



PC Server 520

**User's Handbook
for PCI/EISA**

Note

Before using this information and the product it supports, be sure to read the general information under Appendix B, "Notices" on page 379. Also read the general information under "Product Warranties and Notices" in the *User's Reference*.

Second Edition (May 1996)

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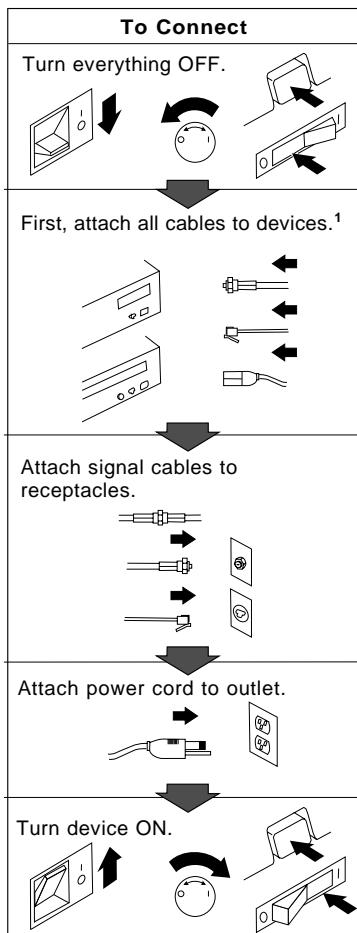
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Safety Information

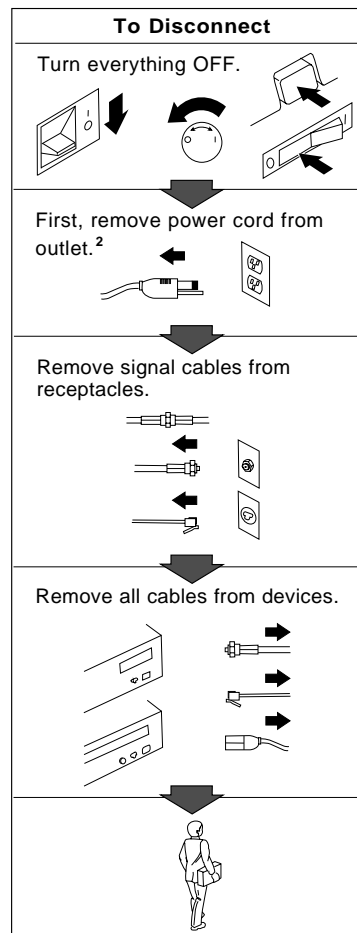


DANGER:

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.



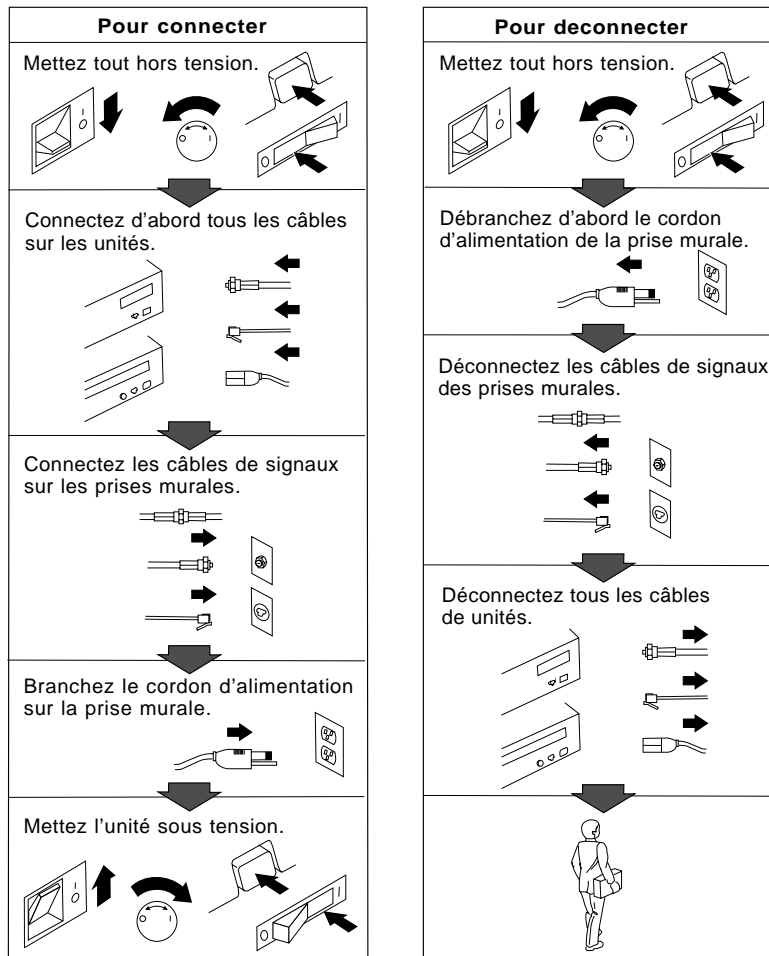
² In the U.K., by law, the power cord must be disconnected after the telephone line cable.

About This Book



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 is a laser product. The drive has a label that identifies its classification. The label, located on the drive, is shown below.

CLASS 1 LASER PRODUCT
LASER KLASSE 1
LUOKAN 1 LASERLAITE
KLASS 1 LASER APPARAT
APPAREIL À LASER DE CLASSE 1
EN 60825

The PC Server 520 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 EN 60825.



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 PC Server 520 has an internal Class 1 gallium-arsenide laser that is nominally 0.14 milliwatts at 765 to 815 nanometers wavelength.

About This Book

About This Book

This book provides the instructions for completing your installation; installing and removing server options; and configuring, modifying, and troubleshooting your server. This book also provides information to help you solve some of the simpler problems that might occur. If you have not yet set up your server, refer to the Setup sheet for instructions on unpacking and cabling the server. See Chapter 2, "Installing Software" on page 21 for details about installing an operating system and other software. Refer to the *User's Reference* for more detailed information about the server's features.

How This Book is Organized

Chapter 1, "Introducing the PC Server 520," introduces and describes the PC Server 520. This chapter also includes an overview of the server's features and components. In addition, this chapter contains instructions for starting the server and using the CD-ROM drive.

Chapter 2, "Installing Software," describes factors that you might want to consider before installing hardware and software in your server. This chapter also provides instructions for completing your installation. This includes installing device drivers, installing an operating system using some of the programs that are provided on compact discs (CDs) in the IBM ServerGuide package, and installing the PeerMaster LAN software that is required for models that come with the PeerMaster adapter.

Chapter 3, "Configuring the Disk Array," applies only to disk-array models. This chapter provides instructions for configuring models that come with a ServeRAID disk-array controller. These instructions include step-by-step procedures for the tasks necessary to configure, add, change, and delete one or more disk arrays. This chapter also contains information about the disk-array adapter configuration program, drive maintenance, and the RAID diagnostic program.

Chapter 4, "Configuring the PeerMaster Adapter," contains instructions for configuring, cabling, and testing the PeerMaster adapter.

Welcome and Thank You

Chapter 5, “Installing Options,” contains step-by-step instructions for installing and removing hardware options, such as memory-module kits, adapters, and internal drives. Instructions for connecting external options are also included in this chapter.

Chapter 6, “Configuring Your Server,” contains instructions for configuring your server. This chapter also provides instructions for using various utility programs.

Chapter 7, “Solving Problems,” contains information to help you solve simple problems that you might encounter with your server. This chapter includes an overview of diagnostic tools, instructions for testing the server, lists of error messages, and troubleshooting charts. This chapter also contains information about checking the server for damage, and resolving configuration conflicts.

Chapter 8, “Getting Help, Service, and Information,” contains information to help you solve more complex problems that you might encounter with your server. This chapter provides instructions on how to obtain service and technical assistance for your PC Server 520 and other IBM products that you might plan to use. This chapter also contains information about other publications, products, warranties, and services that IBM offers. Also included are fax numbers, toll-free telephone numbers, and access information for electronic bulletin boards, online services, and the World Wide Web.

Appendix A, “Server Records,” provides a section to record and update important information about your server, including the serial numbers, key number, and device records (which contain configuration information). Whenever you add options to your server, be sure to update the information in this appendix.

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

If you find a term that you are not familiar with, refer to the glossary located in the back of the *User's Reference*.

Notices Used in This Book

This book contains information notices that relate to a specific topic. The notice definitions are as follows:

- **Notes**

These notices provide important tips, guidance, or advice.

- **Attention**

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

- **Caution**

These notices indicate situations that potentially can be hazardous to you. A caution notice appears just *before* the instruction or situation that could be hazardous.

Welcome and Thank You

Related Publications

In addition to this handbook, the following publications are included with your server:

- The Setup sheet contains the instructions for unpacking, setting up, and cabling your server.
- The *User's Reference* contains detailed information about the advanced features of your server.
- The *PC Server Service and Support* pamphlet contains important information and phone numbers to call for different types of support for your PC Server.
- Included with the ServerGuide package is a publication that describes the advantages of the IBM ServerGuide.

The *IBM PC Servers Hardware Maintenance Manual Supplement* is available for purchase. It contains error codes, advanced diagnostic procedures, and a parts catalog for most models. 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 with various existing Network Operating Systems and application programs.

The publications that come with your server are: the Setup sheet, this *User's Handbook*, the *User's Reference*, and a *PC Server Service and Support* pamphlet. The Setup sheet contains instructions to help you set up your server. See "How This Book is Organized" on page ix for a complete description of the *User's Handbook*. The *User's Reference* contains detailed information about the advanced features of your server. The *PC Server Service and Support* pamphlet contains important information and phone numbers to call for different types of support for your server. Review these publications thoroughly *before* you install an operating system, additional software, or optional hardware in your server.

Also included is the ServerGuide package, which contains several CDs. These CDs contain operating systems, application programs, utility programs, online documentation, and more. Refer to the ServerGuide documentation that comes with ServerGuide for more information.

The PC Server 520 also comes with IBM PC Server Startup Support, which provides coverage during the first 90 days after installation. IBM PC Server Startup Support is available to PC Server customers 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 other vendors. If you need assistance, call IBM at 1-800-772-2227 in the U.S., or call IBM at 1-800-565-3344 in Canada. 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



Chapter 1. Introducing the PC Server 520

Your IBM PC Server 520 has an Intel Pentium microprocessor and symmetric multiprocessing (SMP) upgradability, along with a peripheral component interconnect (PCI) advanced bus, large data-storage capacity, and improved system expandability. The server supports SCSI devices with an IBM PC Server SCSI-2 Fast/Wide PCI Adapter or IBM PC ServeRAID Adapter, depending on the model. This server is specifically designed by IBM to handle heavy file-server applications or moderate database applications in today's network environment. The super video graphics array (SVGA) controller provides compatibility with a wide range of various existing Network Operating Systems and application programs.

As an open-architecture, industry-standard system, the PC Server 520 has been tested for compatibility with numerous IBM and non-IBM adapters and devices. Rugged dependability is achieved by incorporating various 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 LAN environments.

Refer to the Setup sheet for instructions for setting up your server. Be sure to read the publications that come with the IBM ServerGuide package before you set up your server.

This chapter contains an overview of the server features and components. In addition, this chapter describes how to start the server and use the CD-ROM drive.

See Chapter 2, "Installing Software" on page 21 for details about installing an operating system and other software. In addition, this book describes how to configure and use the server, and how to install and remove options. The troubleshooting information will help you solve some of the simpler problems that might occur. Appendix A, "Server Records" on page 369 provides a section for you to record all the important information about your server.

Refer to the *User's Reference* for more detailed information about 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

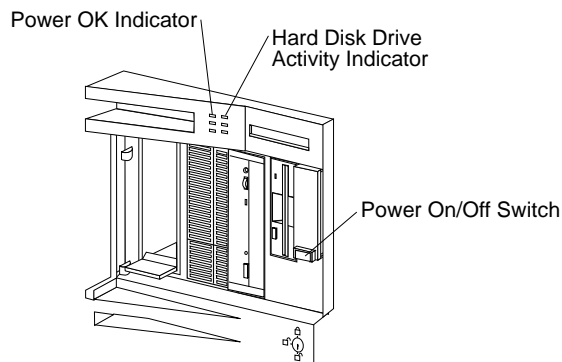
The features in your server vary according to the model that you purchased. The following is a summary of the features that are available with the PC Server 520.

<p>Microprocessor</p> <ul style="list-style-type: none"> • Intel Pentium microprocessor with 16 KB of internal cache; clock rate varies by model • 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 Correcting Code on SIMM (EOS), 70 ns • 32 MB minimum, expandable to 256 MB • Amount of memory is model dependent • 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, 1.44 MB – 3.5-inch, 2.88 MB – 5.25-inch, 1.2 MB <p>Hard Disk Drives</p> <ul style="list-style-type: none"> • Number of drives and drive capacities are model dependent • Can support up to 20 hard disk drives, 18 of them hot-swappable <p>CD-ROM Drive</p> <ul style="list-style-type: none"> • Standard: SCSI-2 CD-ROM 	<p>Keyboard and Auxiliary Device</p> <ul style="list-style-type: none"> • 101-key keyboard • Mouse <p>Expansion Bays and Slots</p> <ul style="list-style-type: none"> • Two PCI slots • Five combination EISA/ISA slots • One shared PCI/EISA slot • 22 drive bays, 18 of them hot-swap <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 • Selectable drive-startup • Security cover (optional) • Supervisor and User passwords <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 	<p>SCSI-2 Controller</p> <ul style="list-style-type: none"> • IBM PC Server SCSI-2 Fast/Wide PCI Adapter on non-disk-array models • IBM PC ServeRAID Adapter on disk-array models <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 Power-On Self-Test (POST) and Basic Input/Output System (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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Controls and Status Indicators

Your server front panel contains one switch: *Power On/Off*. This switch is illustrated below and is described in the following list.

Your server has two light-emitting diode (LED) indicators that show the system status. The amber indicators highlight the alert conditions; the green indicators confirm that the server is operating properly. The two indicators on your server are *Power OK* and *Hard Disk Drive Activity*. These indicators are illustrated below and are described in the following list.





Power On/Off: Use this switch to turn your server on and off.

To turn on the server, press the Power On/Off switch momentarily, and the Power OK indicator will illuminate in approximately one second. The Power On/Off switch is located under a transparent cover on the right side of the front of the server. Before you can turn the server on or off, you must lift this cover to reach the switch.

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

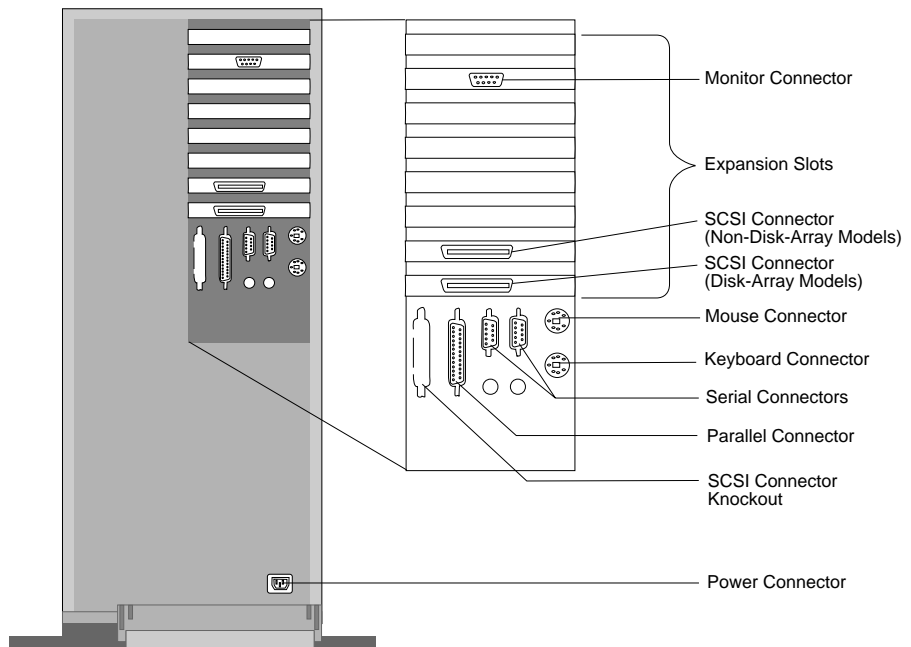


Power OK: This green indicator shows that the server power supply is working properly.



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

Input/Output Connectors



Notes:

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

Input/Output Connectors

Power Connector: The power cable connects here.



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



Keyboard Connector: The keyboard cable connects here.



Parallel Connector: One 25-pin parallel connector is provided. This is where the signal cable for a parallel printer or other parallel device connects to your server.

SCSI Connector Knockout: This knockout allows access to the internal connector on a second SCSI-2 adapter.



Serial Connectors: Two 9-pin serial connectors (A and B) are provided. 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.



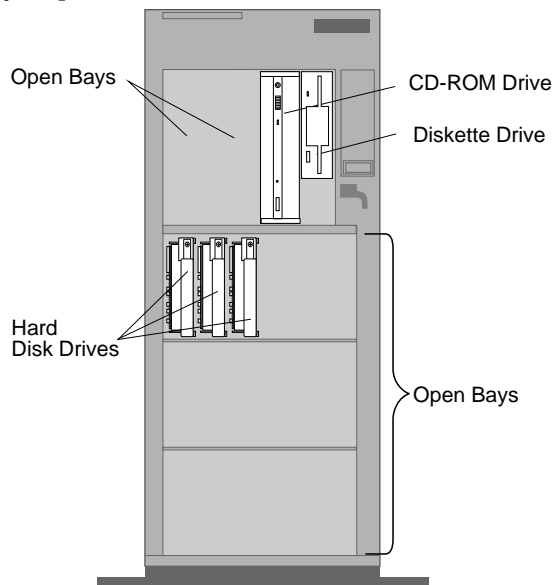
SCSI-2 Connector: For non-disk-array models, external small computer system interface (SCSI) devices attach here. For disk-array models, the SCSI-2 connector is located in the bottom PCI adapter slot.



Monitor Connector: The monitor signal cable attaches to the connector on this adapter.

Expansion Bays

Your server comes with one 3.5-inch, 1.44 MB diskette drive, a SCSI CD-ROM drive, and a removable CD-ROM storage compartment. (1 MB equals approximately 1 000 000 bytes.) The number of preinstalled hard disk drives in your server varies according to the model that you purchased.



CD-ROM Drive: All models come with a SCSI-2 CD-ROM drive.

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

Open Bays: Your server has a special design that gives you the flexibility to use up to 18 hot-swap, 3.5-inch hard disk drives. There is additional open space in the top left bay for two more diskette drives or an additional SCSI drive. For installation instructions and information on the types of drives that you can install in each bay, see Chapter 5, "Installing Options" on page 153.

Hard Disk Drive: All models come with a SCSI-2 adapter to support SCSI drives. The number, capacity, and location 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.

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 a separate sheet that comes with your server.

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

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

Moving the Server

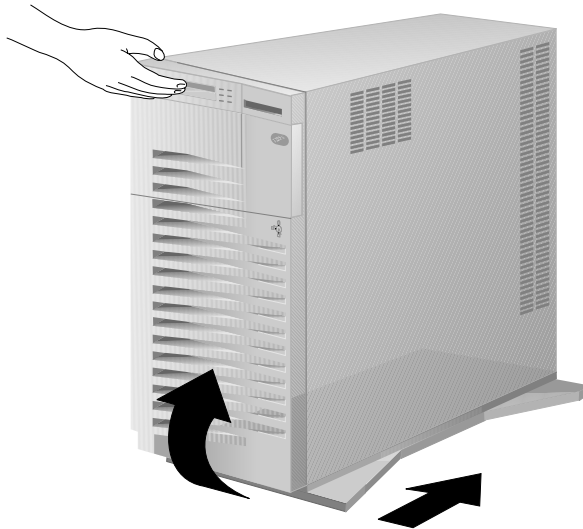
Moving the Server



CAUTION:

Due to the weight of the server, do not attempt to lift the server by yourself. To avoid possible injury while moving or lifting the server, ask another person to help you.

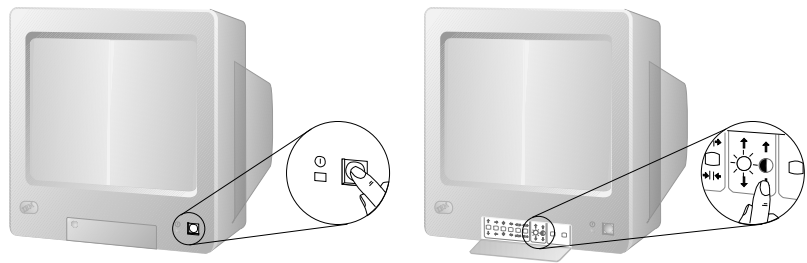
When the server is in the normal upright position, move it by lifting up on the handle and rolling it forward or backward as shown. (A roller is built into the rear of the server base.)



Starting the Server

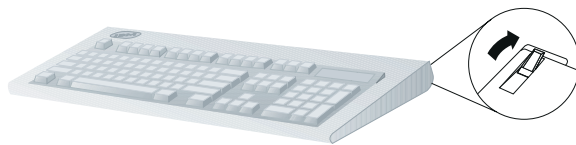
1. Turn on your monitor and adjust the Brightness and Contrast controls to the approximate midpoint.

You can readjust these controls and the monitor location for personal viewing comfort after you turn on your server.



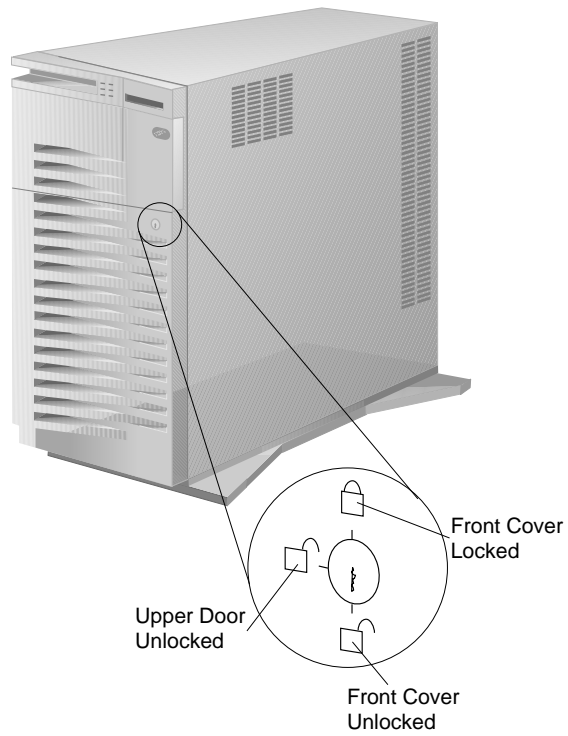
Note: The locations of the Power Switch and the Brightness and Contrast controls on your monitor might be different from those shown above.

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



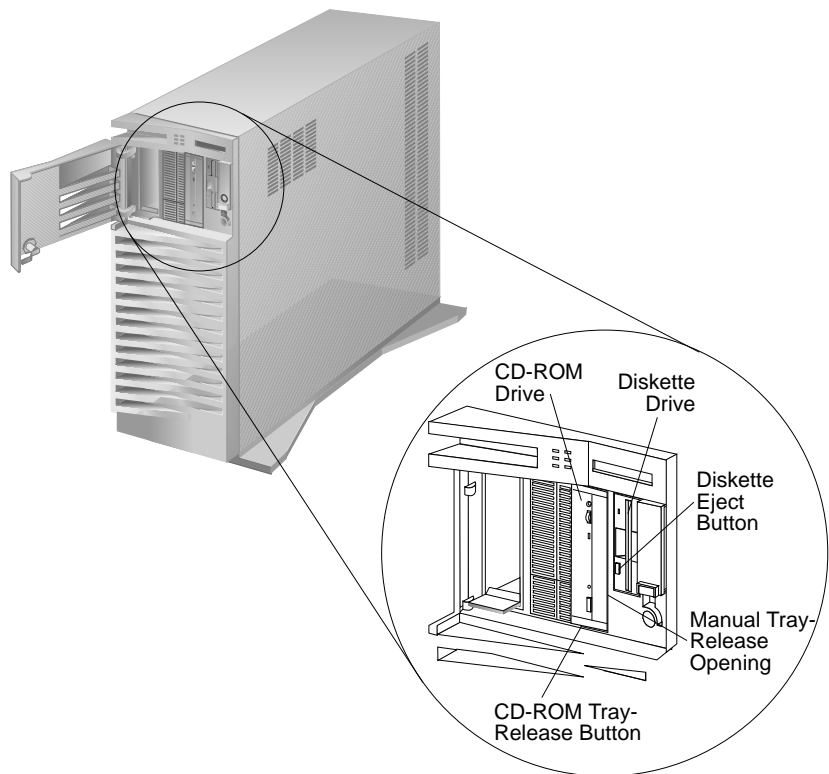
Starting the Server

3. Locate the keys; then, unlock and open the door (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.



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

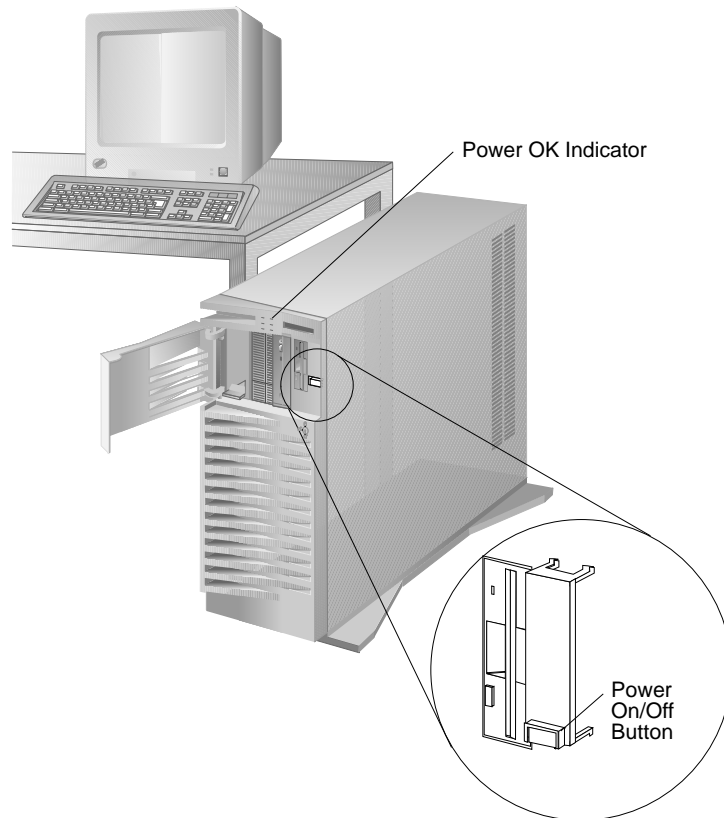
Note: The Power On/Off switch is located under a transparent cover on the right side of the server. You must lift this transparent cover to reach the Power On/Off switch.

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

Starting the Server

7. Turn on the server.

To turn on the server, press the Power On/Off switch momentarily, and the Power OK indicator will illuminate. The *power-on self-test (POST)* begins.



8. Check your monitor. The screen displays the IBM logo and a number that represents the amount of available server memory. The server beeps once to indicate that it is working properly.

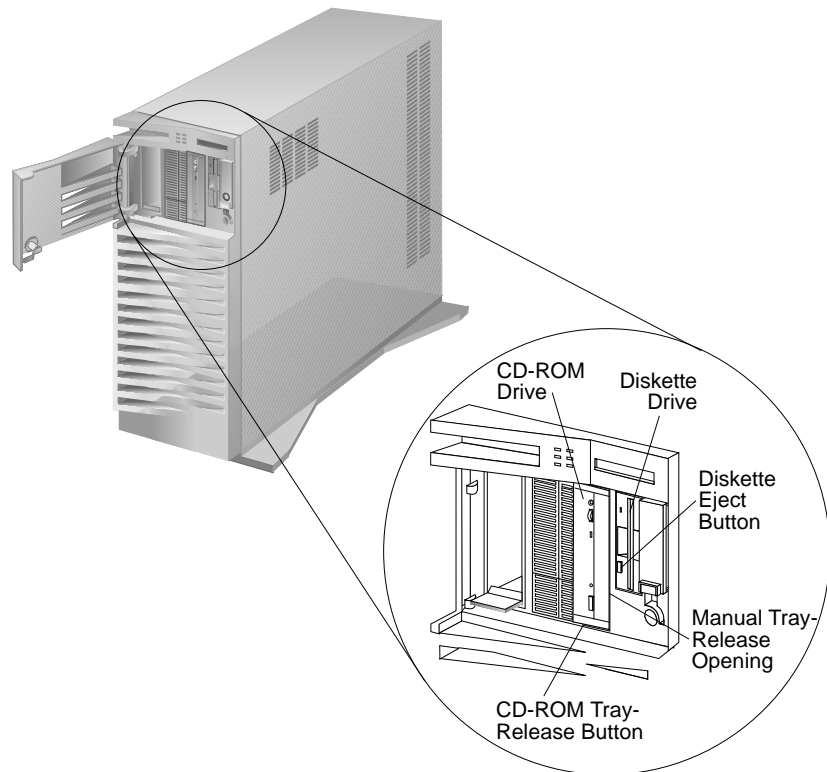
Notes:

- 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, see Chapter 7, “Solving Problems” on page 299.
- If your server stops running during testing or normal operation, call for service. Describe the problem to the service technician.
- If no operating system is installed, a code of 1300 appears on the screen. Before you install an operating system, be sure to start the ServerGuide Main compact disc (CD) and review the README file in the **Start Here** section. See “About ServerGuide” on page 26 for additional information and instructions.

Using the CD-ROM Drive

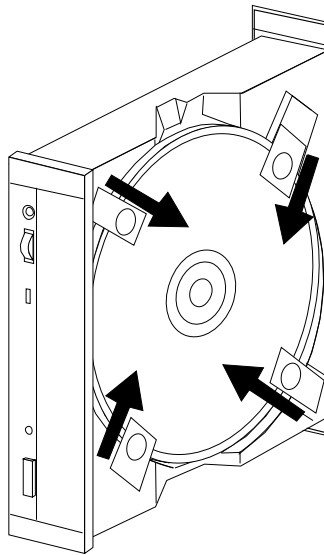
A SCSI-2 CD-ROM drive is a standard feature on all PC Server 520 models. To use the CD-ROM drive:

1. Have the main CD ready.
2. Press the CD-ROM tray-release button. The CD-ROM tray will extend out approximately 25 mm (1 in.) from the server. Pull the tray straight out until it stops.

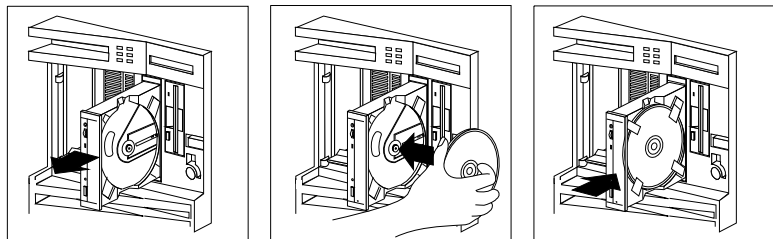


Note: If the CD-ROM tray does not extend out, insert the end of a paper clip into the manual tray-release opening and gently pull the tray open.

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



4. With the label information facing right, center and hold the ServerGuide Main CD on the tray as shown.
5. Insert a 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 back into the server.
7. Insert the ServerGuide License Diskette into the diskette drive.
8. Press the **Ctrl+Alt+Del** key sequence to restart the server.

Getting Help on the World Wide Web

The ServerGuide logo screen appears, followed by a language-selection screen.

9. Select a language; the Main Menu appears.
10. Select **Start Here** and review the information.

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

Getting Help on the World Wide Web

You can access the latest information about configuration and product compatibility 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.
- Certification and compatibility information about Network Operating Systems (NOS) and Operating Systems (OS).
- A listing of products that have been tested for compatibility with IBM PC Server.

For additional information, service, or assistance, see Chapter 8, “Getting Help, Service, and Information” on page 359.

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. 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 Chapter 8, “Getting Help, Service, and Information” on page 359.

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

Chapter 2. Installing Software

Before you install software in your server, you must determine the software, hardware, and operating system requirements for your operating environment. Because some models come with special adapters, you might need to use the configuration programs on an adapter's configuration diskette, such as the ServeRAID Configuration diskette, before you install an operating system and other software.

This chapter describes the factors that you might want to consider before selecting and installing an operating system and other software in your server. This chapter also describes operating system installation. You can install an operating system through ServerGuide or a separately purchased, off-the-shelf operating system.

This chapter also includes instructions for configuring the IBM Ethernet Quad PeerMaster PCI Server Adapter that comes in some models. Finally, this chapter contains a comprehensive checklist for completing the installation.

At this time, you should have unpacked your server and attached cables to it. (Refer to the Setup sheet for instructions.) Be sure to read the publications that come with the IBM ServerGuide package before you set up your server. That chapter also includes instructions for using the CD-ROM drive.

Note: If you need service or assistance, see Chapter 8, "Getting Help, Service, and Information" on page 359.

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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 that 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., 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.

To install your system management device drivers, follow the instructions in the README file on the IBM PC Server Windows NT Support Diskette that comes with the server.

Installing an Operating System

The IBM PC Server 520 combines powerful microprocessor performance, large data-storage capacity, and system expandability, ensuring that your server adapts to handle ever-changing operating requirements. 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 processor socket, using SMP technology. You can maximize the benefits of this technology,

Installing an Operating System

provided that you have an SMP-capable operating system, such as one of the following, installed in your server:

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

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.

- For all disk-array models, a ServeRAID Configuration diskette is included. Before you install an operating system on a disk-array model, use the configuration programs on the ServeRAID Configuration diskette to view or change the existing disk-array configuration. See Chapter 3, “Configuring the Disk Array” on page 75 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 133 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. See Chapter 5, “Installing Options” on page 153 for step-by-step instructions; then, return here. Some options might require device drivers that are not available on ServerGuide. In this case, follow the installation instructions that come with the option; then, return here.

Installing an Operating System

- 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 72.
- If you are installing *your own* operating system:
 1. Review “Software Considerations” on page 22 and “Installing an Operating System” on page 22; then, return here.
 2. Follow the installation instructions that come with your operating system; then, go to “Installation Checklist” on page 72.

The following operating systems require special considerations.

- OS/2
- Novell NetWare
- SCO OpenServer 5.0 (UNIX operating system)
- Windows NT

These considerations are discussed in the following sections.

OS/2 and Novell NetWare Installation

For installation instructions for OS/2 or Novell NetWare, refer to the README files in the **Start Here** section of the ServerGuide Main CD.

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

If you have an OS/2 2.11 SMP license and you want to install OS/2 2.11 SMP on your PC Server 520 without using ServerGuide, call IBM HelpWare at one of the following numbers and request authorized program analysis report (APAR) II08627.

- 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.

About ServerGuide

You must provide your OS/2 license information. The HelpWare group will ship you a CD and installation diskettes.

OS/2 LAN Server 4.0 Fixpaks

There are several Fixpaks available for OS/2 LAN Server 4.0. These Fixpaks are updated periodically to provide optimum support of OS/2 LAN Server 4.0 functions across a wide range of hardware configurations. To receive these updates in the U.S., call the IBM OS/2 Technical Support Center at 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.

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 an 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 an SCO operating system, follow the installation instructions that come with the SCO operating system.

Windows NT Installation

For installation instructions for Windows NT, refer to the README files on the diskette that comes with your operating system and on the ServeRAID 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.

DOS Installation

If you are installing DOS, refer to the README files on the ServeRAID Configuration 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 that are 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 SCSI and 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

Starting ServerGuide

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 “Software Considerations” on page 22, “Installing an Operating System” on page 22, and “Device Drivers” on page 30.

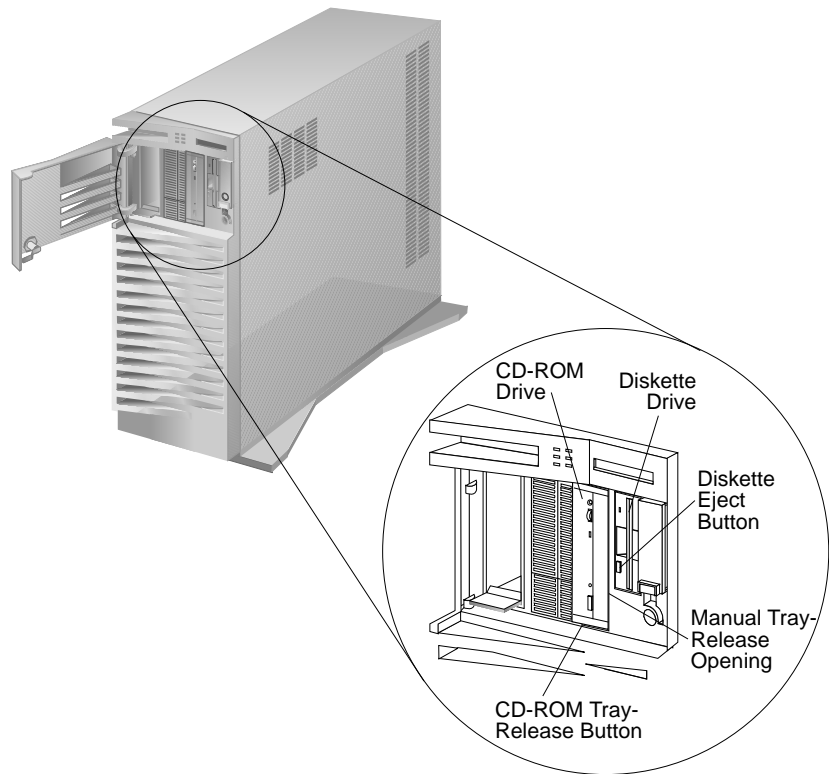
Starting the ServerGuide Main CD

One of the easiest and most efficient ways to install an operating system and take advantage of a wide variety of the latest software for the network environment is to use ServerGuide.

To start the ServerGuide Main CD:

1. If you have not already done so, turn on the server (see “Starting the Server” on page 11).
2. Locate the ServerGuide CD package and diskettes.
3. Have the main CD ready.

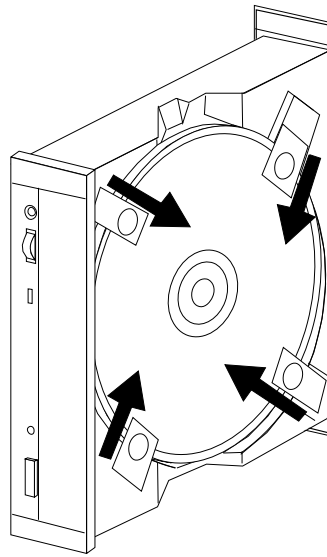
4. Press the CD-ROM tray-release button. The CD-ROM tray will extend out approximately 25 mm (1 in.) from the server. Pull the tray straight out until it stops.



