
```

where *old channel* 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, and *new bay* is the bay where the drive is now located.

For example:

```
(1 :6 > 2:14)  
(2 :5 > 2: 6)
```

In this example, the message indicates that the drive from Channel 1, Bay 6 is now located at Channel 2, Bay 14, and the drive from Channel 2, Bay 5 is now located at Channel 2, Bay 6. The drive might have been physically moved to the new bay.

Three choices will follow this message:

- F4** Retry. Select this key after correcting a problem. For example, select retry after you move the hard disk drive to its previously assigned location.
- F5** Select this key to accept the new state that the ServeRAID adapter will assign to the drive. For example, the adapter will assign the drive a state of defunct.
- F6** Select this key to modify the configuration to match the current drive location.

You might remove the hot-swap drives from the server for security reasons. If you replace the drives but install them in different bays, you can press **F6** to accept the new locations, and the ServeRAID adapter will update the configuration.

New Adapter Installed in a Configured Server

When the ServeRAID adapter detects that the identifiers of the drives do not match the adapter configuration information, the following message appears:

```
host id: old ch: old bay: new ch:new bay
```

where *host ID* is the adapter identification, *old channel* is the channel that matches the drive configuration information, and *old bay* is the bay that matches the drive configuration information. *New ch* is the channel where the drive is now located, and *new bay* is the bay where the drive is now located.

For example:

```
(My Machine : 1:6 > 2:10)
```

In this example, the message indicates that the drive from Channel 1, Bay 6 is now located at Channel 2, Bay 10. The drive might have been physically moved to the new bay.

Two choices will follow this message:

- F4** Retry. Select this key after correcting the problem. For example, select retry after you move the hard disk drive to its previously assigned location, or after you install the original ServeRAID adapter.
- F7** Select this key to import the configuration information from the drive and to update the configuration information on the ServeRAID adapter. This choice is useful when you replace the ServeRAID adapter in an existing disk-array model.

You also might select F7 if you replace a whole set of drives with drives that were configured in another server with a ServeRAID adapter.

Note: When you install drives in a server that has no logical drives defined, the F7 choice will not appear. This can occur when you replace the ServeRAID adapter itself. The adapter does not contain any logical drives in its factory configuration. Therefore, F7 will not appear. In

this case, restart the server and press **Ctrl+I** to enter the Mini-Configuration (see “Using the Mini-Configuration Program” on page 127); then, select **Advanced Functions**. From that menu, select **Import Configuration from Drives to Adapter**.

ServeRAID Adapter Status and Error Messages

This table lists, in alphabetic order, messages associated with the IBM PC ServeRAID Adapter.

Where the “Action” information tells you to start the IBM ServeRAID configuration program, insert the ServeRAID Adapter 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.

RAID Adapter Message	Action
<i>n</i> logical drives are installed.	<i>n</i> represents the number of defined logical drives. This is an information message. No action is required.
Controller is not responding to commands. No logical drives are installed.	The ServeRAID adapter is not operational. Make sure that the adapter is fully seated. If the problem persists, have the system serviced.
Error: Cannot disable this adapter BIOS.	The adapter was unable to prevent an extra copy of the adapter BIOS from being stored on the server. This condition occurs when the server contains multiple ServeRAID adapters. When the prompt to disable extra copies of the adapter BIOS appears, type N (No).

RAID Adapter Message	Action
Following drives not responding. (old state: new state ch: bay)	<p>One or more drives did not respond to the adapter. For example, the adapter detected a new drive in an unconfigured bay, and the drive is not part of the current configuration. This might also occur if the adapter detected that a configured drive is missing.</p> <p>Select F5 to accept the new state that the ServeRAID adapter will assign to the drive. For example, the adapter will assign the drive a state of defunct or empty.</p>
Following new drives found. (old state: new state ch: bay)	<p>One or more drives were found in an unconfigured bay. For each drive listed, a new state of Ready (RDY) appears.</p> <p>This is an information message. No action is required.</p>
Following drives found in new location (old ch: old bay > new ch: new bay)	<p>POST found that the location of one or more drives does not match the stored configuration information. (See "Configured Drives Are Not in the Configured Location" on page 340 for more information.)</p>
Installation stopped.	<p>The server cannot access the ServeRAID adapter.</p> <p>This is a follow-on message to a preceding message. Follow the "Action" instructions for the preceding message to resolve the problem.</p>
Recoverable configuration error; run Configuration program.	<p>An error exists in the configuration data stored on the ServeRAID adapter.</p> <p>Insert the IBM ServeRAID Adapter Configuration Diskette; then, press Ctrl+Alt+Del to restart the system. Follow the instructions on the screen.</p>
ServeRAID firmware version xx.yy	<p>This is the version level of the ServeRAID adapter's firmware.</p> <p>This is an information message. No action is required.</p>
WARNING: <i>n</i> logical drives are critical; <i>n</i> logical drives are offline.	<p>One or more drives have failed.</p> <p>Replace the defunct drives as soon as possible to prevent data loss.</p>
Your server has an error due to a Stripe Locked entry or a Blocked Logical Drive.	<p>During a Rebuild operation, a logical drive defined as RAID level 0 was blocked or a Stripe on a Logical Drive was locked.</p> <p>If you made a backup copy of your configuration before you performed the Rebuild operation, you can press F4 to correct the problem. Then, restore the lost data from the backup copy. Or, you can press F5 to continue without correcting the problem.</p>

PeerMaster Adapter Screen Messages

This section lists the PeerMaster diagnostic and setup error messages, Novell NetWare load-time messages, and Novell NetWare run-time error messages. The messages, shown in **bold** type, and their descriptions are listed in numeric order for each type of message.

Diagnostic and Setup Error Messages

Diagnostic error messages include POST, load-time, and run-time error messages. The error message numbers are expressed as eight-digit decimal numbers, *ZDDDEESZ*, defined as follows:

<i>Z</i>	=	Always zero
<i>DDD</i>	=	The device number assigned to your PeerMaster adapter
<i>EE</i>	=	Diagnostic error number
<i>S</i>	=	Slot number
<i>Z</i>	=	Always zero

For example, an error number of 02762230 represents error number 22 (port 1 loopback failure) of the PeerMaster adapter in expansion slot 3.

0DDD01S0: POST Flash Main Sector Checksum Failure

Action: Call for service.

0DDD02S0: POST was not performed - adapter restarted

Action: Call for service.

0DDD03S0: POST Test Sequencer Internal Failure

Action: Call for service.

0DDD04S0: POST Flash Boot Sector Checksum Failure

Action: Call for service.

0DDD05S0: POST DRAM Size Detection Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

0DDD06S0: POST DRAM Byte (8-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

0DDD07S0: POST DRAM Short (16-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

0DDD08S0: POST DRAM Word (32-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If error message repeats, call for service.