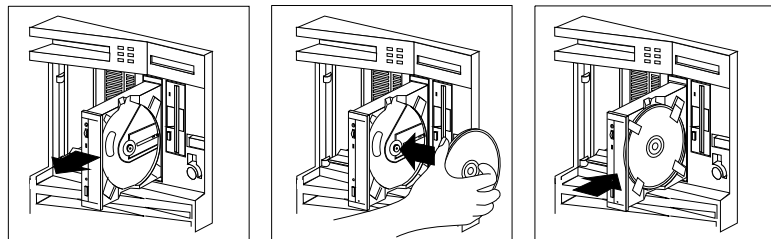
Note: If the CD-ROM tray does not extend out, insert the end of a paper clip into the manual tray-release opening and gently pull the tray open.

Device Drivers

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



6. With the label information facing right, center and hold the ServerGuide Main CD on the tray as shown.
7. Insert a 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.



8. Push the CD-ROM tray back into the server.
9. Insert the ServerGuide License Diskette into the diskette drive.

10. Press the **Ctrl+Alt+Del** key sequence to restart the server.

The ServerGuide logo screen appears, followed by a language-selection screen.

11. Select a language; the Main Menu appears.
12. 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. Update these values if necessary.

Device Drivers

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

If you have a non-disk-array model, your IBM PC Server 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. If you have a disk-array model, 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.

Note: See the README file in the IBM PC Server SCSI-2 Fast/Wide PCI Adapter Support Package or on the Device Driver/Administration and Monitoring diskette that comes with your server for detailed instructions.

Device Drivers

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 there are other products provided on ServerGuide that you want to install, install them now.

2. When the list of network adapters appears in the window box, select **None**.

Note: The IBM Ethernet extended industry-standard architecture (EISA) Adapter and the IBM 16/4 Busmaster EISA Adapter, which appear on the ServerGuide device driver installation menus, are not supported in the IBM PC Server 520. However, the IBM PC Server 520 does support the IBM Auto LANStreamer PCI Adapter, which is a replacement product.

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.COMD 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 on page 31.
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 PeerMaster LAN Software

Installing the PeerMaster LAN Software

Some PC Server 520 models come with an IBM Ethernet Quad PeerMaster PCI 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 comes 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 Chapter 4, "Configuring the PeerMaster Adapter" on page 133.)

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 have:	Go to:
IBM OS/2 LAN Server Version 3x or Version 4x	"Installing PeerMaster Software for OS/2."
Microsoft Windows NT Version 3.51	"Installing PeerMaster Software for Windows NT" on page 35.
Novell NetWare Version 3.1x or Version 4.x	"Installing PeerMaster Software for Novell NetWare" on page 36.
SCO Open Server Enterprise Version 3.x	"Installing Device Drivers for SCO Open Server" on page 36.

For the latest version of the PeerMaster adapter diskette image file, check the IBM bulletin board service (BBS), the IBM Personal Computer Web site, or the IBM Personal Computer FTP site. Search on the keyword **PeerMaster** to locate the file. Compare the file date to your diskette date, to determine the latest version level.

The IBM BBS telephone number is: (919) 517-0001

The IBM Personal Computer Web site URL address is:
<http://www.pc.ibm.com/>

The IBM Personal Computer FTP site address is: <ftp.pc.ibm.com>

Use “anonymous” as the user name and your e-mail address as the password.

Installing PeerMaster Software for OS/2

Before continuing, be sure you have properly completed the hardware installation of your PeerMaster adapter.

The installation instructions and device drivers for IBM OS/2 LAN Server Version 3x or 4x are provided on the The PeerMaster Server Adapter Option Diskette that comes with your PeerMaster adapter. The files are located in the OS2 directory.

The OS2 directory includes:

A:\OS2\NDIS.TXT

(where A: is the primary drive where OS2 is installed)

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

Be sure to print and read the NDIS.TXT file before you begin this portion of the installation.

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

1. Follow the instructions in the NDIS.TXT file on the PeerMaster Server Adapter Option Diskette for installing the PeerMaster LAN software for OS/2 server.
2. Then, continue with “Using NetFinity with Your PeerMaster Adapter” on page 61.

Installing PeerMaster LAN Software

Installing PeerMaster Software for Windows NT

Before continuing, be sure you have properly completed the hardware installation of your PeerMaster adapters.

The installation instructions and device drivers for Microsoft Windows NT Version 3.5x are provided on the PeerMaster Server Adapter Option Diskette that comes with your PeerMaster adapter. These files are located in the NT directory.

The NT directory includes:

A:\NT\README.TXT
(where A: is the primary drive)

The README.TXT file contains installation instructions for the PeerMaster Program files for Microsoft Windows. This file also contains a description of all the files in the NT directory.

Be sure to print the README.TXT file before you begin this portion of the installation.

Installing PeerMaster Software for Novell NetWare

Before continuing, be sure you have completed the hardware installation and configuration of your PeerMaster adapter.

This section contains instructions for installing and configuring the Novell NetWare LAN software. For more information about Novell NetWare, refer to the documentation that comes with the software.

Installing Device Drivers for SCO Open Server

Before continuing, be sure you have properly completed the hardware installation of your PeerMaster adapter.

An adapter diskette image file containing a link layer interface (LLI) driver is available for the SCO Open Server Enterprise Release 3.x operating system. Search the IBM BBS or the IBM Personal Computer Web site for the keyword **PeerMaster** to locate the file. The file is compressed in the Z format. It can be downloaded to a DOS or OS/2 system and written to a DOS diskette, or downloaded to a UNIX system. Copy the file to the server hard disk and expand it using the UNIX UNCOMPRESS command. Use the UNIX DD command to create a UNIX diskette containing the drivers. For detailed instructions, configuration information, and usage information, review the SCO driver README file.

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 38.

Note: The software supplied with the PeerMaster adapter enables multiple physical LAN segments to be registered with Novell NetWare as a single VNET.

1. Review “Precautions, Limitations, and Guidelines” on page 38 for specific Novell NetWare information.
2. Copy the LAN software onto your server hard disk. Install the files for the PeerMaster adapter onto the DOS partition of your server by copying them from the PeerMaster Server Adapter Option Diskette. “Installing Network Device Drivers” on page 39 guides you through this process.

Installing PeerMaster LAN Software

3. Start the server and activate the Novell NetWare operating system at this time. “Starting Novell NetWare” on page 39 guides you through this process.
4. Load the PeerMaster adapter device drivers. Two device drivers are provided for the PeerMaster adapter. MXPCI4BT.LAN is the LAN device driver for the PeerMaster adapter. This device driver enables the PeerMaster adapter to perform traditional network functions. The other device driver, VNET.LAN, is the virtual network device driver. This device driver enables the PeerMaster adapter to operate in VNET Switch mode. “Loading the Network Device Drivers” on page 40 and “Sample AUTOEXEC.NCF Files” on page 53 guide you through this process.
5. Update the Novell NetWare system files. The PeerMaster adapter is shipped with the latest versions of several Novell NetWare loadable module (NLM) files. These NLM files are required for the proper operation of the 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 46 guides you through this process.
6. Modify the AUTOEXEC.NCF file, if desired. Update your server startup configuration files to enable automatic loading of your newly installed PeerMaster adapter. “Loading the Network Device Drivers” on page 40 and “Sample AUTOEXEC.NCF Files” on page 53 guide you through this process.

Precautions, Limitations, and Guidelines

Review this section before you begin the installation and configuration of the Novell NetWare device drivers.

- All ports within a VNET must be configured to the same frame type.
- To support multiple frame types, you can load VNET.LAN multiple times. When this is done, each instance of VNET.LAN must be bound to a different network number and include the identical grouping of the PeerMaster adapters.
- You must configure a single PeerMaster adapter to operate exclusively either as a VNET switch or as a traditional adapter. Both modes cannot be supported simultaneously by a single PeerMaster adapter.
- Frame types loaded for VNET.LAN must be loaded for MXPCI4BT.LAN. Examples of frame types include the IEEE 802.2 and 802.3 format as well as the Ethernet II and Ethernet SNAP.
- 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 MXPCI4BT.LAN is successfully loaded with the slot parameter value equal to the number for that port.
- To include previously inactive ports in an existing VNET, it is necessary to unload VNET.LAN, activate additional ports, and then reload VNET.LAN. Thus, it is best to activate all ports of a PeerMaster adapter before loading VNET.LAN.

Installing PeerMaster LAN Software

Installing Network Device Drivers

To install the network device drivers, create a subdirectory using the DOS command. In the following examples we are using the subdirectory name NETWARE.

1. Insert the PeerMaster Server Adapter Option Diskette into an available diskette drive and change to the Novell NetWare device driver directory, for example:

```
CD A:\NETWARE
```

2. Create a subdirectory on a DOS partition of your server hard disk, for example:

```
C:\NETWARE
```

3. Copy the contents of the device driver directory on the PeerMaster Server Adapter Option Diskette to the target directory, for example:

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

The directory on the PeerMaster Server Adapter Option Diskette contains the open data-link interface (ODI) device drivers for your PeerMaster adapter, the latest versions of various Novell NetWare NLM files, and several sample AUTOEXEC.NCF files.

Starting Novell NetWare

To start Novell NetWare:

1. Start your server and enter the command to start the Novell NetWare server software. If your server is running Novell NetWare Version 3.11, manually load the system file, *LSLENH.NLM*.
2. Load the file from the DOS drive and directory into where the device drivers from the PeerMaster Server Adapter Option Diskette were copied, for example:

```
:LOAD C:\PATH\LSLENH  
(where C: is the primary drive and PATH is  
the directory)
```

The power-on self-test (POST) results are displayed at device driver load time. POST failures typically indicate an installation or

hardware problem with the PeerMaster adapter. For more information on POST errors, see “PeerMaster Adapter Screen Messages” on page 330.

Loading the Network Device Drivers

Your PeerMaster adapter comes with two network device drivers:

- **MXPCI4BT.LAN:** This is the base device driver for using your PeerMaster adapter. Once loaded and bound to a protocol, this device driver enables your PeerMaster adapter to deliver the functions associated with traditional network adapters.
- **VNET.LAN:** This device driver enables several ports to be bound to a protocol, such as internetwork packet exchange (IPX), as a single VNET. VNETs enable PeerMaster adapters to provide high-performance Ethernet switching functions transparently under Novell NetWare.

It is necessary to understand *pseudo slot numbers* to load PeerMaster device drivers. Traditional Novell NetWare device drivers use expansion-slot numbers to associate specific LAN segments with device-driver instances. PeerMaster adapters, however, provide multiple LAN segments per expansion slot. For this reason, pseudo slot numbers are used to uniquely identify each of the four ports on a PeerMaster adapter. Pseudo slot numbers are two-digit, decimal numbers, *xy*, where *x* is the unique BIOS or Flash slot number assigned to the target PeerMaster adapter and *y* is the PeerMaster adapter port number being configured. For example, a pseudo slot number of 23 represents port 3 of the PeerMaster adapter configured as slot number 2.

Most Significant Digit = Slot Number
(Slot 1, 2, 3, ..., 8)

The configured slot number is the number that you assigned to the PeerMaster adapter. See “Using the PeerMaster Setup Utility Program” on page 143 for more information.

Least Significant Digit = Port Number
(Port 1, 2, 3, 4)

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

You can specify unique configuration information for each instance of the device driver by entering keywords on the command line. The following sections provide descriptions of the keywords that each device driver supports.

Keywords Supported Only by MXPCI4BT.LAN

SLOT This keyword is used to specify the port associated with the device driver instance being loaded. Slot values are expressed as pseudo slot numbers. The following example illustrates the use of the SLOT keyword.

```
SLOT=SL0T21
```

RXCOUNT This keyword is used to specify the amount of resources allocated for reception from the PeerMaster adapter. For more information on this keyword, see “Adjusting Transmit and Receive Resources” on page 59.

Keywords Supported Only by VNET.LAN

in, where *n* can be any number 1 through 8.

This keyword is used to indicate that the PeerMaster adapter configured as slot *n* is to be included in the VNET.

Keywords Supported by Both MXPCI4BT.LAN and VNET.LAN

NAME This keyword is used to associate a unique name with a device-driver name for each instance as it is loaded. The device-driver name can be used later to uniquely bind the device driver instance to a protocol. For more information on this parameter, refer to the documentation that comes with your version of Novell NetWare. The following example illustrates the use of the NAME keyword.

```
NAME=SL0T21
```


FRAME This keyword is used to load a frame type for the device driver instance being loaded. For more information on this parameter, refer to the documentation that comes with your version of Novell NetWare. The following example illustrates the use of the FRAME keyword.

```
FRAME=ETHERNET_802.2
```

NODE This keyword is used to override the factory-provided MAC address present on your PeerMaster adapter. When specified for MXPCI4BT.LAN, this keyword overrides the factory-provided address. When specified for VNET.LAN, this keyword overrides both factory-provided and MXPCI4BT.LAN-specified node addresses. The specified address must not be a group address. The following example illustrates the use of the NODE keyword.

```
NODE=000000123456
```

AGE This keyword is used to adjust the length of the aging timeout used by the device driver and microcode to purge unused entries from the address learning table used by the packet switching function. For more information on this keyword, see “Adjusting the Aging Timer” on page 58.

TXCOUNT This keyword is used to specify the amount of resources allocated for transmission to the PeerMaster adapter. For more information on this keyword, see “Adjusting Transmit and Receive Resources” on page 59.

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Loading Procedure for PeerMaster Adapter Device Drivers

The manner in which the PeerMaster adapter device drivers are loaded and configured defines the operational characteristics of the PeerMaster adapter. You must take special care to properly load and configure the device drivers.

This section provides three examples of the load process. The first example illustrates the device driver loading procedure to configure a PeerMaster adapter to operate in the *traditional adapter* mode. The second example illustrates the procedure to configure a PeerMaster adapter to operate in the *VNET switch* mode. The third example illustrates the procedure to configure multiple PeerMaster adapters to operate in a combined *traditional adapter* and *VNET switch* mode.

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 treats each PeerMaster port as a separate PeerMaster adapter.

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

```
:LOAD C:\NETWARE\MXPCI4BT.LAN SLOT=21
```

This command will cause Novell NetWare to load the device driver for port 1 of the PeerMaster adapter that is configured as slot number 2.

For each PeerMaster adapter, the base driver *MXPCI4BT.LAN* can issue a maximum of four load commands per frame type. Novell NetWare loads the default frame type for each device driver instance unless the *FRAME* keyword is used to request a specific

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frame type. The PeerMaster adapter comes configured with four unique Ethernet MAC addresses. Thus, you do not 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 the load command is issued, Novell NetWare creates a unique instance of the LAN device driver. You can use the NAME keyword to bind a unique name to each instance of the device driver. You can use this unique name with each device driver when binding a specific instance of the device driver network protocol. The following example illustrates use of the NAME keyword:

```
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=21 NAME=SLOT21
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=22 NAME=SLOT22
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=23 NAME=SLOT23
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=24 NAME=SLOT24
(where C: is the primary drive and PATH is the directory)
```

These commands cause Novell NetWare to load one instance of the LAN device driver for each port of the PeerMaster adapter that is configured as slot number 2. The NAME keyword associates each device driver instance with a unique name (such as slot21, slot22, and so forth).

In the traditional adapter mode, you must bind each device driver instance to a network protocol using a unique network number. The unique device driver names established using the NAME keyword bind each device 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 you issue the load command, the NAME keyword is optional. Alternatively, you can specify the actual device driver name (MXPCI4BT.LAN) in the bind command. The bind command presents you with the list of device driver instances to choose from if a specific instance is not specified. Unique device driver names

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enable the bind process to occur without manual intervention. You can automate the binding process by adding these statements to the AUTOEXEC.NCF file.

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

This section describes the loading procedure for VNET switch mode.

1. Load the PeerMaster adapter device driver once for each port, using the following commands.

```
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=21  
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=22  
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=23  
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=24
```

(where *C:* is the primary drive and *PATH* is the directory)
2. Load the VNET.LAN device driver using the following command.

```
:LOAD C:\PATH\VNET.LAN
```

(where *C:* is the primary drive and *PATH* is the directory)
3. Bind all active 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 53.

Frame types, other than the default frame type, specified when loading MXPCI4BT.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 example shows how to create a VNET that supports multiple frame types.

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```
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=21 FRAME=ETHERNET_II
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=22 FRAME=ETHERNET_II
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=23 FRAME=ETHERNET_II
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=24 FRAME=ETHERNET_II
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=21 FRAME=ETHERNET_802.2
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=22 FRAME=ETHERNET_802.2
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=23 FRAME=ETHERNET_802.2
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=24 FRAME=ETHERNET_802.2
```

```
:LOAD C:\PATH\VNET.LAN FRAME=ETHERNET_II NAME=VNET2
:LOAD C:\PATH\VNET.LAN FRAME=ETHERNET_802.2 NAME=VNET3
(where C: is the primary drive and PATH is the directory)
```

```
:BIND IPX VNET2 NET=2
:BIND IPX VNET3 NET=3
```

Loading Combined VNETs and Traditional Networks

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

To determine if packets have been lost due to lack of resources, view the custom statistics using MONITOR.NLM. See “Custom Statistics for VNET.LAN” on page 48 for details. If you need to modify the count of these resources, see “Adjusting Transmit and Receive Resources” on page 59 for details.

Specific instructions on how to create combined networks are provided in “Sample AUTOEXEC.NCF Files” on page 53.

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 into the Novell NetWare partition of your server. The following table indicates the system files to replace.

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Filename	Novell NetWare 3.11	Novell NetWare 3.12	Novell NetWare 4.x
MONITOR.NLM	replace		
LSLENH.NLM	replace		
MSM.NLM			replace
MSM31X.NLM	replace	replace	
ETHERTSM.NLM	replace	replace	
PATCHMAN.NLM	replace		

To update the system files, do the following steps:

1. Insert the PeerMaster Server Adapter 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 Server Adapter Option Diskette with the dates of the same files located in the SYS:\SYSTEM directory of your server. If the specified file does not already exist, or if it is an old version, replace the file with the newer version provided on the PeerMaster Server Adapter Option Diskette.

Note: To copy a file, you might require supervisor 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 the system files to your server, you will no longer have to manually load system files from your DOS partition.

Unloading the Network Device Drivers

Using Novell NetWare, you can unload LAN device drivers after they are loaded and operational. When both MXPCI4BT.LAN and VNET.LAN are loaded, it is important to unload VNET.LAN first, then unload MXPCI4BT.LAN. When you unload a device driver, all ports controlled by that device driver will become unbound from the protocol stack. Specific named instances of the device driver may not be selectively unloaded.

Using Novell NetWare Monitor

The Novell NetWare MONITOR.NLM provides custom statistics for VNET.LAN and MXPCI4BT.LAN.

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 when multiple instances are loaded by two parameters: slot number and frame type. The following example shows 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 PeerMaster 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 0. The upper eight bits of the mask—bits 8 through 15—represent the physical slots 1 through 8. The following table shows the relationship between VNET.LAN slot numbers and physical slot numbers.

VNET.LAN Slot	Slot Number
100	1
200	2
400	3
800	4
1000	5
2000	6
4000	7
8000	8

The VNET slot number of 4100 specifies an instance of VNET.LAN that includes the PeerMaster adapters configured to slots 7 and 1. The sample slot value of 0C00 specifies a VNET.LAN including the PeerMaster adapters configured to slots 3 and 4. Note that multiple instances of VNET.LAN include the PeerMaster adapters configured

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to slots 3 and 4. Instances of VNET.LAN with identical slot numbers can be uniquely selected by their frame type.

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

- **Learned Entry Discards**

The 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 presently increasing, it indicates that the problem has been occurring but is not persistent.

- **Peer Packets Received**

The number of packets sourced from other PeerMaster adapters that 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 other PeerMaster 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 other PeerMaster adapters and received from the system bus interface by this adapter that were discarded by the following process.

- Port n Packets Received

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

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 to its segment by port n (where $n = 1, 2, 3,$ or 4).

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 from its segment by port n (where $n = 1, 2, 3,$ or 4) that were discarded by the switch-forwarding process.

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Custom Statistics for MXPCI4BT.LAN

You can display custom statistics for MXPCI4BT.LAN using MONITOR.NLM. You can select a specific instance of MXPCI4BT.LAN when multiple instances are loaded by two parameters: slot number and packet type. The following example shows how MONITOR.NLM prompts you to select among multiple instances of MXPCI4BT.

```
MXPCI4BT SLOT=15 FRAME=ETHERNET_802.2
MXPCI4BT SLOT=16 FRAME=ETHERNET_802.2
MXPCI4BT SLOT=17 FRAME=ETHERNET_802.2
MXPCI4BT SLOT=18 FRAME=ETHERNET_802.2
```

Slot numbers appear in hex format. Slot numbers specified when loading the device driver, however, must be specified in decimal format. Therefore, you must translate slot numbers from hex to decimal when loading the device drivers. The preceding example represents the device 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 peer-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 that the port received 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 that the port was unable to receive from its segment due to lack of resources.
- Receive Errors: The total number of damaged packets that the port received from its segment.
- Bytes Transmitted: The total number of bytes that the port transmitted to its segment.

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- **Unicast Packets Transmitted:** The total number of unicast packets that 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 unable to transmit to its segment due to lack of resources.
- **Transmit Packets:** The total number of packets transmitted by the port to its segment.
- **Bus Transfer Errors:** The total number of transmission errors that occurred when data was transferred between other PeerMaster adapters, or between the host system and a PeerMaster adapter.
- **Host Transfer Errors:** The total number of transmission errors that occurred when data was transferred between the host system and a PeerMaster adapter.
- **Peer Receive Out of Resources:** The total number of packets that a PeerMaster adapter received from other PeerMaster adapters that were discarded due to insufficient resources to transmit the packet.
- **Peer Transmit Out of Resources:** The total number of packets sent to other PeerMaster adapters that were discarded due to insufficient resources on the 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 sourced by the host system that were discarded by a PeerMaster adapter due to insufficient resources to transmit the packets.
- **Microcode Version:** The revision level of the operational microcode on the PeerMaster adapter.

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Generic Statistics

When operating in VNET switch mode, PeerMaster adapters switch receive 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 open data-link interface (ODI) device driver.
- **Total Packets Received:** The total number of packets received by the host ODI device driver.
- **Total Send OK Byte Count (Low or High):** The total number of bytes sent by the host ODI device driver.
- **Total Receive OK Byte Count (Low or High):** The total number of bytes received by the host ODI device driver.
- **All Ethernet-Specific Statistical Counters:** This includes all Ethernet-specific statistics, such as collisions, transmit status, and receive status. These counters contain the sum of all transmit and receive statistics resulting from both the host ODI device 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 device 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 Novell NetWare Version 3.11:

```
:LOAD C:\PATH\LSLENH  
(where C: is the primary drive and PATH is the directory)
```

The following 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 different network number. The PeerMaster adapter will not be able to switch packets between segments. Cross-segment traffic, if any, must be routed by a server microprocessor.

```
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=21 NAME=SLOT21
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=22 NAME=SLOT22
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=23 NAME=SLOT23
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=24 NAME=SLOT24
(where C: is the primary 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 the same network number. The PeerMaster adapter can switch packets between segments in this mode.

```
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=11
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=12
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=13
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=14

:LOAD C:\PATH\MXPCI4BT.LAN SLOT=21
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=22
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=23
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=24
(where C: is the primary drive and PATH is the directory)
```

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Create a VNET that globally includes all ports (no slots are specifically included)

```
:LOAD C:\PATH\VNET.LAN
:BIND IPX VNET NET=2
(where C: is the primary drive and PATH is the directory)
```

Three PeerMaster Adapters - Example 1: Adding the following commands to your AUTOEXEC.NCF file will cause your PeerMaster adapter to form a combined network that is composed of an 8-segment VNET and four traditional networks. Cross-segment traffic within the 8 segments of the VNET is switched by the PeerMaster adapters. Cross-segment traffic from the VNET to a traditional network, or between traditional network segments, is routed internally by the server.

You can load the VNET.LAN device driver multiple times to create multiple VNETs. The keywords to include a specific PeerMaster adapter into a VNET are i1, i2, ... i8. The keyword i1 indicates a request to include the PeerMaster adapter in expansion slot 1 into the VNET being formed, i2 indicates the PeerMaster adapter in slot 2, and so forth.

The following example shows a server with three PeerMaster adapters installed in expansion slots 1, 2, and 3.

```
:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=11
:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=12
:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=13
:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=14

:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=21  NAME=SLOT21
:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=22  NAME=SLOT22
:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=23  NAME=SLOT23
:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=24  NAME=SLOT24

:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=31
:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=32
:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=33
:LOAD C:\PATH\MXPCI4BT.LAN  SLOT=34
(where C: is the primary drive and PATH is the directory)
```

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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 C:\VNET.LAN i1 i3
:BIND IPX VNET NET=2
(where C: is the primary drive)
```

In the preceding example, the PeerMaster adapters in slots 1 and 3 create an 8-segment VNET and are configured as network number 2. The PeerMaster adapter in slot 2 is loaded in the traditional manner, and the four ports are each bound to the protocol with a different 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.

Three PeerMaster Adapters - Example 2: Adding the following commands to your AUTOEXEC.NCF will cause your PeerMaster adapter to form a combined network that is composed of two 4-segment VNETs and four traditional single segment networks. Cross-segment traffic within the two 4-segment VNETs is switched by the two PeerMaster adapters. Cross-segment traffic entering or leaving the VNET, or between one of the four traditional network segments, is routed internally by the server.

The load command for VNET.LAN device drivers provides keywords that configure the device driver to include specific PeerMaster adapters into the VNET. You can load the VNET.LAN device driver multiple times to create multiple VNETs. The keywords to include a specific PeerMaster adapter into a VNET are i1, i2, ... i8. The keyword i1 indicates a request to include the

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PeerMaster adapter in expansion slot 1 into the VNET being formed, i2 indicates the PeerMaster adapter in slot 2, and so forth. You can name each VNET separately, using the NAME keyword on the load command. Each VNET, when bound to a protocol, must be assigned a different network number. The following example shows the loading of multiple VNETs.

```
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=11 NAME=SLOT11
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=12 NAME=SLOT12
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=13 NAME=SLOT13
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=14 NAME=SLOT14
```

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

```
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=21
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=22
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=23
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=24
```

```
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=31
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=32
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=33
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=34
```

(where *C:* is the primary drive and *PATH* is the directory)

Create two named VNETs (VNET2 and VNET3) using the 'i_' keywords to include specific adapters into each VNET.

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

(where *C:* is the primary drive and *PATH* is the directory)

Adjusting the Aging Timer

To support packet-switching functions, your PeerMaster adapter maintains an internal database containing packet-forwarding information. This information table can contain up to 4096 entries. To prevent the overflow of information in the table, unused entries are purged on a periodic basis. Aging timers define the length of this period, with a default value of 60 seconds. Entries not accessed during this time 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 packets. When the PeerMaster adapter receives a response from the destination, the forwarding information is updated in the table and subsequent packets to that address are no longer forwarded 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 can 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 C:\PATH\MXPCI4BT.LAN SLOT=11 AGE=N
:LOAD C:\PATH\VNET.LAN AGE=N
(where C: is the primary drive and PATH is the directory)
```

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

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

Note that the keyword must be specified on the load command lines for MXPCI4BT.LAN and VNET.LAN. Use the same value on both command lines.

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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 database.

Adjusting Transmit and Receive Resources

Various transmit and receive control blocks and buffers exist to support the bus-master interface between the PeerMaster adapter and the host-based device driver. The number of transmit and receive packets that the interface can handle is 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 is used to allocate the amount of resources allocated to transmit packets to the adapter, as follows:

```
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=11 TXCOUNT=nnn
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=12
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=13
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=14
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=21 TXCOUNT=nnn
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=22
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=23
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=24
:LOAD C:\PATH\VNET.LAN TXCOUNT=nnn
(where C: is the primary 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 PeerMaster adapter is ignored by the device driver. The keyword must be specified on the load command line for MXPCI4BT.LAN and VNET.LAN. The value of TXCOUNT for VNET.LAN must equal the sum of all PeerMaster adapters included in the VNET. For instance, the value of TXCOUNT for VNET.LAN in the previous example is 40 if the values for slots 11 and 21 were each specified as 20.

Installing PeerMaster LAN Software

TXCOUNT values for MXPCI4BT.LAN
Minimum value of nnn = 2
Maximum value of nnn = 80
Default value of nnn = 10

TXCOUNT values for VNET.LAN
Minimum value of nnn = 10
Maximum value of nnn = 500
Default value of nnn = 20

The maximum TXCOUNT value of 80 is recommended. The actual maximum can vary as a function of the configured size of the PeerMaster adapter memory window and the amount of available memory on that PeerMaster adapter. If the requested number is greater than the device 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 PeerMaster adapter, as follows:

```
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=11 RXCOUNT=nn  
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=12  
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=13  
:LOAD C:\PATH\MXPCI4BT.LAN SLOT=14  
(where C: is the primary drive and PATH is the directory)
```

The parameter *nn* is a 2-digit decimal number that specifies the number of control blocks and buffers. The keyword must be specified on the load command line for MXPCI4BT.LAN. The first port loaded on a PeerMaster adapter sets the RXCOUNT of resources for that adapter. The RXCOUNT keyword for subsequent loads of the same PeerMaster adapter is ignored by the device driver.

Minimum value of nn = 2
Maximum value of nn = 80
Default value of nn = 10

The maximum value of 80 is recommended. The actual maximum might vary as a function of the configured size of the PeerMaster

Installing PeerMaster LAN Software

adapter memory window and the amount of available memory on that adapter. If the requested number is greater than the device driver can provide, the default value will be used. *Do not set RXCOUNT below the default value of 10.*

Note: The RXCOUNT keyword is not recognized by VNET.LAN.

Using NetFinity with Your PeerMaster Adapter

IBM NetFinity Services is a complete network system-management environment that combines monitoring and management features with intuitive graphical user interfaces. The monitoring services built into NetFinity enable LAN administrators to gather critical server, LAN, and PeerMaster adapter information from the NetFinity Manager system.

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 kilobytes-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. They also show the number of packets that were received by a port from its segment.

- 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 are:

- 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 current screen.

- System Information Tool

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

Installing PeerMaster LAN Software

Installing PeerMaster Software for NetFinity

Your PeerMaster Server Adapter Option Diskette comes with program files that enable you to monitor and manage your PeerMaster adapter using NetFinity Manager for OS/2, Services for OS/2, or NetFinity Services for NetWare.

Installing NetFinity Software for OS/2

Before installing these programs, make sure that the installation of NetFinity Services and the PeerMaster adapters is complete.

Note: A README file is present in the directory of
 \NETFINTY\OS2 for installation instructions.

The NetFinity program files on your PeerMaster Server Adapter Option Diskette support the following versions of IBM LAN Server:

 IBM LAN Server 3.x and 4.x

The following file contain the NetFinity program files which monitor the operation of your PeerMaster adapter and make information available to the NetFinity Manager.

- MONMX4BT.DLL

 This file is the NetFinity base monitor for MXPCI4BT.OS2 which is required for Quad-BT adapters.

Assumptions:

1. Your PeerMaster adapters are installed and fully operational.
2. NetFinity Service or Manager for OS/2 that comes with NetFinity are installed and fully operational. You should be able to monitor the basic operations and configuration of your server at this time.

To install the PeerMaster Adapter NetFinity support program files, follow this procedure:

1. Insert the PeerMaster Server Adapter Option Diskette that comes with your PeerMaster adapter into the diskette drive of your OS/2 server.
2. Make the directory current where the NetFinity program files for your PeerMaster adapter is located current, for example,

```
CD A:\NETFINTY\OS2
```
3. Change the directory so that the NetFinity default directory and drive for installation is **C:\NETFIN**. Your installation may be different.
4. Copy the program files for your PeerMaster adapter into the NETFIN directory on the server, for example,

```
COPY A:*. * C:*. *
```

5. Restart the server to load the new program files.

Continue with “Monitoring Your PeerMaster Adapter” on page 66 to complete the installation.

Installing PeerMaster LAN Software

Installing PeerMaster Software for Novell NetWare

Before installing these programs, make sure that the installation of NetFinity Services and the PeerMaster adapters is completely installed.

Note: A README file is present in the directory of the diskette \NETFINTY\NETWARE for installation instructions.

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

Novell NetWare Version 3.1x and 4.x

The following two files are in the NETFINTY/NETWARE directory of the PeerMaster Server Adapter Option Diskette that comes with your adapter.

- MONPC4BT.NLM

This file is the NetFinity base monitor for MXPCI4BT.NLM that monitors the traditional operation of the PeerMaster adapter and provides Ethernet information.

- MONVNET.NLM

This file is the NetFinity base monitor for VNET.LAN that monitors the switching operations of the PeerMaster adapters.

Assumptions:

1. Your PeerMaster adapters are installed and fully operational.
2. The NetFinity Services and NetWare Server programs that come with NetFinity are installed and fully operational. You should be able to monitor the basic operations and configuration of your server at this time.

Installing PeerMaster LAN Software

To install the programs, follow this procedure:

1. Insert the PeerMaster Server Adapter Option Diskette that comes with your PeerMaster adapter into the diskette drive of the server.

2. Make the directory current where the NetFinity program files for your PeerMaster adapter is located, for example,

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

3. Change the directory so that the NetFinity default directory and drive for installation is **C:\NETFINTY**. Your installation may be different.

4. Copy the program files for your PeerMaster adapter into the NETFINTY directory on the server, for example,