0DDD09S0: POST DRAM Long (64-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

0DDD10S0: POST DRAM Trip (96-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

0DDD11S0: POST DRAM Quad (128-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

0DDD12S0: POST DRAM Addressability Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

0DDD13S0: POST SRAM Size Detection Failure

Action: Call for service.

0DDD14S0: POST SRAM Byte (8-bit) Wide Failure

Action: Call for service.

0DDD15S0: POST SRAM Short (16-bit) Wide Failure

Action: Call for service.

0DDD16S0: POST SRAM Word (32-bit) Wide Failure

Action: Call for service.

0DDD17S0: POST SRAM Long (64-bit) Wide Failure

Action: Call for service.

0DDD18S0: POST SRAM Trip (96-bit) Wide Failure

Action: Call for service.

0DDD19S0: POST SRAM Quad (128-bit) Wide Failure

Action: Call for service.

0DDD20S0: POST SRAM Addressability Failure

Action: Call for service.

0DDD21S0: POST Timer Failure

Action: Call for service.

0DDD22S0 POST Ethernet Port 1 Internal Loopback Failure

Action: Call for service.

0DDD23S0: POST Ethernet Port 2 Internal Loopback Failure

Action: Call for service.

0DDD24S0: POST Ethernet Port 3 Internal Loopback Failure

Action: Call for service.

0DDD25S0: POST Ethernet Port 4 Internal Loopback Failure

Action: Call for service.

0DDD26S0: POST Ethernet Port 1 External Loopback Failure

Action: Verify that the port is cabled properly and try again. If the error repeats, call for service.

0DDD27S0: POST Ethernet Port 2 External Loopback Failure

Action: Verify that the port is cabled properly and try again. If the error repeats, call for service.

0DDD28S0: POST Ethernet Port 3 External Loopback Failure

Action: Verify that the port is cabled properly and try again. If the error repeats, call for service.

0DDD29S0: POST Ethernet Port 4 External Loopback Failure

Action: Verify that the port is cabled properly and try again. If the error repeats, call for service.

0DDD30S0: POST Ethernet Port 1 Device Verification Failure

Action: Call for service.

0DDD31S0: POST Ethernet Port 2 Device Verification Failure

Action: Call for service.

0DDD32S0: POST Ethernet Port 3 Device Verification Failure

Action: Call for service.

0DDD33S0: POST Ethernet Port 4 Device Verification Failure

Action: Call for service.

0DDD91S0: Communications to the adapter failed. The Diagnostic Program was not run.

Action: Verify the adapter configuration using the Configuration/Setup utility program.

0DDD92S0: Communications to the adapter failed. The Diagnostic Program was not run.

Action: Verify the adapter configuration using the Configuration/Setup utility program.

0DDD93S0: Communications to the adapter failed. The Diagnostic Program was not run.

Action: Verify the adapter configuration using the Configuration/Setup utility program.

0DDD99S0: The adapter is not enabled.

Action: Verify the adapter configuration using the Configuration/Setup utility program.

Novell NetWare Load-Time Error Messages

Load-time error messages can occur under two conditions. If POST completes successfully, the device driver attempts to initialize and download the PeerMaster adapter software. If POST completes unsuccessfully, the driver will not attempt to load the adapter software. This section describes the error messages that might appear during load time.

050: The adapter cannot be found

Action: The driver assumes that your PeerMaster adapter has not been installed. Verify that your adapter is properly installed. If it is, then treat this error in the same manner as “The adapter has failed.”

058: The adapter does not respond

Action: The driver is not able to communicate with the PeerMaster adapter. At load-time, this is an irrecoverable error that causes the driver to terminate the load process. It might help to restart the server or run your system configuration program to check for possible system conflicts. If restarting your server does not clear the problem, and system conflicts do not exist, call for service.

070: The adapter has failed

Action: The driver is not able to communicate with the adapter. At load time, this is an irrecoverable error that causes the driver to terminate the load process. It might help to restart your server or run your system configuration program to check for possible system conflicts. If restarting your server does not clear the problem, and system conflicts do not exist, call for service.

073: Unable to allocate memory

Action: The driver was not able to allocate sufficient memory to perform its functions. Unload the driver and unnecessary NLMs and try again. If this does not help, exit and reload the server and try again. If the problem persists, you must install additional memory in your server.

110: Unable to download the firmware

Action: The driver is not able to communicate with the adapter. At load time, this is an irrecoverable error that causes the driver to terminate the load process. It might help to restart your server or run your system configuration program to check for possible system conflicts. If restarting your server does not clear the problem, and system conflicts do not exist, call for service.

203: Adapter diagnostics failed to complete

Action: The driver is not able to communicate with the adapter. At load time, this is an irrecoverable error that causes the driver to terminate the load process. It might help to restart your server or run your system configuration program to check for possible system conflicts. If restarting your server does not clear the problem, and system conflicts do not exist, call for service.

301: POST Flash Main Sector Checksum Failure

Action: Call for service.

302: POST was not performed - adapter restarted

Action: Call for service.

303: POST Test Sequencer Internal Failure

Action: Call for service.

304: POST Flash Boot Sector Checksum Failure

Action: Call for service.

305: POST DRAM Size Detection Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

306: POST DRAM Byte (8-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

307: POST DRAM Short (16-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

308: POST DRAM Word (32-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If error message repeats, call for service.

309: POST DRAM Long (64-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

310: POST DRAM Trip (96-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

311: POST DRAM Quad (128-bit) Wide Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

312: POST DRAM Addressability Failure

Action: The power unit is down. Verify that the DRAM SIMM is seated properly on the adapter and try again. If the error message repeats, call for service.

313: POST SRAM Size Detection Failure

Action: Call for service.

314: POST SRAM Byte (8-bit) Wide Failure

Action: Call for service.

315: POST SRAM Short (16-bit) Wide Failure

Action: Call for service.

316: POST SRAM Word (32-bit) Wide Failure

Action: Call for service.

317: POST SRAM Long (64 bit) Wide Failure

Action: Call for service.

318: POST SRAM Trip (96-bit) Wide Failure

Action: Call for service.

319: POST SRAM Quad (128-bit) Wide Failure

Action: Call for service.

320: POST SRAM Addressability Failure

Action: Call for service.

321: POST Timer Failure

Action: Call for service.

322: POST Ethernet Port 1 Internal Loopback Failure

Action: Call for service.

323: POST Ethernet Port 2 Internal Loopback Failure

Action: Call for service.

324: POST Ethernet Port 3 Internal Loopback Failure

Action: Call for service.

325: POST Ethernet Port 4 Internal Loopback Failure

Action: Call for service.