```
COPY A:*. * C:*. *
```

5. Restart the server to load the new program files.

You can now monitor the functions of your PeerMaster adapters from NetFinity Manager.

Continue with “Monitoring Your PeerMaster Adapter” on page 66 to complete the installation.

Monitoring Your PeerMaster Adapter

The PeerMaster monitor 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 comes with it.

If you are installing a PeerMaster adapter in a server that is running Novell NetWare, you can only gather data from the server from an OS/2 or Windows system running NetFinity Manager. NetFinity Services is not available locally on systems running Novell NetWare.

Remote System Manager

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

Installing PeerMaster LAN Software

1. From the Remote System Manager screen, select **Add Group**.
2. Select **Discover System**.
After communication with your server is established, an icon (graphic symbol) will appear for your new server.
3. Double-click on the new icon.

After adding your server to the Remote System Manager, you may 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 Server Adapter Option Diskette into the diskette drive of the system that has NetFinity manager installed. NetFinity will copy the appropriate files 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 adapters. Expansion slot numbers are used to select a specific PeerMaster 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 PeerMaster adapter and *y* is the target port on the adapter. For example, a pseudo slot number of 23 represents port 3 of the PeerMaster adapter in 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 mode 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 *promiscuous mode* (accepts all frames transmitted on the LAN segment). Each port can provide information on the actual use of the LAN segment onto which it is attached. This information is provided in kilobytes-per-second (KBps) and packets-per-second (pps).

LAN Switch In

When the switching function on this port is enabled, the monitor displays the number of packets that the switching function accepted from the port and then forwarded to another LAN segment.

LAN Switch Out

When the switching function on this port is enabled, the monitor displays the number of packets that the switching function forwarded to the specified port for transmission into its segment.

Peer Switch In

When the switching function on this port is enabled, the monitor displays the number of packets that the switching function received from other PeerMaster adapters and forwards them to local ports for transmission into their segments.

When the switching function on this port is enabled, the monitor displays the number of packets that the switching function received and forwards them to local ports for transmission onto segments controlled by other ports.

Arranging Your Workspace

Arranging Your Workspace

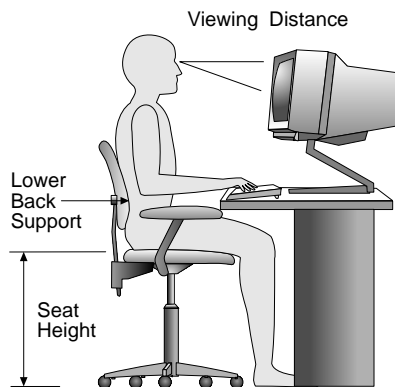
To get the most from your server, arrange both the equipment you use and your work area to suit your needs and the kind of work you do. Your comfort is of foremost importance, but light sources, air circulation, and the location of electrical outlets also can affect the way you arrange your workspace.

Comfort

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

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

When using the keyboard, keep your forearms parallel to the floor and your wrists in a neutral, comfortable position. Try to keep a light touch on the keyboard and your hands and fingers relaxed. You can change the angle of the keyboard for maximum comfort by adjusting the position of the keyboard feet.



Adjust the monitor so the top of the screen is at, or slightly below, eye level. Place the monitor at a comfortable viewing distance,

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

Glare and Lighting

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

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

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

Air Circulation

Your server and monitor produce heat. Your server has one or more fans that pull in fresh air and force out hot air. The monitor lets hot air escape through vents. Blocking the air vents can cause overheating, which might result in a malfunction or damage. Place the server and monitor so that nothing blocks the air vents; usually, 51 mm (2 in.) of air space is sufficient. Also, make sure the vented air is not blowing on someone else.

Installation Checklist

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. See Chapter 6, “Configuring Your Server” on page 273 for information about configuring your server and using these utility programs. See Chapter 7, “Solving Problems” on page 299 for details about troubleshooting. If your server is a disk-array model, read and become familiar with Chapter 3, “Configuring the Disk Array” on page 75. 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 133.
- Record your identification numbers**

Your server has important identification information that you will need if you have it serviced. Appendix A, “Server Records” on page 369 shows where to find these numbers, and provides space to record and retain information. Be sure to record your ServerGuide License Diskette serial number in Appendix A.

Installation Checklist

Install options

If you decided earlier to delay installing your options, you might want to complete these installations now. See Chapter 5, “Installing Options” on page 153 for step-by-step 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 “Using the Setup Program” on page 275.

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 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 monitoring programs (ServeRAID)

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.

Device Drivers

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 Chapter 2, "Installing Software" 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 90.
 - To create a disk array, go to “Creating a Disk Array” on page 91.
- Backup the disk-array configuration. See “Backing Up Your Disk-Array Configuration” on page 122.

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, review the README file in **Start Here** on the ServerGuide Main CD. To install your operating system from the ServerGuide CD, see “About ServerGuide” on page 27 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.

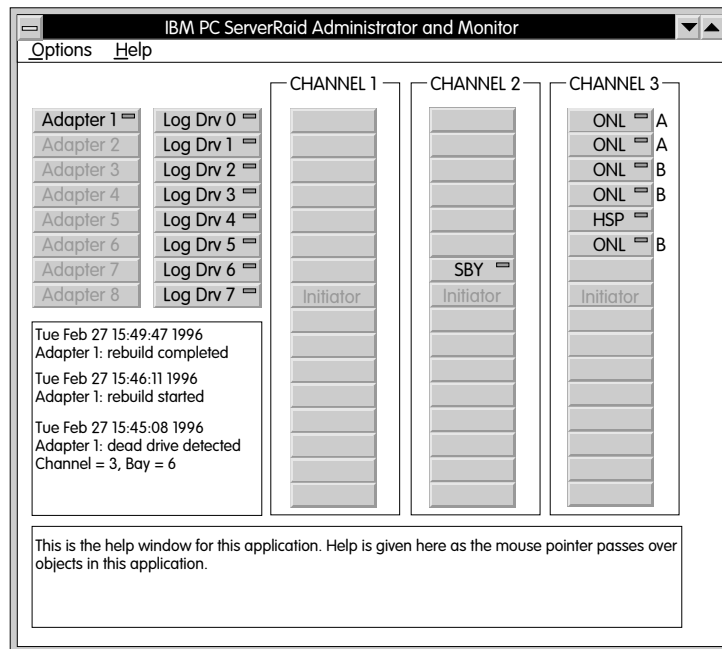
If you install an operating system from the ServerGuide CD, the device drivers will be installed automatically. However, if you install your operating system from diskettes, you will need to install the device drivers. See the README file on the Device Driver/Administration and Monitoring diskette for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

Administration and Monitoring Utilities

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 Internal Drives" on page 197.

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

Additional Storage Capacity

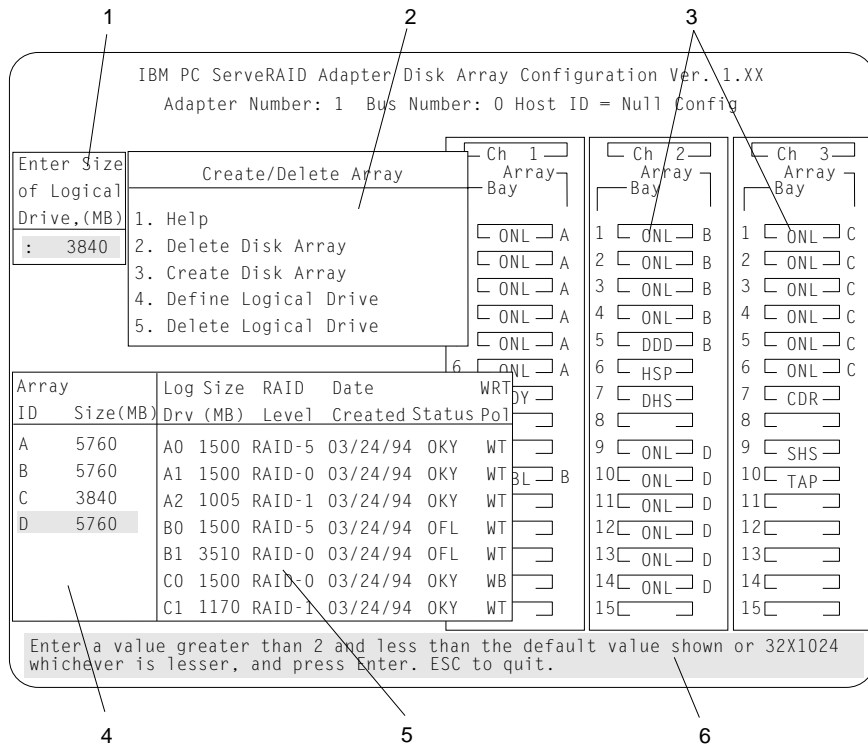
With the Administration and Monitoring program Remote Monitor, you can dynamically add capacity to your server by defining additional arrays and logical drives (when your operating system supports this). When you use the Remote Monitor, you do not have to restart the server to create an array.

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 91). 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 Configuration Diskette (also called the ServeRAID 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.

RAID Technology



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 197 to see the physical location of the hard disk drives.
- The IDs for the hot-swap 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 252 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.

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

Starting the ServeRAID Configuration Program

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**.

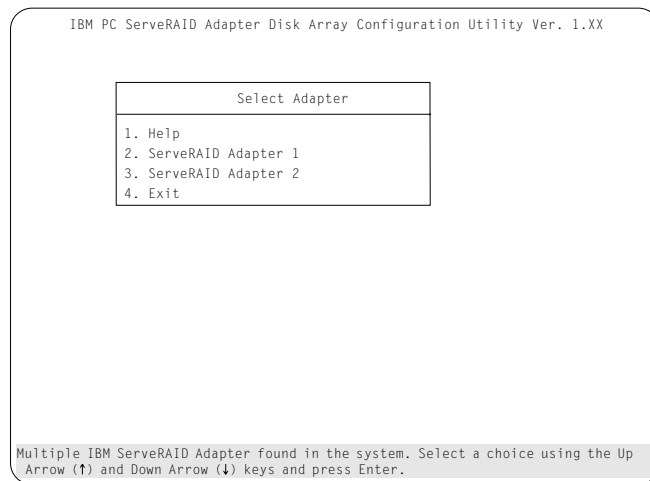
During the power-on self test (POST), the ServeRAID adapter checks the configuration information on the adapter and on the hard disk drives connected to it.

- If POST does not detect problems or changes, the Main Menu appears. See “The ServeRAID Adapter Main Menu” on page 87.
- If POST detects any change in the adapter configuration, a configuration error message displays. See “ServeRAID Adapter POST and Setup Messages” on page 331.
- If POST detects an adapter hardware problem, an error message displays. See “ServeRAID Adapter Status and Error Messages” on page 335.

Starting the ServeRAID Configuration Program

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.

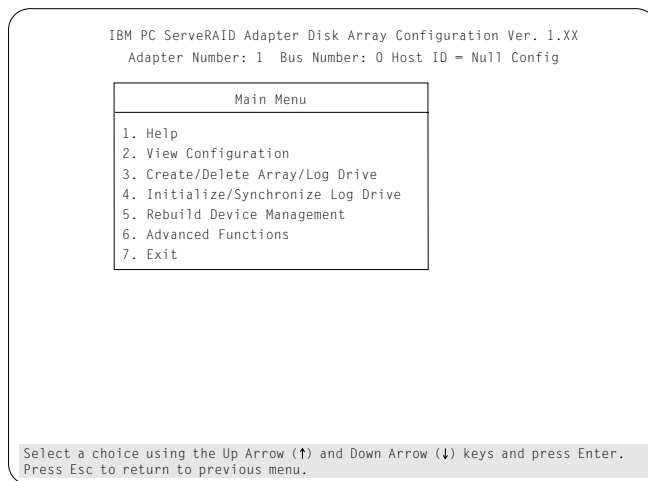


Notes:

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.

Starting the ServeRAID Configuration Program

- **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.

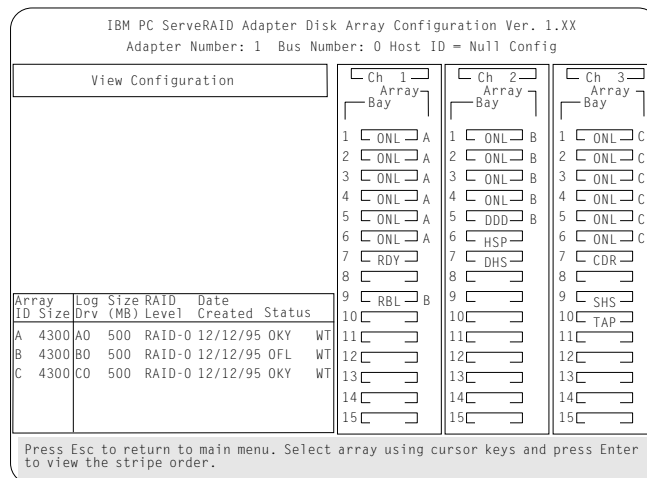
Viewing the ServeRAID Configuration

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 86).
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 93
- “Defining a Hot-Spare Drive” on page 98
- “Deleting a Disk Array” on page 99
- “Deleting a Logical Drive” on page 101
- “Redefining Space in an Array” on page 102
- “Defining the State of a Drive” on page 108

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 86).

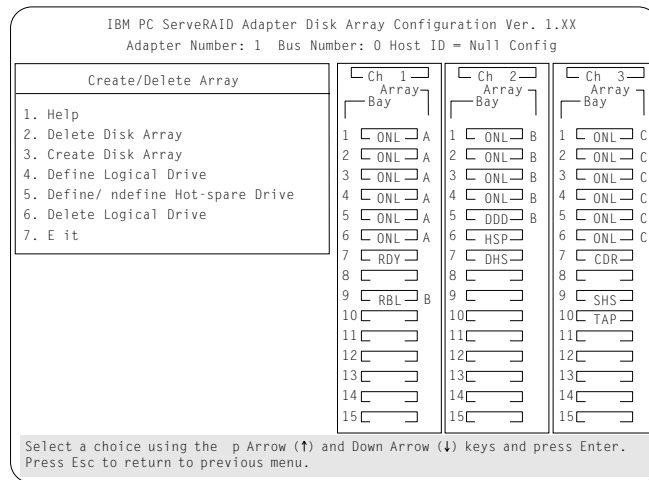
Note: To create an array using hard disks in an existing array, see “Redefining Space in an Array” on page 102.

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

Performing Common Tasks

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 86).
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) 3840	Create/Delete Array 1. Help 2. Delete Disk Array 3. Create Disk Array 4. Define Logical Drive 5. Define/ ndefine Hot-spare Drive 6. Delete Logical Drive	Ch 1 Array Bay 1 <input type="checkbox"/> ONL A 2 <input type="checkbox"/> ONL A 3 <input type="checkbox"/> ONL A 4 <input type="checkbox"/> ONL A 5 <input type="checkbox"/> ONL A 6 <input type="checkbox"/> ONL A 7 <input type="checkbox"/> HSP A 8 <input type="checkbox"/> DHS A	Ch 2 Array Bay 1 <input type="checkbox"/> ONL B 2 <input type="checkbox"/> ONL B 3 <input type="checkbox"/> ONL B 4 <input type="checkbox"/> ONL B 5 <input type="checkbox"/> ONL B 6 <input type="checkbox"/> ONL B 7 <input type="checkbox"/> CDR B 8 <input type="checkbox"/> SHS B 9 <input type="checkbox"/> TAP B 10 <input type="checkbox"/> ONL D 11 <input type="checkbox"/> ONL D 12 <input type="checkbox"/> ONL D 13 <input type="checkbox"/> ONL D 14 <input type="checkbox"/> ONL D 15 <input type="checkbox"/> ONL D	Ch 3 Array Bay 1 <input type="checkbox"/> ONL C 2 <input type="checkbox"/> ONL C 3 <input type="checkbox"/> ONL C 4 <input type="checkbox"/> ONL C 5 <input type="checkbox"/> ONL C 6 <input type="checkbox"/> ONL C 7 <input type="checkbox"/> CDR C 8 <input type="checkbox"/> SHS C 9 <input type="checkbox"/> TAP C 10 <input type="checkbox"/> ONL D 11 <input type="checkbox"/> ONL D 12 <input type="checkbox"/> ONL D 13 <input type="checkbox"/> ONL D 14 <input type="checkbox"/> ONL D 15 <input type="checkbox"/> ONL D																																																															
<table border="1"> <thead> <tr> <th>Array ID</th> <th>Size(MB)</th> <th>Log Size</th> <th>RAID Drv (MB)</th> <th>RAID Level</th> <th>Date Created</th> <th>Status</th> <th>WRT Pot</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>5760</td> <td>A0</td> <td>1500</td> <td>RAID-5</td> <td>03/24/94</td> <td>OKY</td> <td>WT</td> </tr> <tr> <td>B</td> <td>5760</td> <td>A1</td> <td>1500</td> <td>RAID-0</td> <td>03/24/94</td> <td>OKY</td> <td>WT</td> </tr> <tr> <td>C</td> <td>3840</td> <td>A2</td> <td>1005</td> <td>RAID-1</td> <td>03/24/94</td> <td>OKY</td> <td>WT</td> </tr> <tr> <td>D</td> <td>5760</td> <td>B0</td> <td>1500</td> <td>RAID-5</td> <td>03/24/94</td> <td>OFL</td> <td>WT</td> </tr> <tr> <td></td> <td></td> <td>B1</td> <td>3510</td> <td>RAID-0</td> <td>03/24/94</td> <td>OFL</td> <td>WT</td> </tr> <tr> <td></td> <td></td> <td>C0</td> <td>1500</td> <td>RAID-0</td> <td>03/24/94</td> <td>OKY</td> <td>WB</td> </tr> <tr> <td></td> <td></td> <td>C1</td> <td>1170</td> <td>RAID-1</td> <td>03/24/94</td> <td>OKY</td> <td>WT</td> </tr> </tbody> </table>	Array ID	Size(MB)	Log Size	RAID Drv (MB)	RAID Level	Date Created	Status	WRT Pot	A	5760	A0	1500	RAID-5	03/24/94	OKY	WT	B	5760	A1	1500	RAID-0	03/24/94	OKY	WT	C	3840	A2	1005	RAID-1	03/24/94	OKY	WT	D	5760	B0	1500	RAID-5	03/24/94	OFL	WT			B1	3510	RAID-0	03/24/94	OFL	WT			C0	1500	RAID-0	03/24/94	OKY	WB			C1	1170	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.		
Array ID	Size(MB)	Log Size	RAID Drv (MB)	RAID Level	Date Created	Status	WRT Pot																																																												
A	5760	A0	1500	RAID-5	03/24/94	OKY	WT																																																												
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C	3840	A2	1005	RAID-1	03/24/94	OKY	WT																																																												
D	5760	B0	1500	RAID-5	03/24/94	OFL	WT																																																												
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		C0	1500	RAID-0	03/24/94	OKY	WB																																																												
		C1	1170	RAID-1	03/24/94	OKY	WT																																																												

- 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.

Performing Common Tasks

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 and 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*.

Performing Common Tasks

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 108).

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 86).
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="checkbox"/> ONL <input type="checkbox"/> A	1 <input type="checkbox"/> ONL <input type="checkbox"/> B	1 <input type="checkbox"/> ONL <input type="checkbox"/> C
2. Delete Disk Array	2 <input type="checkbox"/> ONL <input type="checkbox"/> A	2 <input type="checkbox"/> ONL <input type="checkbox"/> B	2 <input type="checkbox"/> ONL <input type="checkbox"/> C
3. Create Disk Array	3 <input type="checkbox"/> ONL <input type="checkbox"/> A	3 <input type="checkbox"/> ONL <input type="checkbox"/> B	3 <input type="checkbox"/> ONL <input type="checkbox"/> C
4. Define Logical Drive	4 <input type="checkbox"/> ONL <input type="checkbox"/> A	4 <input type="checkbox"/> ONL <input type="checkbox"/> B	4 <input type="checkbox"/> ONL <input type="checkbox"/> C
5. Define/ ndefine Hot-spare Drive	5 <input type="checkbox"/> ONL <input type="checkbox"/> A	5 <input type="checkbox"/> DDD <input type="checkbox"/> B	5 <input type="checkbox"/> ONL <input type="checkbox"/> C
6. Delete Logical Drive	6 <input type="checkbox"/> ONL <input type="checkbox"/> A	6 <input type="checkbox"/> HSP <input type="checkbox"/>	6 <input type="checkbox"/> ONL <input type="checkbox"/> C
7. E it	7 <input type="checkbox"/> RDY <input type="checkbox"/>	7 <input type="checkbox"/> DHS <input type="checkbox"/>	7 <input type="checkbox"/> CDR <input type="checkbox"/>
	8 <input type="checkbox"/>	8 <input type="checkbox"/>	8 <input type="checkbox"/>
	9 <input type="checkbox"/> RBL <input type="checkbox"/> B	9 <input type="checkbox"/>	9 <input type="checkbox"/> SHS <input type="checkbox"/>
	10 <input type="checkbox"/>	10 <input type="checkbox"/>	10 <input type="checkbox"/> TAP <input type="checkbox"/>
	11 <input type="checkbox"/>	11 <input type="checkbox"/>	11 <input type="checkbox"/>
	12 <input type="checkbox"/>	12 <input type="checkbox"/>	12 <input type="checkbox"/>
	13 <input type="checkbox"/>	13 <input type="checkbox"/>	13 <input type="checkbox"/>
	14 <input type="checkbox"/>	14 <input type="checkbox"/>	14 <input type="checkbox"/>
	15 <input type="checkbox"/>	15 <input type="checkbox"/>	15 <input type="checkbox"/>

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

3. Select **Define/Undefine 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 91.
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. See “Backing Up Your Disk-Array Configuration” on page 122 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.

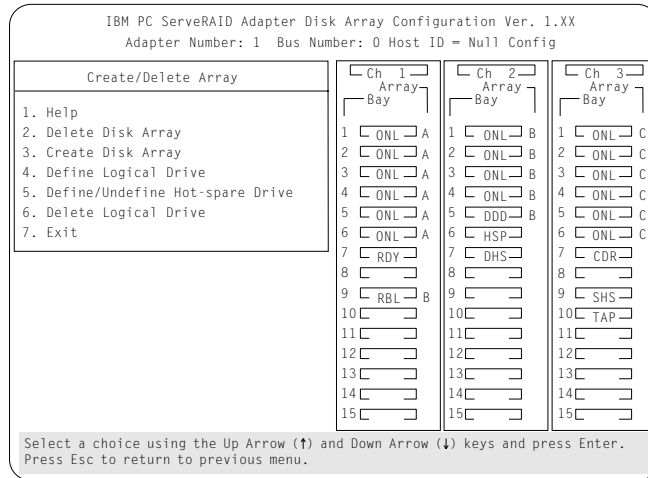
To delete a disk array:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 86).
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.

Performing Common Tasks

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.

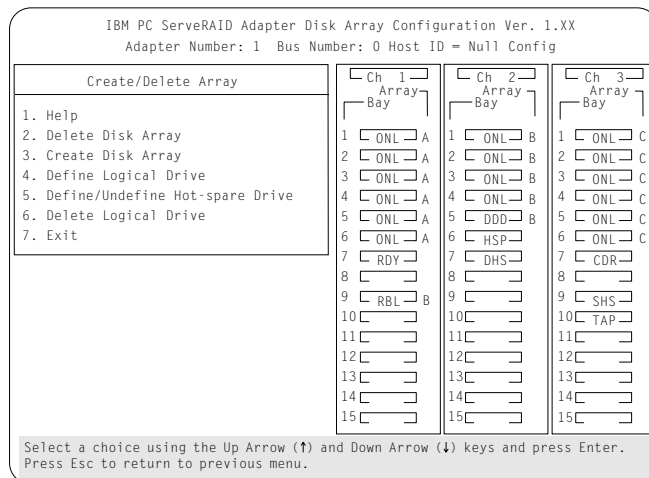
If a defunct drive is still in a bay, the status shows a Defunct Hot-spare (DHS) drive. You can select **Rebuild/Device Management**, then reset the drive state by selecting **Set Device State** (see “Defining the State of a Drive” on page 108 for more information). If the drive is good, set the drive 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 86).
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.

Performing Common Tasks

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 82 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 86).
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, see “Defining the State of a Drive” on page 108 for step-by-step instructions.
6. Create a new disk array and define logical drives.

See “Creating a Disk Array” on page 91 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.

Drive Maintenance

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.

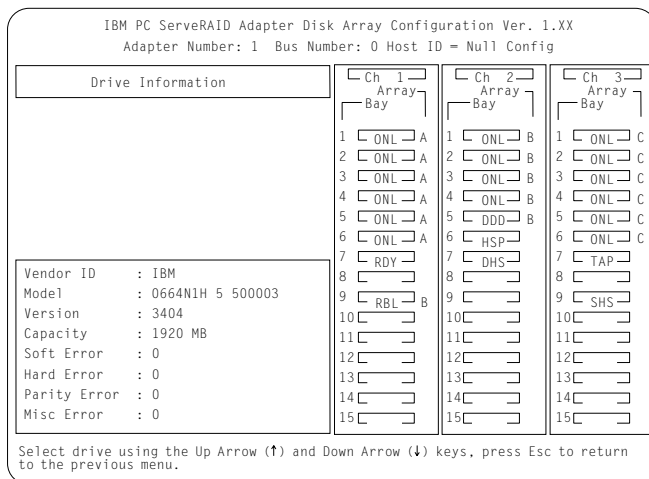
Obtaining Drive Status

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. Review 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 86).
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.

Drive Maintenance

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 115.

- 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.

Drive Maintenance

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.

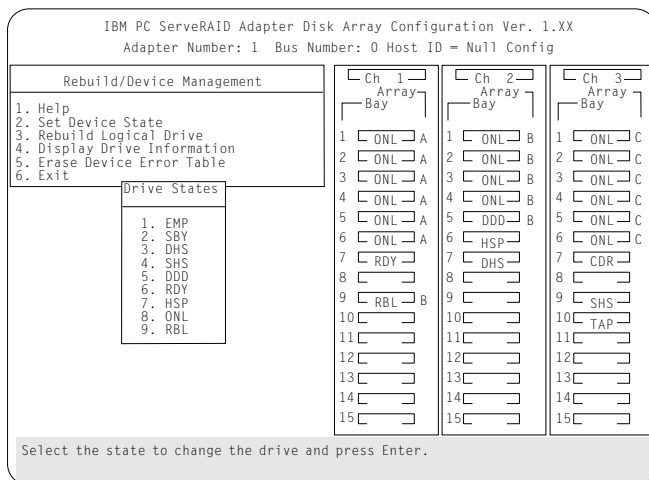
Defining the State of a Drive

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 86).
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 106 for an explanation of the bay numbers.

Drive Maintenance

6. If you want to create a disk array, go to “Creating a Disk Array” on page 91.
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. See “Backing Up Your Disk-Array Configuration” on page 122 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.

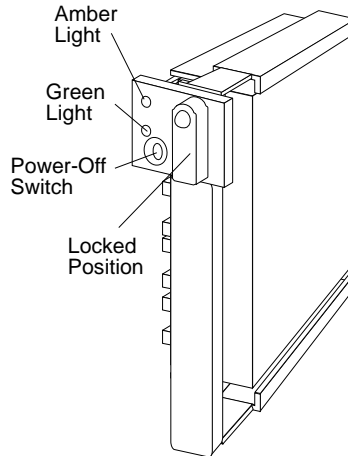
After you install a new hard disk drive, the Replace process changes the drive status from **DDD** to **RBL** if the array contains a **CRT** logical drive. After the Rebuild process, the hard disk drive status changes from **RBL** to **ONL**.

- 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.

Drive Maintenance

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:

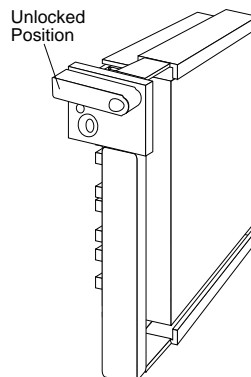
1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 86).

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:

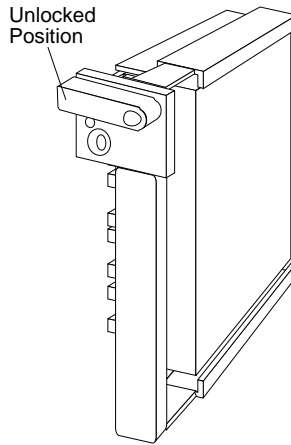
Attention: Removing the wrong hard disk drive can cause loss of all data in the array.

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 115. 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.

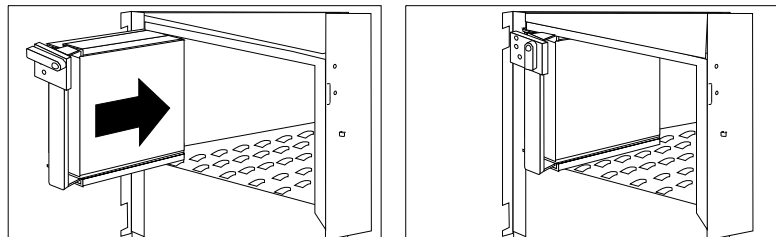


Drive Maintenance

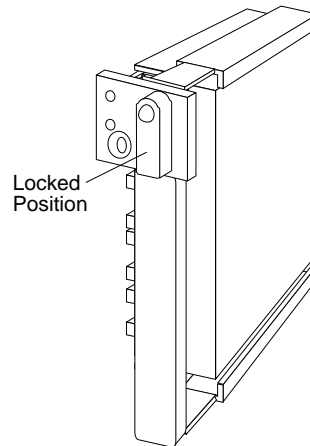
6. Disconnect the drive from the connector on the backplane, by grasping the handle on the drive tray and pulling the drive out of the server. Store the drive in a safe place.
7. Install the hard disk drive:
 - a. Move the tray knob to the unlocked position.



- 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.

Resetting the Adapter Configuration

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 122).
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:

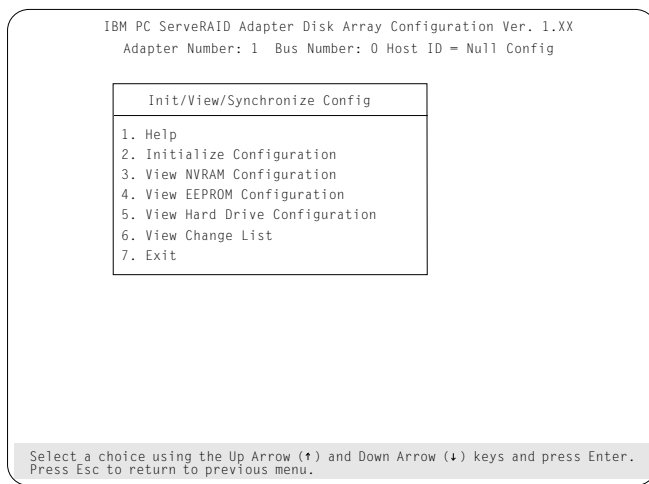
- **Initialize Configuration** restores the factory default settings, and resets all functional, connected, hard disk drives to the Ready (RDY) state.
- **View NVRAM Configuration** displays the current configuration settings for the adapter's NVRAM.
- **View EEPROM Configuration** displays the current 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 119.

To initialize, reset, or view the adapter configuration:

1. Start the ServeRAID configuration program (see “Starting the ServeRAID Configuration Program” on page 86).
2. Select **Advanced Functions** from the Main Menu.
3. Select **Init/View/Synchronize Config**.

Resetting the Adapter Configuration

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.

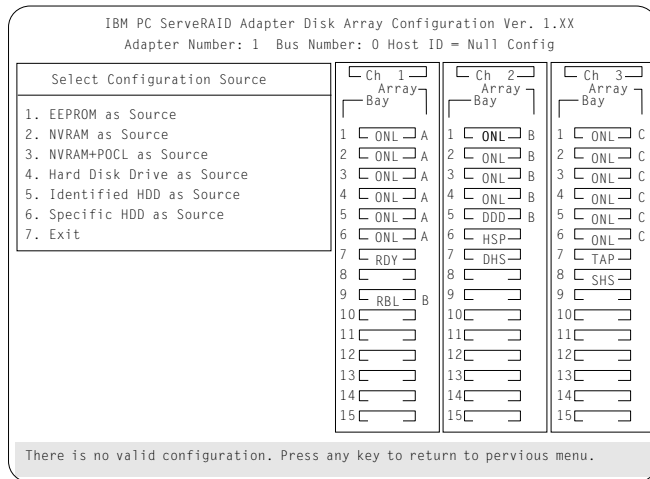
- **View Power-on Change List** displays any drives that have changed states since the last time the server was powered on or restarted.
- **View Wrong SCSI ID List** provides a list of hard disk drives that were found at a different SCSI ID location than the last time the server was powered on or restarted.
- **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 130 for more information.)

Resetting the Adapter Configuration

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.



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

Select Configuration Source	Ch 1 Array Bay	Ch 2 Array Bay	Ch 3 Array Bay
1. EEPROM as Source	1 ONL A	1 ONL B	1 ONL C
2. NVRAM as Source	2 ONL A	2 ONL B	2 ONL C
3. NVRAM+POCL as Source	3 ONL A	3 ONL B	3 ONL C
4. Hard Disk Drive as Source	4 ONL A	4 ONL B	4 ONL C
5. Identified HDD as Source	5 ONL A	5 DDD B	5 ONL C
6. Specific HDD as Source	6 ONL A	6 HSP B	6 ONL C
7. Exit	7 RDY	7 DHS	7 TAP C
	8	8 SHS	8 SHS
	9 RBL B	9	9
	10	10	10
	11	11	11
	12	12	12
	13	13	13
	14	14	14
	15	15	15

There is no valid configuration. Press any key to return to pervious menu.

- **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.

Running RAID Subsystem Diagnostics

- **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 86).
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 126.
5. Follow the instructions on the screen.

Additional Disk-Array Tasks

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 86).
3. Select **Advanced Functions** from the Main Menu.
4. Select **Backup config. to diskette**.
5. Remove the ServeRAID 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 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 86).
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.

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

Additional Disk-Array Tasks

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 86).
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						Ch 1 Array Bay	Ch 2 Array Bay	Ch 3 Array Bay
1. Help						1 ONL A	1 ONL B	1 ONL C
2. Backup config. to Diskette						2 ONL A	2 ONL B	2 ONL C
3. Restore config. from Diskette						3 ONL A	3 ONL B	3 ONL C
4. Change Write Policy						4 ONL A	4 ONL B	4 ONL C
5. Change RAID Parameters						5 ONL A	5 DDD B	5 ONL C
6. IBM RAID Subsystem Diagnostics						6 ONL A	6 HSP B	6 ONL C
7. Init/View/Synchronize Config						7 RDY A	7 DHS B	7 ONL C
8. Display/Change Adapter Params						8 ONL A	8 ONL B	8 ONL C
9. Exit						9 RBL B	9 ONL B	9 SHS C
						10 ONL A	10 ONL B	10 TAP C
						11 ONL A	11 ONL B	11 ONL C
						12 ONL A	12 ONL B	12 ONL C
						13 ONL A	13 ONL B	13 ONL C
						14 ONL A	14 ONL B	14 ONL C
						15 ONL A	15 ONL B	15 ONL C

Array ID	Log Size	RAID Drv (MB)	Level	Date Created	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

Additional Disk-Array Tasks

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. See “Backing Up Your Disk-Array Configuration” on page 122 for more information.

Additional Disk-Array Tasks

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 86).
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.

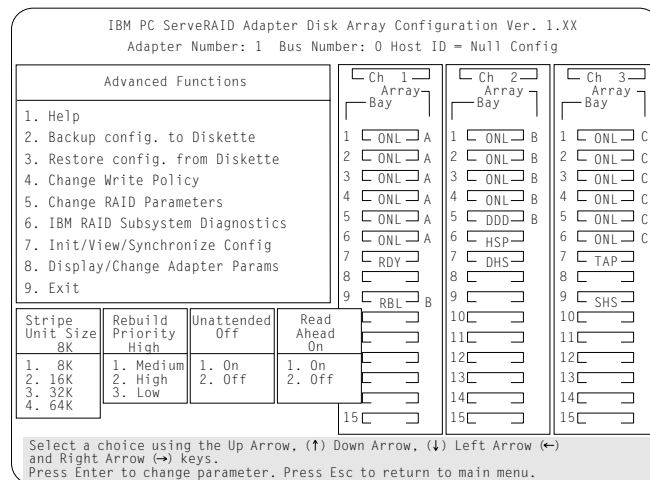
You can perform a low-level format on one drive at a time.

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 86).
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 129 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 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 127 for information), the adapter pauses briefly to permit a user to override the default action; then the adapter rearranges the configuration information. Unattended mode also clears 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.

Additional Disk-Array Tasks

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 86).
2. Select **Advanced Functions** from the Main Menu.
3. Select **Display/Change Adapter Params** and press **Enter**. The following screen appears.

Additional Disk-Array Tasks

IBM PC ServeRAID Adapter Disk Array Configuration Ver. 1.XX Adapter Number: 1 Bus Number: 0 Host ID = Null Config			
Display/Change Adapter Parameter	Ch 1 Array Bay	Ch 2 Array Bay	Ch 3 Array Bay
1. Help 2. Display Adapter Status 3. Change Adapter Host/SCSI ID 4. Set BIOS Compatability Mapping 5. Set Channel => Bank Mapping 6. Exit	1 <input type="checkbox"/> ONL A 2 <input type="checkbox"/> ONL A 3 <input type="checkbox"/> ONL A 4 <input type="checkbox"/> ONL A 5 <input type="checkbox"/> ONL A 6 <input type="checkbox"/> ONL A 7 <input type="checkbox"/> RDY 8 <input type="checkbox"/> 9 <input type="checkbox"/> RBL B 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12 <input type="checkbox"/> 13 <input type="checkbox"/> 14 <input type="checkbox"/> 15 <input type="checkbox"/>	1 <input type="checkbox"/> ONL B 2 <input type="checkbox"/> ONL B 3 <input type="checkbox"/> ONL B 4 <input type="checkbox"/> ONL B 5 <input type="checkbox"/> DDD B 6 <input type="checkbox"/> HSP 7 <input type="checkbox"/> DHS 8 <input type="checkbox"/> 9 <input type="checkbox"/> 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12 <input type="checkbox"/> 13 <input type="checkbox"/> 14 <input type="checkbox"/> 15 <input type="checkbox"/>	1 <input type="checkbox"/> ONL C 2 <input type="checkbox"/> ONL C 3 <input type="checkbox"/> ONL C 4 <input type="checkbox"/> ONL C 5 <input type="checkbox"/> ONL C 6 <input type="checkbox"/> ONL C 7 <input type="checkbox"/> TAP 8 <input type="checkbox"/> 9 <input type="checkbox"/> SHS 10 <input type="checkbox"/> 11 <input type="checkbox"/> 12 <input type="checkbox"/> 13 <input type="checkbox"/> 14 <input type="checkbox"/> 15 <input type="checkbox"/>
Set BIOS Compatability Mapping			
1. Extended BIOS Mapping (8GB) 2. Limited BIOS Mapping (2GB)			
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 252.) 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 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 134 for information.)
 - **View Configuration** shows the current configuration information for the ServeRAID adapter. (See “Viewing Configuration Information” on page 135 for information.)
 - **Advanced Functions** resets the adapter, initializes the configuration, and imports the configuration from drives. (See “Using Advanced Configuration Functions” on page 135 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.

Using the Mini-Configuration Program

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 127.)
- **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	138
Traditional Adapter Mode	138
VNET Switch Mode	139
Configuration Examples	140
Using the PeerMaster Setup Utility Program	147
Displaying the PeerMaster Adapter	148
Guidelines for Assigning Slot Numbers	149
Running PeerMaster Diagnostic Programs	151
Displaying PeerMaster PCI Configuration Registers	153
Attaching Network Cables to Your Adapter	155

Choosing a Mode of Operation

Choosing a Mode of Operation

You can configure the PeerMaster adapter to operate in either of two modes:

- Traditional adapter mode, which is used when you expect little or no cross-subnetwork traffic. (Subnetwork is also called *subnet*.)
- Virtual subnetwork (VNET) switch mode, which is used when you need to configure multisegment subnetworks. The PeerMaster adapter provides media-rate Ethernet switching among all LAN segments within a virtual network without intervention by a server microprocessor.

Choose the mode of operation and configuration that fits the needs of your network. Both modes of operation are described in this section, and examples of configurations are provided in “Configuration Examples” on page 140.

Traditional Adapter Mode

When the PeerMaster adapter is operating in the traditional adapter mode, each LAN segment of the adapter is separately registered with the network operating system (NOS). The PeerMaster adapter appears as four separate, traditional adapters to the NOS; therefore, each network LAN segment must be configured with a unique network number.

All cross-segment traffic must be forwarded by a server microprocessor or by an external device, such as a bridge, router, or switch.

VNET Switch Mode

When the PeerMaster adapter is operating in the VNET switch mode, multiple LAN segments of the adapter are jointly registered with the NOS as a single segment. This multisegment subnetwork is referred to as a virtual subnetwork or a VNET. You can configure multiple PeerMaster adapters to operate together in various ways, such as:

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

When configured in the VNET switch mode, the PeerMaster adapter serves as a high-performance Ethernet switching subsystem within your server; this subsystem provides media-rate frame forwarding across all segments within each VNET. This mode is well suited for creating switched, multisegment, high-bandwidth work groups or departments. The server microprocessor is shielded from the task of routing, and no external internetworking devices are required to support these bandwidth-intensive work groups.

Following are guidelines for using VNET switch mode:

- Do not externally join (with bridges, switches, or concentrators) PeerMaster adapter ports within a VNET.
- You may externally attach any number of devices to a VNET.

Choosing a Mode of Operation

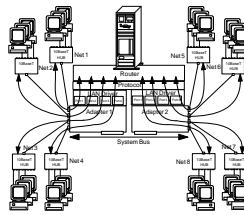
Configuration Examples

The following configuration examples describe various possible PeerMaster adapter modes of operation that you can configure with two PeerMaster adapters.

- The example presented in the traditional adapter mode is an 8-segment configuration.
- The examples presented in the VNET switch mode are:
 - An 8-port VNET configuration
 - Two 4-port VNETs, each configured from one PeerMaster adapter
 - An 8-segment network configured as one 4-port VNET and four traditional subnetworks

Each PeerMaster adapter can be used 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.

Traditional Adapter Mode Configuration



The example in the preceding figure shows:

- A server with two PeerMaster adapters configured in the traditional adapter mode. Within this mode each of the eight network segments is registered with the protocol as a unique subnet network. Clients on all ports have direct access to the server.
- An 80 Mbps (Mb equals 1 000 000 bits) network composed of eight subnetworks.
- A server-based software router, above the protocol, that is required to provide cross-segment connectivity.

The advantage of the traditional adapter mode is that the internal router can be used to selectively restrict cross-segment traffic throughout the multisegment network. The disadvantage of this mode is that server responsiveness might be heavily impaired due to the burden of internal routing. Use this mode only when little or no cross-segment traffic is expected.

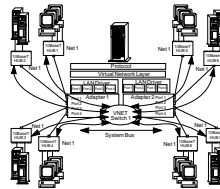
VNET Switch Mode Configurations

The following three configurations show examples of using the PeerMaster adapter in the VNET switch mode.

- VNET Switch Mode - Single VNET
- VNET Switch Mode - Multiple VNETs
- VNET Switch Mode - Combined VNETs and Traditional Nets

Choosing a Mode of Operation

VNET Switch Mode — Single VNET



The illustration shows:

- A subnet network (Net 1) composed of eight physical segments.
- Two PeerMaster adapters configured as one large VNET.

When the PeerMaster adapters are configured as one large VNET, they act as a high-performance network adapter as well as an integrated subsystem (based upon BusBIOS) that provide media-rate Ethernet switching between network devices across all LAN segments.

- A VNET registering all eight active segments with the protocol as a single subnetwork.
- Curved arrows indicating the flow of cross-segment traffic in the VNET.

Devices can roam (physically detached and reattached) among segments within a VNET, without loss of active sessions to the server or to peer devices throughout the VNET.

The PeerMaster subsystem and the VNET driver dynamically detect the relocation of the device and remap traffic for that device in real time.

All cross-segment traffic is forwarded by the PeerMaster subsystem; therefore, server responsiveness is not compromised due to heavy cross-segment traffic.

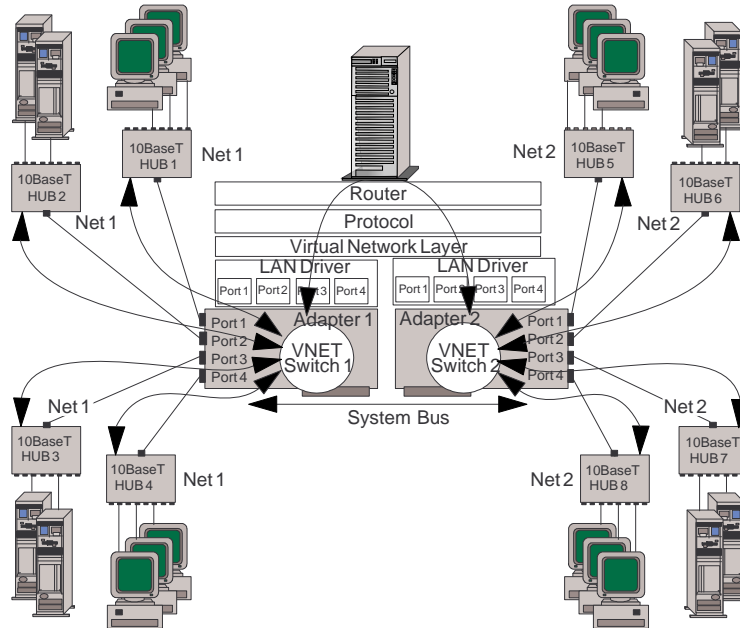
The PeerMaster adapter performs two types of packet switching, port-to-port and peer-to-peer.

Choosing a Mode of Operation

Type	Description	Example
Port-to-port	This type of switching occurs when the source and destination segments reside on the same PeerMaster adapter.	Adapter 1 forwards data packets between port 1 and 2 of that adapter.
Peer-to-peer	This type of switching occurs when the source and destination segments reside on separate PeerMaster adapters.	The adapters forward data packets between port 1 of adapter 1 and port 1 of adapter 2.

Choosing a Mode of Operation

VNET Switch Mode — Multiple VNETs:



Choosing a Mode of Operation

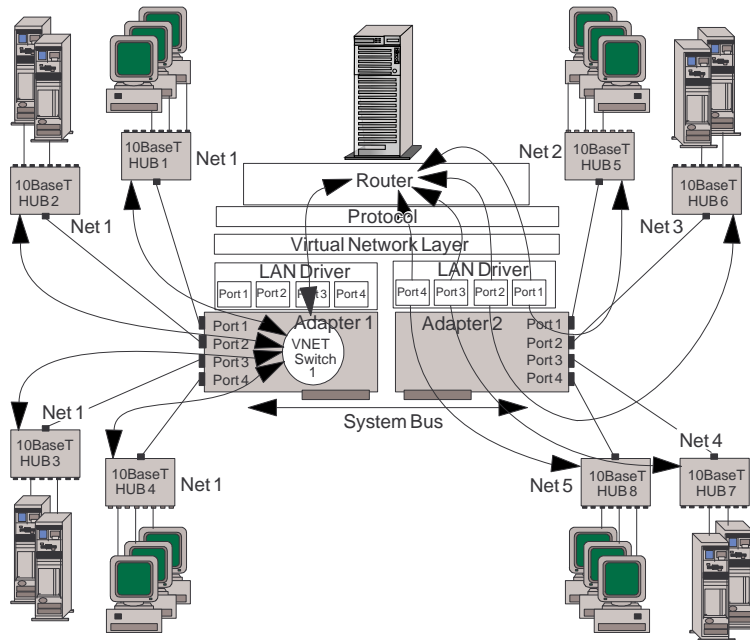
The illustration shows:

- Two subnetworks (Net 1 and Net 2) each composed of one 4-segment VNET. All traffic between ports in Net 1 or between ports within Net 2 is port-to-port. All traffic between a port in Net 1 and a port in Net 2 is peer-to-peer.
- Two PeerMaster adapters, each configured as an independent VNET.
- Two instances of the VNET driver. All four ports of each PeerMaster adapter are registered with the protocol as a single subnetwork.
- A curved arrow that shows the flow of port-to-port traffic between VNETs. This traffic is forwarded by the internal router of the server.
- Curved arrows that indicate the flow of traffic within each VNET. This traffic is forwarded by the microprocessor on each PeerMaster adapter.

Each VNET can represent a different department or work group. This configuration provides two virtual switches. Creating multiple VNETs is a way of separating departments or work groups. The internal router of the server can then be configured to pass selected traffic between VNETs.

Choosing a Mode of Operation

VNET Switch Mode — Combined Net Types: Use a configuration that combines VNETs and Traditional Nets only when you expect little or no cross-VNET traffic.



The illustration shows:

- A 5-subnet network (Net 1, Net 2, Net 3, Net 4, and Net 5) configured as one 4-segment VNET on adapter 1 and four traditional subnet networks (Net 2, Net 3, Net 4, and Net 5) on adapter 2. In this configuration, all traffic in Net 1 is port-to-port. All traffic from Net 1 to any other Net is peer-to-peer. Any traffic between Net 2, 3, 4 and 5 is port-to-port.
- Curved arrows that show the flow of peer-to-peer traffic between subnet networks such as traffic between Net 1 and Net 2. This traffic is forwarded by the internal router of the server.
- Curved arrows that indicate the flow of port-to-port traffic within the VNET. This traffic is forwarded by the microprocessor on the each PeerMaster adapter.

Using the PeerMaster Setup Utility Program

Each VNET can represent a large department while the traditional subnet networks represent smaller work groups. You can configure the internal router to restrict traffic between the departments.

Using the PeerMaster Setup Utility Program

During system power-up, PCI BIOS detects, assigns, and initializes the following operational characteristics of the PeerMaster adapter:

- Host IRQ level
- Memory-mapped runtime registers
- I/O-mapped runtime registers
- Base address for shared memory
- PCI bus number
- PCI device number
- BIOS slot number (supported in systems with PCI BIOS 2.1 only)

Each PeerMaster adapter must be identified by a unique expansion-slot number.

The PeerMaster setup utility program, PSSETUP.EXE, is provided in the root directory of the PeerMaster PCI Server Adapter Option Diskette. You can use this DOS-based program to configure and verify the operation of the PeerMaster adapter. You can use the setup utility program with a startable DOS diskette if your server is not DOS-based.

The PeerMaster setup utility program, PSSETUP.EXE, also identifies the version of PCI BIOS in your system.

Using the PeerMaster Setup Utility Program

Displaying the PeerMaster Adapter

The `/list` parameter is used to display a list of all detected PeerMaster adapters. When PSSETUP is run with the `/list` parameter, a list of all PeerMaster adapters is displayed along with the bus and device numbers. The `/bus` and `/device` parameters can be used to specify a specific adapter if multiple adapters are present.

1. Insert the PeerMaster PCI Server Adapter Option Diskette into drive A.
2. At the DOS command prompt, type `A:\PSSETUP /list` and press **Enter**.

A screen similar to the following is displayed.