326: POST Ethernet Port 1 External Loopback Failure

Action: Verify that the port is cabled properly and try again. If the error repeats, call for service.

327: POST Ethernet Port 2 External Loopback Failure

Action: Verify that the port is cabled properly and try again. If the error repeats, call for service.

328: POST Ethernet Port 3 External Loopback Failure

Action: Verify that the port is cabled properly and try again. If the error repeats, call for service.

329: POST Ethernet Port 4 External Loopback Failure

Action: Verify that the port is cabled properly and try again. If the error repeats, call for service.

330: POST Ethernet Port 1 Device Verification Failure

Action: Call for service.

331: POST Ethernet Port 2 Device Verification Failure

Action: Call for service.

332: POST Ethernet Port 3 Device Verification Failure

Action: Call for service.

333: POST Ethernet Port 4 Device Verification Failure

Action: Call for service.

Novell NetWare Run-Time Messages

It is possible that an irrecoverable or recoverable error might occur during normal operation of the adapter. The following table describes the run-time errors that might appear.

Recoverable Errors and Warnings

58: The adapter does not respond

Description: To clear a detected run-time error, the driver has attempted to reset, reload, and reinitialize the adapter. These messages indicate that errors have occurred during the recovery process. This message does not indicate that the driver has terminated the recovery process. The driver will attempt to recover control of the adapter at periodic intervals. The driver will not redisplay the error message each time it attempts to recover from the error. If the driver is not able to recover from any of these errors after several minutes, call for service.

110: Unable to download the firmware

Description: To clear a detected run-time error, the driver has attempted to reset, reload, and reinitialize the adapter. These messages indicate that errors have occurred during the recovery process. This message does not indicate that the driver has terminated the recovery process. The driver will attempt to recover control of the adapter at periodic intervals. The driver will not redisplay the error message each time it attempts to recover from the error. If the driver is not able to recover from any of these errors after several minutes, call for service.

111: Invalid Pipe Command

Description: To clear a detected run-time error, the driver has attempted to reset, reload, and reinitialize the adapter. These messages indicate that errors have occurred during the recovery process. This message does not indicate that the driver has terminated the recovery process. The driver will attempt to recover control of the adapter at periodic intervals. The driver will not redisplay the error message each time it attempts to recover from the error. If the driver is not able to recover from any of these errors after several minutes, call for service.

112: The adapter watchdog failed

Description: To clear a detected run-time error, the driver has attempted to reset, reload, and reinitialize the adapter. These messages indicate that errors have occurred during the recovery process. This message does not indicate that the driver has terminated the recovery process. The driver will attempt to recover control of the adapter at periodic intervals. The driver will not redisplay the error message each time it attempts to recover from the error. If the driver is not able to recover from any of these errors after several minutes, call for service.

113: Adapter resetting... please wait

Description: To clear a detected run-time error, the driver has attempted to reset, reload, and reinitialize the adapter. These messages indicate that errors have occurred during the recovery process. This message does not indicate that the driver has terminated the recovery process. The driver will attempt to recover control of the adapter at periodic intervals. The driver will not redisplay the error message each time it attempts to recover from the error. If the driver is not able to recover from any of these errors after several minutes, call for service.

229: The adapter alert condition has been corrected

Description: This message indicates the successful recovery from one of the previous run-time error conditions.

388: Ethernet Media Port 1 Tx Carrier Sense Errors, check your cable

Description: Check your cables, adapter cables, or concentrator.

389: Ethernet Media Port 2 Tx Carrier Sense Errors, check your cable

Description: Check your cables, adapter cables, or concentrator.

390: Ethernet Media Port 3 Tx Carrier Sense Errors, check your cable

Description: Check your cables, adapter cables, or concentrator.

391: Ethernet Media Port 4 Tx Carrier Sense Errors, check your cable

Description: Check your cables, adapter cables, or concentrator.

395: Ethernet Media Port 1 Tx Carrier Sense Errors corrected

Description: Problem is solved.

396: Ethernet Media Port 2 Tx Carrier Sense Errors corrected

Description: Problem is solved.

397: Ethernet Media Port 3 Tx Carrier Sense Errors corrected

Description: Problem is solved.

398: Ethernet Media Port 4 Tx Carrier Sense Errors corrected

Description: Problem is solved.

Irrecoverable Errors

If you receive an error that is not described in the preceding error-message lists, you might have an irrecoverable (fatal) error. The error message indicates that the adapter has experienced an irrecoverable run-time error.

To make the adapter functional, unload the drivers, then reload them. If unloading and reloading the drivers does not make the adapter functional, restart the server and try again.

If these procedures do not work, or if the message occurs again, record the error number and message string and call for service.

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.

Note: If you are instructed to use the System Diskettes, insert the Reference Diskette first. (Refer to “Using the System Diskettes” on page 164 for information on System Diskettes.)

In these charts, an *X* can be any alphanumeric character.

CD-ROM Drive	
Problems	Action
The CD is not working properly.	<p>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.</p> <p>If this does not correct the problem, clean the optical-head lens. Discs for cleaning the lens are available from your place of purchase.</p> <p>If a problem still exists, have the system serviced.</p>
CD-ROM drive tray 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, call for service.
CD-ROM drive not recognized	Use SCSISelect to verify the SCSI ID of the CD-ROM drive (see “SCSISelect Utility Program Options” on page 171 for information on the SCSISelect utility program). If SCSISelect does not indicate a conflict with the SCSI IDs, call for service.

Troubleshooting

Diskette Drive Problems	Action
Diskette drive In-Use light stays on, or the system bypasses the diskette drive.	<p>If a diskette is in the drive, verify that:</p> <ol style="list-style-type: none">1. The diskette is good and not damaged. (Try another diskette if you have one.)2. The diskette is inserted correctly (label up and metal-shutter end first) in the drive.3. The diskette contains the necessary files to start the system.4. Your software program is OK. <p>If the diskette drive In-Use light stays on, or the system continues to bypass the diskette drive, have the system serviced.</p>

Microprocessor Problems	Action
	<p>If you have upgraded the microprocessor or added a second processor, verify that:</p> <ol style="list-style-type: none">1. The microprocessor is not damaged and is seated correctly.2. The microprocessor-speed jumper is set as specified on the system label.3. If your server contains two microprocessors, they are the same speed. <p>If the problem persists, have the server serviced.</p>

Monitor Self-Tests	Action
	<p>Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, refer to the information supplied with the monitor for adjusting and testing instructions.</p> <p>If you still cannot find the problem, have the monitor and system serviced.</p>

Monitor Problems	Action
<p>Wavy, unreadable, rolling, or distorted screen, or screen jitter.</p>	<p>If the monitor self-tests show the display 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 the monitor on.</p> <p><i>Notes:</i></p> <ol style="list-style-type: none"> 1. The distance between monitors and diskette drives should be at least 76 mm (3 in.) to prevent diskette drive read/write errors. 2. The use of non-IBM monitor cables might cause unpredictable problems. 3. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. See your IBM reseller or IBM marketing representative. <p>If the problem remains, have the monitor and system serviced.</p>
<p>The monitor works when you turn on the system, but goes blank when you start some application programs.</p>	<p>Verify that:</p> <ol style="list-style-type: none"> 1. The monitor power cable is connected to the monitor and to 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 correctly to the video connector on the system or to the video adapter.