```
PSSETUP: IBM Ethernet PCI PeerMaster Setup Utility V1.0x  
(c) Copyright 1995 Xpoint Technologies, Inc.
```

```
PCI BIOS Version Detected: 02.00
```

```
Bus: 0 Device: 8 Flash Slot: 2 BIOS Slot: N/A  
*Flash slot number needs to be set with PCI BIOS 02.00
```

In the above example, the following information is provided:

- **Bus:** The PeerMaster adapters reside on PCI bus 0.
- **Device:** PCI BIOS assigned device number 8 to the PeerMaster adapter.
- **Flash Slot:** Flash slot numbers are retrieved from flash memory and displayed in this field.

Note: In the above example, PSSETUP was used to assign flash slot number 2 to the detected PeerMaster adapter.

- **BIOS Slot:** This field displays the BIOS slot number of the adapter reported by PCI BIOS. The above example contains N/A in this field because PCI BIOS 2.0 does not assign BIOS slot numbers. A system with PCI BIOS 2.1 would contain the BIOS-reported slot number for each detected device.

Continue with “Guidelines for Assigning Slot Numbers” on page 149.

Guidelines for Assigning Slot Numbers

If you must assign slot number for the specific device driver that you intend to install, the README.TXT file on the PeerMaster Server Adapter Option Diskette states if you must manually assign slot numbers.

When assigning slot numbers, you are not constrained by physical slot numbers. If valid slot numbers are not clearly present on your system, then simply assign slot numbers in a manner that logically identifies the PeerMaster adapters in your system.

Valid slot numbers are defined as follows:

- Flash slot numbers must be assigned manually in the range of 1 through 8.
- Each PeerMaster adapter must be assigned a unique flash slot number.

Continue with “Manually Assigning Slot Numbers” on page 150.

Using the PeerMaster Setup Utility Program

Manually Assigning Slot Numbers

Note: Do not run the following function when the PeerMaster device drivers are active. This function will require a reset of the target PeerMaster adapter which will cause all active LAN connections to drop.

The `/slot` parameter is used to manually assign slot numbers to each PeerMaster adapter. The `/bus` and `/device` parameters can be used to specify a specific adapter if multiple adapters are present. If multiple adapters are present and the `/bus` and `/device` parameters are omitted, PSSETUP permits you to select a specific adapter from the list of detected adapters. See “Displaying the PeerMaster Adapter” on page 148.

The following example shows the use of PSSETUP to manually assign a slot number to a PeerMaster adapter in a system where PCI BIOS 2.0 is resident and the `/bus` and `/device` parameters are specified.

1. Insert the PeerMaster PCI Server Adapter Option Diskette into drive A.
2. At the DOS command prompt, type:
A:\PSSETUP /slot:2 /device:8 /bus:0 and press **Enter**.

A screen similar to the following is displayed.

```
PSSETUP: IBM Ethernet PCI PeerMaster Setup Utility V1.0x  
(c) Copyright 1995 Xpoint Technologies, Inc.
```

```
PCI BIOS Version Detected: 02.00
```

```
Flash Programming in Progress..  
Flash Programming Result: Successful
```

In the above example, the target PeerMaster adapter (device: 8 on bus: 0) is manually assigned slot number 2. This value is stored in flash memory on the PeerMaster adapter. PSSETUP will now report a flash slot value of 2 for this adapter.

If the flash program is not successful, run the diagnostic program to diagnose the PeerMaster adapter.

Continue with “Running PeerMaster Diagnostic Programs.”

Running PeerMaster Diagnostic Programs

The `/diag` parameter is used to initiate the PeerMaster adapter diagnostics programs. The `/bus` and `/device` parameters specify a specific PeerMaster adapter if multiple adapters are present. If multiple adapters are present and the `/bus` and `/device` parameters are omitted, PSSETUP permits you to select the specific PeerMaster adapter from a list of detected adapters.

The `/diag` option also displays data stored in flash memory on the PeerMaster adapter.

Each PeerMaster adapter contains a power-on self-test (POST). You must run the PeerMaster diagnostics program to verify the proper installation and operation of a PeerMaster adapter.

To run the diagnostics programs:

1. Insert the PeerMaster PCI Server Adapter Option Diskette into drive A.
2. At the DOS command prompt, type: `A:\PSSETUP /diag` and press **Enter**.

Using the PeerMaster Setup Utility Program

A screen similar to the following appears.

```
PSSETUP: IBM Ethernet PCI PeerMaster Setup Utility V1.0x
(c) Copyright 1995 Xpoint Technologies, Inc.
```

```
PCI BIOS Version Detected:      02.00

Bus                             0
Device                          8
Flash Slot                      2
Flash Boot Sector Version       1.00
Flash Main Sector Version       1.00
Flash Main Life Counter         0
Flash 1st Param Life Counter    1
Flash 2nd Param Life Counter    0
DRAM Size                      1048576
SRAM Size                      524288
Number of MAC Addresses         5
MAC Address 1                   nnnnn
MAC Address 2                   nnnnn
MAC Address 3                   nnnnn
MAC Address 4                   nnnnn
MAC Address 5                   nnnnn
POST Results                    Successful
```

The following list describes the fields reported by the /diag parameter:

- **Bus:** The target PeerMaster adapter resides on this PCI bus.
- **Device:** The PCI BIOS-assigned device number for the specific PeerMaster adapter.
- **Flash Slot:** The manually assigned slot number associated with this PeerMaster adapter.
- **Flash Boot Sector Version:** The version of microcode in this flash sector.
- **Flash Main Sector Version:** The version of microcode in this flash sector.
- **Flash Main Life Counter:** The number of times this flash sector is written to.

- **Flash 1st Param Life Counter:** The number of times this flash sector is written to.
- **Flash 2nd Param Life Counter:** The number of times this flash sector is written to.
- **DRAM Size:** The byte count of dynamic RAM resident on a PeerMaster adapter.
- **SRAM Size:** The byte count of static RAM resident on a PeerMaster adapter.
- **Number of MAC Addresses:** The number of medium access control (MAC) addresses programmed into the flash memory.
- **MAC Address 1—5:** The actual MAC addresses. MAC addresses 1 through 4 are assigned to ports 1 through 4 respectively. MAC address 5 is reserved for use by PeerMaster adapter resident management software.
- **POST Results:** This field displays the POST completion status reported by a PeerMaster adapter. If POST does not complete successfully, record the error number and see “POST Error Messages” on page 310 for a description of the error and suggested actions.

When the diagnostic program completes successfully, your PeerMaster adapter is properly configured, and operational.

Continue with “Displaying PeerMaster PCI Configuration Registers” to help diagnosis misconfigured systems or to view the configuration of the PeerMaster adapter.

Displaying PeerMaster PCI Configuration Registers

The `/config` parameter displays the configuration space for a specific PeerMaster adapter. All PCI devices provide configuration registers that PCI BIOS initializes during system startup. These registers set the configuration for the device. Under normal conditions, it is not necessary to use this option. You can use this option to help diagnosis a misconfigured system, or view the configuration of the PeerMaster adapter.

Using the PeerMaster Setup Utility Program

To run the configuration programs:

1. Insert the PeerMaster PCI Server Adapter Option Diskette into drive A.
2. At the DOS command prompt, type **A:\PSSETUP /config** and press **Enter**.
3. Select a specific PeerMaster adapter to configure.

The following example screen illustrates the configuration information displayed by the /config parameter. For a description of the PCI configuration registers, refer to the PCI BIOS 2.x Specification.

```
PSSETUP: IBM Ethernet PCI PeerMaster Setup Utility V1.0x  
(c) Copyright 1995 Xpoint Technologies, Inc.
```

```
PCI BIOS Version Detected: 02.00
```

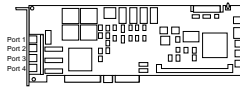
PCI CONFIGURATION REGISTERS

```
Vendor ID                nnnnn  
Device ID                nnnnn  
Command                  nnnnn  
Status                   nnnnn  
Revision ID              nnnnn  
Class Code               nnnnn  
Cache Line Size         nnnnn  
Latency Timer           nnnnn  
Header Type              nnnnn  
BIST                     nnnnn  
Memory Mapped Runtime Registers nnnnn  
I/O Mapped Runtime Registers nnnnn  
Base Address for Shared Memory nnnnn  
Interrupt Line          nnnnn  
Interrupt Pin           nnnnn  
Minimum Grant Period    nnnnn  
Maximum Latency Period  nnnnn
```

Continue with “Attaching Network Cables to Your Adapter” on page 155.

Attaching Network Cables to Your Adapter

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



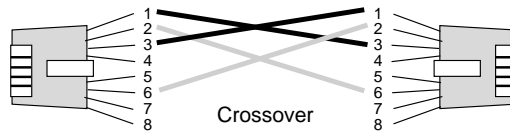
You can connect two types of network cables to a PeerMaster adapter: straight-through and crossover.

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



Attaching Network Cables to Your Adapter

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



Attention:

To ensure proper operation of the PeerMaster adapter, do not externally join ports of PeerMaster adapters (using bridges, switches, or concentrators).

Chapter 5. 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. See “Installation Sequence” on page 184 for the required installation sequence for installing a combination of industry-standard architecture (ISA), extended industry-standard architecture (EISA), and peripheral component interconnect (PCI) adapters in your server.

This chapter contains:

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Before You Begin

- If you have a disk-array model, you must configure your disk arrays after you install hard disk drives, as described in “Installing Internal Drives” on page 197. In this case, follow the instructions in Chapter 3, “Configuring the Disk Array” on page 77, after installing the drives. Return here to install your remaining options, if applicable. See Chapter 6, “Configuring Your Server” on page 279 for additional details about configuration, and a description of your server utility programs.
- Become familiar with the safety and handling guidelines specified under “Safety Information” on page ix, “Electrical Safety” on page 161, and “Handling Static-Sensitive Devices” on page 162. These guidelines will help you work safely while working with your server or options.

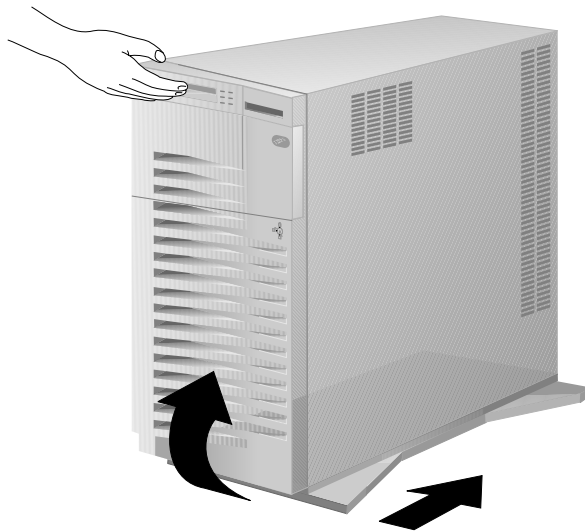
Moving the Server



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. Therefore, before you can turn off 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.

Handling Static-Sensitive Devices



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 can seriously damage computer components and optional devices.

Attention: When you are adding an internal option, do not open the static-protective package that contains 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:

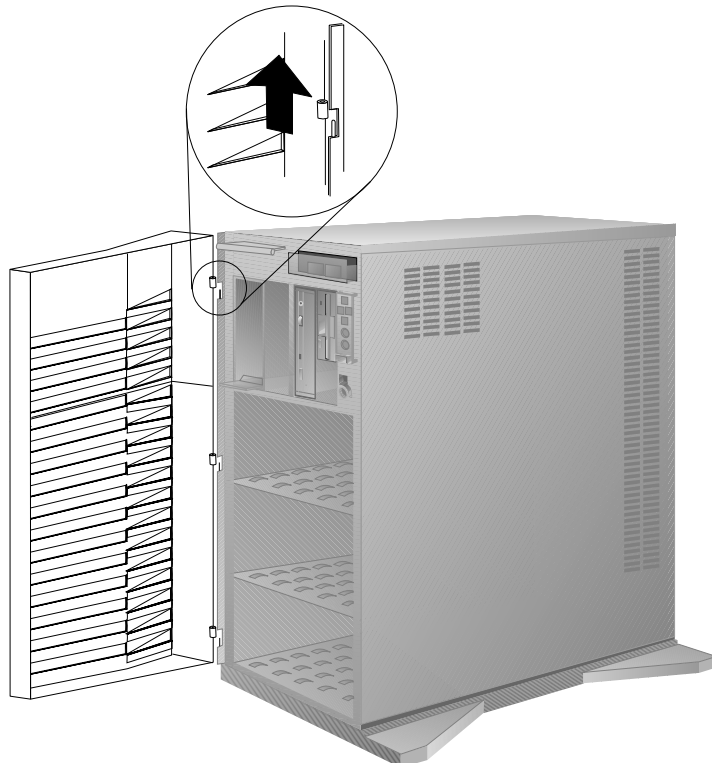
- Limit your movement. Movement can cause static electricity to build up around you.
- Always handle components carefully. Handle adapters and memory-module kits by the edges. Never touch any exposed circuitry.
- Prevent others from touching components.
- When you are installing a new option, touch the static-protective package containing the option to a metal expansion-slot screw or other unpainted metal surface on the server for at least 2 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 came in on a smooth, level surface and place the option on it.
- Do not place the option on the server covers or other metal surface.

Preparing to Install Options

Before you begin:

Be sure you have read “Electrical Safety” on page 161 and “Handling Static-Sensitive Devices” on page 162.

1. Unlock the door.
2. If you are installing 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 front cover by lifting it up and off the hinge pins; then, store the cover in a safe place.

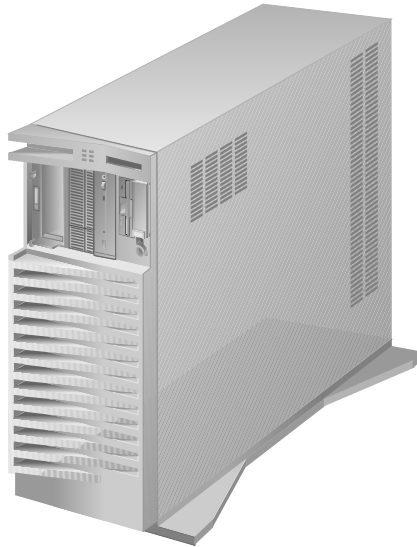


Preparing to Install Options

3. Remove all media (diskettes, CDs, optical discs, or tapes) from the drives; then, turn off the server and all attached options.

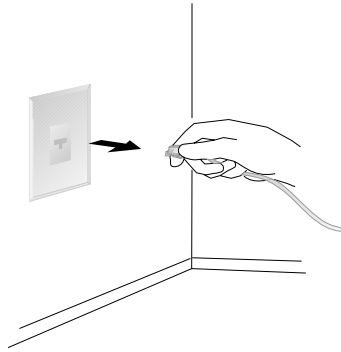
Note: To turn off the server, press the Power On/Off switch. The Power On/Off switch is located under a transparent cover on the right side of the front of the server. Therefore, before you can turn off the server, you must lift this transparent cover to reach the Power On/Off switch.

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



Preparing to Install Options

4. If you have a modem or fax machine attached to the server, disconnect the telephone line from the wall outlet.

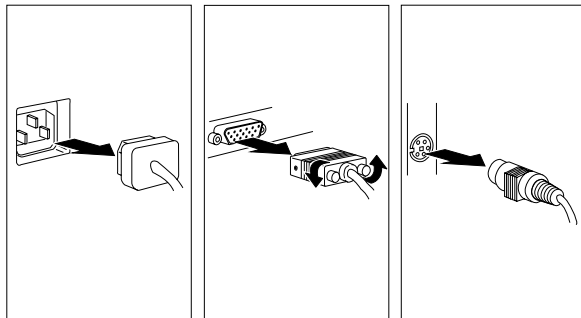


Preparing to Install Options

5. Unplug all power cords (cables) from electrical outlets.

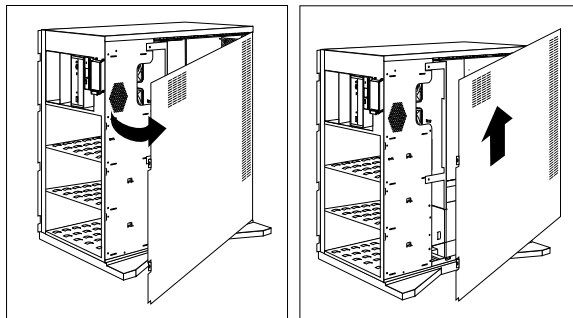
Note the locations of the following; then, disconnect them from the back of the server:

- 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 carefully lifting it up and off the hinges. Store it in a safe place.



Preparing to Install Options

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 169.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 197
- Removing an internal drive? — Go to “Removing Internal Drives” on page 241.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- Installing an external option? — Go to “Connecting External Options” on page 270.

Installing Memory-Module Kits

Adding memory to your server is an easy way to make programs run faster. You can increase the amount of memory in your server by installing options called *memory-module kits*. Your server uses 72-pin, single-inline, Error Correcting Code on SIMM (EOS) memory modules. The EOS feature increases system reliability by detecting single-bit memory errors and correcting them in real time, without reducing system performance.

You install memory-module kits in connectors inside the server. Memory-module kits *must* be installed in pairs of the same size and speed. All models have eight memory connectors. You can install up to 256 MB of EOS memory in your server. The memory-module kit sizes available for your server are 16 MB and 32 MB. The correct speed for these kits is 70 ns.

Notes:

1. It is possible to install SIMMs in combinations where the total amount of installed memory does not appear on the memory configuration screen. In the unlikely event that this occurs, select the next lower setting on the memory configuration menu, and all of the installed memory will be supported on your server.
2. The PC Server 520 does not support memory expansion adapters.
3. Parity memory-module kits *must not* be used in combination with EOS memory-module kits.

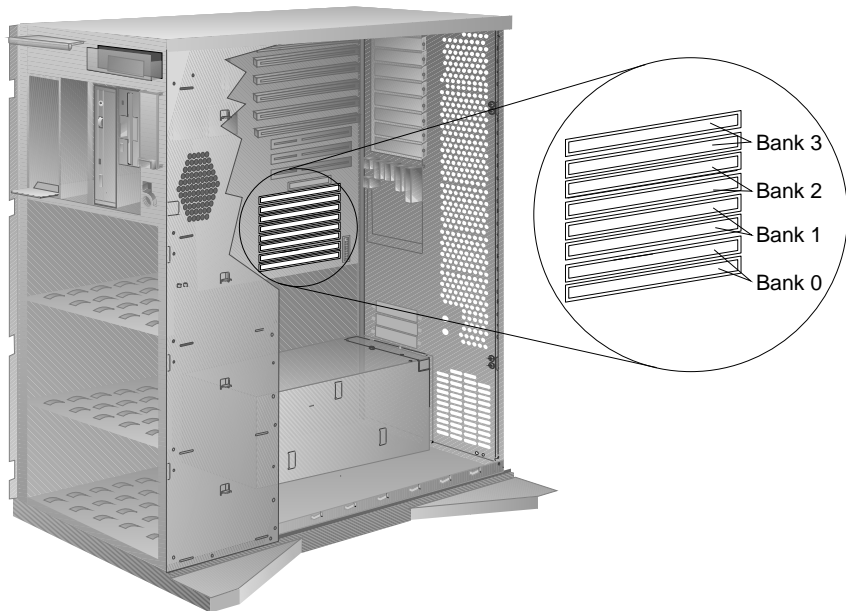
Before you begin:

Be sure you have:

- Read “Electrical Safety” on page 161 and “Handling Static-Sensitive Devices” on page 162.
- Removed the server side cover (see “Preparing to Install Options” on page 163).

Installing Memory-Module Kits

The following illustration shows the memory-module connectors for all models.



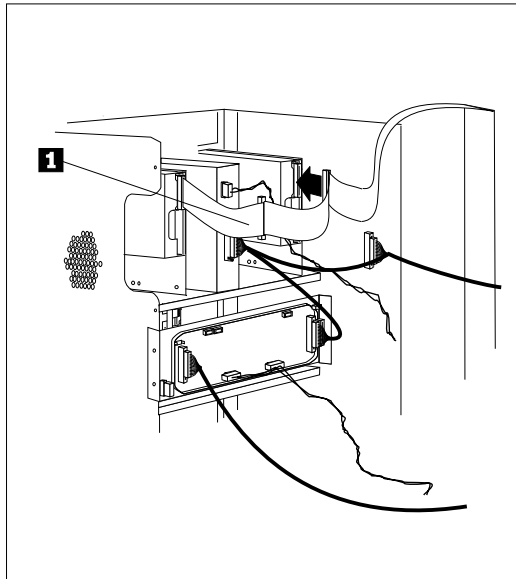
1. Locate the memory connectors on the system board.

When you are instructed to install the kits (in step 4 on page 172), install them in pairs of adjacent memory connectors, with no vacant memory connectors in between. Each pair of connectors is a *bank*. Your server has four banks: 0, 1, 2, and 3. Your server is shipped with two memory-module kits installed in bank 0, located near the bottom of the system board. If additional memory is required, install two 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 175, and install two other kits as described in this section.

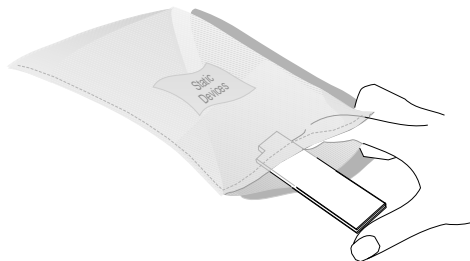
As a minimum, your server requires memory modules of the same size in bank 0. When you install memory-module kits in any given bank, all of the kits in that bank must be the same size.

Installing Memory-Module Kits

2. If necessary, disconnect the diskette cable **1** from the connector by pressing the plastic levers on each side of the cable.



3. Touch the static-protective package to any unpainted metal surface on the server. Then remove the memory-module kit from the package.

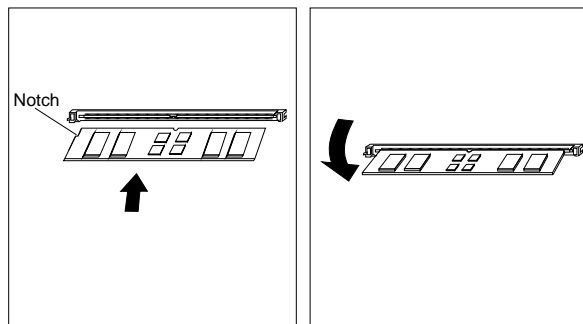


Installing Memory-Module Kits

4. Install the kit:

Note: You must install the memory-module kits in pairs of the same size.

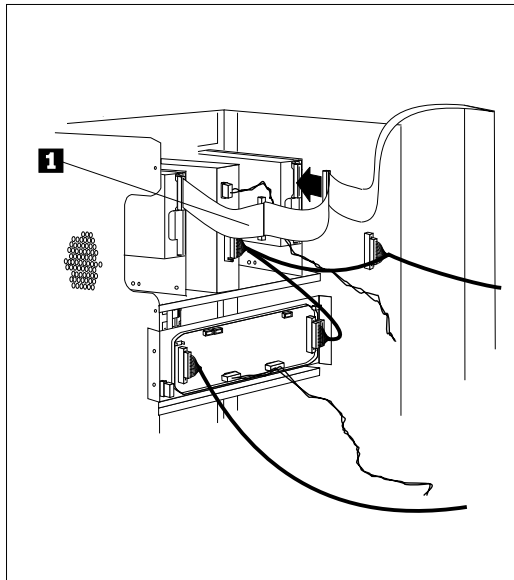
- a. Turn the memory-module kit so that the notched end is on the left.



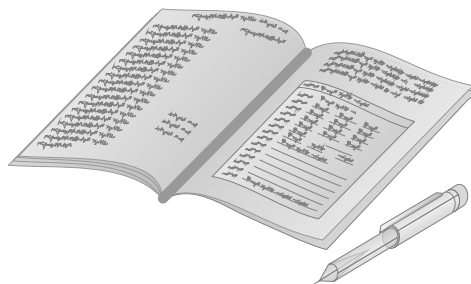
- b. Insert the kit into the connector, downward at a 45-degree angle.
- c. Pivot the kit toward the bottom of the server, until it snaps into place.
- d. Repeat these steps for each kit that you install.

Installing Memory-Module Kits

5. If you removed it, reconnect the diskette cable **1** to the connector.



6. Go to “Configuring Memory” on page 293 to reconfigure your PC Server 520. Then return here.
7. Go to Table 3 on page 379 to record the sizes of the memory-module kits and the connectors into which they are installed. Then return here and continue with “What to do next?” on page 174 to determine your next step.



Installing Memory-Module Kits

What to do next?

- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 197.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 241.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

Removing Memory-Module Kits

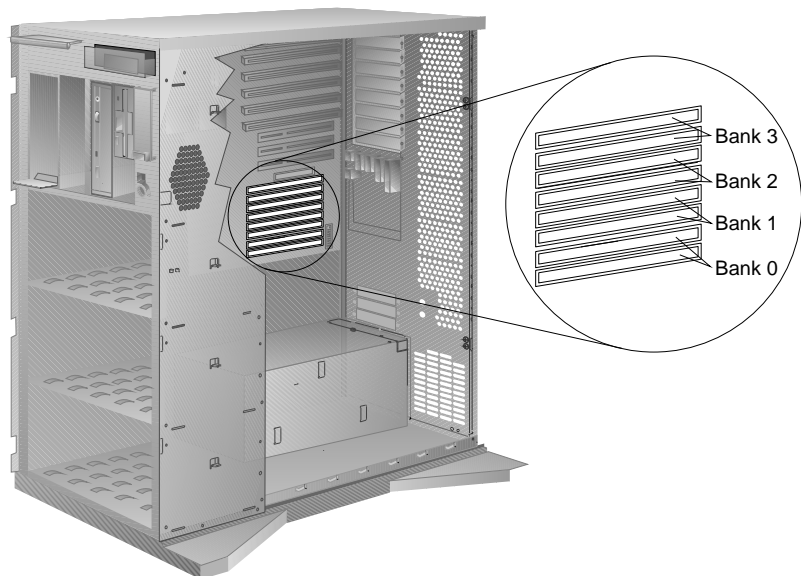
Before you begin:

Be sure you have:

- Read “Electrical Safety” on page 161 and “Handling Static-Sensitive Devices” on page 162.
- Removed the server side cover (see “Preparing to Install Options” on page 163).

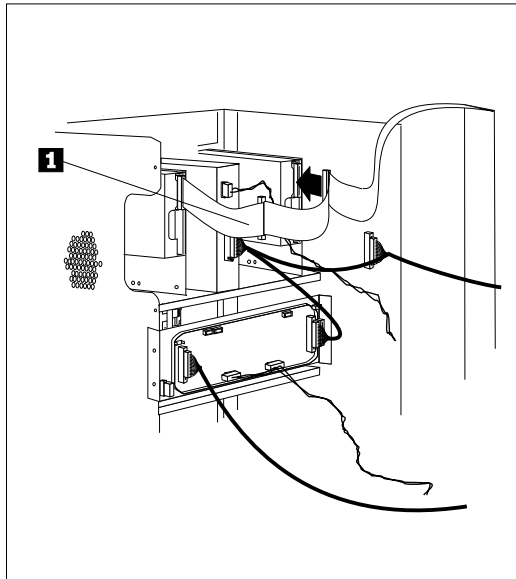
1. Locate the memory-module kit connectors and determine which memory-module kits you want to remove.

Note: You must remove the memory-module kits in pairs, starting with the kits that are installed in the two bottom connectors (bank 0).

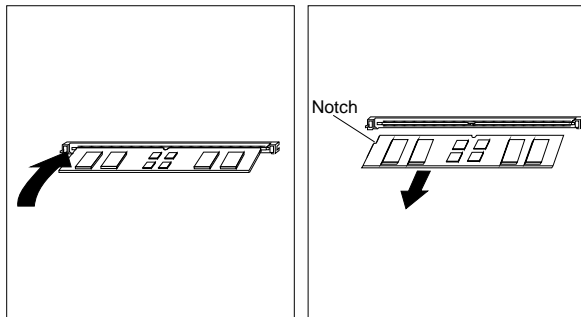


Removing Memory-Module Kits

2. If necessary, disconnect the diskette cable **1** from the connector by pressing the plastic levers on each side of the cable.

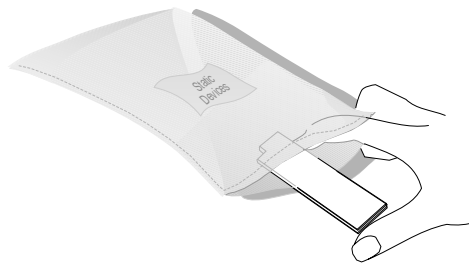


3. Remove the memory-module kit:
 - a. Carefully press the two retainers on the connector outward.
 - b. Pivot the kit forward and lift it out.



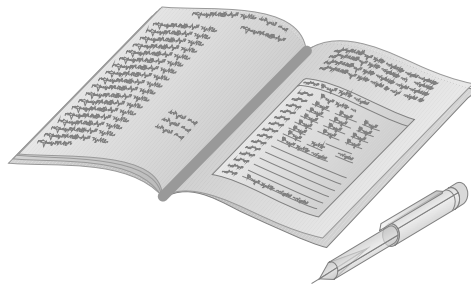
Removing Memory-Module Kits

4. Store any memory-module kits that you are no longer using in a static-protective package. Make a note of the kit size and speed for future reference.



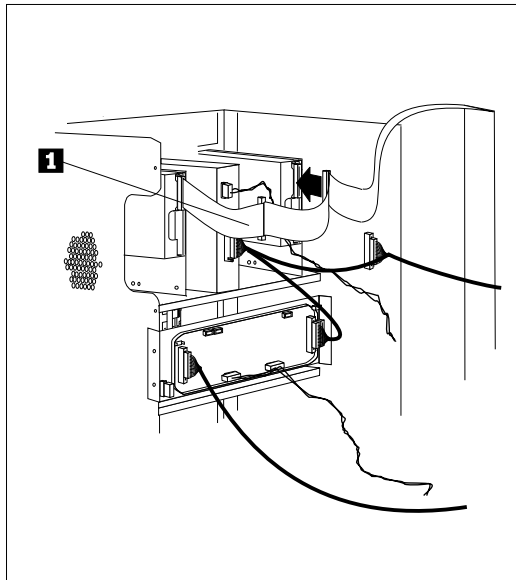
5. If you are installing memory-module kits in the empty connectors, go to “Installing Memory-Module Kits” on page 169.

If you are not installing memory-module kits in the empty connectors, go to Table 3 on page 379 to update the memory information; then, return here.



Removing Memory-Module Kits

6. If you removed it, reconnect the diskette cable **1** to the connector.



7. Reinstall the cover (see “Completing the Installation” on page 266) and run the EISA Configuration program (see “Using the EISA Configuration Diskette” on page 295). The next time that you start the server, a message appears to indicate that memory has been added or removed.

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 169.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 197.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 241.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

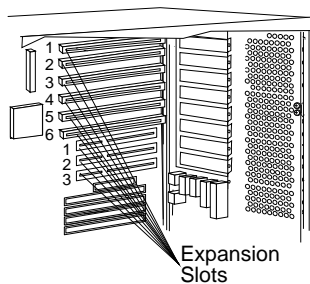
Installing Adapters

Before you begin:

Be sure you have:

- Read “Electrical Safety” on page 161 and “Handling Static-Sensitive Devices” on page 162.
- Read the instructions that come with the adapter.
- Removed the server side cover (see “Preparing to Install Options” on page 163).

Your server has nine connectors called *expansion slots*. To locate the expansion slot numbers for your server, refer to the following illustration. The video adapter and the SCSI-2 adapter are installed in two of the slots.



The remaining slots are available for future expansion and growth. For example, you can add adapters to provide communication, specialized graphics, and sound. This extends the capabilities and power of your server. Many adapters provide bus-master capabilities, which enable the adapters to perform operations without interrupting the server's microprocessor.

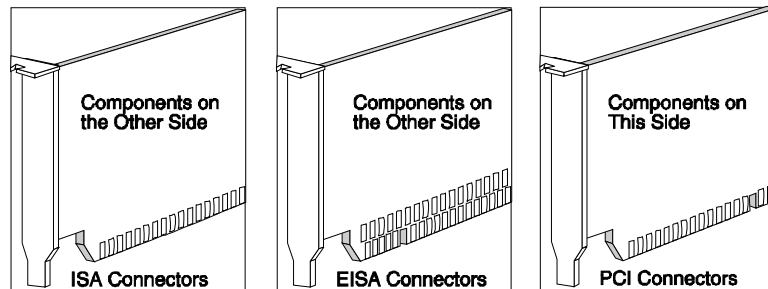
Note: If you have four bus-master adapters, install them in slots 1, 2, 3, and 4. Slots 4, 5, and 6 share requests for system resources.

These expansion slots have Plug and Play capabilities. This feature requires a configuration file (.CFG) for each installed ISA adapter. See "Configuration Files" on page 289 for information about creating ISA Configuration files. When operating systems that support this feature become available, your server will automatically configure itself when you install ISA and PCI Plug and Play devices.

Considerations

Three types of adapters are available for your PC Server 520:

- ISA
- EISA
- PCI



Installing Adapters

- Review the documentation that comes with the adapter and follow those instructions in addition to the instructions given in this chapter. If you need to change the switch or jumper settings on your adapter, follow the instructions that come with the adapter documentation.
- Your server supports one monitor adapter. Your server comes with an SVGA monitor adapter preinstalled in EISA expansion slot 2.
- XGA adapters are not supported.
- You can install EISA or ISA adapters in EISA slots 1–6 only.
- You can install PCI adapters in PCI slots only.
- The bottom EISA slot and the top PCI slot are shared slots. That is, if you install an EISA or ISA adapter in the bottom EISA slot, you cannot install a PCI adapter in the top PCI slot, and vice versa. This means that only eight expansion slots can be occupied at any given time, although the server has nine expansion slots. Thus, your server has eight expansion slot covers, as shown in the following illustration.



- Your server comes with a half-length, SCSI-2 adapter preinstalled in one of the expansion slots.
 - If your server is a disk-array model, this adapter is an IBM PC ServeRAID Adapter, and it is preinstalled in the bottom PCI slot (PCI slot 3).
 - If your server is a non-disk-array model, this adapter is an IBM PC Server SCSI-2 Fast/Wide PCI Adapter, and it is preinstalled in a PCI slot.
 - If you are installing an additional PC ServeRAID Adapter, check the README file on your IBM PC ServeRAID Configuration Diskette for information regarding what you need to do.
- You can install full-length EISA or ISA adapters in EISA expansion slots 1–3.
- You can install full-length PCI adapters in PCI expansion slots 2 and 3.
- You can install half-length EISA and PCI adapters in the remaining expansion slots.
- Your PC Server 520 uses a rotational interrupt technique to configure PCI adapters. This technique enables you to install a variety of PCI adapters that currently do not support sharing of PCI interrupts.

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 that you are installing physically touches the microprocessor or another component, select a different expansion slot that can adequately accommodate the adapter.

Installing Adapters

Installation Sequence

To ensure that your server configures correctly, you must observe the following protocol if you install different types of adapters at the same time:

1. Install the ISA adapters.

Note: Your PC Server 520 supports a new Plug and Play feature. This feature requires a configuration file (.CFG) for each installed ISA adapter. See “Configuration Files” on page 289.

2. Reinstall the cover (see “Completing the Installation” on page 266) and reconnect the cables (see step 4 on page 268).
3. Configure the ISA adapters (see “Configuring EISA, ISA, and PCI Adapters” on page 288).

Note: ISA interrupts cannot be shared.

4. Disconnect the cables (see step 5 on page 166) and remove the cover (see “Preparing to Install Options” on page 163).
5. Install the EISA adapters.
6. Reinstall the cover (see “Completing the Installation” on page 266) and reconnect the cables (see step 4 on page 268).
7. Configure the EISA adapters by running the EISA Configuration program (see “Configuring EISA, ISA, and PCI Adapters” on page 288 and “Using the EISA Configuration Diskette” on page 295).
8. Disconnect the cables (see step 5 on page 166) and remove the cover (see “Preparing to Install Options” on page 163).
9. Install the PCI adapters.
10. Reinstall the cover (see “Completing the Installation” on page 266) and reconnect the cables (see step 4 on page 268).

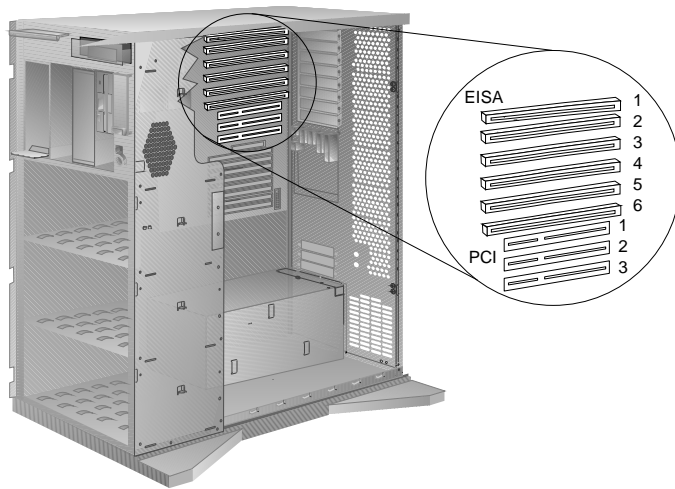
Note: During POST, your server automatically configures all currently installed ISA Plug and Play and PCI devices.

If you do not install and configure the adapters in this order, you might receive system configuration errors or encounter configuration conflicts. If a resource conflict occurs, resolve it by following the instructions in “Configuration Conflicts” on page 299.

Installation Procedure

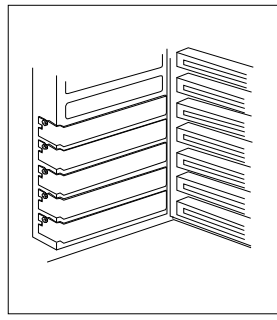
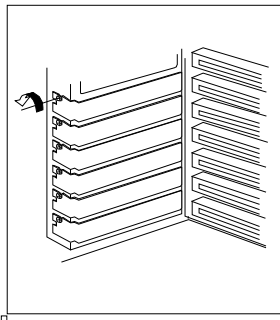
1. Determine which expansion slot you will use for the adapter.
The top six slots are for EISA or ISA adapters, and the bottom three slots are for PCI adapters. The bottom EISA slot and the top PCI slot together represent a shared slot. If you use one of these slots, you cannot use the other.

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 181, you can use any empty EISA or PCI slot.



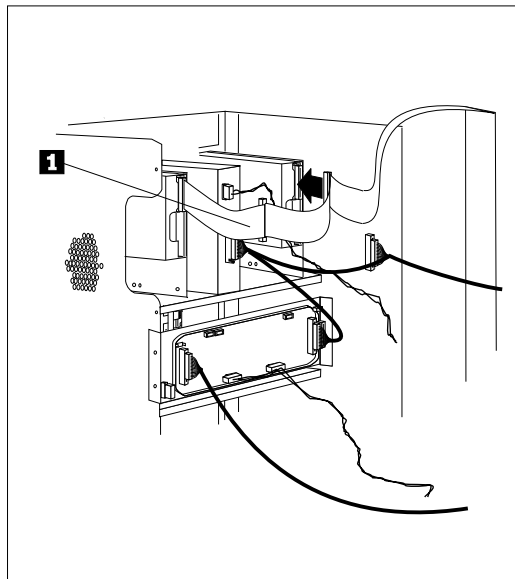
Installing Adapters

2. Remove the expansion-slot cover:
 - a. Loosen and remove the screw on the top of the expansion-slot cover.
 - b. Slide the expansion-slot cover out of the server.
 - c. Store it in a safe place for future use.



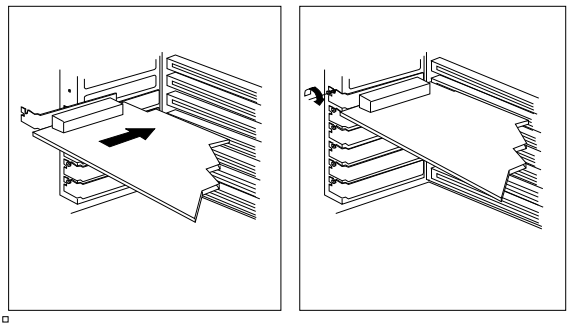
Installing Adapters

3. If you are installing a full-length adapter or a half-length SCSI-2 adapter, disconnect the diskette cable **1** from the connector by pressing the plastic levers on each side of the cable.

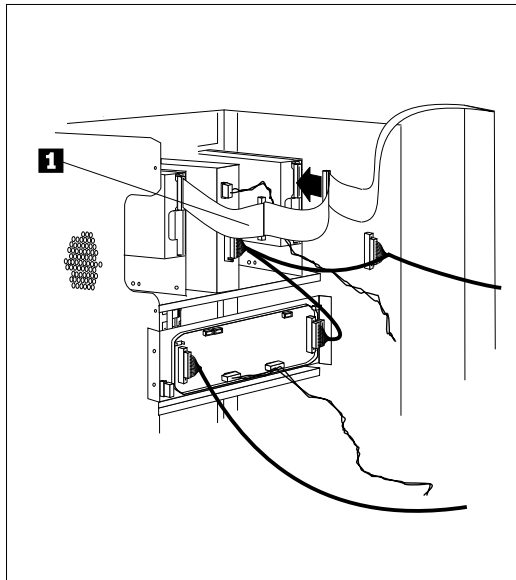


Installing Adapters

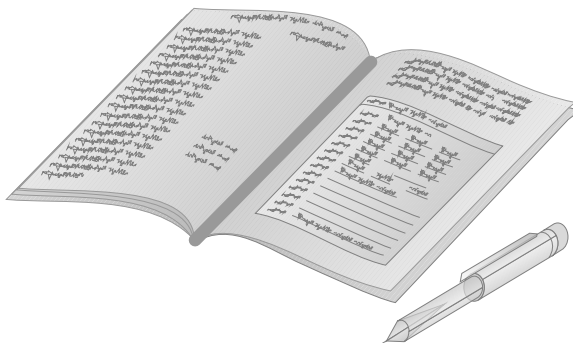
4. Install the adapter:
 - a. Carefully grasp the adapter and align it with the expansion slot.
 - b. Press the adapter *firmly* into the expansion slot.
 - c. Tighten the expansion-slot screw on the top of the adapter bracket.



5. If you removed it, reconnect the diskette cable **1** to the connector.



6. Go to Table 4 on page 380 or Table 5 on page 381 and write the adapter name next to the slot into which it is installed; then, return here.



Installing Adapters

Note: If you installed an ISA or EISA adapter, you must run the EISA Configuration program. See “Using the EISA Configuration Diskette” on page 295 for instructions on running this program.

Verifying Compatibility between Network Adapters and Device Drivers

If you are having trouble with the installation or operation of a network adapter using OS/2 for SMP 2.11 and OS/2 LAN Server 4.0, ensure that the network-adapter device driver supports dual processors.

Table 1 lists the network adapters and device drivers that support dual processors and have been verified to work with the IBM PC Server 520, OS/2 for SMP 2.11, and OS/2 LAN Server 4.0.

Network Adapter	Device Driver	LAN Server 4.0 MPTS
3Com TokenLink III EISA	IBMTOKMP.OS2	IBM SMP Token-Ring Network Adapter
3Com EtherLink II 3C503-16 ISA	ELNKII.OS2	3Com 3C503 EtherLink II Adapter
3Com EtherLink III EISA	ELNK3.OS2	3Com EtherLink III Family OS/2
3Com EtherLink III ISA	ELNK3.OS2	3Com EtherLink III Family OS/2
IBM Token-Ring Network 16/4 ISA	IBMTOKMP.OS2	IBM SMP Token-Ring Network Adapter
IBM Token-Ring 16/4 ISA-16	IBMTOKMP.OS2	IBM SMP Token-Ring Network Adapter
IBM LAN Adapter for Ethernet ISA	IBMENI.OS2	IBM LAN Adapter for Ethernet
Intel TokenExpress 16S ISA	OLITOK16.OS2	Use the network driver interface specification (NDIS) driver on the adapter diskette
Intel EtherExpress 16C ISA	EXP16.OS2	Intel EtherExpress 16 Family
SMC EtherCard Elite 16 Ultra ISA	SMC8000.OS2	Use the NDIS driver on the adapter diskette

Table 1. Network Adapters and Device Drivers for PC Server 520

If OS/2 LAN Server provides a device driver for your network adapter, use Table 1 on page 190 to determine the appropriate device driver to select during the installation process. If OS/2 LAN Server does not provide the device driver, use the NDIS device driver on the diskettes that come with the adapter. (Check the adapter documentation for installation instructions.)

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 169.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 197.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 241.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

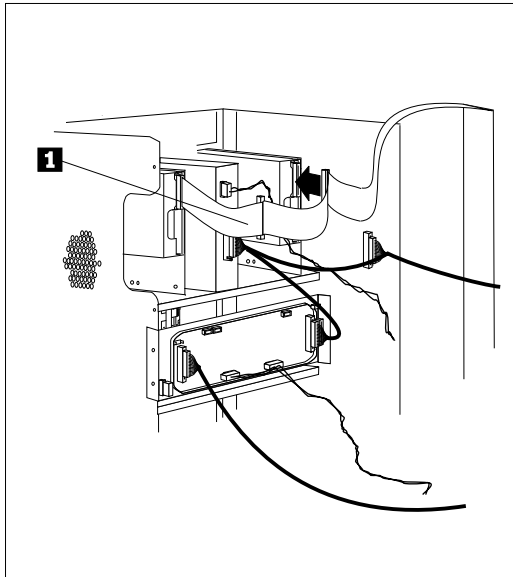
Removing Adapters

Removing Adapters

1. Remove the adapter:

Note: If you are removing a PCI adapter, the screw is on the inside back of the server.

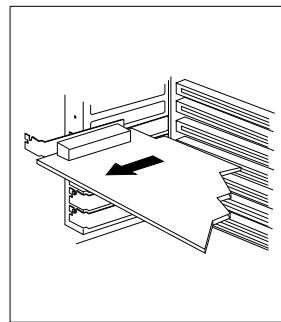
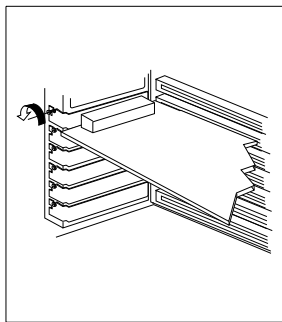
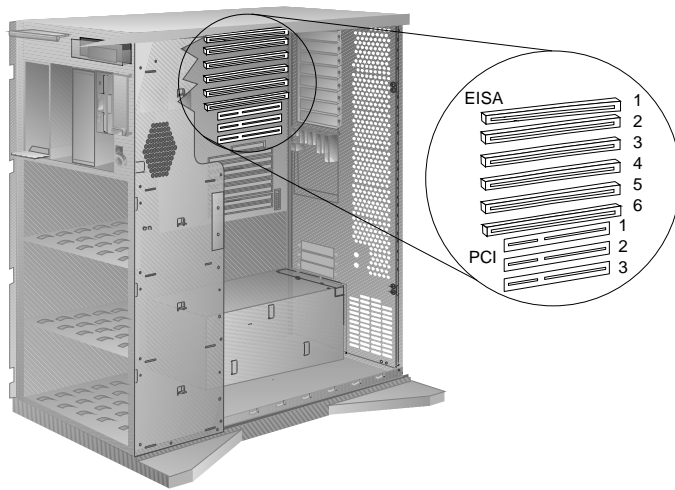
- a. If you are removing a full-length adapter or a half-length SCSI-2 adapter, disconnect the diskette cable **1** from the connector by pressing the plastic levers on each side of the cable.



- b. Note the slot number of the adapter that you are removing.
- c. Loosen and remove the screw on top of the adapter bracket.
- d. If there are any internal cables attached to the adapter, disconnect them.

Removing Adapters

- e. Deflect the card guide snap to release the front end of the adapter.
- f. Carefully pull the adapter out of the slot.

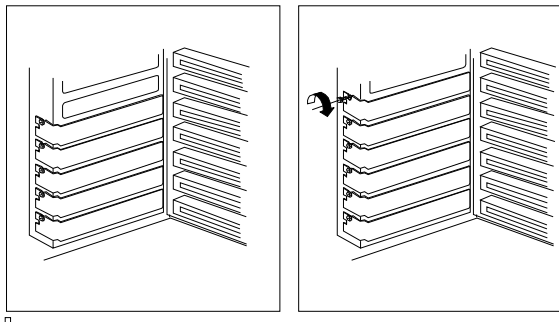


Removing Adapters

2. If you are installing another adapter in this expansion slot, see “Installing Adapters” on page 180 for instructions.

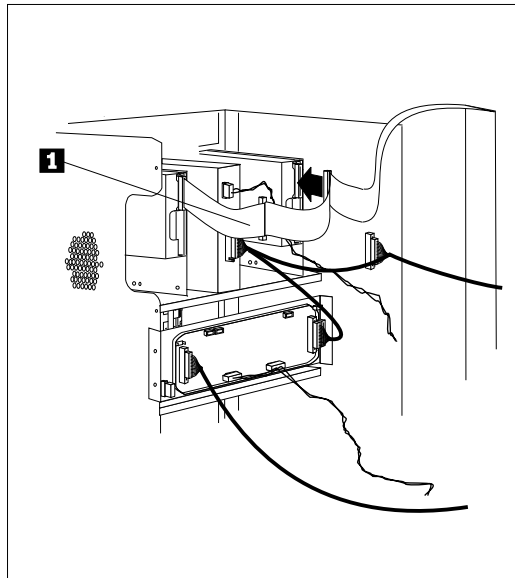
If you are not installing another adapter in this expansion slot, replace the expansion-slot cover:

- a. Slide the cover over the open expansion slot.
- b. Tighten the expansion-slot screw on the top of the expansion-slot cover.

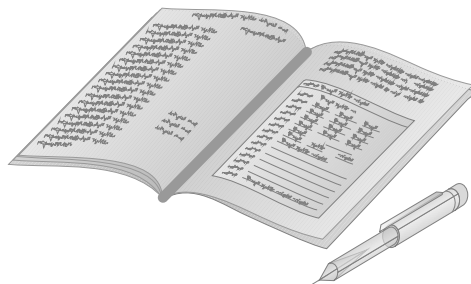


Removing Adapters

3. If you removed it, reconnect the diskette cable **1** to the connector.



4. Go to Table 4 on page 380 or Table 5 on page 381 and delete the name of the adapter that you removed; then, return here.



Note: If you removed an ISA or EISA adapter, you must run the EISA Configuration program. See “Using the EISA

Removing Adapters

Configuration Diskette” on page 295 for instructions on running this program.

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 169.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 197
- Removing an internal drive? — Go to “Removing Internal Drives” on page 241.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

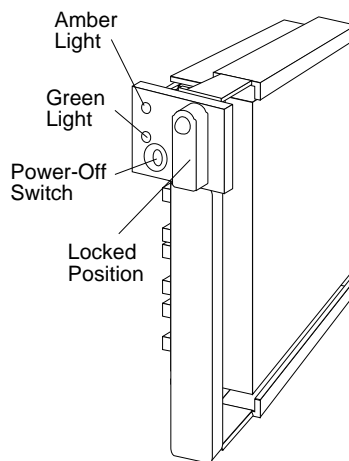
Installing Internal Drives

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

- Diskette
- Hard disk
- Rewritable optical disc
- Tape

Your server has 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 also known as *hot-swap* drives.

The hot-swap drive tray III for your server 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.



Installing Internal Drives

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.

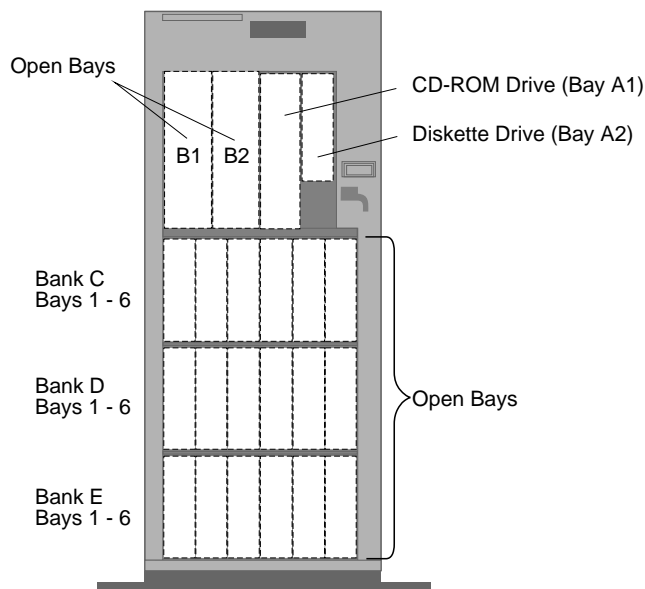
Each hot-swap drive that you plan to install must have a hot-swap drive tray III attached. Trays are available for two drive types: narrow and wide. The narrow tray supports 8-bit drives; the wide tray supports 16-bit drives. Select the appropriate drive trays for your hot-swap drives. If necessary, contact your IBM reseller or IBM marketing representative to purchase the types of drive trays that you need.

Internal 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 hard disk drives in banks C, D, and E only. Banks C, D, and E each contain 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.

Installing Internal Drives

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 SCSI connector on the ServerRAID adapter. This allows you to support six half-high drives or 12 slim-high drives on a single SCSI-2 bus.

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.



A *cover plate* (sometimes called a *bezel* or *face plate*) covers the front of bay B2 only. If you install a drive that uses removable media, such as diskettes, optical discs, or tapes, you might have to change this plate.

Installing Internal Drives

Considerations

- 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, removable-media device and one 3.5-inch, half-high or one-inch high, removable-media device, or
 - Two 3.5-inch or two 5.25-inch, slim-high or half-high, removable-media devices

- You cannot install hot-swap drives in bay B.
- PC Server 520 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 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 have another power supply installed by your IBM service technician. (Instructions for removing the fan assembly and installing a backplane are given in “Installing a Drive in Bank D” on page 221.)

You might need to install an additional SCSI-2 adapter. (Instructions are given in “Installing Adapters” on page 180.)

- Each backplane has six connectors, to support up to six hard disk drives.
- An address jumper is located on the rear of each backplane. You must set the jumpers on these backplanes as described in “Setting the Backplane Address Jumper (J2)” on page 251.

- A SCSI ID jumper (J12) is located on the rear of each backplane. When you daisy-chain two backplanes in a disk-array model, you must set the jumpers on these backplanes as described in “Setting Backplane SCSI ID Jumpers (J12)” on page 252.
- If the drive you are installing in a hot-swap tray has jumpers (for example, ID jumper), remove the jumper pin block from the drive.

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 adapter.

Note: Any information about SCSI drives also applies to other SCSI devices, such as scanners and printers.

The server comes with a SCSI-2 adapter. The number of preinstalled SCSI hard disk drives varies according to model. If you install additional SCSI devices, each SCSI device that is connected to the adapter needs a unique identification (ID) so that the SCSI-2 adapter can identify the devices and ensure that different devices do not attempt to transfer data at the same time. If you need to set IDs for SCSI devices, refer to the instructions that come with those devices.

Your server automatically sets SCSI IDs for hot-swap drives. These IDs are determined by the drive locations in the bays. The SCSI ID for the preinstalled CD-ROM drive in bay A is set to 6, and the SCSI ID for the SCSI-2 adapter is set to 7. The processing sequence for SCSI devices is set according to their IDs.

The SCSI-2 adapter has both internal and external ports. Depending on your server configuration, you can attach additional SCSI drives by *chaining* them (connecting them together with cables). Depending on the type of SCSI-2 adapter installed in your server, the adapter supports a total of 15 or 45 SCSI drives (internal and external). Refer to the *User's Reference* for more information.

Installing Internal Drives

To configure the SCSI devices that you install in a non-disk-array model, use the SCSISelect utility program. See “Using the SCSISelect Utility Program” on page 303. For disk-array models, use the ServeRAID configuration program described in Chapter 3, “Configuring the Disk Array” on page 77.

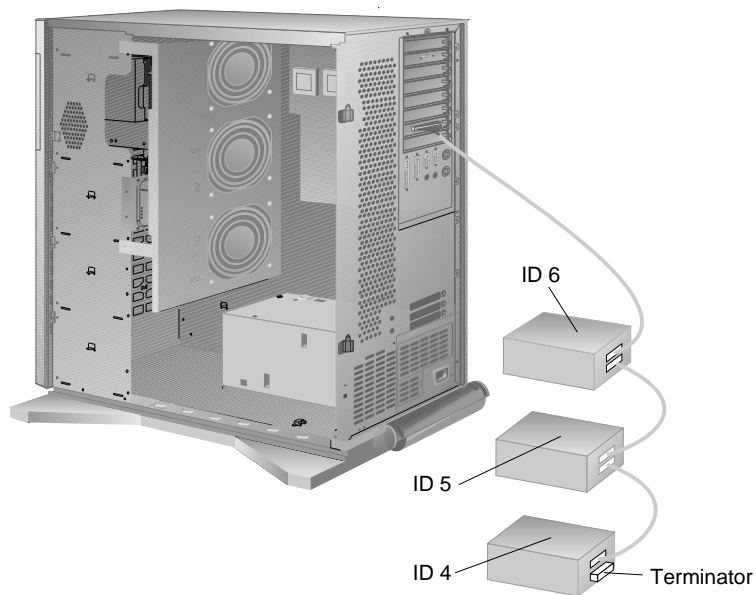
There are two types of SCSI devices: wide and narrow. You must use 16-bit cables to attach wide devices. Use 8-bit cables to attach narrow devices. Wide device IDs can be set to any number from 0 to 15. Narrow devices can have their IDs set only from 0 to 7. The preinstalled CD-ROM drive in bay A is a narrow device.

Two devices on the same bus (internal or external) cannot have the same ID; however, your server can use the same ID for an internal device and an external device. The primary partitions on SCSI drives that are connected to the internal bus on a given adapter are assigned drive letters before the external drives that are connected to the same adapter are assigned drive letters. If multiple adapters are installed in your server, the drives that are connected to the adapter in the lowest number expansion slot are assigned drive letters first.

Installing Internal Drives

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 might need to terminate the last device in the chain.

Note: The backplanes automatically set termination for all the drives in the hot-swap bays.



The SCSI-2 adapter automatically adjusts for termination. (Refer to the instructions that come with the SCSI device for more information about terminators. Refer to the *User's Reference* for additional information about your server SCSI subsystem.)

Note: Be sure to read the README file on the SCSI-2 Option Diskette for any last-minute updates.

Installing Internal Drives

Preinstallation Steps (All Bays)

Before you install drives in your server, verify that you have all of the cables, drive trays, and any other equipment specified in the documentation that comes with the 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-drive trays	No	Yes	Yes	Yes
Purchase and install backplane before installing first hot-swap drive	Not applicable	No ¹	Yes	Yes
Purchase second 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
<i>Notes:</i> <ol style="list-style-type: none">1. Bank C comes with a preinstalled hot-swap backplane.2. Another power supply must be installed by an IBM service technician (if not previously installed).3. Bank C comes with a SCSI-2 cable that connects the SCSI-2 adapter to the SCSI-2 input connector on the backplane.				

Before you begin:

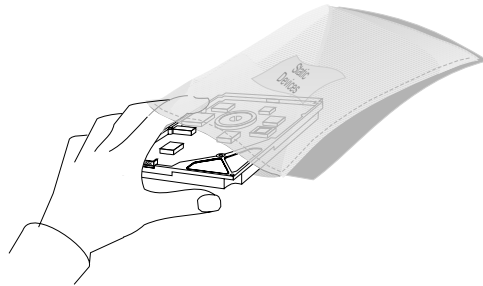
Be sure you have:

- Read “Electrical Safety” on page 161 and “Handling Static-Sensitive Devices” on page 162.
- Read the documentation that comes with the internal drive.
- Opened the front cover. If you are installing or removing backplanes, cables, the fan assembly, and adapters, also remove the server side cover (see “Preparing to Install Options” on page 163).

Installing Internal Drives

Note: All internal drives in this server are mounted vertically.

1. Choose the bay in which you want to install the drive.
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 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:

- Automatic SCSI ID setting applies only to hot-swap hard disk drives. Therefore, if you install a non-hot-swap SCSI drive (in bay B only), you must set a SCSI ID for that drive.
- Remove the terminators from the drives that you plan to install in bay B. The cable that connects to bay B already has a terminator.

Installing Internal Drives

What to do next?

- To install a drive in bay B, go to “Installing a Drive in Bay B” on page 207.
- To install a drive in bank C, go to “Installing a Drive in Bank C” on page 216.
- To install a drive in bank D, go to “Installing a Drive in Bank D” on page 221.
- To install a drive in bank E, go to “Installing a Drive in Bank E” on page 233.

Installing a Drive in Bay B

Before you begin:

Be sure you have:

- Removed the side cover (see “Preparing to Install Options” on page 163).
- Prepared the drive for installation (see “Preinstallation Steps (All Bays)” on page 204).

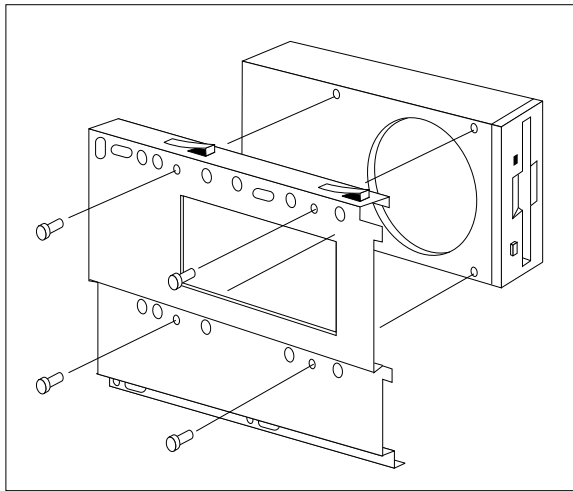
The SCSI cabling that is supplied with your server supports a maximum of seven internal SCSI drives (including those in bay B and bank C, and the CD-ROM drive in bay A).

If you are installing a SCSI drive in bay B, and bank C contains six drives, you must 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 245. If you remove a drive from bank C, remove one of the drives that has a low-number ID, starting with the drive in bank C, bay 1 (SCSI ID 0).

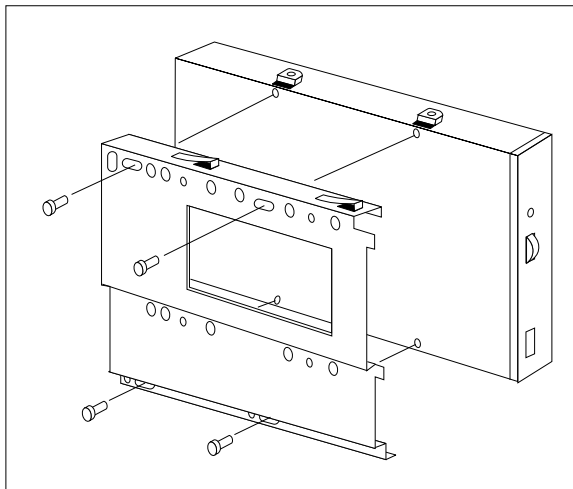
You can connect the drives in bay B to bank C or bank D. However, when you install slow devices such as tape drives in bay B, performance of the drives in bank C or D is affected. You might choose to connect these devices to a separate SCSI-2 adapter.

Installing Internal Drives

1. Each drive that you install in bay B must have a tray like that shown below. An extra tray is shipped in bay B; attach it to your drive. If your drive comes with a different tray, remove it and install the IBM tray.



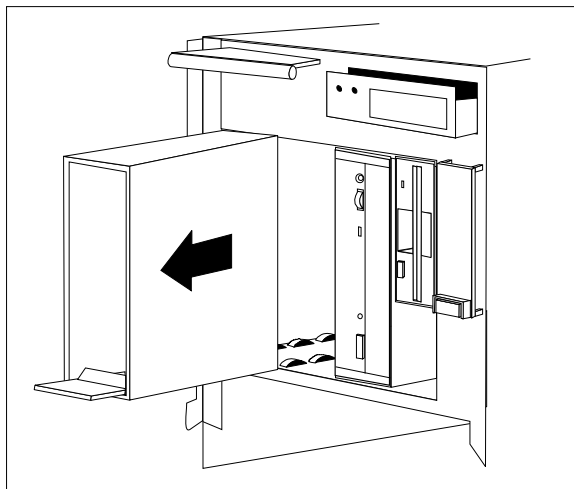
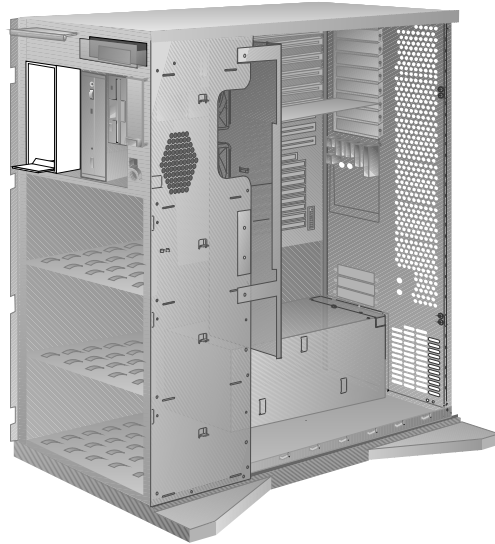
3.5-inch drive



5.25-inch drive

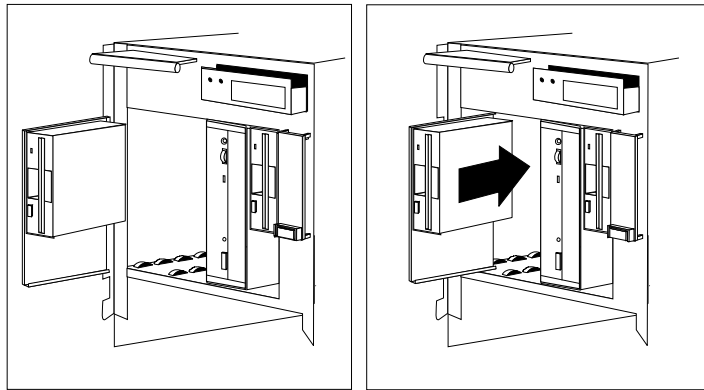
Installing Internal Drives

2. If you are installing a drive in bay B1, remove the CD storage compartment.



Installing Internal Drives

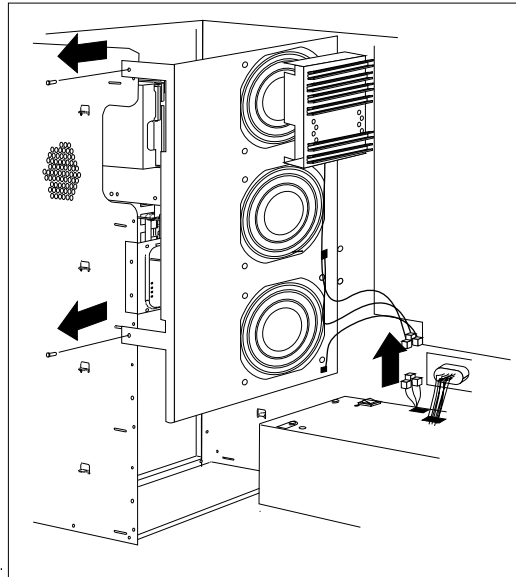
3. Install the drive:
 - a. Position the drive vertically, with the connectors facing the rear of the server.
 - b. Align the drive with the guides on the bottom of the bay and slide it to the rear of the bay until it stops.



Installing Internal Drives

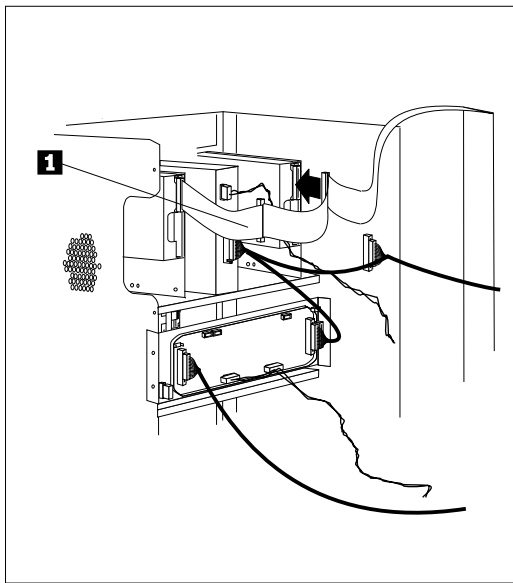
4. Slide the diskette drive and the CD-ROM drive forward. If you do not have enough room to connect the cables to the new drive, remove the fan assembly:
 - a. Disconnect the fan assembly cable from the fan bracket.

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 sliding it up and pulling it 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.

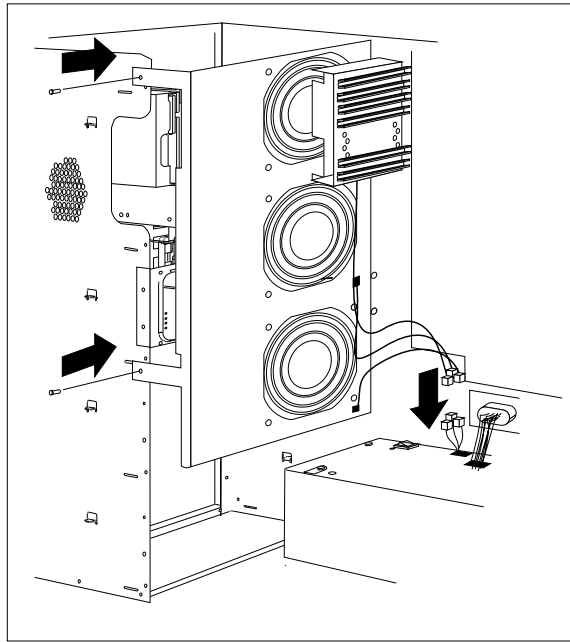


Note: Empty cable connectors have been omitted for clarity.

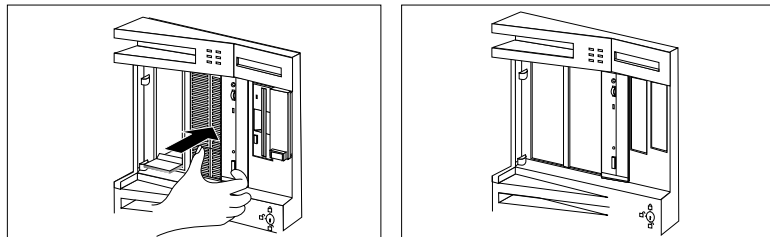
- b. If you are installing a SCSI drive, locate the SCSI drive connector. (There is only one SCSI connector available.)
- c. Attach the power cable connector to the 4-pin connector on the drive.

6. If you removed the fan assembly, reinstall it with the two screws that you removed in step 4 on page 211.

Reconnect the fan assembly cable.



7. If you installed a removable-media drive in bay B2, remove the cover plate from the front cover by pushing it, gently, out of the front cover.



Installing Internal Drives

8. Go to Table 6 on page 384 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 169.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive in bank C? — Go to “Installing a Drive in Bank C” on page 216.
- Installing an internal drive in bank D? — Go to “Installing a Drive in Bank D” on page 221.
- Installing an internal drive in bank E? — Go to “Installing a Drive in Bank E” on page 233.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 241.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

Installing a Drive in Bank C

Before you begin:

Be sure you have:

- Purchased a hot-swap-drive tray for each hot-swap drive that you plan to install.
- Prepared the drive for installation (see “Preinstallation Steps (All Bays)” on page 204).
- Opened the front cover (see “Preparing to Install Options” on page 163)

If you are also installing or removing backplanes, cables, the fan assembly, and adapters, be sure that you have:

- Removed the side cover (see “Preparing to Install Options” on page 163)
- Ensured that the backplane address jumper J2 is set to “C.”

Notes:

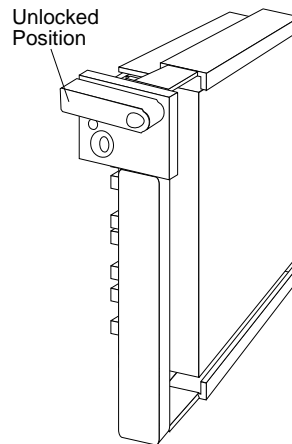
- Banks C, D, and E support hot-swap drives only.
- If your server is a disk-array model, you must reconfigure your disk arrays after you install hard disk drives. See “Starting the ServeRAID Configuration Program” on page 86 for details.
- You do not have to turn off the server to install additional hot-swap 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 no SCSI drive is in bay B, you can have up to six drives in bank C.

Installing Internal Drives

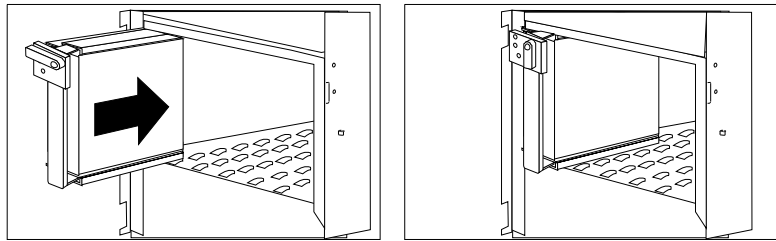
1. Each drive that you plan to install in bank C and connect to a hot-swap backplane III must have a hot-swap drive tray III attached. If your drive has a different tray attached, remove it and attach the appropriate drive tray to your drive. Follow the instructions in the kit that contains the hot-swap drive tray III.
2. Install the hard disk drive:
 - a. Move the tray knob to the open position.



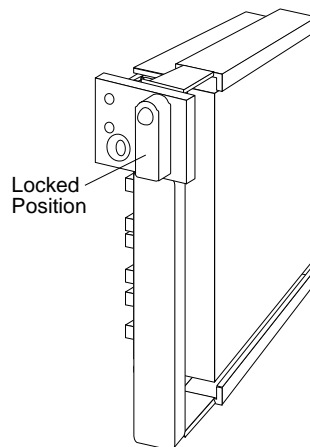
- b. Position the drive tray assembly vertically, with the connector facing the rear of the server.

Installing Internal Drives

- 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.)

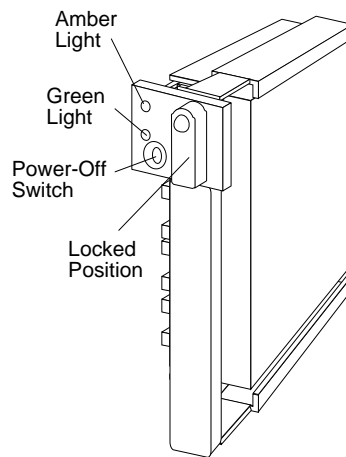


- d. Slide the tray to the rear of the bay until it stops. Be sure it is connected properly to the backplane.
- e. Move the tray knob to the locked position.

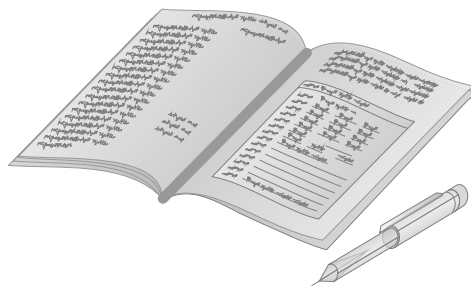


Installing Internal Drives

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 6 on page 384 to record the drive location and the SCSI ID that is assigned to the drive (see “SCSI Drives” on page 201 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 you install hard disk drives. See “Starting the ServeRAID Configuration Program” on page 86 for details.

Installing Internal Drives

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 169.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive in bay B? — Go to “Installing a Drive in Bay B” on page 207.
- Installing an internal drive in bank D? — Go to “Installing a Drive in Bank D” on page 221.
- Installing an internal drive in bank E? — Go to “Installing a Drive in Bank E” on page 233.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 241.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

Installing a Drive in Bank D

Before you begin:

Be sure you have:

- Purchased a hot-swap-drive tray for each hot-swap drive that you plan to install and prepared the drive for installation (see “Preinstallation Steps (All Bays)” on page 204).