<p>Blank screen and no beep.</p> <p>Note: If you are not sure about the beeps, turn the system off, then on again, and listen for the beep.</p>	<p>Verify that:</p> <ol style="list-style-type: none"> 1. The system power cord is plugged into the system and a working electrical outlet. 2. The cables connected to the system are secure. (For information about where cables connect, see "Completing the Installation" on page 289.) 3. The system and monitor power switches are on. <p>If the items above are correct and the screen remains blank, have the system serviced.</p>

Troubleshooting

Monitor Problems	Action
Blank screen and one beep.	Verify that: <ol style="list-style-type: none">1. The monitor power cable is connected to the display and to 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 correctly to the video connector on the system board or to the video adapter. If the screen remains blank, run the monitor self-tests. If those tests show the monitor is OK, have the system serviced.
Blank screen, continuous beep, or more than one beep.	Have the system serviced.
Only the cursor (_) appears.	Have the system serviced.
Wrong characters appear on the screen.	Have the system serviced.
General Problems	Action
Problems such as broken cover locks or indicator lights not working.	Have the system serviced.
Intermittent Problems	Action
A problem occurs only occasionally and is difficult to detect.	Verify that: <ol style="list-style-type: none">1. All cables and cords are securely connected to the rear of the system and attached options.2. When the system is turned on, air is flowing from the rear of the system at the fan grill. If there is no air flow, the fan is not working. This causes the system to overheat and shut down.3. The last external device in each SCSI chain is terminated correctly. (See "SCSI Drives" on page 218 for more information about SCSI terminators.) If these items are correct, the next time it occurs, make a note of what the system is doing when the problem occurs again. Then have the system serviced.

Keyboard, Mouse, or Pointing-Device Problems	Action
All or some keys on the keyboard do not work.	<p>You might have a password set or have disketteless operation enabled. To use the system, type the correct password and press Enter.</p> <p>If you forget your power-on password, and an administrator password has been set, use the administrator password at the power-on prompt; then start the Configuration/Setup utility program and change the power-on password. If no administrator password has been set, you can erase the power-on password by removing the battery from the system board for approximately 15 minutes. See “Removing an Unknown Power-On Password” on page 284 for instructions.</p> <p>If you forget your administrator password, you cannot erase it. Have the system serviced.</p> <p>If no passwords are set, or if the password is not working correctly, have the system, keyboard, and keyboard cable serviced.</p>
The mouse or pointing device does not work.	<p>Verify that:</p> <ol style="list-style-type: none"> 1. The mouse or pointing-device cable is securely connected and the device drivers are installed correctly. 2. Disketteless operation is not set. Disketteless operation disables the pointing-device port when the system is turned on, and the device driver will not be loaded. <p><i>Note:</i> The pointing-device port is also known as the auxiliary-device port or mouse port.</p> <p>If the problem remains, have the system and the device serviced.</p>

Option Problems	Action
An IBM option that was just installed does not work.	<p>Verify that:</p> <ol style="list-style-type: none"><li data-bbox="645 326 1035 348">1. The option is designed for the system.<li data-bbox="645 354 1139 456">2. The Reference Diskette was updated with the information on the Option Diskette, if one was provided. (See "Using the System Diskettes" on page 164.)<li data-bbox="645 461 1160 510">3. You followed the installation instructions supplied with the option.<li data-bbox="645 515 980 538">4. The option is installed correctly.<li data-bbox="645 543 1160 591">5. You have not loosened any other installed options or cables.<li data-bbox="645 597 1144 671">6. The configuration information has been updated. To update the configuration information, run the Automatic Configuration program. <p>If you are using an expanded- or enhanced-memory manager, such as the DOS Expanded Memory Specification (EMS) driver, go to "Configuration Conflicts" on page 372.</p> <p>If all of the above items are correct, start the system programs and run the Test the Computer program. If the test programs find no problem, have the system and the option serviced.</p>
An IBM option that used to work does not work now.	<p>Verify that all of the option hardware and cable connections are secure.</p> <p>If the option came with its own test instructions, use those instructions to test the option.</p> <p>If the failing option is a SCSI option, verify that:</p> <ol style="list-style-type: none"><li data-bbox="645 1100 1084 1149">1. The cables for all external SCSI options are connected correctly.<li data-bbox="645 1154 1160 1256">2. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. (See "SCSI Drives" on page 218 for more information on SCSI terminators.)<li data-bbox="645 1262 1160 1336">3. All external SCSI options are turned on. External SCSI options must be turned on before the system is turned on. <p>If the items above are correct and the test programs find no problem, have the system and option serviced.</p>

Printer Problems	Action
<p>The printer does not work.</p>	<p>Verify that:</p> <ol style="list-style-type: none"> 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 system. (For the location of the serial or parallel port, see “Input/Output Connectors” on page 8.) <p><i>Note:</i> Non-IBM printer cables might cause unpredictable problems.</p> <ol style="list-style-type: none"> 3. You have assigned the printer port correctly in your operating system or application program. <p>If the items above are correct and the printer still does not work, run the tests described in the printer manual. If the tests show the printer is OK, have the system serviced.</p>
Software Problem	Action
<p>Is your software program OK?</p>	<p>To determine if problems are caused by the software, verify that:</p> <ol style="list-style-type: none"> 1. Your system has the minimum memory requirements needed to use the software. Refer to the information supplied with the software to verify memory requirements. <p><i>Note:</i> If you have just installed an adapter or memory, you might have a memory address conflict (see “Configuration Conflicts” on page 372).</p> <ol style="list-style-type: none"> 2. The software is designed to operate on your system. 3. Other software works on your system. 4. The software you are using works on another system. <p>If you received any error messages when using the software program, refer to the information supplied with the software for a description of the messages and solutions to the problem.</p> <p>If the items above are correct and the problem remains, contact your place of purchase or service technician for help.</p>

System Diskette Backup Copy Problems	Action
Did you update the backup copy of your System Diskettes?	<p>Always keep a current backup copy of your system programs. The copy should contain the current configuration information and test programs for your system. If the system programs are not current, the test programs might not find the problem.</p> <p>Some options come with an Option Diskette. Be sure to copy this diskette to the System Diskettes when you install the option. This Option Diskette contains the option test program and configuration information. If you installed an option, check its instructions to see if it came with an Option Diskette.</p>

Note: If you cannot find the problem in the troubleshooting charts, go to “Testing the System” on page 312 to test the system. If you already have run the test program, or if running the test does not reveal the problem, have the system serviced.