- Opened the front cover (see “Preparing to Install Options” on page 163). 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 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 5 on page 224. (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.

Installing Internal Drives

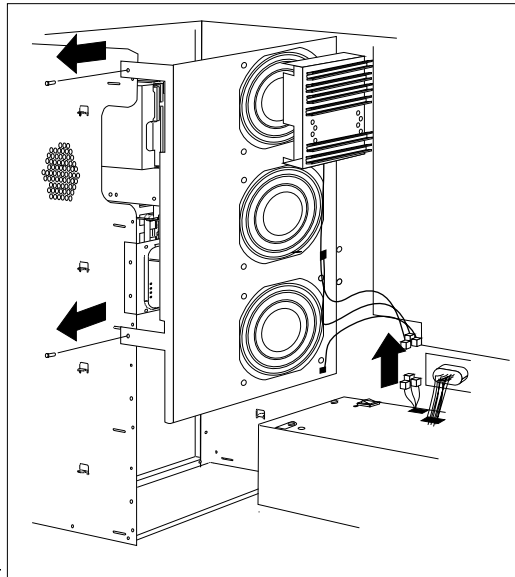
Notes:

- Banks C, D, and E support hot-swap drives only.
- For non-disk-array models, you might need to install an additional SCSI-2 adapter. To order this adapter, 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 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 252.)
- You can install up to three half-high drives or six slim-high drives in each of banks C, D, and E.
- 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-swap 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.

Installing Internal Drives

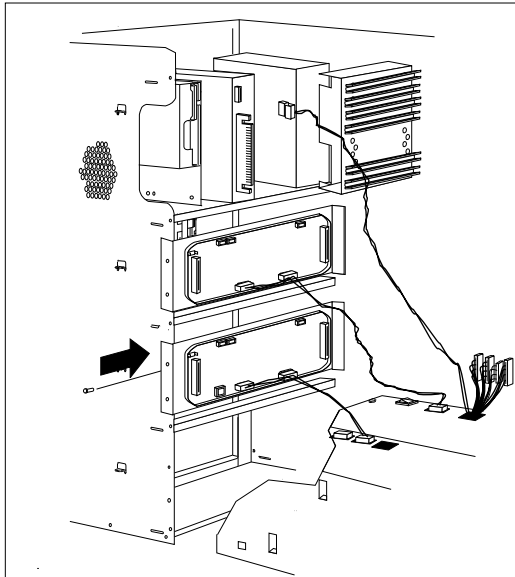
If the fan assembly is installed, you must remove it before you can install the backplane in the rear of bank D.

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 sliding it up and pulling it out.



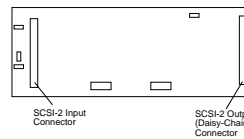
Installing Internal Drives

4. 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 251).
5. Install the backplane at the rear of bank D:
 - a. 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.
 - b. Secure the backplane with one screw, as shown.



- c. Install a power cable that connects the backplane to the additional power supply.

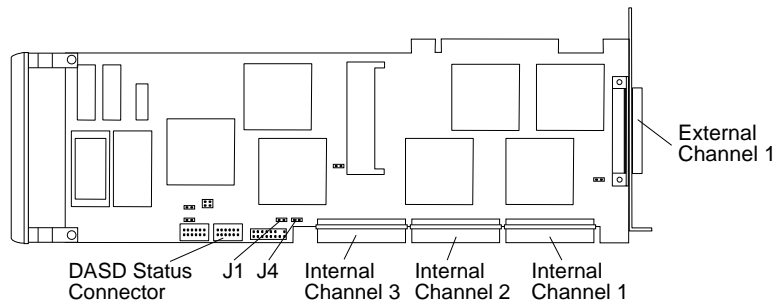
The SCSI-2 cable connectors on the rear of the backplane are shown in the following illustration. The SCSI ID address jumper on the backplane determines the SCSI IDs for the hot-swap drives in Bank D. See “Setting Backplane SCSI ID Jumpers (J12)” on page 252 for more information.



6. If your server is a disk-array model, go to step 10 on page 226 for cabling instructions. If your server is a non-disk-array model, continue with step 7.
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, refer to “Installing Adapters” on page 180 for installation instructions; otherwise, then, continue with step 8.
8. Refer to the following information for help in connecting 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 connector on the SCSI-2 adapter. 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; two SCSI-2 adapters are installed in PCI slots. A SCSI cable connects the CD-ROM drive to the SCSI-2 output connector on the bank C backplane. Separate SCSI cables connect the SCSI-2 input connectors on the backplanes in banks C and D to the internal 16-bit SCSI-2 connectors on the SCSI-2 adapters. In this example, you can also connect external devices to the external connectors on the SCSI-2 adapters. A DASD status cable (also known as a system status cable) connects the adapter to the backplanes in banks C and D.

Installing Internal Drives

9. Go to step 13 on page 227.
10. If you have a disk-array model, an IBM PC ServeRAID Adapter is installed in your server. You can connect internal SCSI drives to the Channel 1, Channel 2, or Channel 3 connector on the top of the adapter. By default, the SCSI cable connects the SCSI-2 input connector on the bank C backplane to the Channel 3 connector on the ServeRAID adapter.



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 connector on bank D.

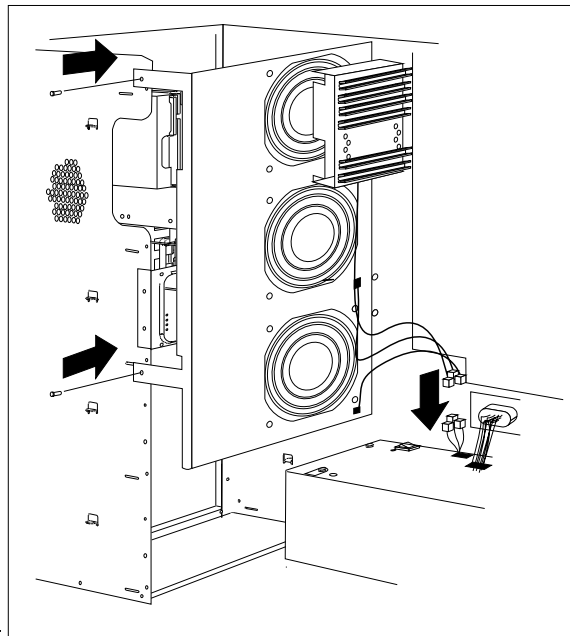
Notes:

- 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 130 for more information.)

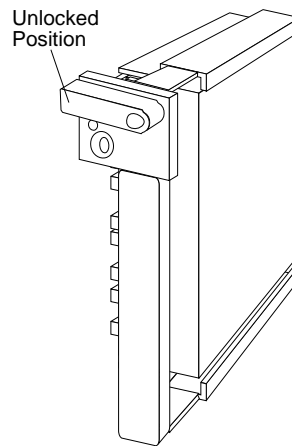
12. Refer to the following information for help in connecting the cables properly in a disk-array model.
 - **Example 1:** In the original cable routing in a disk-array model, the backplane in bank C is cabled to Channel 3 on a ServeRAID adapter. A DASD status cable (also known as a system status cable) 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 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. Connect the LED cable to connector J4 on the ServeRAID adapter.

Installing Internal Drives

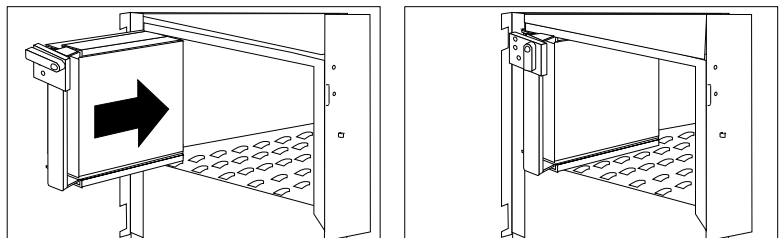
14. Each drive that you plan to install in bank D must have a hot-swap-drive tray attached. If your drive comes with a different tray, remove it and attach the appropriate hot-swap-drive tray to your drive. Follow the instructions in the kit that contains the hot-swap-drive tray.
15. Reinstall the fan assembly that you removed in step 3 on page 223.
16. Reinstall the fan assembly screws that you removed in step 2 on page 223.
17. Reconnect the fan assembly cable that you disconnected in step 1 on page 223.



18. Install the hard disk drive in bank D:
 - a. Move the tray knob to the open position.

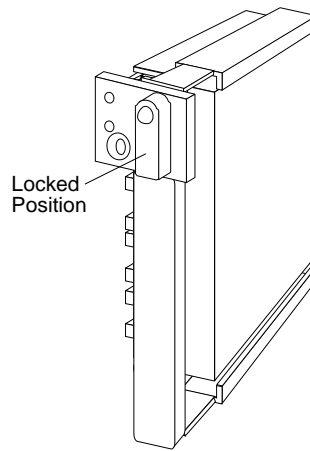


- b. Position the drive tray assembly vertically, with the connector facing the rear of the server.
 - c. Align the side of the tray with the raised guides on the bottom of the bay. (Note the arrows pointing towards the backs of the bays.)
 - d. Slide the drive tray to the rear of the bay until it connects to the backplane. Be sure it is connected properly to the backplane.

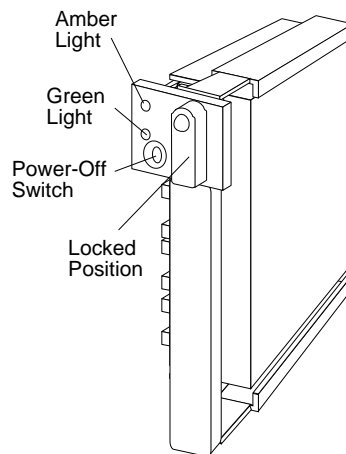


Installing Internal Drives

- 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.



19. Go to Table 6 on page 384 to record the drive location and the SCSI ID that is assigned to the drive (see “SCSI Drives” on page 201 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 you install hard disk drives. See “Starting the ServeRAID Configuration Program” on page 86 for details.

Installing Internal Drives

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 169.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive in bay B? — Go to “Installing a Drive in Bay B” on page 207.
- Installing an internal drive in bank C? — Go to “Installing a Drive in Bank C” on page 216.
- Installing an internal drive in bank E? — Go to “Installing a Drive in Bank E” on page 233.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 241.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

Installing a Drive in Bank E

Before you begin:

Be sure you have:

- Purchased a hot-swap drive tray III for each hot-swap drive that you plan to install and prepared the drive for installation (see “Preinstallation Steps (All Bays)” on page 204).
- Removed the side cover (see “Preparing to Install Options” on page 163).
- Removed the cardboard packing material from bank E.

You must also order a hot-swap backplane and install it at the rear of bank E. (To order the backplane, contact your IBM reseller or IBM marketing representative.)

- Contacted your IBM service technician to have another power supply installed (if it has not already been installed for bank D).
- Ensured that the backplane address jumper J2 is set to “E” (see “Setting the Backplane Address Jumper (J2)” on page 251).

Installing Internal Drives

Notes:

- Banks C, D, and E support hot-swap drives only.
- If your server is a disk-array model and you have drives installed in banks C and D, and attached to the external SCSI-2 connector, you must install an additional SCSI-2 adapter. If you have a non-disk-array model, you might need to install an additional SCSI-2 adapter. (See “Installing Adapters” on page 180 for instructions.)
- You can install up to three half-high hot-swap drive IIIs in each of banks C, D, and E.
- 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 bus using the “daisy chain option” cable. However, the SCSI ID jumper (J12) on one backplane must be set to HI. (See “Setting Backplane SCSI ID Jumpers (J12)” on page 252.)
- After the backplane is completely installed, you do not have to turn off the server to install hot-swap 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.

1. If required for your server, install an additional SCSI-2 adapter in one of the empty expansion slots (see “Installing Adapters” on page 180).

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 cable 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 223).

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 251.

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, and the SCSI ID setting for each bank. (See “Changing the ServeRAID Adapter Parameters” on page 130 for more information on defining the Bank Mapping. See “Setting Backplane SCSI ID Jumpers (J12)” on page 252 for instructions on setting the SCSI ID jumpers.)

4. Install the backplane at the rear of bank E (see step 5 on page 224).
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.

Installing Internal Drives

- **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 one SCSI-2 adapter. Internal SCSI cables connect the SCSI-2 input connectors on the backplanes in bank D and bank E to the other SCSI-2 adapters. A DASD status cable (also known as a system status cable) connects to the backplanes in banks C, D, and E.

- **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.

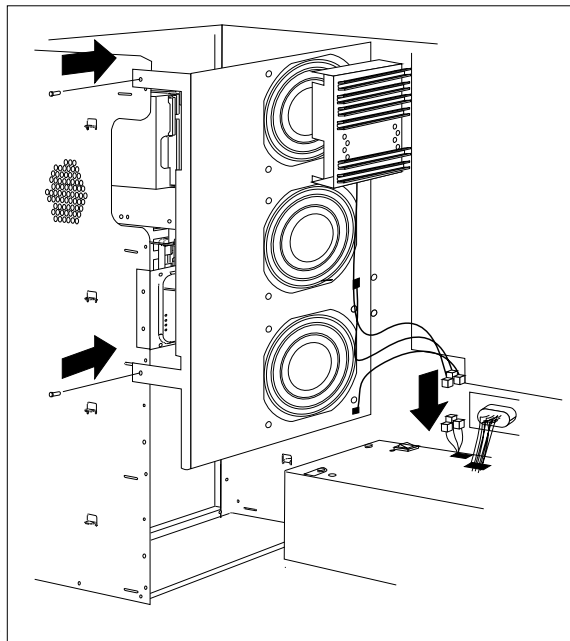
In this example, you cannot connect external devices to the ServeRAID adapter. Instead, you must install a second ServeRAID adapter to support external devices.

- **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; the backplane in bank E is set to HI. 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 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.

In this example, you can connect external devices to the external connector on the ServeRAID adapter.

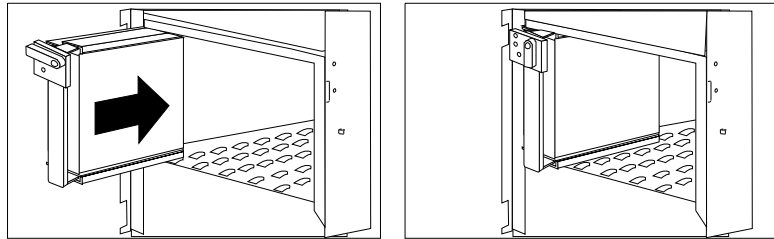
Installing Internal Drives

7. Reinstall the fan assembly that you removed in step 2 on page 235 (see step 15 on page 228).
8. Reinstall the screws that you removed in step 2 on page 235.
9. Reconnect the fan assembly cable that you disconnected in step 2 on page 235.

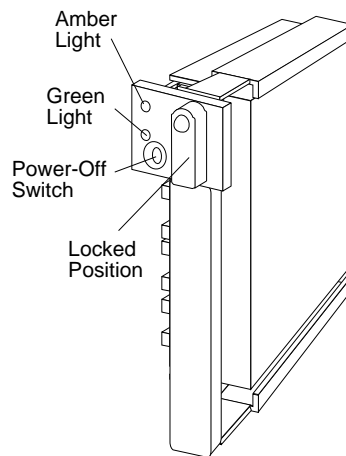


Installing Internal Drives

10. Each drive that 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 18 on page 229 for detailed instructions).



Note: If you turned on the server before installing the drive, the light on the knob of the drive tray illuminates, indicating that the drive was installed correctly.



12. Go to Table 6 on page 384 to record the drive location and the SCSI ID that is assigned to the drive (see “SCSI Drives” on page 201 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 you install hard disk drives. See “Starting the ServeRAID Configuration Program” on page 86 for details.

Installing Internal Drives

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 169.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive in bay B? — Go to “Installing a Drive in Bay B” on page 207.
- Installing an internal drive in bank C? — Go to “Installing a Drive in Bank C” on page 216.
- Installing an internal drive in bank D? — Go to “Installing a Drive in Bank D” on page 221.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 241.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

Removing Internal Drives

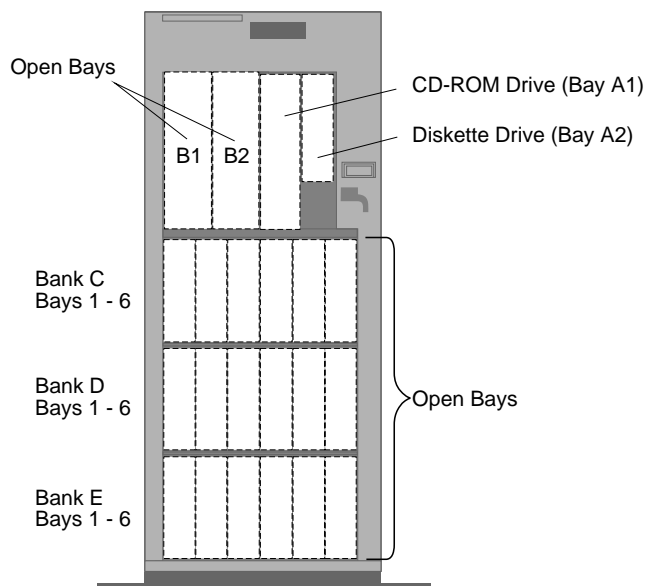
Before you begin:

Be sure you have:

- Read “Electrical Safety” on page 161 and “Handling Static-Sensitive Devices” on page 162.
- Opened the front cover, and if necessary, removed the side cover (see “Preparing to Install Options” on page 163).
- Determined the correct location of a failed hard disk drive. If you have a disk-array model, see “Logical and Hard Disk Drive Status Indications” on page 111 for additional information.

To remove a drive from bay B, go to “Removing a Drive from Bay B” on page 242.

To remove a drive from bank C, D, or E, go to “Removing a Drive from Bank C, D, or E” on page 245.



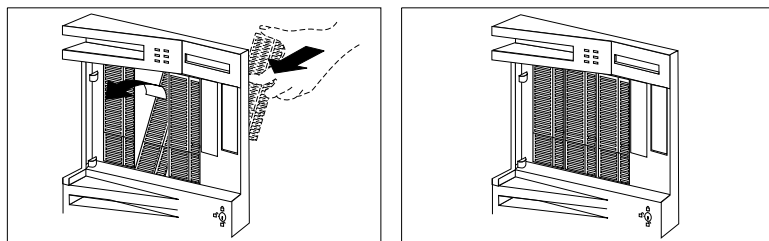
Removing Internal Drives

Removing a Drive from Bay B

Note: To locate bay B, see the illustration given under “Removing Internal Drives” on page 241.

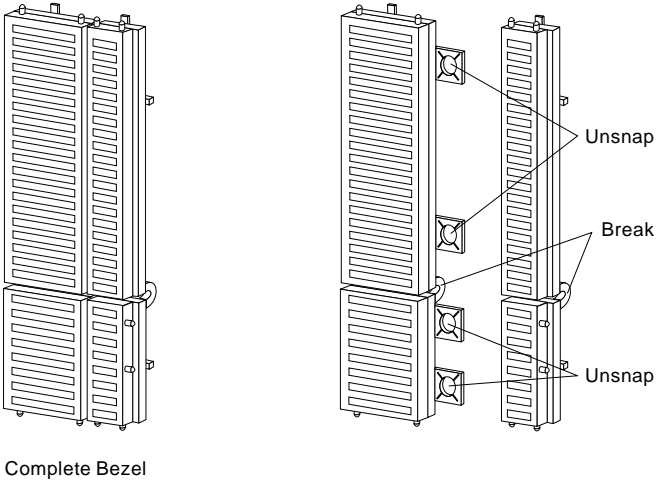
To remove a drive from bay B, do the following steps:

1. Find the drive that 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. Insert the cover plate by pushing it, gently, into the front cover.



- a. You can adjust the size of the cover plate as shown in the following illustration.

Removing Internal Drives

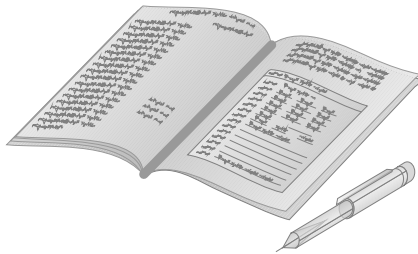


b. Press the cover plate into place in the front cover.

6. What to do next?
- If you are removing another internal drive from bay B, return to step 1 on page 242.
 - If you are installing another internal drive in bay B, go to step 1 on page 205.
 - 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 245.
 - If you are not installing or removing another internal drive, continue with the next step.

Removing Internal Drives

7. Go to Table 6 on page 384 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 169.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 197.
- Removing an internal drive from bank C, D, or E? — Go to “Removing a Drive from Bank C, D, or E” on page 245.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

Removing a Drive from Bank C, D, or E

Notes:

- To locate banks C, D, and E, see the illustration given under “Removing Internal Drives” on page 241.
- You do not have to turn off the server to remove a drive from banks C, D, and 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 that appears on your server display 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 you assigned RAID level 1 or 5 to the logical drives in your disk array. However, the RAID controller can rebuild the data that you need, provided that certain conditions are met. See Chapter 3, “Configuring the Disk Array” on page 77 for further details.

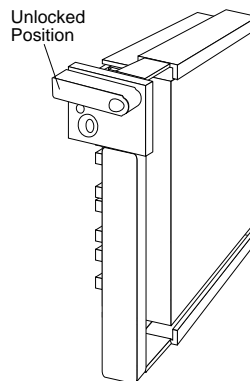
Removing Internal Drives

To remove a drive from bank C, D, or E, do the following steps:

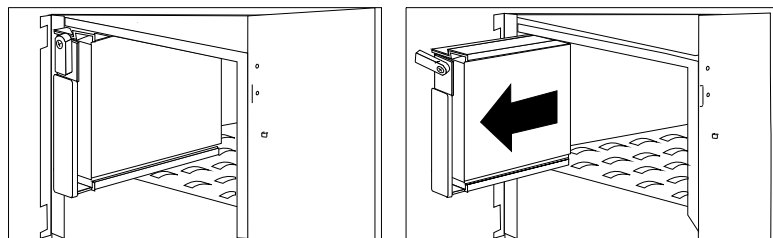
1. Find the defective drive that you plan to remove.
2. Ensure that you have selected the correct drive for removal.

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.



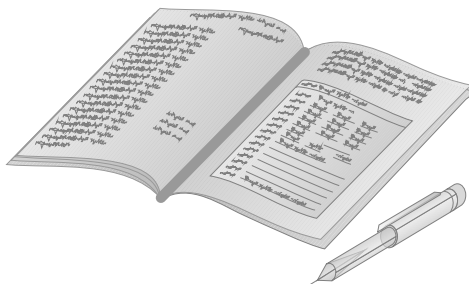
5. Disconnect the drive from the connector on the backplane, by grasping the handle on the drive tray and pulling the drive out of the server. Store the drive in a safe place.



Removing Internal Drives

Note: If you have a disk-array model, you must reconfigure your disk arrays after you remove hard disk drives. See “Starting the ServeRAID Configuration Program” on page 86 for details.

6. What to do next?
 - If you are removing another hot-swap drive, return to step 1 on page 246.
 - 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 205.
 - If you are not installing or removing another internal drive, continue with the next step.
7. Go to Table 6 on page 384 and update the drive information; then, return here to determine your next step.



Removing Internal Drives

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 169.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 197.
- Removing an internal drive from bay B? — Go to “Removing a Drive from Bay B” on page 242.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

Changing Jumper Settings

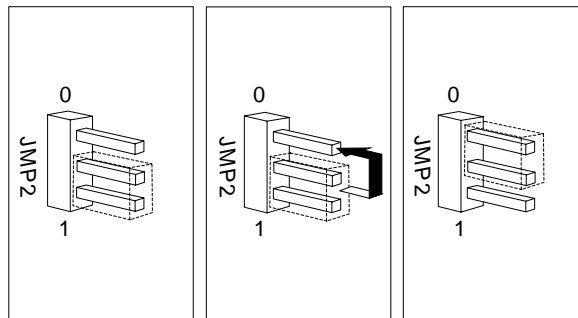
The system board and the system-board jumper settings for your model appear on a label inside your server. These values are preset. If you need to change them, follow the instructions given in “How to Set Jumpers.” You will see the label when you remove the cover. (To remove the cover, go to “Preparing to Install Options” on page 163.)

You might also need to change jumper settings on other devices, including adapters and backplanes. Refer to the documentation that comes with the devices for specific information about the appropriate jumper settings.

How to Set Jumpers

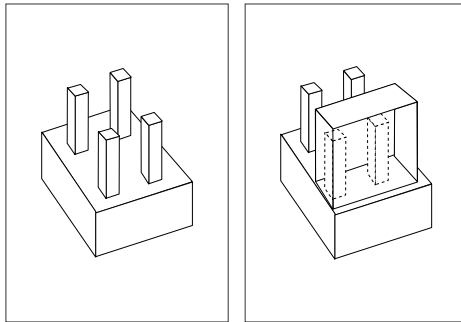
A jumper covers pins on a pin block and might be positioned to the left or to the right. The jumper setting depends on which pins are covered. For example, on the three-pin administrator password jumper, you cover the left and center pins to set the change state.

Jumper positions are indicated on the system board with the jumper location identifier (for example, “J1”) and the “0” or “1” symbol. The following illustration shows a 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.



Changing Jumper Settings

The following illustration shows a jumper being placed over two pins on a four-pin block.



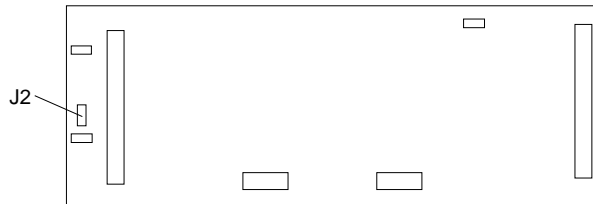
To change a jumper setting:

1. Lift the jumper straight up off the pin block.
2. 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 to identify the backplane location within the server. This ensures proper server operation.

Locate the address jumper on the rear of the backplane, as shown in the following figure; then, read the table below to determine the setting for your system configuration.

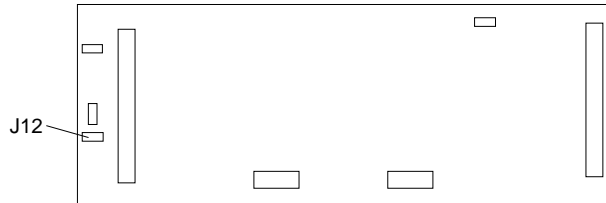


Jumper Position	Description
E	Address for a backplane installed in Bank E
D	Address for a backplane installed in Bank D
C	Address for a backplane installed in Bank C

Changing Jumper Settings

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.

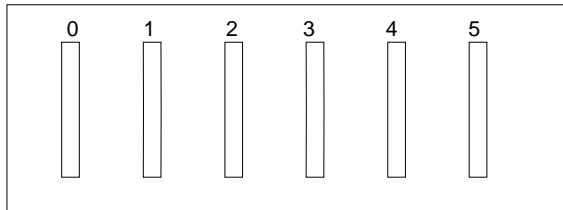
The following table summarizes the jumper settings for the SCSI ID jumper (J12).

Jumper Position	Description																				
J12 <table style="display: inline-table; vertical-align: middle;"> <tr> <td>2</td><td>4</td><td>6</td><td>8</td><td></td></tr> <tr> <td>•</td><td>•</td><td>•</td><td>•</td><td>LO</td></tr> <tr> <td>•</td><td>•</td><td>•</td><td>•</td><td></td></tr> <tr> <td>1</td><td>3</td><td>5</td><td>7</td><td></td></tr> </table>	2	4	6	8		•	•	•	•	LO	•	•	•	•		1	3	5	7		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.
2	4	6	8																		
•	•	•	•	LO																	
•	•	•	•																		
1	3	5	7																		
J12 <table style="display: inline-table; vertical-align: middle;"> <tr> <td>2</td><td>4</td><td>6</td><td>8</td><td></td></tr> <tr> <td>•</td><td>■</td><td>•</td><td>•</td><td>HI</td></tr> <tr> <td>•</td><td>■</td><td>•</td><td>•</td><td></td></tr> <tr> <td>1</td><td>3</td><td>5</td><td>7</td><td></td></tr> </table>	2	4	6	8		•	■	•	•	HI	•	■	•	•		1	3	5	7		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.
2	4	6	8																		
•	■	•	•	HI																	
•	■	•	•																		
1	3	5	7																		

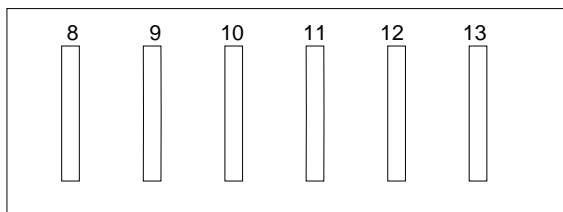
Changing Jumper Settings

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 201.

Changing Jumper Settings

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 169.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 197.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 241.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 255.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

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 you install the second microprocessor, your PC Server 520 can operate as an SMP server. With SMP, 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 computer-aided design (CAD) programs, and modeling or simulation programs.

Before you begin:

Be sure you have:

- Read “Electrical Safety” on page 161 and “Handling Static-Sensitive Devices” on page 162.
- Removed the side cover (see “Preparing to Install Options” on page 163).
- Obtained the Processor Upgrade Option Kit.
- 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 that comes with your server and operating system.
- Reviewed the system-board label and verified that both microprocessors have the same clock speed, and that the microprocessor-speed jumpers are set to that speed.

Installing a Microprocessor

Notes:

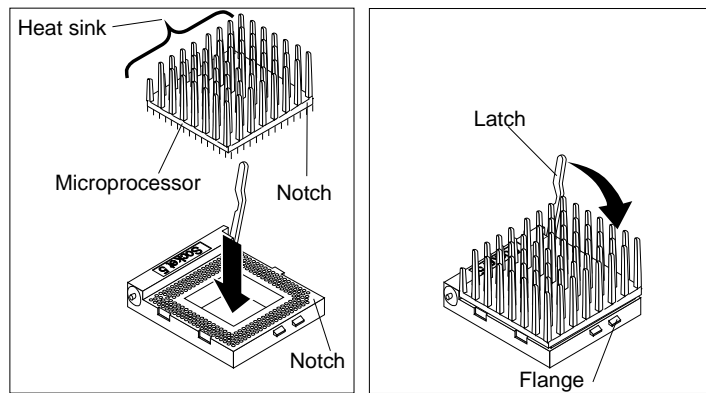
- The illustrations in this section might differ slightly from your hardware.
 - Install the microprocessor before you install OS/2 2.11 for SMP. If you have already installed OS/2 2.11 for SMP, you must add the statement `PSD=OS2APIC.PSD` to the `CONFIG.SYS` file, or reinstall OS/2 2.11 for SMP.
1. Refer to the label inside the cover of your PC Server to locate the primary and secondary microprocessor sockets and the microprocessor-speed jumpers on the system board. 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).

Note: Both microprocessors must have the same speed to ensure proper server operation.
 2. Remove the microprocessor from the static-protective bag. Locate the notch (beveled corner) on the microprocessor.
 3. Lift the latch on the secondary socket.
 4. Carefully align the notch (beveled corner) of the microprocessor with the notch (beveled corner) on the socket.

Installing a Microprocessor

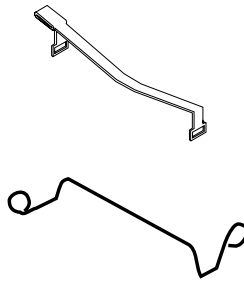
5. Center the microprocessor over the socket.
6. Carefully put the microprocessor into place. Ensure that the pins on the microprocessor align with the holes in the socket.

Attention: Do not force the pins into the socket. If you feel any resistance, remove the microprocessor and check the orientation and alignment.



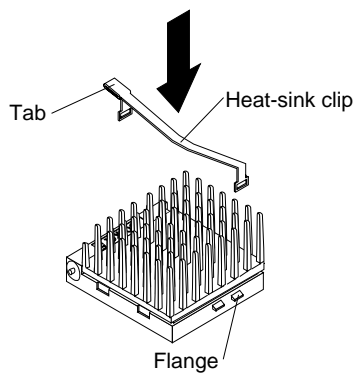
Installing a Microprocessor

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.
 - If it is the bottom clip, go to step 12 on page 259.



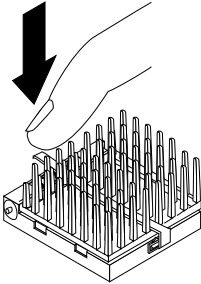
8. Move the latch downward until the microprocessor is completely locked into the socket. Make sure the latch is in the fully closed position.
9. Position the heat-sink clip over the flange, as shown.

Note: Make sure that the tab on the heat-sink clip faces away from the middle of the two sockets.

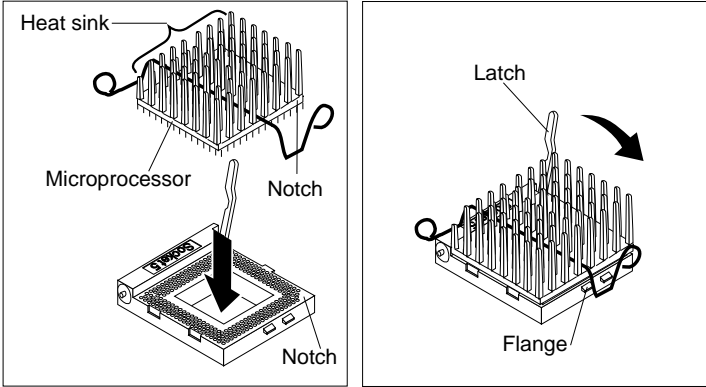


Installing a Microprocessor

- 10. Clip one end of the heat-sink clip over the flange. Then, place the clip on top of the heat sink and press down until it is secure on both sides of the socket.

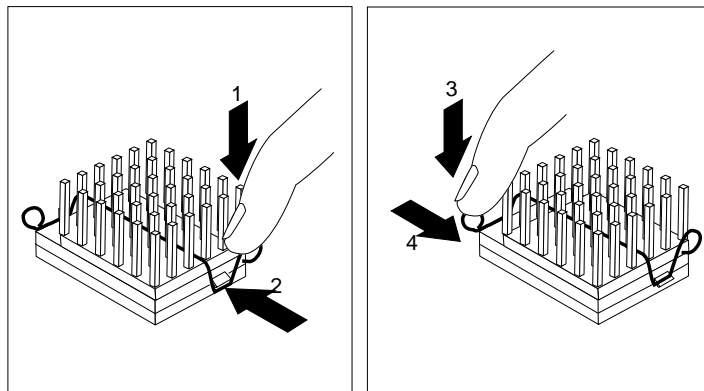


- 11. Go to step 15 on page 260.
- 12. Move the latch downward until the microprocessor is completely locked into the socket. Make sure the latch is in the fully closed position.



Installing a Microprocessor

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. Push down on one of the rounded ends of the heat-sink clip until it catches under the flange. Then, do the same to the other end of the heat-sink clip to lock the microprocessor into position.



15. If you have no other options to install, replace the cover on the server (see “Completing the Installation” on page 266) and reconnect the cables and power cord (see step 4 on page 268).
16. Because you installed a new microprocessor in your server, you might want to upgrade your operating system. You must update your server configuration.
 - a. 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 Software” on page 21.
 - b. Run the Setup program. See “Using the Setup Program” on page 281 for instructions.
 - c. If applicable, record your updated configuration information in the appropriate tables in “Installed Device Records” on page 378. Then, return here to determine your next step.

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 169.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 175.
- Installing an adapter? — Go to “Installing Adapters” on page 180.
- Removing an adapter? — Go to “Removing Adapters” on page 192.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 197.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 241.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 249.
- Installing or removing a security feature? — Go to “Security Procedures” on page 262.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 266.
- Installing an external option? — Go to “Connecting External Options” on page 270.

Security Procedures

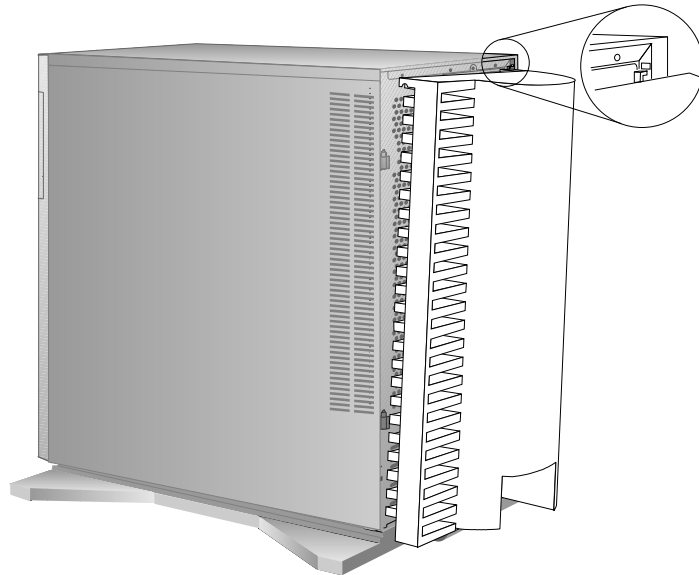
Security Procedures

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 might need to remove the server cover.

Two types of system passwords are available to prevent unauthorized access to your server. These are the supervisor and user passwords. They are described in detail in your *User's Reference*. To set or change these passwords, follow the instructions given in "Setting Passwords" on page 283.

Security-Cover Option

For additional security, you might want to control access to the cables and cable connectors on your server. The optional IBM PC Server Security Cover restricts cable access while creating a sleek, streamlined profile. This optional cable cover also protects your server identification numbers, which are located on a label. Your *User's Reference* describes this feature. Instructions for installing this option are in a separate booklet that comes with the security-cover option. If you want to purchase this option, contact your IBM reseller or IBM marketing representative for additional information.



Installing a U-Bolt

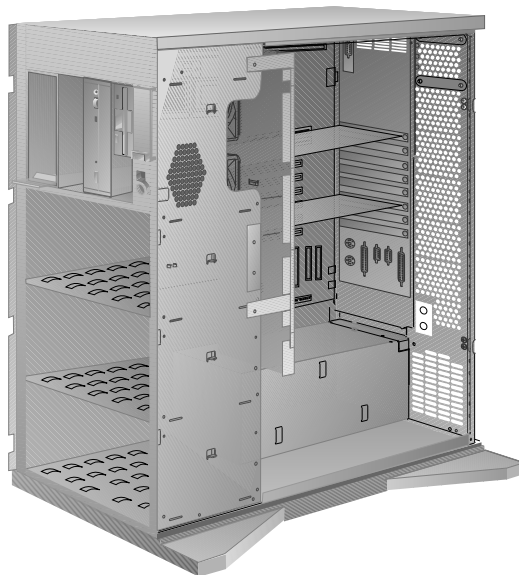
Before you begin:

Be sure you have:

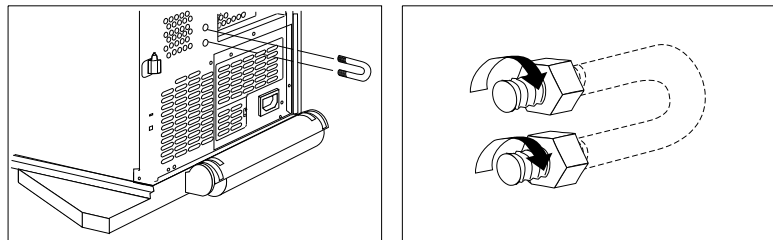
- Obtained a 19 mm (3/4 in.) U-bolt or wire rope (similar to National Manufacturing No. 3230, STK No. 176-735).
- Obtained a security cable.
- Obtained a lock, such as a combination lock or padlock.
- Read “Electrical Safety” on page 161 and “Handling Static-Sensitive Devices” on page 162.
- Removed the server side cover (see “Preparing to Install Options” on page 163).

1. Install the U-bolt:

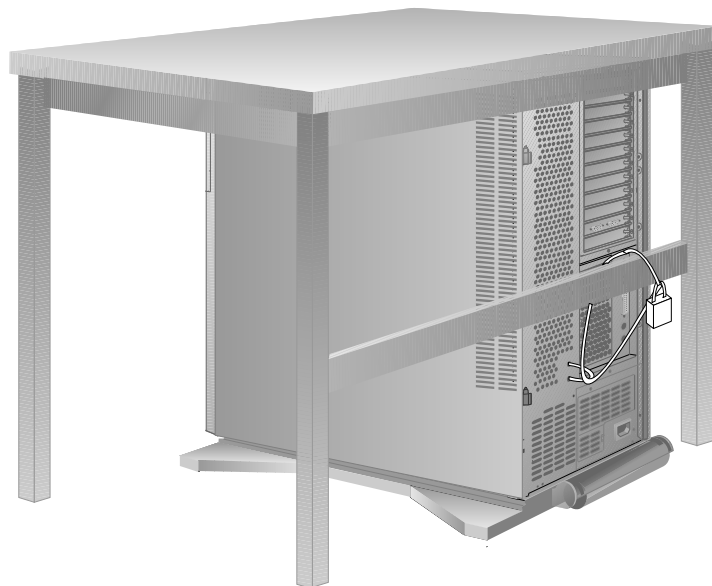
- a. Locate the two holes for the U-bolt in the rear panel of the server.



- b. Insert the U-bolt through the holes and secure it in place with the nuts.



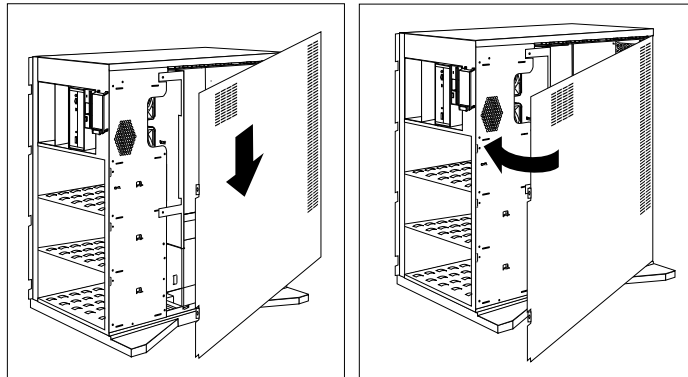
2. Reinstall the server side and front covers, and attach the cables (see “Completing the Installation” on page 266).
3. Insert the security cable through the U-bolt. Loop the cable around (or through) an object from which it cannot be removed; then, fasten the cable ends together with the lock.



Completing the Installation

Completing the Installation

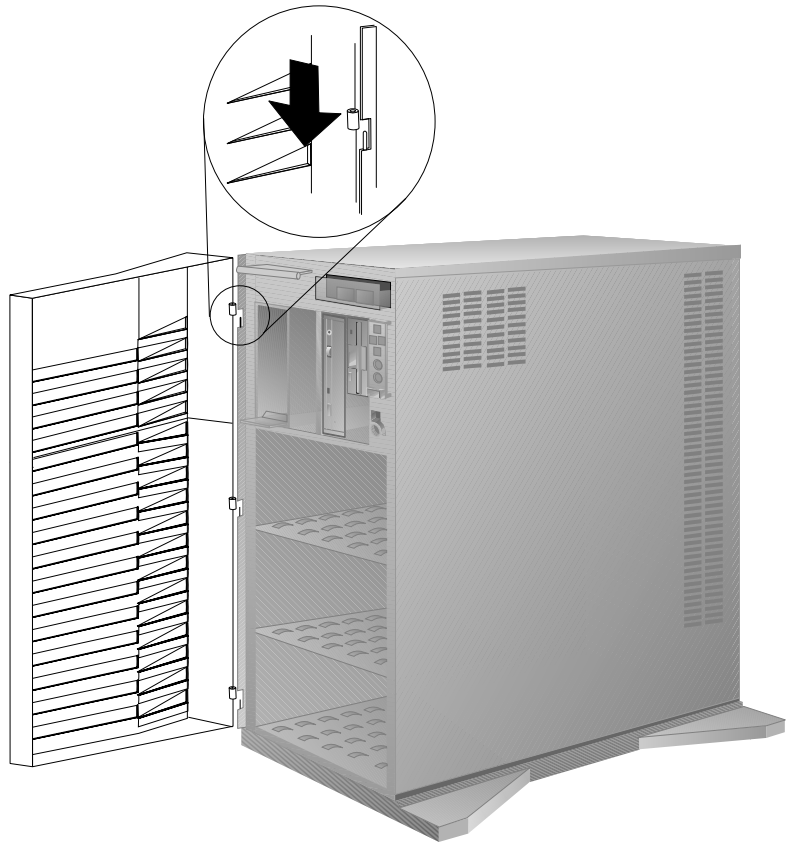
1. Reinstall the side cover:
 - a. Align the pins on the rear of the side cover with the two hinges on the rear of the server. Open the side cover to a 90-degree angle.
 - b. Slide the side cover down.
 - c. Push the side cover to close it.



Completing the Installation

2. If you removed the front cover, reinstall it:

Note: Before installing 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 install it.



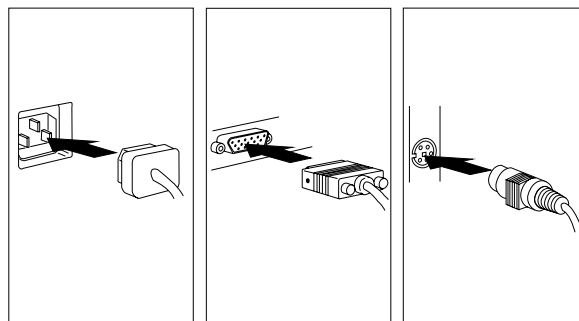
- a. Align the hinges on the front cover with the pins on the server.
 - b. Slide the door down.
3. Close and lock the door.

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.

Completing the Installation

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.



What to do next?

- Installing an external option? — Go to “Connecting External Options” on page 270.
- No external options to install?
 - If you installed options during the initial setup of your server, go to Chapter 2, “Installing Software” on page 21 to complete the installation procedure. Then return here.
 - If you installed hot-swap drives, you might need to update your server configuration parameters.

If your server is a disk-array model, go to Chapter 3, “Configuring the Disk Array” on page 77 to see if you need to update your RAID configuration information, and then go to Chapter 6, “Configuring Your Server” on page 279 for additional details about configuration.

If your server is a non-disk-array model, go to Chapter 6, “Configuring Your Server” on page 279 to see if you need to configure your server.

- If you removed memory modules or internal drives, you must run the Setup program. See “Using the Setup Program” on page 281 for instructions.
- If you removed an ISA or EISA adapter, you must run the EISA Configuration program. See “Using the EISA Configuration Diskette” on page 295 for instructions.
- Device drivers to install? (The instructions that come with the option will tell you if device drivers are required and how to install them.) If you do not need to install any device drivers or configure the system, your server is ready to use.

Connecting External Options

Connecting External Options

Before you begin:

Be sure you have read “Electrical Safety” on page 161 and “Handling Static-Sensitive Devices” on page 162.

To connect external options (printer, scanner, SCSI devices, and so on) to your PC Server 520, see the documentation that comes with the options.

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.



Connecting External SCSI Devices

Note: If you plan to install both internal and external SCSI devices, you must follow the instructions given in “SCSI Drives” on page 201 in addition to the instructions in this section. Read “SCSI Drives,” and then return here.

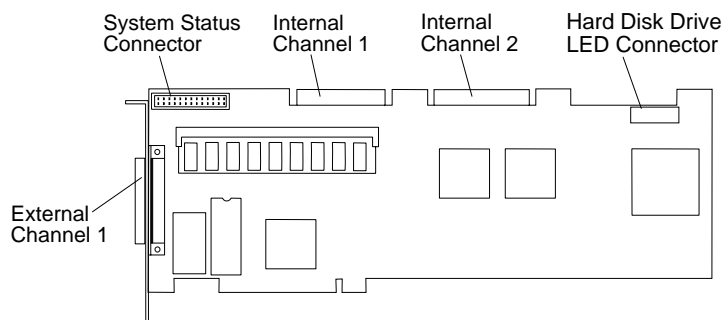
Connecting External Options

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.

The SCSI-2 adapter for disk-array models has three channels, each of which supports up to 15 devices. You can use all three channels to support internal devices. If you want to connect external devices, you can connect them to Channel 1, and connect internal devices to Channels 2 and 3.

The SCSI-2 adapter for non-disk-array models can support a total of 15 devices. If your server has seven internal devices, the SCSI-2 adapter can support up to seven external devices.

Note: You cannot use both internal connectors on the SCSI-2 adapter and also use the external connector. You cannot use the internal channel 1 connector and the external connector at the same time. If you intend to use the external connector, connect internal SCSI-2 devices to the internal channel 2 connector. Refer to the following illustration.



Termination Requirements

The requirements for terminating external SCSI devices are:

- If you attach both internal and external SCSI devices, you must terminate the last internal device and the last external device. For non-disk-array models, you must also change the

Connecting External Options

termination setting of the SCSI-2 adapter in the SCSISelect utility program, as described in “Using the SCSISelect Utility Program” on page 303, so that the SCSI-2 adapter is no longer terminated.

- If you attach only external devices to the SCSI-2 adapter, you must terminate the last device on the cable. If you install only one external device, it must be terminated. Since the SCSI-2 adapter is already terminated, do not change the termination setting.

Cabling Requirements

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 SCSI-2 adapter, using a SCSI cable. Before you install external SCSI devices, you must have the correct external SCSI cables. See Table 2 on page 273 for information on cable lengths. The cables must have the proper connector for the SCSI-2 adapter on one end, and the proper connector for the first external device on the other end. To select and order the correct cables for use with external devices, contact your IBM reseller or IBM marketing representative.

The SCSI-2 Fast/Wide PCI Adapter can support a total of 15 devices and the PC ServeRAID Adapter can support a total of 45 devices. However, you must not exceed the maximum cable lengths listed in Table 2 on page 273.

If you are using a SCSI data transfer rate greater than 5 MB per second, the maximum length of the SCSI bus (cable) must not exceed 3 meters (9.8 feet). If you are using a SCSI data transfer rate of 5 MB per second or slower, the maximum length of the SCSI bus cable must not exceed 6 meters (19.7 feet). These lengths apply to the combined lengths of the internal and external cables. Adhering to these standards ensures that your server operates properly.

The following table 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 SCSI narrow cable = 1 meter (3.3 ft.) Length of 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 SCSI narrow cable = 1 meter (3.3 ft.) Length of 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 2. Maximum External SCSI Cable Lengths

Connecting External Options

Setting SCSI IDs for External Devices

The internal channel connectors and the external channel connector on the PC ServeRAID Adapter accept SCSI IDs from 0 through 14. (You cannot use the internal Channel 1 connector when you use the external connector.) Each device that is attached to the external channel connector must have a unique SCSI ID, and each device that is attached to the internal channel connector must have a unique SCSI ID.

For example, you can have a SCSI ID of 0 for a device that is attached to the channel 1 connector, and a SCSI ID of 0 for a device that is attached to the channel 2 connector of the same PC ServeRAID Adapter. However, you cannot have a SCSI ID of 0 for two devices that are attached to the same channel connector.

Note: Read the README file on the ServeRAID Configuration diskette for updated information. Select **Option Diskette** from the first menu screen.

You must set a unique SCSI ID for each external SCSI device that is connected to the SCSI-2 adapter, so that the SCSI-2 adapter can identify the devices and ensure that different devices do not attempt to transfer data at the same time. Therefore, do not set the SCSI IDs for external devices to the values that you use for internal devices. (See “SCSI Drives” on page 201 for additional SCSI IDs.) Refer to the instructions that come with the SCSI devices for more information about setting a SCSI ID.

Your server automatically sets SCSI IDs for hot-swap drives. These IDs are determined by the drive locations in the bays. The SCSI ID for the preinstalled CD-ROM drive in bay A is set to 6, and the SCSI ID for the SCSI-2 adapter is set to 7. The processing sequence for SCSI devices is set according to their IDs.

Note: If you install a second SCSI-2 adapter, you can use the same SCSI IDs that you use for the preinstalled SCSI-2 adapter.

Installation Procedure

To attach an external device:

1. Turn off the server and all attached devices.

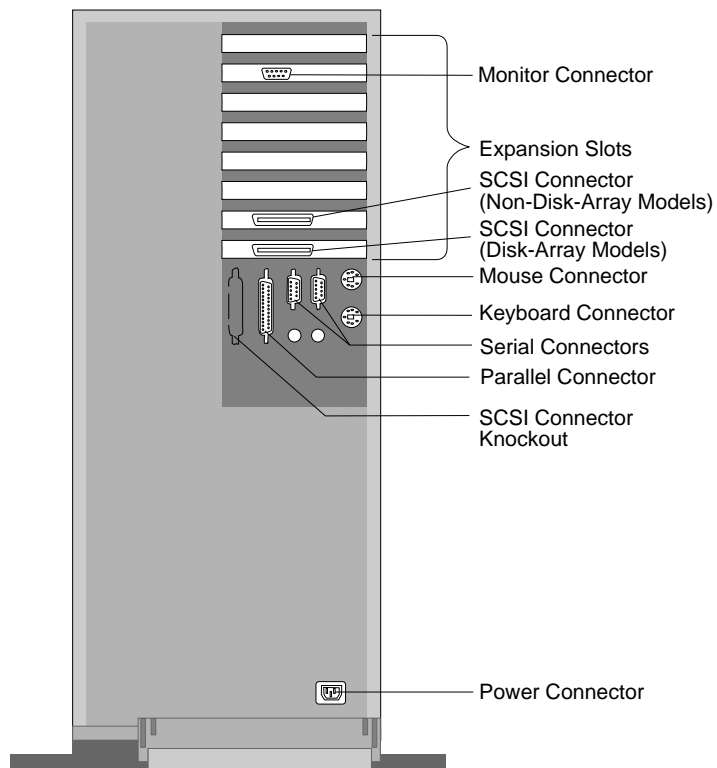
Note: To turn off the server, press the Power On/Off switch. The Power On/Off switch is located under a transparent cover on the right side of the front of the server. Therefore, before you can turn off the server, you must lift this transparent cover to reach the Power On/Off switch.

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

2. Follow the instructions that come with the option to prepare it for installation and to connect it to the server.

Connecting External Options

3. Go to Table 7 on page 385 to record the type of external device that you installed and the location into which it is installed; then, go to “What to do next?” on page 277 to determine your next step.



What to do next?

- If you installed options during the initial setup of your server, go to Chapter 2, “Installing Software” on page 21 to complete the installation procedure. Then return here.
- If you installed hot-swap drives, you might need to update your server configuration parameters.

If your server is a disk-array model, go to Chapter 3, “Configuring the Disk Array” on page 77 to see if you need to update your RAID configuration information; then, go to Chapter 6, “Configuring Your Server” on page 279 for additional details about configuration.

If your server is a non-disk-array model, go to Chapter 6, “Configuring Your Server” on page 279 to see if you need to configure your server.

- If you removed memory modules or internal drives, you must run the Setup program. See “Using the Setup Program” on page 281 for instructions.
- If you installed or removed an ISA or EISA adapter, you must run the EISA Configuration program. See Chapter 6, “Configuring Your Server” on page 279 for instructions.
- Device drivers to install? (The instructions that come with the option will tell you if device drivers are required and how to install them.) If you do not need to install any device drivers or configure the system, your server is ready to use.

Connecting External Options

Chapter 6. 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.

For information about configuring the IBM PC ServeRAID Adapter, see “Starting the ServeRAID Configuration Program” on page 86.

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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 that 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 any of the following standards:

- Peripheral Component Interconnect (PCI)
- Extended Industry Standard Architecture (EISA)
- Industry Standard Architecture (ISA)

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. The built-in Setup program configures system board functions, such as the serial and parallel port assignments. It also allows you to set passwords for starting up and accessing the Setup program. Use the PC Server 520 EISA Configuration Diskette to configure EISA and ISA adapters (boards). For non-disk-array models, use the built-in SCSI-2 adapter utility program (SCSISelect Utility program) to configure the SCSI devices that you install in your server. For disk-array models, use the program that is provided on the ServeRAID Configuration diskette.

Using the Setup Program

The built-in Setup program is used for system board configuration. The configuration information is stored in the nonvolatile random-access memory (NVRAM). In most cases, the server operates 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 drive types).

Review this section and the information that came with the device before making changes. Also, record the current settings (see “Recording and Restoring Default Settings” on page 283) before making any changes.

Changing Settings

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 advance through the items on the screen. Change selections by first advancing to the item that you want to change; then, use the plus key (+) or minus key (-) to make the change.

Online Help information is available on the right side of the screen for each selection. To access menu-bar selections within the Setup program, use the Right Arrow (→) or Left Arrow (←) key.

The Setup program consists of the following menu bar selections:

Main: Use the Main selection to set the System Time and Date. This menu also allows you to view or change configuration settings for diskette drives, memory, video, and cache.