Beep Codes

One beep and the appearance of text on the monitor indicates successful completion of POST. More than one beep indicates that POST detects an error.

Beep codes are sounded in a series of two or three sets of beeps. The duration of each beep is constant, but the length of the pause between the beeps varies. For example, a 1-2-4 beep code sounds like one beep, a pause, two consecutive beeps, another pause, and four more consecutive beeps.

It is possible to misinterpret a beep code if you do not understand exactly how they work. Keeping in mind that POST error codes vary in the length of the pause, and not the duration of the beep tones will help you to distinguish the beeps.

Beep Code Chart

Beep Code	Description
1-1-3	CMOS write/read failure
1-1-4	BIOS ROM checksum failure
1-2-1	Programmable Interval Timer test failure
1-2-2	DMA initialization failure
1-2-3	DMA page register write/read test failure
2-1-1	Secondary DMA register test in-progress or failure
2-1-2	Primary DMA register test in-progress or failure
2-1-3	Primary interrupt mask register test failure
2-1-4	Secondary interrupt mask register test failure
2-2-2	Keyboard controller test failure
1-3	Video controller failure
<i>Action:</i> Have the system serviced.	
1-2-4	RAM refresh verification failure
1-3-1	First 64K RAM test failure
1-3-2	First 64K RAM parity test failure
<i>Action:</i> Reseat the memory module and the memory riser card. If the problem recurs, have the system serviced.	

Checking the System for Damage

This section provides instructions on what to do if your system 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 system, have it serviced.

If you see no damage, turn on the system. If it works correctly, the system probably did not suffer any damage.

**CAUTION:**

Observe all safety and electrostatic precautions listed in this book to avoid personal injury or damage to your system.

Checking the System for Damage

If the system does not work correctly, turn it off and check the adapters and memory modules to ensure that they are seated properly. Go to “Electrical Safety” on page 179 and follow the instructions for opening your system; then reseal all adapters and memory modules.

If the system still does not work correctly, start the system programs and test the system. Refer to “Testing the System” on page 312 for instructions.

After Spilling Liquid on It

If liquid gets on the keyboard:

1. Turn off the system.
2. Unplug the keyboard from the back of the system.
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 system. 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 system.
3. Unplug the monitor from the system and the electrical outlet.
4. Have the monitor serviced immediately.

If liquid gets inside the system:

1. Turn off the system and all attached devices.
2. Unplug the system from the electrical outlet and all attached devices.
3. Have the system serviced immediately.

Installing Additional Test Programs

You can copy other test programs to the Diagnostic Diskettes. These other programs are usually provided on the diskette that comes with a device. After you add the programs to the System Board Diagnostic Diskette, you can include information from the programs in the Test Log.

Before the test programs can find these programs to run as the User Diags test group, information about them must be included in a file called USERDIAG.CFG. This is an ASCII text file. It must include the following three items for each test to run:

- Program Name (.COM and .EXE files only)
- Test Description of the test to be run
- Command-line parameters to be passed to the program identified in the first item of this list

The user diagnostic tests must generate the following return codes upon completion so that the tests can be registered properly in the test log:

- | | |
|---------------------|-------------------|
| 0 | The test passed. |
| 1 | The test failed. |
| 2 or greater | The test aborted. |

Abort messages from the user diagnostic test program also report the ABORT return code.

Notes:

1. All of the information for a given test must be on a single line, and a semicolon (;) must separate the items on the line.
2. Make sure you press Enter at the end of each line of text in the USERDIAG.CFG file. This creates a carriage return line feed (CR LF) which is necessary for the User Diagnostics to be found and executed.
3. If the program executable file is in a directory other than the QA directory (or other directory you have designated

Installing Additional Test Programs

to contain the QA files), that directory must be listed in the PATH= section of the AUTOEXEC.BAT.

4. You can use a .CFG file other than USERDIAG.CFG if you use the command line "USRCONFIG=*filename*," when running the diagnostic programs. For example, you might use: QAPLPRO /USRCONFIG=MYTESTS.CFG.

USERDIAG.CFG Example

An example USERDIAG.CFG file might look like the following:

Program Name	Test Description	Command-Line Parameter
BBSMODEM.EXE;	9600 Baud 5 Line Modem;	5
TEST1.EXE;	Generic 1;	
TEST2.EXE;	Generic 2;	
TESTALL.EXE;	CMD 1;	1
TESTALL.EXE;	CMD 2;	2
TESTALL.EXE;	CMD 3;	3

Note: You can have more than one command-line parameter for any given test.

When you view these tests on the Test Group window for the User Diag test group, they appear as follows:

- (◆) 9600 Baud 5 Line Modem
- (◆) Generic 1
- (◆) Generic 2
- (◆) CMD 1
- (◆) CMD 2
- (◆) CMD 3

The diagnostic program automatically assigns a test number to each test. The test numbers start at 201 and continue upward as needed. The number for the above tests are as follows:

- 202 9600 Baud 5 Line Modem
- 203 Generic 1
- 204 Generic 2
- 205 CMD 1
- 206 CMD 2

207 CMD 3

Using the Utility Programs

The System Board Diagnostic Diskette contains utility programs for formatting diskettes and editing.

Formatting Diskettes

To format a diskette within the diagnostic programs, insert a diskette into diskette drive A or B; then select one of the following options:

Format A: high density — 1.44 MB

Format A: low density — 720 KB

Format B: high density — 1.44 MB

Format B: low density — 720 KB

After selecting one of the above options to format a diskette, follow the instructions that appear on the screen.

Using the File Editor

The file editor allows you to modify text files. By modifying files, such as your AUTOEXEC.BAT or CONFIG.SYS files, you can improve the test system's performance and eliminate unnecessary lines of information in those files.

Note: Always make a backup copy on a self-starting diskette of the AUTOEXEC.BAT and CONFIG.SYS files *before* making any changes.

The File Editor is an ASCII text editor that uses the following function keys:

Key	Description
Arrows	Use the arrow keys to move the cursor to the place in the text where you want to make changes.
Home	To move the cursor to the start of the current line, press Home once. To move to the beginning of the current screen, press Home twice. To move to the beginning of the file, press Home three times.

- End** To move the cursor to the end of the current line, press End once. To move the cursor to the end of the current screen, press End twice. To move the end of the file, press End three times.
- F2** To be in search mode, press **F2**. You are prompted to enter the search word or words on a reverse highlighted line at the bottom of the File Edit Screen. After typing in the search word, press **Enter**.
- F3** To find the next occurrence of a search word, press **F3**.
- F4** To mark the start of a block of text (if you have not previously marked it), press **F4**. If you previously marked the block of text, pressing this key unmarks the text block.