Advanced: The Advanced selection allows you to enable boot (startup) options, to set up integrated peripherals, and to enable the **Plug and Play O/S** (operating system) feature.

Attention: Be sure to set the correct values for your server. Otherwise, your server might not operate properly.

Setup Program

Security: Use the Security selection to set a supervisor-level password to control access to the Setup program, or to set a password on boot (startup). Also, use this menu selection to control diskette drive access to a supervisor, user, or both. This selection also allows you to write-protect the boot sector of a hard disk drive. Write-protecting the boot sector is a form of virus protection.

Help: When you scroll to any screen choice, the Item Specific Help panel displays alongside the choices. General help information is available by pressing **F1**.

Starting the Setup Program

To access the Setup program:

1. Remove all diskettes from the server.

Note: Do *not* start the Setup program while you are using the EISA Configuration program.

2. Turn on the server and watch the screen. Be ready to act quickly.
3. After the IBM logo screen appears and then quickly disappears, you are prompted to Press <F2> to enter SETUP. As soon as you see that prompt, press **F2**. If the Setup program screen does not appear, restart your system and try again.

Note: If a configuration error occurs, a prompt appears before the operating system starts (see "Configuration Conflicts" on page 299).

4. Follow the instructions on the screen to view or change the configuration.

You must *correctly* exit from the Setup program to save the configuration information.

5. Press **Esc** or move the cursor to the **Exit** option on the menu bar.
6. Select **Exit** from the menu bar.
7. Select **Save Changes and Exit**.

Recording and Restoring Default Settings

If you have a printer attached to your server, you can use the **Print Screen** key to print the configuration settings. The default settings are helpful when you install additional options, or if you need to have your system serviced. Also, record the new settings each time that you make changes. Be sure to record the current configuration settings in “Installed Device Records” on page 378. You can restore default settings easily by using the Setup program.

To restore default settings:

1. Turn on the server.
2. Press **F2** to enter the Setup program.
3. Press **F9** to restore the default settings.
4. Select **Exit** from the menu bar.
5. Select **Save Changes and Exit**.

Setting Passwords

To control access to your server, you can implement several of the security measures described in your *User's Reference*, including password protection. Two types of passwords are available with the PC Server 520. These are the supervisor and user passwords. To set these passwords and other security features, select the Security menu bar from the Setup program and follow the instructions on the screen.

Note: The default values for all security-related data fields are given in Table 3 on page 379.

After you set the supervisor password, Enter password appears on the screen each time that you attempt to access the Setup program. After you set the user password, Enter password appears on the screen each time you attempt to access your operating system. (The passwords do not appear on the screen as you type them.) If you enter the wrong password, Invalid password appears on the screen, and Enter password appears again. After three incorrect attempts, you must turn off the server and start again.

Setup Program

Supervisor Password

The supervisor password allows you to control who has access to the Setup program. If a supervisor password is set, you must enter it to use the Setup program. Only someone who knows the supervisor password can change it.

Before you can set a supervisor password, you must first set your selectable drive-startup sequence, as described in “Setting the Selectable Drive-Startup Sequence” on page 287.

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

Note: To remove a supervisor password, press **Enter** when the **Enter new password** data field is blank.

To set a supervisor password:

1. Start the Setup program.
2. Select **Set Supervisor Password** from the Security menu screen.
The **Set Supervisor Password** screen appears.
3. Type a password in the **Enter new password** data field.

Note: You can use any combination of up to seven characters (A-Z, a-z, and 0-9) for your supervisor password. For additional security, the user and supervisor passwords should not be the same. Keep a record of your password in a secure place.

4. Press **Enter**.
The cursor moves to the **Re-enter new password** data field.
5. To verify that you typed the correct password, type the password in the **Re-enter new password** data field. If you did not type the correct password, a warning message appears. Press **Enter** to return to the **Enter new password** data field. Return to step 3.
6. If you typed the correct password, press **Enter** to save it.

The password becomes effective immediately after you enter it. After you set the supervisor password, you are prompted to enter it each time that you attempt to start the Setup program.

User Password

You do not need to set a user password, but a password helps to protect the information that you store in your server. The user password controls access to your operating system and the information stored on your hard disk drives.

Note: Before setting the user password, you must set the supervisor password.

To set a user password:

1. Start the Setup program.
2. Select **Set User Password** on the Security menu screen.
The **Set User Password** screen appears.
3. Type the password in the **Enter new password** data field.

Note: You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for your user password. For additional security, the user and supervisor passwords should not be the same. Keep a record of your password in a secure place.

4. Press **Enter**.
The cursor moves to the **Re-enter new password** data field.
5. To verify that you typed the new password correctly, type the password in the **Re-enter new password** data field. If you did not type the correct password, a warning message appears. Press **Enter** to return to the **Enter new password** data field. Return to step 3.
6. If you typed the correct password, press **Enter** it.

The password becomes effective immediately after you enter it. You are prompted to enter the user password each time you start your operating system, after POST occurs.

Setup Program

Password on Boot

Your server comes with the Password on boot feature set to **Disabled**. If you enable this feature, you must enter a password each time you start the system. To enable this feature:

1. Start the Setup program.
2. Select the Security menu option.
3. Type either your supervisor or user password in the **Password on boot** data field.

Diskette Drive Access

The setting for this option controls who has access to the diskette drives (user and supervisor, or supervisor only). Your server is shipped with this feature set to **User**, so that both the user and supervisor have diskette drive access. To change this setting so that only the supervisor has access, select the Security menu option and enter the word **Supervisor** in the **Diskette access** data field. If the supervisor and user passwords are enabled, only the supervisor can change this setting.

Fixed Disk Boot Sector

The setting for this option indicates whether the boot sector of your hard disk is write-protected. Write-protecting the boot sector helps to prevent viruses from corrupting your hard disk. (See your *User's Reference* for additional information about viruses.) Your server is shipped with this feature set to **Normal**. To change this setting so that the disk is write-protected, select the Security menu option and enter **Write Protect** in the **Fixed disk boot sector** data field. If the supervisor and user passwords are enabled, only the supervisor can change this setting.

Setting the Selectable Drive-Startup Sequence

Selectable drive startup (referred to as **Boot Sequence** on the Advanced Setup program screen, under the **Boot Options** choice) allows you to control the startup sequence of the drives in your server. Each time you turn on the server, it checks the drives as it looks for the operating system. The order in which the system checks the drives is the drive-startup sequence.

In most cases, you do not need to change the default drive-startup sequence. However, you might want to do so if you are working with multiple operating systems, or diskette drives of different sizes.

The default drive-startup sequence first checks the primary diskette drive for a self-starting (bootable) diskette. If one is present, the operating system or program is loaded from the diskette. If not, the system then checks the primary hard disk for an operating system. If one is present, it loads the operating system from that hard disk.

If you start the system from a diskette, the drive that contains the diskette becomes drive A, regardless of the defined sequence, and the first hard disk that you select in the startup sequence becomes drive C.

If you elect to switch the startup sequence of the diskette drives, use the **Swap Floppies** selection.

To change the startup sequence:

1. Turn on the server. Be ready to act quickly.
2. After the IBM logo screen appears and then quickly disappears, you are prompted to Press <F2> to enter SETUP. As soon as you see that prompt, press **F2**. If the Setup program screen does not appear, restart your system and try again.
3. Press the right cursor key to go to the **Advanced** menu of the Setup program.
4. Select **Boot Options**; then, follow the instructions on the screen.

Configuring EISA, ISA, and PCI Adapters

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

When installing different types of adapters at the same time, install and configure them in the following sequence:

1. ISA
2. EISA
3. PCI

Note: During POST, your server automatically configures ISA Plug and Play and PCI devices.

1. Run the Setup program and record the current configuration settings.

See “Starting the Setup Program” on page 282.

2. Backup the EISA Configuration Diskette.

See “Backing Up the EISA Configuration Diskette” on page 295.

3. Start the EISA Configuration Diskette and:

- a. Record the current settings.
- b. Install configuration files (.CFG).

Note: If the .CFG files didn't come with the adapter, see “Configuration Files” on page 289.

See “Recording EISA Configuration Settings” on page 297 and “Starting the EISA Configuration Diskette” on page 297.

4. Set jumpers or switches on the server system board.

See “Changing Jumper Settings” on page 249.

5. Set jumpers or switches on the device.

See the instructions that came with the adapter.

6. Install the adapter in the server.
See “Installing Adapters” on page 180.
7. Install software programs.
See the installation instructions that came with the software.
8. Resolve configuration conflicts.
See “Configuration Conflicts” on page 299.

Configuring ISA or EISA Features and Options

Some ISA and most EISA devices come with option diskettes. These diskettes can contain any or all of the following types of information:

- Configuration files (.CFG)
- Diagnostic files (.DGS)
- Device drivers
- Sample applications (mini-applications)

Configuration Files

A configuration file is required to configure the server for ISA or EISA adapters. You have to copy this configuration file, which has a file-name extension of .CFG, from the device diskette to the EISA Configuration Diskette before installing the device in the server. The configuration file reserves the system resources that the adapter needs to function properly.

Some ISA adapters come with a diskette that contains the CFG file for the adapter. If you want to install ISA adapters that did not come with their own CFG files, you must use your PC Server 520 EISA Configuration Diskette to create a unique CFG file for each adapter.

Note: The unique .CFG files are slot sensitive. That is, they should not be used to configure identical adapters in multiple systems unless you install the adapters in the same expansion slots within each system.

ISA/EISA Configuration

To create a unique CFG file for an ISA adapter:

1. Insert the IBM PC Server 520 EISA Configuration Diskette into diskette drive A.
2. Start the configuration utility program.
3. At the main menu, select Step 2, **Add or remove boards**.
4. At the next menu, select the slot in which you installed the adapter.
5. At the next screen, select **OK**.
6. At the next screen, press **F5**; then, select **Create .CFG file**.
7. Press **Enter**.
8. At the Create a board CFG file screen, type in the adapter manufacturer and description (for example, IBM Token Ring); then press **Enter**.
9. Refer to the adapter documentation for information about specific configuration parameters (such as IRQ or DMA channel) required for the adapter. Then, follow the instructions on the screen to enter the appropriate parameters on the menu.

Note:

- a. Normally, ISA adapters do not use every parameter. Most adapters require only a port address.
- b. The SVGA video adapter in your server requires specific memory and I/O address assignments to function properly. To avoid configuration conflicts, do not assign the following SVGA memory and I/O addresses to other adapters or options in your server:

- Memory address space:

A000H – C7FFH

- I/O address spaces:

02E0h – 02EFh

03B0h – 03DFh

46E8h

10. After you type in all of the appropriate parameters, press **F10**.

11. At the next screen, carefully verify that the information is correct; then, press **Enter**.
12. At the Add Confirmation window, press **Enter** again.
13. In the next window (add), press **Enter**.
The adapter description appears in the selected slot.
14. Verify the installation; then press **F10**.
15. At the next menu, select **Save and exit the configuration utility**.

Note: PCI devices do *not* require .CFG files.

Diagnostic Files

The Diagnostic program that comes with your server is the primary method of testing the server. Some optional devices and adapters come with option-specific diagnostic files. These files provide a more specialized test of the option. “Installing Additional Test Programs” on page 360 provides additional information about installing and using diagnostic files. Also, refer to the documentation that came with the option for information on installing and running option-specific diagnostics.

Device Drivers

Device drivers are programs designed to support a specific type of hardware device. They provide instructions that enable the computer to interact with the device, or to take advantage of a device's special feature. The device driver might ship with the operating system, the application program, or on the option diskette. Not all devices require device drivers. Refer to the documentation that came with the option for additional information.

ISA/EISA Configuration

Sample Applications

Some optional devices provide small applications or sampler files. These applications demonstrate the capabilities of the device and serve as software examples for programming the device. Refer to the documentation that came with the option for additional information.

To configure your server for an ISA or EISA adapter:

1. Read the documentation that came with the adapter.
2. Copy any files with the extension of *.CFG* from the option diskette to the EISA Configuration Diskette. See “Configuration Files” on page 289 for important information about configuring ISA adapters.
3. Start the EISA Configuration Diskette (see “Starting the EISA Configuration Diskette” on page 297).
4. Record the new configuration information (see “Recording EISA Configuration Settings” on page 297).
5. Save the new configuration settings to the EISA Configuration Diskette and to the NVRAM (see “Starting the EISA Configuration Diskette” on page 297).
6. Set any jumpers or switches on the adapter.
7. Install the adapter in the server (see “Installing Adapters” on page 180).

Configuring PCI Features and Options

PCI devices automatically communicate with the server configuration information. This usually results in automatic configuration of a PCI device. If a conflict does occur, see “Configuration Conflicts” on page 299.

Assigning Interrupt Levels

Your PC Server 520 uses a rotational interrupt technique to configure PCI adapters. This technique enables you to install a variety of PCI adapters that currently do not support sharing of PCI interrupts.

Always use the backup copy of the IBM PC Server 520 EISA Configuration Diskette when assigning interrupts for EISA and ISA adapters. You cannot assign an EISA or ISA adapter the same interrupt that you have assigned to a PCI adapter. This is because the PC Server 520 does not support interrupt sharing among PCI, EISA, and ISA adapters.

If a situation occurs where you need an additional interrupt, you can use an interrupt from another function that you might not need, such as COM2 (Interrupt 3).

Configuring Memory

After you add (or remove) extended memory, you must update the EISA Configuration Diskette.

Note: Not performing the following procedure could result in memory errors, and in your operating system not recognizing your added (or removed) memory.

1. Start the EISA Configuration Diskette (see “Starting the EISA Configuration Diskette” on page 297).
2. Select Step 3, **View or edit details**. The system information appears.
3. Under **Advanced System Feature Setup**, select **Total System Memory**.

Configuring Memory

4. Select the correct amount of memory; then, press **F10**.

Note: It is possible to install single-inline memory modules (SIMMs) in combinations where the total amount of installed memory does not appear on the memory configuration screen. In the unlikely event that this occurs, select the next lower setting on the memory configuration menu, and all of the installed memory will be supported on your server.

5. Return to the Main Menu, save the configuration, and exit from the utility program.

Using the EISA Configuration Diskette

You must use the EISA Configuration Diskette anytime you want to change resource allocations, such as:

- Adding or removing devices
- Moving devices
- Changing device function
- Resolving conflicts
- Adding or removing PCI adapters

Each time you use the EISA Configuration Diskette to configure your server, the configuration information is saved in a *System Configuration Information (SCI)* file and in the NVRAM configuration. Only devices that you install and configure correctly appear on the EISA Configuration screens.

Backing Up the EISA Configuration Diskette

Use an operating system command, such as the DOS DISKCOPY command, to make a *complete* backup copy of the EISA Configuration Diskette. Using the backup copy can prevent damage to the original diskette. Your operating system documentation provides information on backing up diskettes.

Making Menu Selections

When you start the backup copy of the EISA Configuration Diskette, an introductory screen appears. Press **Y**. The Main Menu, **Steps in configuring your computer**, appears. The EISA Configuration program main menu contains five steps:

Step 1

Important EISA configuration information: This step provides information about the differences between the ISA configuration process and the EISA configuration process.

Step 2

Add or remove boards: If the server is configured correctly, this step provides a list of the devices installed in the EISA expansion

EISA Configuration Diskette

slots. The **Add** choice allows you to add ISA devices to the configuration. If EISA adapters are installed in your server, and you have not copied the *.CFG* file to the EISA Configuration Diskette, you are prompted to insert the adapter configuration diskette into the diskette drive. The *.CFG* file is copied to your diskette. If the adapter *.CFG* file is copied to the EISA Configuration Diskette before starting the diskette, and the adapter is installed in your server, EISA devices are added automatically.

Step 3

View or edit details: After adding EISA or ISA adapters in Step 2, use the **Edit** selection of this step to configure them. Use the **Edit Resources** selection of this step for complex configurations. If you change a setting in this step, you might have to change a switch or jumper setting on the system board or on a device.

Step 4

Examine switches or print report: After Steps 1 and 2 have been completed correctly, this step displays the correct switch and jumper settings for the installed devices that have switches and jumpers. Also, you can choose to print a system configuration report.

Step 5

Save and exit: This step allows you to save your configuration or to discard the changes before you exit from the program.

Use the Up Arrow (↑) or Down Arrow (↓) key to highlight your selection; then press **Enter** to make your selection. To help you track your progress, a checkmark (✓) appears on the main menu next to the completed steps.

You can access help information through:

- Help windows, which remain active.
- Information windows, which appear automatically as a result of some configuration activities.

- The Help=F1 prompt, which allows you to access the Help Menu for screens displaying the prompt. To remove the Help Menu, press **Esc**.

Recording EISA Configuration Settings

Record the configuration settings you made in Step 3, **View or edit details** and Step 4, **Examine switches or print report** on a separate sheet and store it in a safe place for future reference. If you have a printer attached to your server, you can use the **Print Screen** key to print these settings. The settings are helpful when you install additional options, or if you need to have your system serviced. Also, record the new settings each time you make changes. Be sure to record the current configuration settings in the tables in “Installed Device Records” on page 378.

Starting the EISA Configuration Diskette

Using a backup copy of the EISA Configuration Diskette can prevent damage to the original diskette (see “Backing Up the EISA Configuration Diskette” on page 295).

To start the EISA Configuration Diskette:

1. Insert the backup copy of the EISA Configuration Diskette into the diskette drive.
2. Turn on the server, or if it is already on, shut down the operating system and restart the server.
3. When the first screen appears, press **Y**. Follow the instructions on the screen until the Main Menu, **Steps in configuring your computer**, appears.
4. Use the Up Arrow (↑) or Down Arrow (↓) key to advance through the items on the screen. Use the Tab key to select choices on the bottom of the screen. Press the Esc key to return to a previous menu.
5. Press **Enter** to make a selection.

EISA Configuration Diskette

6. Follow the instructions on the screen to view or change (edit) the configuration information.

Note: Adapters that are installed in your server appear automatically on the EISA Configuration screens *after* you copy the adapter configuration file (file with an extension of *.CFG*) to the EISA Configuration Diskette. If you want to manually add an EISA adapter that you have not yet installed in your server, add it using Step 2 from the menu. (see “Making Menu Selections” on page 295). To configure ISA adapters, follow the instructions on the screen.

Using the Advanced Functions

Locking an ISA adapter reserves the selected resources and prevents the system from using them to resolve resource conflicts. Use the **Advanced** function to *lock* ISA boards. An exclamation mark (!) appears next to locked adapters.

To use the Advanced functions:

1. Start the backup copy of the EISA Configuration Diskette (see “Starting the EISA Configuration Diskette” on page 297).
2. At the main menu, select Step 3, **View or edit details**.
3. Press **F7**. The Advanced functions screen appears.
4. Follow the instructions on the screen to:
 - a. Lock or unlock boards
 - b. View additional system information
 - c. Set verification mode
 - d. Maintain SCI files

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, if you install an ISA network adapter and an EISA network adapter, both requesting *IRQ 5*, only one of the adapters can be configured.)
- 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 adapter).

The steps required to resolve a configuration error depends on the number and variety of hardware devices and software programs that you install. If a hardware configuration error is detected, a *configuration error* message appears after the server completes POST, but before the operating system starts. You can bypass the error or start one of the configuration utility programs. Press **F1** to bypass the error and load the operating system. Press **F2** to start the Setup program. To start the EISA Configuration Diskette, insert the diskette in the diskette drive and press **F1**.

The Setup program and the EISA Configuration program only configure the system hardware. These programs do not consider the requirements of the operating system or the application programs. See “Resolving Software Configuration Conflicts” on page 301 for additional information.

Configuration Conflicts

Resolving Hardware Configuration Conflicts

Use the following information to help resolve hardware configuration conflicts:

1. Run the Setup 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 Setup Program” on page 282 for instructions.)
2. Determine which adapter or device is causing the error. The EISA Configuration program specifies how the server checks for resource conflicts. Initially, this verification mode is set to automatic. When the mode is set to automatic, the EISA Configuration program tries to resolve configuration conflicts for you. Use the **Advanced** selection of the EISA Configuration Diskette's View or edit details screen to change the setting (see “Using the Advanced Functions” on page 298).

If the automatic verification mode is set, the configuration program attempts to resolve conflicts for you. However, this might disable adapters or system board features. For example, if you choose IRQ 4 for an adapter, the program disables Serial Port 1, which uses IRQ 4. If this happens, and you do not want this feature disabled, choose another IRQ for your adapter.

If you set the verification mode to *manual*, the configuration utility program does *not* try to resolve a conflict. Instead, you have to determine if a resource conflict has occurred and then resolve the conflict. When the verification mode is set to manual, an asterisk (*) appears on the View or edit details screen next to adapters in conflict.

If the EISA Configuration program cannot resolve a configuration error, it *deactivates* the adapter and displays the deactivated status (<->) on the View or edit details screen.

3. Update system configuration information (.SCI) files. Use the **Advanced** selection of the EISA Configuration Diskette's View or edit details screen to update or copy the server system configuration information file (see “Using the Advanced Functions” on page 298).

4. Change configuration resource allocations. Use the built-in Setup program to view or change system board resource allocations. Use the **Advanced** selection of the EISA Configuration Diskette's View or edit details screen to view the available or the used system resources (see "Using the Advanced Functions" on page 298). Use the **Edit Changes** selection to change resource allocations for complex configurations.
5. Change adapter jumpers or switches. Jumpers and switches define the system resources that a device can use. If the settings are incorrect or set to use a resource that cannot be shared, a conflict occurs and the device remains deactivated by the configuration program. Use the EISA Configuration Diskette's Step 4, **Examine switches or print report** screen to verify switches (see "Making Menu Selections" on page 295). If a change is required, see "Preparing to Install Options" on page 163, to remove the cover. In addition, read the documentation that came with the device.
6. Change system board jumpers or switches. See "Preparing to Install Options" on page 163, to remove the cover. Then refer to the system-board diagram inside your server.
7. Remove the device or adapter. Some configurations are not supported (for example, you cannot operate the server with two ISA SVGA adapters installed). If you must remove an adapter, see "Removing Adapters" on page 192.

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 there is a conflict, 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.

Configuration Conflicts

You can resolve conflicts by changing either the software or the hardware configuration.

Note: Start the EISA Configuration Diskette to view the addresses used by your system board functions. Use the **Advanced** function of Step 3, **View or edit details** to view the addresses used by your adapters. (See “Using the Advanced Functions” on page 298 for instructions.)

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. To do this, use the EISA Configuration 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.

Using the SCSISelect Utility Program

The SCSI-2 Fast/Wide PCI Adapter on a non-disk-array model 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 your non-disk-array server. The SCSISelect prompt appears after the IBM PC Server screen. 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 appear 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. For this option to take effect, you must insert a CD-ROM in the CD-ROM drive.• Init13Extensions. When set to <i>On</i>, these BIOS extensions are enabled.

SCSI Disk Utility Programs

To see the SCSI device IDs or to 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.

Chapter 7. Solving Problems

This chapter contains information to help you solve some of the simpler problems you might have with your IBM PC Server 520. For more complex technical problems, see Chapter 8, “Getting Help, Service, and Information” on page 367.

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Getting Started

If you are not familiar with the diagnostic tools and programs, continue reading this chapter, then return here. If you are familiar with these topics, select the appropriate instructions from the following list:

- To interpret an error message (for example, you have a **0164** on the screen), go to “POST Error Message Table” on page 325.
- If you want to verify that the system is operating correctly, go to “About the Test Programs” on page 312.
- For more information about a hardware failure (for example, keys on the keyboard not working) or a screen prompt, go to “Troubleshooting Charts” on page 350.

Overview of the Diagnostic Tools

System problems can be caused by hardware, software, or 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.

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

- Power-on self-test (POST)
- POST beep codes
- Test programs
- Error messages
- Troubleshooting charts
- Option Diskettes

Overview of the Diagnostic Tools

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
- Starts the video operation
- Verifies that the diskette drives are working
- Verifies that the hard disk drive is working

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 can 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.

Test Programs

The QAPLUS/PRO test programs, developed by DiagSoft, Inc. for IBM, are the primary method of testing the IBM PC Server 520. 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 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 adapter, 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 configuration information. For example, you can view the IRQ/DMA assignments, memory usage, device drivers, and so on.

- **Utility Programs**

The Diagnostic Diskette also contains utility programs, such as an ASCII text editor and a diskette format program.

Overview of the Diagnostic Tools

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. A list of these error messages is given in “POST Error Message Table” on page 325.

POST Beep Codes

POST beep codes are sounds emitted from the speaker, if POST finds a problem. One beep indicates the POST completed successfully. Multiple beeps indicate that a problem was found by the POST. A list of the beep error codes is given in “Beep Codes” on page 349.

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 comes with your software package.

Troubleshooting Charts

The troubleshooting charts given in “Troubleshooting Charts” on page 350 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 comes with an Option Diskette, you might need to install some configuration (.CFG) files or diagnostic files (.EXE or .COM). See Chapter 5, “Installing Options” on page 157 for instructions on installing the configuration or see “Installing Additional Test Programs” on page 360 for installing diagnostic files.

About the Test Programs

About the Test Programs

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. 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 comes 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.

The Main Menu of the 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 Diagnostic 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 Diagnostic 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 320 for more information about running the module tests.
 - **Options** allows 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 322.
- **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 hardware and software configuration information. For example, you can view the IRQ/DMA assignments, memory usage, 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 Diagnostic Diskette. These utility programs include: the File Editor, the Format Diskette, and the

About the Test Programs

Hard Disk Utilities. For more information about the File Editor, see "Using the File Editor" on page 363.

- **Exit:** Select this choice to exit from the 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. One of the important help categories is function key usage. Pressing Esc exits Help and returns to where you were previously.
Esc	Returns to the previous menu.

Additional keys are active in the Test Module Selection and Test Group screens. These include:

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 (for example, COM1, COM2, or First Microprocessor, Second Microprocessor, and so on).
- Displays previous logical unit number.

About the Test Programs

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 diagnostic programs, IntruderAlert checks for damage to the 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

Starting the Test Programs

To start the test programs from diskette:

Note: Use your backup copy of the Diagnostic Diskette to run the diagnostic programs.

1. Insert the backup copy of the Diagnostic Diskette into the primary diskette drive (usually drive A).
2. Turn on the system. The IBM PC Server 520 logo appears on your screen, followed by the system running POST. When POST completes, QAPlus/PRO for IBM appears on your screen.
3. Press any key to continue. The Welcome window appears.
4. Press any key to continue.

Note: IntruderAlert starts and runs automatically after you press any key. If IntruderAlert detects a problem with the diagnostic diskette, it will automatically stop further testing. See "IntruderAlert" on page 317 for more information.

5. Press **Enter**.

Several analysis programs start and run automatically. When they complete, the Main Menu appears.

6. Use the Up Arrow (↑) or Down Arrow (↓) key to move the highlight bar to your desired Main Menu selection.
7. Press **Enter**.

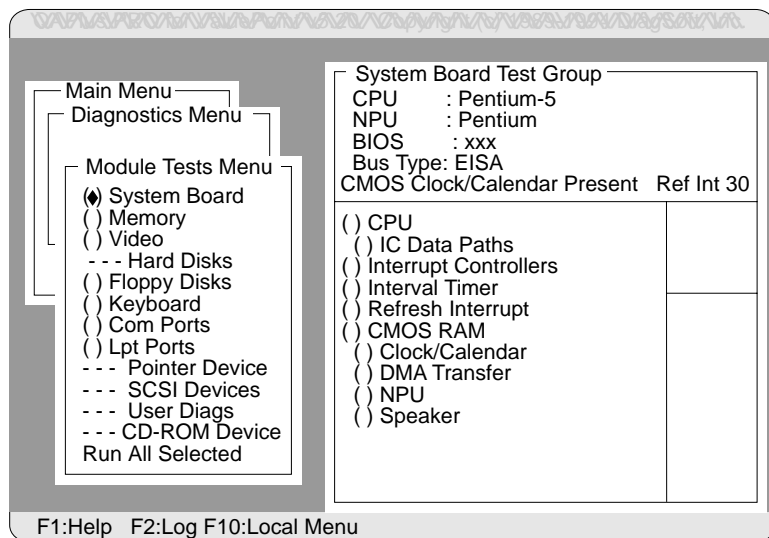
Note: To stop running a specific test or stop testing after you have started a test, press Esc while the test is running. The test pauses at the first possible opportunity, and the Skip/Abort Test Menu appears.

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.

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.



Starting the Test Programs

Using the Module Tests

To start the Module Tests from the Main Menu of the 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.
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.

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.

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.

Starting the Test Programs

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 that 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 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.

Starting the Test Programs

- **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:** This choice enables you to save a custom test script. See “Creating Test Scripts” on page 321 for a more detailed description of scripting.

POST Error Message Table

The following table shows error messages that might appear on the screen during the power-on self-test (POST).

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 Message	Description
0103 0107	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 recurs, have the system serviced.
0115	A hardware error occurred. <i>Action:</i> Have the system serviced.
0120	Previous Boot Incomplete. (Cache disabled). Reboot to restore previous configuration. <i>Action:</i> The server was powered-off during POST. The cache was disabled, and a default configuration has been loaded. Restart the server to restore the previously defined configuration.
0121	A system-board 256 KB ROM error occurred. <i>Action:</i> Run the test programs to determine the cause of the problem and the action to take. If the test programs find nothing wrong, but the problem remains, have the system serviced.