- F5** To complete the block marking (started with F4), press **F5**. If you did not previously press **F4** to start marking a block of text, F5 is ignored.
- F6** To move an active (marked) block of text, first press F6 while the cursor is within the active block. Then, move the cursor to the new location where the active block is to be moved, and press **F6** again. If no block of text is active, F6 is ignored.
- F7** To copy an active (marked) block of text to the a new location, move the cursor to the new location and press **F7**. If no block of text is active, F7 is ignored.
- F8** To delete an active (marked) block of text, move the cursor within the active block and press **F8**. If no block of text is active, F8 is ignored.
- F10** To save all changes and exit the file, press **F10**.
- Insert** Insert is the default text-editing mode of the File Editor. To toggle between replace and insert modes, press Insert.

To access the File Editor:

1. Select **File Editor** from the Utilities Menu; then press **Enter**.
2. Insert a diskette into drive A or drive B before selecting the file you want to edit; then select the file from the Files Selection box.

Configuration Conflicts

3. Press **Enter**.
4. Make your changes.
5. When you are done, press **F10** to update the file with the changes you made, or press **Esc** to quit the editing process without saving the changes.

Note: Pressing F1 when inside the File Editor displays all of the keyboard functions available to you while editing.

Configuration Conflicts

The Automatic Configuration program configures only the system hardware. It does not consider the requirements of the operating system or the application programs. For these reasons, configuration conflicts might occur.

Resolving Memory-Address Conflicts

The Automatic Configuration program might change the memory-address space used by some hardware options. If it does, the new address might conflict with addresses defined for use through expanded memory specification (EMS). (EMS is used only with DOS.)

If a memory 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 message.
- Screen messages indicate that a memory-address conflict exists.

You can resolve memory-address conflicts by changing either the software or hardware configuration setup.

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 8 KB of space in the hex C0 to C7FFF EMS memory area. EMS device drivers must use addresses different from those assigned to video read-only memory (ROM). You can view or change the current setting for video ROM by using the **Devices and I/O Ports** menu in the Configuration/Setup utility program.

If the SVGA or EMM386 device driver is causing the memory-address conflict, refer to your DOS documentation. For conflicts caused by device drivers supplied with application programs instead of those supplied with DOS, refer to the documentation supplied with the device drivers.

Changing the Hardware Configuration Setup

An alternative way to resolve memory-address conflicts is to change the address of the conflicting hardware option by using the Set/View Micro Channel Configuration program.

Note: PCI configuration is resolved during system startup. Any unresolved conflicts cause a POST error message to be displayed.

To change the configuration information, select **Set/View Micro Channel Configuration** from the system programs Main Menu. Identify the adapter using the addresses assigned to the EMS device driver; then set the adapter to a nonconflicting address.

Configuration Conflicts

Change Configuration

Slot 1 - IBM Ethernet Adapter/A	
Adapter Media Type Selection	[Autosense]
System Interrupt Level	[Interrupt]
Micro Channel I/O Address	[IC00-ICFF]
Streaming Date Select	[Enabled]
Fairness	[Fairness ON]
Arbitration Level	[Level 5]
Parity Enable/Monitor Feedback	[Parity OFF/Monitor OFF]
Slot 2	[Empty]
Slot 3	[Empty]
Slot 4	[Empty]
Slot 5	[Empty]

F1=Help F3=Exit F5=Previous F6=Next F7=Bkwd F8=Fwd
F10=Save

Note: If you run the Automatic Configuration program after changing an address, the address you changed will be set back to its default (and possibly conflicting) value.

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. This section provides information about those sources.

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

Before You Call for Help

Many server 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 server or software. Also, be sure to read the information in any README files that come with your software.

Your server and most operating systems and application programs come with documentation that contains troubleshooting procedures and explanations of error messages. This handbook and other documentation that come with your server also contain information about the diagnostic tests you can perform.

If you suspect a hardware problem, run the diagnostic tests and make a note of any error messages you receive. Then look up the message in the documentation and take the appropriate action.

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

Using the HelpWare Support Family

IBM HelpWare is the solution for IBM PC service and support wherever IBM products are sold and serviced. Purchasing an IBM PC hardware product entitles you to standard help and support during the warranty period. If you need additional support and services, HelpWare provides a wide variety of extended solutions 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

The IBM PC Company 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 PC Company BBS:

- In the U.S., call 1-919-517-0001.
- In Canada:
 - In Markham, call 905-316-4255.
 - In Montreal, call 514-938-3022.
 - In Toronto, call 416-492-1823.
 - In Vancouver, call 604-664-6466.

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**.

On the World Wide Web, the IBM Personal Computers home page has information about IBM Personal Computer products and support. The address for the IBM Personal Computer home page is:

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

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 free marketing and technical information on many topics, including hardware, operating systems, and local area networks (LANs). You can call the IBM PC Company 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 PC Company Automated Fax System, do the following:

- In the U.S., call 1-800-426-3395.
- In Canada, call 1-800-465-3299.

Getting Help by Telephone

During the warranty period, you can get help and information by telephone through the IBM HelpWare PC Support Line. Expert technical-support representatives are available to assist you with questions you might have on the following:

- Setting up your server and IBM monitor
- Installing and setting up IBM options purchased from IBM or an IBM reseller
- 60-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, you are eligible for PC Server Startup 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

Getting Help, Service, and Information

Please have the following information ready when you call:

- Serial numbers of your server, 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 server when you call.

These services are available 24 hours a day, 7 days a week (excluding some holidays).

- 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 need to move your server 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 HelpWare Services

During and after the warranty period, you can purchase additional HelpWare 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.

Using the World Wide Web

Also available to you is the latest information about product compatibility and configuration. This information is updated as new PC Server products are announced. For a product to be included in the PC Server compatibility list, it must pass a strict set of hardware and operating system compatibility tests. The following is a sample of the information available at <http://www.pc.ibm.com/servers/> on the World Wide Web.

- A listing of products that have been tested for compatibility with IBM PC Server.
- Certification and compatibility information about Network Operating Systems (NOS) and Operating Systems (OS).
- Direct access to device drivers, flash BIOS updates, and other code.
- Descriptions of PC Server compatibility and certification tests.
- Detailed reports about the performance of PC Servers.

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 380.

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 the same support as the Enhanced PC Support line, except for application and non-IBM option support.

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.”

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 through 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. HelpWare 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 1-800-426-7697.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your IBM reseller or IBM marketing representative.

Obtaining IBM Operating System Updates

IBM provides update diskettes, called ServicePaks or corrective service diskettes (CSDs), to customers who report a DOS or OS/2 problem for which there is or will be a corrective program.

You can obtain update diskettes from the following sources:

- IBM PC Company BBS. See “Using Electronic Support Services” on page 376 for information on how to access this bulletin board system.
- OS/2 BBS. In the U.S. or Canada, call 1-800-547-1283.
- OS/2 Technical Support Center. In the U.S. or Canada, call 1-800-992-4777.
- World Wide Web. The address is <http://www.ibm.com>.
- CompuServe and PRODIGY.
- 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. and Puerto Rico, call 1-800-879-2755.
- In other countries, contact your IBM reseller or IBM marketing representative.

Record the Identification Numbers

Record and retain the following information.

Product Name	IBM PC Server 520
Machine Type	8641
Model	<input type="checkbox"/> with preinstalled hard disk drive <input type="checkbox"/> without preinstalled hard disk drive
Serial Number	_____
Key Serial Number	_____
ServerGuide License Diskette Serial Number	_____

Table 4. PC Server 520 Identification Numbers

The server identification numbers appear on a label on the rear of the server. If you installed the optional PC Server Security Cover on your server, you must remove the cover to see the label.

The server serial number is also located on top of the handle on the front of the server. To see this label, you must first remove the front cover.

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.

Note: Anyone who has access to the key serial number and manufacturer address can order duplicate keys, so store the tag in a safe place.

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. It is recommended that you 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. Table 5 on page 385 lists the default values for configuration choices in the Configuration/Setup utility program.

Menu Options	Default Value	New Value	Additional Information
System Summary			
Microprocessor	Pentium	_____	_____
Microprocessor Speed	_____	_____	_____
System Memory	640 KB	_____	_____
Extended Memory	15360 KB	_____	_____
Video Controller	SVGA	_____	_____
Cache Size	512 KB	_____	_____
Shadow RAM	384 KB	_____	_____
System ROM	F000h — FFFFh	_____	_____
Memory Type	[Parity]	_____	_____
Diskette Drive A:	[1.44 MB 3.5 in]	_____	_____
Diskette Drive B:	[not installed]	_____	_____
Mouse	[Installed]	_____	_____
Micro Channel Configuration			
Micro Channel Slot 1	Empty	_____	_____
Micro Channel Slot 2	Empty	_____	_____
Micro Channel Slot 3	Empty	_____	_____
Micro Channel Slot 4	Empty	_____	_____
Micro Channel Slot 5	Empty	_____	_____
Micro Channel Slot 6	Empty	_____	_____
<i>Note:</i> Some models ship with a preinstalled network adapter.			
Product Data			
Machine Type/Model	8641	_____	_____
Flash EEPROM Revision Level	_____	_____	_____
System Board Identifier	_____	_____	_____
System Serial Number	_____	_____	_____
BIOS Date	_____	_____	_____
Devices and I/O Ports			
Serial Port A Address	[3F8h – IRQ 4]	_____	_____
Serial Port B Address	[2F8h – IRQ 3]	_____	_____
Parallel Port	[3BCh – IRQ 7]	_____	_____
Parallel Port Mode	[Standard]	_____	_____
Parallel Port Extended Mode	[]	_____	_____
Mouse	[Installed]	_____	_____
Diskette Drive A:	[1.44 MB 3.5 in]	_____	_____
Diskette Drive B:	[not installed]	_____	_____
Video Setup			
Video Controller	SVGA	_____	_____
Video Memory	1024 KB	_____	_____
Video Display Type	[User Defined]	_____	_____
Monitor Horizontal Frequency	[Not Used]	_____	_____
Refresh Rate For (640x480)	[60 Hz]	_____	_____
Refresh Rate For (800x600)	[Undefined]	_____	_____
Refresh Rate For (1024x768)	[Undefined]	_____	_____

Device Records

Menu Options	Default Value	New Value	Additional Information
Refresh Rate For (1280x1024)	[Undefined]	_____	_____
Refresh Rate For (1600x1200)	[Undefined]	_____	_____
System Security			
Power-On Password		_____	_____
System Owner's Name		_____	_____
Administrator Password		_____	_____
Secure Diskette Drives	[Disabled]	_____	_____
Start Options			
Keyboard Numlock State	[On]	_____	_____
Keyboard Speed	[Fast]	_____	_____
Disketteless Operation	[Disabled]	_____	_____
Monitorless Operation	[Disabled]	_____	_____
Keyboardless Operation Mode	[Disabled]	_____	_____
First Startup Drive	[Diskette Drive 0]	_____	_____
Second Startup Drive	[Hard Disk 0]	_____	_____
Third Startup Drive	[Disabled]	_____	_____
Fourth Startup Drive	[Disabled]	_____	_____
Power On Self Test	[Enhanced]	_____	_____
SureTest	[Disabled]	_____	_____
Virus Detection	[Enabled]	_____	_____
Advanced Setup			
Cache Control			
Cache State	[Enabled]	_____	_____
Cache Size	[512 KB]	_____	_____
ROM Shadowing			
F0000h - FFFFFh (System BIOS)	Enabled	_____	_____
E8000h - EFFFFh	Enabled	_____	_____
E0000h - E7FFFh	Enabled	_____	_____
DC000h - DFFFFh	[Disabled]	_____	_____
D8000h - DBFFFh	[Disabled]	_____	_____
D4000h - D7FFFh	[Disabled]	_____	_____
D0000h - D3FFFh	[Disabled]	_____	_____
CC000h - CFFFFh	[Disabled]	_____	_____
C8000h - CBFFFh	[Disabled]	_____	_____
C0000h - C7FFFh (Adapter Video BIOS)	[Enabled]	_____	_____

Table 5. Configuration/Setup Program Defaults and Changes

The following table shows the defaults for system memory and extended memory in your server. Record changes to existing memory and upgrades here.

Option	Default Value	New Value	Additional Information
System Memory	640 KB	_____	_____
Extended Memory	360 KB	_____	_____
Bank 0 socket	16 MB Kit	_____	16 MB Kit <input type="checkbox"/> 32 MB Kit <input type="checkbox"/>
Bank 0 socket	16 MB Kit	_____	16 MB Kit <input type="checkbox"/> 32 MB Kit <input type="checkbox"/>
Bank 1 socket	_____	_____	16 MB Kit <input type="checkbox"/> 32 MB Kit <input type="checkbox"/>
Bank 1 socket	_____	_____	16 MB Kit <input type="checkbox"/> 32 MB Kit <input type="checkbox"/>
Bank 2 socket	_____	_____	16 MB Kit <input type="checkbox"/> 32 MB Kit <input type="checkbox"/>
Bank 2 socket	_____	_____	16 MB Kit <input type="checkbox"/> 32 MB Kit <input type="checkbox"/>
Bank 3 Socket	_____	_____	16 MB Kit <input type="checkbox"/> 32 MB Kit <input type="checkbox"/>
Bank 3 Socket	_____	_____	16 MB Kit <input type="checkbox"/> 32 MB Kit <input type="checkbox"/>
Total Memory	_____	_____	_____

Note: Memory module kits must always be added in matched pairs.

Table 6. RAM Default Settings and Changes

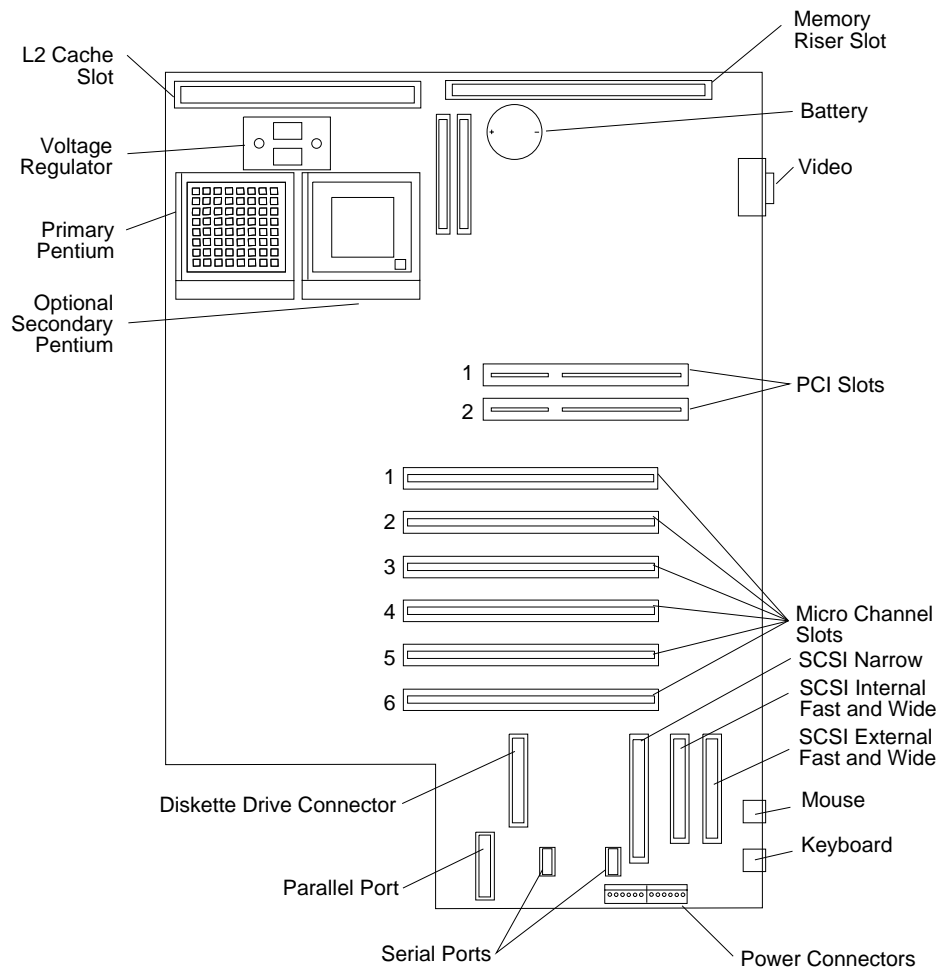
Record expansion slot configuration information for your server in the following table.

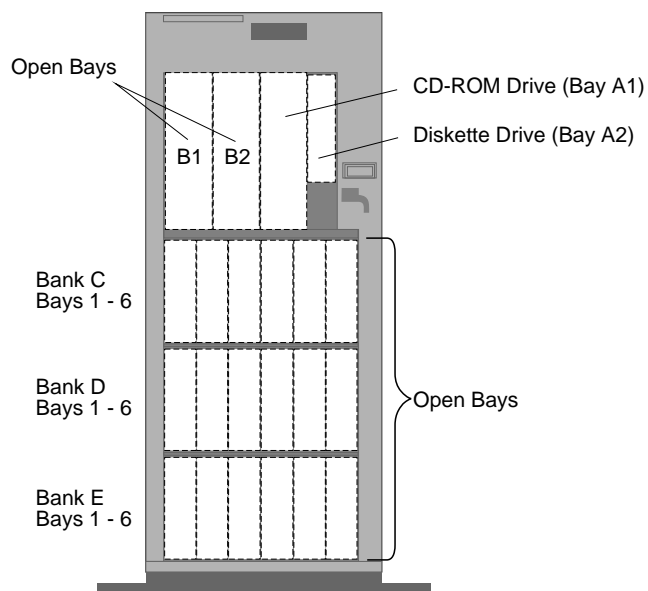
Expansion Slot	IRQ	DMA	I/O Port	ROM/RAM Address	Option Description and Additional Information
1	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____
6	_____	_____	_____	_____	_____
7	_____	_____	_____	_____	_____
8	_____	_____	_____	_____	_____

Note: Before manually setting values, review "Configuration Conflicts" on page 168 and follow the instructions for avoiding configuration conflicts.

Table 7. Expansion Slot Configuration Information

The following simplified layout of the system board identifies server components. You might need to refer to the diagram when recording information in Table 8 on page 390.





Notes:

- If you attach a drive or other device to an adapter, record the expansion-slot number for that adapter in the *Location* field of this table.
- Your model might have more preinstalled drives than shown in Table 8 on page 390.

Device Records

Location	Drive or Device Description
Bay A1	_____
Bay A2	_____
Bay B1	_____
Bay B2	_____
Bank C Bay 1	_____
Bank C Bay 2	_____
Bank C Bay 3	_____
Bank C Bay 4	_____
Bank C Bay 5	_____
Bank C Bay 6	_____
Bank D Bay 1	_____
Bank D Bay 2	_____
Bank D Bay 3	_____
Bank D Bay 4	_____
Bank D Bay 5	_____
Bank D Bay 6	_____
Bank E Bay 1	_____
Bank E Bay 2	_____
Bank E Bay 3	_____
Bank E Bay 4	_____
Bank E Bay 5	_____
Bank E Bay 6	_____

Table 8. Internal Drives and Devices

Location	External Devices
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Table 9. External Drives and Devices

Note: If you attach a drive or other device to an adapter, be sure to record the descriptive information in the appropriate column in Table 7 on page 387 (in the same row as the expansion-slot number of the adapter).

Table 10 shows the default cable connections from the ServeRAID adapter Channels to each bank in the server.

<i>Table 10. Channel-to-Bank Mapping on a ServeRAID Adapter</i>				
Channel	Default Cabling	New Cabling	Default J12 Setting¹	New J12 Setting
Channel 1	Bank E ²	_____	Low	_____
Channel 2	Bank D ²	_____	Low	_____
Channel 3	Bank C	_____	Low	_____
<i>Notes:</i>				
1. Backplane jumper J12 defines the SCSI IDs for drives installed in the bank as Low (0 to 5) or High (8 to 13).				
2. When this backplane is installed.				

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Part Number: 78H6336

Printed in U.S.A.

May 1996

78H6336