0130	The system is not able to start the diskette in the drive. The diskette might be damaged, incorrectly formatted, or inserted incorrectly. <i>Action:</i> Try another startable diskette. If the problem recurs, have the system serviced.
0163	The time-of-day clock is not set. <i>Action:</i> Run the Setup program to set the correct date and time. To start the Setup program, turn on the server, or press Ctrl+Alt+Del to restart the server. When the IBM logo screen disappears, press F2 quickly, when prompted, to enter Setup. If the problem recurs, have the system serviced.

POST Error Messages

POST Message	Description
0164	<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>Action:</i></p> <ul style="list-style-type: none">• If you have just added or removed memory, you must run the EISA Configuration Diskette and update the EISA configuration information. If the problem recurs, have the system serviced.• If you have not just installed memory, have the system serviced.
0165	<p>A change in the adapter configuration occurred. This error generally occurs under one or more of the following conditions:</p> <ul style="list-style-type: none">• A new adapter was installed and the system was not reconfigured.• One or more adapters were moved to a different slot.• An 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 have just added, removed, or changed the location of an EISA or an ISA adapter, start the EISA Configuration Diskette and update the configuration information. If the problem recurs, have the system serviced. <p>Some adapters have an <i>additional</i> diskette containing a configuration file (CFG) for the adapter. If the adapter comes with its own configuration file, use the EISA Configuration programs to install the 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.
0168	<p>An error occurred during the testing of the real-time clock.</p> <p><i>Action:</i> Run the test programs to determine the cause of the problem and the action to take. If the problem recurs, have the system serviced.</p>
0171	<p>An error occurred during testing of the battery-backed memory that stores the configuration information.</p> <p><i>Action:</i> Have the system serviced.</p>

POST Error Messages

POST Message	Description
0173 0174	<p>A change in device configuration occurred. This error occurs under one or more of the following conditions:</p> <ul style="list-style-type: none">• A new device was installed• A device was moved to a different location or cable connection• A device was removed• A device is failing and is no longer recognized by the system as being installed• An external device is not turned on <p><i>Action:</i> Verify that all external devices are turned on. External devices must be turned on before the system is turned on.</p> <ul style="list-style-type: none">• If you have just added, removed, or changed the location of an EISA or an ISA adapter, start the EISA Configuration Diskette and update the configuration information. If the problem recurs, have the system serviced.• If you have not just added, removed, or changed the location of a device, run the test programs to identify the failing device. Then have the system serviced.
0201	<p>A memory error occurred during testing of the system board.</p> <p><i>Action:</i> Ensure that the memory modules are installed properly. If the modules are properly installed, run the test programs to determine the cause of the problem and the action to take. If the test programs do not find the problem, replace the failing memory module.</p>
0295	<p>Memory Size Mismatch, Memory has been added or removed or is defective.</p> <p><i>Action:</i></p> <ul style="list-style-type: none">• If you have just added or removed memory-module kits, start the EISA Configuration Diskette and update the configuration information. If the problem recurs, call for service.• If you have not just added or removed memory-module kits, run the test programs to identify the failing memory module kit. Replace the defective memory module kit, or call for service.

POST Error Messages

POST Message	Description
0301 0303 0304	<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 five seconds; then turn on the system. If the error message goes away, replace the device. <p>If the error message recurs, have the system, keyboard, and cable serviced.</p>
0601 0610 0612 0616 0632 0642	<p>An error occurred during testing of the diskette drive and diskette-drive controller. This error can be caused by a loose or incorrectly connected cable, a failing drive, or a failing system board. Error code 0610 signifies that the test program cannot find the diskette-drive controller for drive A. Error code 0612 signifies that the test program cannot find the diskette-drive controller for drive B. Error code 0632 signifies that diskette drive A is failing. Error code 0642 signifies that diskette drive B is failing.</p> <p><i>Action:</i> The system can be used, but one or more diskette drives might not work. Check the configuration information and ensure that it is correct. If the configuration information is correct, start the test programs and test the failing diskette drive. If the problem recurs, have the system serviced.</p>
0653	<p>The system is not able to start the diskette in the drive. The diskette might be damaged, incorrectly formatted, or inserted incorrectly.</p> <p><i>Action:</i> Try another startable diskette. If the problem recurs, have the system serviced.</p>
0655	<p>A hardware error occurred.</p> <p><i>Action:</i> Have the system serviced.</p>
1300 1301	<p>No operating system or startable diskette was found.</p> <p><i>Action:</i> Install an operating system (see Chapter 2, "Installing Software" on page 21), or insert a startable (bootable) diskette into the primary diskette drive and press any key.</p>

POST Error Messages

POST Message	Description
1701	A hard disk drive failure occurred.
1702	<i>Action:</i> Press F1 to restart the system. If the problem recurs, have the system serviced.
1726	
02401	<p>An error occurred during testing of the video controller. This error can be caused by a monitor, system board, or video adapter failure.</p> <p><i>Action:</i> Verify that the monitor is connected correctly to the video adapter or video port. Then ensure that the switch or jumper settings for your video adapter are set correctly. If the above items are correct, have the monitor and system serviced.</p>

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 has a CD-ROM drive but 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 201 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 130 for more information on the channel and bank mapping.)</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 104.

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 130 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.

ServeRAID Adapter Messages

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.

ServeRAID Adapter Messages

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 133); 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 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).

ServeRAID Adapter Messages

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 333 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>The configuration data stored on the adapter NVRAM does not match the configuration data stored in the adapter EEPROM.</p> <p>Insert the IBM ServeRAID Configuration diskette; then, press Ctrl+Alt+Del to restart the system. Select Advanced Functions and synchronize the adapter configuration. See "Resetting the Adapter Configuration" on page 117 for more information.</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 Blocked Logical Drive.	<p>One or more logical drives are in a blocked state.</p> <p>Press F4 to unblock the logical drive. Or press F5 to continue without any changes.</p>

PeerMaster Adapter Screen Messages

This section lists the PeerMaster diagnostic and setup error messages, Novell NetWare load-time error messages, and Novell NetWare run-time error messages. The messages are in **bold** type; their descriptions or actions 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. You may invoke these self tests using the setup and diagnostics program, PSSETUP.EXE, provided on your PeerMaster Server Adapter Option Diskette. Refer to “Running PeerMaster Diagnostic Programs” on page 151 for more information.

1: POST Flash Main Sector Checksum Failure

Action: Call for service.

2: POST was not performed - adapter restarted

Action: Call for service.

3: POST Test Sequence Internal Failure

Action: Call for service.

4: POST Flash Boot Sector Checksum Failure

Action: Call for service.

5: POST DRAM Size Detection Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

6: POST DRAM Byte (8 bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

PeerMaster Adapter Screen Messages

7: POST DRAM Short (16 bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

8: POST DRAM Word (32 bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

9: POST DRAM Long (64 bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

10: POST DRAM Trip (96 bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

11: POST DRAM Quad (128 bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

12: POST DRAM Addressability Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

13: POST SRAM Size Detection Failure

Action: Call for service.

14: POST SRAM Byte (8 bit) Wide Failure

Action: Call for service.

15: POST SRAM Short (16 bit) Wide Failure

Action: Call for service.

16: POST SRAM Word (32 bit) Wide Failure

Action: Call for service.

17: POST SRAM Long (64 bit) Wide Failure

Action: Call for service.

18: POST SRAM Trip (96 bit) Wide Failure

Action: Call for service.

19: POST SRAM Quad (128 bit) Wide Failure

Action: Call for service.

20: POST SRAM Addressability Failure

Action: Call for service.

21: POST Timer Failure

Action: Call for service.

22: POST Ethernet Port N Internal Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

23: POST Ethernet Port N Internal Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

24: POST Ethernet Port N Internal Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

25: POST Ethernet Port N Internal Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

26: POST Ethernet Port N External Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

PeerMaster Adapter Screen Messages

27: POST Ethernet Port N External Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

28: POST Ethernet Port N External Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

29: POST Ethernet Port N External Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

30: POST Ethernet Port N Device Verification Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

31: POST Ethernet Port N Device Verification Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

32: POST Ethernet Port N Device Verification Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

33: POST Ethernet Port N Device Verification Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

34: POST Ethernet Port N Device Verification Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

Novell NetWare Load-Time Error Messages

Load-time errors might 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 device 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

Description: The device driver assumes that your PeerMaster adapter has not been installed. Verify that your PeerMaster adapter is properly installed. If so, then treat this error in the same manner as “The adapter has failed.”

058: The adapter does not respond

Description: The device driver is not able to communicate with the PeerMaster adapter. If this occurs when the device driver is being loaded, it is an irrecoverable error that causes the device 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

Description: The device driver is not able to communicate with the PeerMaster adapter. If this occurs when the device driver is being loaded, it is an irrecoverable error that causes the device 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.

073: Unable to allocate memory

Description: The device driver was unable to allocate sufficient memory to perform its functions. Unload the device driver and unnecessary NLMs and try again. If this does not help, exit and restart the server and try again. If the problem persists, you must install additional memory into your server.

PeerMaster Adapter Screen Messages

110: Unable to download the firmware

Description: The device driver is not able to communicate with the PeerMaster adapter. If this occurs when the device driver is being loaded, it is an irrecoverable error that causes the device 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.

203: Adapter diagnostics failed to complete

Description: The device driver is not able to communicate with the PeerMaster adapter. If this occurs when the device driver is being loaded, it is an irrecoverable error that causes the device driver to terminate the load process. It might help to restart the computer or run your system configuration program to check for possible system conflicts. If restarting your computer 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: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

306: POST DRAM Byte (8-bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

307: POST DRAM Short (16-bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

308: POST DRAM Word (32-bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

309: POST DRAM Long (64-bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

310: POST DRAM Trip (96-bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

311: POST DRAM Quad (128-bit) Wide Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, call for service.

312: POST DRAM Addressability Failure

Action: Power down the server. Verify proper seating of the DRAM SIMM on the adapter and try again. If failure persists, 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.

PeerMaster Adapter Screen Messages

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 N Internal Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

323: POST Ethernet Port N Internal Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

324: POST Ethernet Port N Internal Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

325: POST Ethernet Port N Internal Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

326: POST Ethernet Port N External Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

327: POST Ethernet Port N External Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

328: POST Ethernet Port N External Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

329: POST Ethernet Port N External Loopback Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

330: POST Ethernet Port N Device Verification Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

331: POST Ethernet Port N Device Verification Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

332: POST Ethernet Port N Device Verification Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

333: POST Ethernet Port N Device Verification Failure
(N = 1, 2, 3, or 4)

Action: Call for service.

PeerMaster Adapter Screen Messages

Novell NetWare Run-Time Messages

It is possible that a recoverable or irrecoverable error might occur during normal operation of the PeerMaster adapter. The following tables describe the run-time errors that might appear.

58: The adapter does not respond

Description: To clear a detected run-time error, the device driver has attempted to reset, reload, and reinitialize the PeerMaster adapter. This message indicates that an error occurred during the recovery process. This message does not indicate that the device driver has terminated the recovery process. The device driver will attempt to recover control of the PeerMaster adapter at periodic intervals. The message will not display each time the device driver attempts to recover from the error. If, after several minutes, the device driver is not able to recover from this error, call for service.

110: Unable to download the microcode

Description: To clear a detected run-time error, the device driver has attempted to reset, reload, and reinitialize the PeerMaster adapter. This message indicates that an error occurred during the recovery process. This message does not indicate that the device driver has terminated the recovery process. The device driver will attempt to recover control of the PeerMaster adapter at periodic intervals. The message will not display each time the device driver attempts to recover from the error. If, after several minutes, the device driver is not able to recover from this error, call for service.

111: Invalid Pipe Command

Description: To clear a detected run-time error, the device driver has attempted to reset, reload, and reinitialize the PeerMaster adapter. This message indicates that an error occurred during the recovery process. This message does not indicate that the device driver has terminated the recovery process. The device driver will attempt to recover control of the PeerMaster adapter at periodic intervals. The message will not display each time the device driver attempts to recover from the error. If, after several minutes, the device driver is not able to recover from this error, call for service.

112: The adapter watchdog failed

Description: To clear a detected run-time error, the device driver has attempted to reset, reload, and reinitialize the PeerMaster adapter. This message indicates that an error occurred during the recovery process. This message does not indicate that the device driver has terminated the recovery process. The device driver will attempt to recover control of the PeerMaster adapter at periodic intervals. The message will not display each time the device driver attempts to recover from the error. If, after several minutes, the device driver is not able to recover from this error, call for service.

113: Adapter resetting... please wait

Description: To clear a detected run-time error, the device driver has attempted to reset, reload, and reinitialize the PeerMaster adapter. This message indicates that an error occurred during the recovery process. This message does not indicate that the device driver has terminated the recovery process. The device driver will attempt to recover control of the PeerMaster adapter at periodic intervals. The message will not display each time the device driver attempts to recover from the error. If, after several minutes, the device driver is not able to recover from this error, call for service.

229: PeerMaster 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 N Tx Carrier Sense Errors, check your cable
(N = 1, 2, 3, or 4)**

Action: Check your cables or concentrator.

**389: Ethernet Media Port N Tx Carrier Sense Errors, check your cable
(N = 1, 2, 3, or 4)**

Action: Check your cables or concentrator.

**390: Ethernet Media Port N Tx Carrier Sense Errors, check your cable
(N = 1, 2, 3, or 4)**

Action: Check your cables or concentrator.

PeerMaster Adapter Screen Messages

**391: Ethernet Media Port N Tx Carrier Sense Errors, check your cable
(N = 1, 2, 3, or 4)**

Action: Check your cables or concentrator.

395: Ethernet Media Port N Tx Carrier Sense Errors corrected

Action: The problem is corrected.

396: Ethernet Media Port N Tx Carrier Sense Errors corrected

Action: The problem is corrected.

397: Ethernet Media Port N Tx Carrier Sense Errors corrected

Action: The problem is corrected.

398: Ethernet Media Port N Tx Carrier Sense Errors corrected

Action: The problem is corrected.

n Technical Description

Action: Call for service and report the technical description.

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 four sets of beeps. The duration of each beep is constant, but the length of the pause between the beeps varies. For example, a 1-2-3-3 beep code sounds like one beep, a pause, two consecutive beeps, another pause, three more consecutive beeps, another pause, and three 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
1-2-3-3	BIOS ROM check failure.
1-3-1-3	The keyboard controller failed.
2-1-2-3	ROM copyright notice test failed.
2-2-3-1	The interrupt test failed.
<i>Action:</i> Have the system serviced.	
1-3-1-1	RAM refresh verification failed.
1-3-4-1	There is an address line failure within the first 512 KB of RAM.
1-3-4-3	There is a memory test failure within the first 512 KB of RAM.
<i>Action:</i>	
<ol style="list-style-type: none"> 1. Reseat the memory module. 2. Run the diagnostic program. See "Starting the Test Programs" on page 318. 	
If the problem recurs, have the system serviced.	

Troubleshooting Charts

Troubleshooting Charts

You can use the troubleshooting charts in this section to find solutions to problems that have definite symptoms.

Look for the symptom in the left column of the chart. Instructions and probable solutions to the problem are in the right column of the chart.

In these charts, an X can be any alphanumeric character.

CD-ROM Drive Problems	Action
CD-ROM Drive Tray Not Working	The system must be turned on. If the system is on and the tray does not eject, insert the end of a paper clip into the small hole (to the left of the tray load and eject button) on the front of the CD-ROM drive. If the drive still does not work correctly, have the system serviced.

Diskette Drive Problems	Action
Diskette drive In-Use light stays on, or the system bypasses the diskette drive.	<p>If there is a diskette 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 (see the Software Problems troubleshooting chart provided later in this section).5. Your Boot Sequence is set correctly (check the Boot Sequence setting in the Setup program). <p>If the diskette drive In-Use light stays on, or the system continues to bypass the diskette drive, have the system serviced.</p>

Troubleshooting Charts

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 that comes 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
Wavy, unreadable, rolling, distorted screen, or screen jitter.	<p>If the monitor self-tests show that the monitor is OK, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor.</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. 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 for information about the enhanced monitor cable. <p>If the problem recurs, have the monitor and system serviced.</p>
The monitor works when you turn on the system, but goes blank when you start some application programs.	<p>Verify that the primary monitor cable is connected to the video port.</p> <p>To find the video port, see "Input/Output Connectors" on page 6.</p> <p>Be sure you installed the necessary drivers for the application.</p>

Troubleshooting Charts

Monitor Problems	Action
Blank screen	Verify that: <ol style="list-style-type: none">1. The voltage-selection switch is set to the correct setting.2. The system power cord is plugged into the system and a working electrical outlet.3. The monitor is turned on and the Brightness and Contrast controls are adjusted correctly.4. The monitor signal cable is connected to the correct connector on the system. If the items above are correct and the screen remains blank, have the system serviced.
Only the cursor appears.	Have the system serviced.
Wrong characters appear on the screen.	Have the system serviced.
EISA Adapter Problems	Action
BCLK default setting causing system to hang when using EISA Adaptec SCSI adapter.	Change the default setting from 28 to 12.
General Problems	Action
Problems such as broken cover locks or indicator lights not working.	Have the system serviced.
System continuously restarts.	Have the system serviced.

Troubleshooting Charts

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 201 for more information about SCSI terminators.) If the items above are correct, have the system serviced.
<hr/>	
Keyboard, Mouse, or Pointing-Device Problems	Action
All or some keys on the keyboard do not work.	<ol style="list-style-type: none">1. Make sure the keyboard cable is properly connected to the system.2. Make sure that the system and the monitor are turned on. If the items above are correct, have the system serviced.
The mouse or pointing device does not work.	Verify that the mouse or pointing-device cable is securely connected and the device drivers are installed correctly. <i>Note:</i> The pointing-device port is also known as the auxiliary-device port or mouse port. If the problem recurs, have the system and the device serviced.

Troubleshooting Charts

Memory Problems	Action
The amount of memory displayed is less than the amount of memory installed.	<p>Verify that:</p> <ol style="list-style-type: none"><li>1. The memory modules are seated properly.<li>2. Memory modules must be installed in pairs. See “Installing Memory-Module Kits” on page 169 for more information.<li>3. You updated the configuration information. Whenever you change the memory or an option, you must update the configuration by running the EISA Configuration program (see “Starting the EISA Configuration Diskette” on page 297). <p>If the above items are correct, have the system serviced.</p> <p>Run the memory test program from your Diagnostic Diskette (see “Starting the Test Programs” on page 318). The system might have detected a bad memory module and automatically reallocated memory to enable you to continue to operate. If the memory tests fail, have the system serviced.</p>
Experiencing client dropoff due to heavy traffic on the server.	Increase memory. For example, you might install 16 MB of EOS memory in bank 1.

Option Problems	Action
<p>An IBM option that was just installed does not work.</p>	<p>Verify that:</p> <ol style="list-style-type: none"> 1. The option is designed for the system. 2. You followed the installation instructions that were supplied with the option. 3. The option is installed correctly. 4. You have not loosened any other installed options or cables. 5. You updated the configuration information. Whenever you change the memory or an option, you must update the configuration by running the EISA Configuration program (see "Starting the EISA Configuration Diskette" on page 297). Press F2 quickly, when prompted, to enter Setup. <p>If you are using an expanded- or enhanced-memory manager, such as the DOS Expanded Memory Specification (EMS) driver, go to Chapter 5, "Installing Options" on page 157.</p> <p>If all of the above items are correct, start the test programs. If the test programs find no problem, have the system and the option serviced.</p>
<p>An IBM option that used to work does not work now.</p>	<p>Verify that all of the option hardware and cable connections are secure.</p> <p>If the option comes with its own test instructions, use those instructions to test the option.</p> <p>If the items above are correct and the test programs found no problem, have the system and the option serviced.</p> <p>If the failing option is a SCSI option, verify that:</p> <ol style="list-style-type: none"> 1. The cables for all external SCSI options are connected correctly. 2. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. (See "SCSI Drives" on page 201 for more information on SCSI terminators.) 3. All external SCSI options are turned on. External SCSI options must be turned on before the system is turned on. <p>If the problem recurs, have the system serviced.</p>

Troubleshooting Charts

Parallel Port Problems	Action
The number of parallel ports displayed is less than the number of parallel ports installed.	Verify that: <ol style="list-style-type: none">1. Each port is assigned a unique address.2. The parallel-port adapter, if you installed one, is seated properly. If the items above are correct, have the system serviced.

Serial Port Problems	Action
The number of serial ports displayed is less than the number of serial ports installed.	Verify that: <ol style="list-style-type: none">1. Each port is assigned a unique address.2. The serial-port adapter, if you installed one, is seated properly. If the items above are correct, have the system serviced.

Printer Problems	Action
The printer does not work.	Verify that: <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 6.) <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.4. You have assigned the printer port correctly using the Setup program. If the items above are correct and the printer still does not work, run the tests described in the manual that comes with your printer. If the tests show the printer is OK, have the system serviced.

Troubleshooting Charts

Software Problems	Action
Is your software program OK?	<p>To determine if problems are caused by the software, verify that:</p> <ol style="list-style-type: none"><li>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. <i>Note:</i> If you have just installed an adapter or memory, you might have a memory address conflict (see “Configuration Conflicts” on page 299).<li>2. The software is designed to operate on your system.<li>3. Other software works on your system.<li>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>

Checking for Damage

Checking the System for Damage

This section provides instructions on what to do if your system is damaged.

After Dropping It

Obvious damage:

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.

No obvious damage:

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 “Safety Information” on page ix to avoid personal injury or damage to your system.

If it does not work correctly, turn off the system and check the adapters and memory modules to ensure that they are seated correctly. See Chapter 5, “Installing Options” on page 157 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 test programs and test the system. See “Starting the Test Programs” on page 318 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

Installing Additional Test Programs

You can add other test programs to the Diagnostic Diskette. These other programs are usually provided on the diskette that comes with a device. After you add the programs to the 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 numbers for the tests listed above are as follows:

- 202 9600 Baud 5 Line Modem
- 203 Generic 1
- 204 Generic 2
- 205 CMD 1
- 206 CMD 2

Installing Additional Test Programs

207 CMD 3

Using the Utility Programs

The Diagnostic Diskette contains utility programs for formatting diskettes and editing.

Formatting Diskettes

To format a diskette within the diagnostic programs, select one of the following options:

Format A: high density

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.

Using the Utility Programs

- 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 there is no active block of text, F6 is ignored.
- F7** To copy an active (marked) block of text to the new location, move the cursor to the new location and press F7. If there is no active block of text, F7 is ignored.
- F8** To delete an active (marked) block of text, move the cursor within the active block and press F8. If there is no active text block, 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 that you want to edit; then, select the file from the Files Selection box.
3. Press **Enter**.
4. Make your changes.

Using the Utility Programs

5. When you are done, press **F10** to update the file with the changes that you made, or press **Esc** to quit the editing process without saving the changes.

Note: When you are using the File Editor, you may press F1 to display all of the available keyboard functions.

Using the Utility Programs

Chapter 8. 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 Service

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.

Most servers, operating systems, and application programs come with documentation that contains troubleshooting procedures and explanations of error messages. (For troubleshooting and error information about your PC Server 520, see “Troubleshooting Charts” on page 350, “POST Error Message Table” on page 325, “SCSI Messages” on page 330, and “ServeRAID Adapter Status and Error Messages” on page 335). The documentation that comes with your server also contains information about the diagnostic tests that you can perform (see “Starting the Test Programs” on page 318).

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 Chapter 7, “Solving Problems” on page 305, 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

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 services 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

Using the HelpWare Support Family

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

Using the HelpWare Support Family

- 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

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

Purchasing Additional HelpWare Services

- 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 373.

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” on page 373.

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

Obtaining IBM Operating System Updates

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 368 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.
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Ordering Publications

Appendix A. Server Records

Whenever you add options to your server, be sure to update the information in this appendix. Accurate, up-to-date records make it easier to add other options and, if the need should arise, to report a hardware problem.

Recording the Server Serial Number

Record and retain the following information. In the box below, check or highlight the applicable server information for future reference.

Product Name	IBM PC Server 520
Machine Type 8641	Pentium Microprocessor
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	_____

Installed Device Records

The server serial number and other identification numbers are located on a label on the rear of the server. If you installed a cable cover on your server, you must remove it to see this label.

The server serial number is also located on the handle on the front of the server. To see the server identification numbers on this label, you must first remove the front cover.

Attention: 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 your system default configuration settings and the options currently installed in or attached to your system. 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 in new values later, when you update your system configuration.

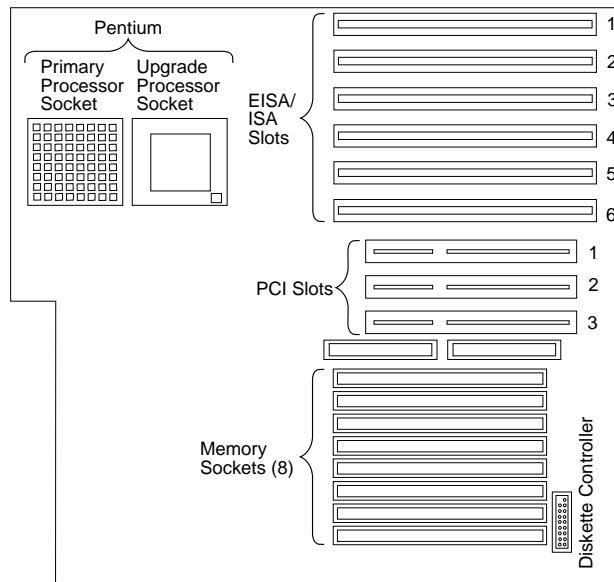
Installed Device Records

Option	Default Value	New Value	Additional Information
Diskette A	1.44 MB, 3.5 in.	_____	Record additional drive information in Table 6 on page 384.
Diskette B	Not installed	_____	
Video System	SVGA	_____	
Video BIOS Shadow	Enabled	_____	Record additional information in Table 4 on page 380. Select <i>Disabled</i> for adapters that cannot be shadowed.
System Memory	640 MB	_____	_____
<u>Extended Memory</u>		_____	_____
Bank 0 Socket 1	16 MB Kit	_____	16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 0 Socket 2	16 MB Kit	_____	16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 1 Socket 3		_____	16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 1 Socket 4		_____	16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 2 Socket 5		_____	16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 2 Socket 6		_____	16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 3 Socket 7		_____	16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 3 Socket 8		_____	16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Total Memory	32 MB	_____	_____
Cache State	Enabled	_____	_____
COM1 Port	3F8	_____	_____
COM2 Port	2F8	_____	_____
LPT Port	378, IRQ 7	_____	_____
LPT mode	Output only	_____	_____
Diskette controller	Enabled	_____	_____
Large disk DOS compatibility	DOS	_____	_____
Memory gap	Disabled	_____	_____
Boot sequence	A: then C:	_____	<i>C: First</i> will not check Drive A.
Swap diskettes	Normal	_____	_____
Diskette check	Disabled	_____	_____
SETUP prompt	Enabled	_____	_____
Post Errors	Enabled	_____	_____
Supervisor Password is	Enabled	_____	_____
User Password is	Disabled	_____	_____
Set Supervisor Password	Press Enter	_____	Controls access to the Setup program.
Set User Password	Press Enter	_____	Must set supervisor password first.
Password on boot	Disabled	_____	_____
Diskette access	User	_____	_____
Hard disk boot sector	Normal	_____	_____

Table 3. Setup Program Configuration Defaults and Changes

Installed Device Records

Refer to the following system-board illustration when completing Table 4 and Table 5 on page 381.



Slot	IRQ	DMA	I/O Port	ROM/RAM Address	Option Description and Additional Information
1	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	Video: SVGA
3	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____
6	_____	_____	_____	_____	_____

Note: Do not use the bottom EISA slot if the adjacent PCI slot is occupied. Before setting values or installing options in these slots, review “Configuring EISA, ISA, and PCI Adapters” on page 288, “Using the EISA Configuration Diskette” on page 295, and “Installing Adapters” on page 180, and follow the instructions for avoiding configuration conflicts. If a conflict occurs, resolve it as described in “Configuration Conflicts” on page 299.

Table 4. EISA/ISA Expansion Slot Configuration Information

Installed Device Records

Table 5 (Page 1 of 2). Internal and External Options

Location	Option Description	Bus Architecture	
Memory ¹			
Bank 0	<u>16 MB Kit</u> <input type="checkbox"/> <u>32 MB Kit</u> <input type="checkbox"/>		
Bank 1	<u>16 MB Kit</u> <input type="checkbox"/> <u>32 MB Kit</u> <input type="checkbox"/>		
Bank 2	<u>16 MB Kit</u> <input type="checkbox"/> <u>32 MB Kit</u> <input type="checkbox"/>		
Bank 3	<u>16 MB Kit</u> <input type="checkbox"/> <u>32 MB Kit</u> <input type="checkbox"/>		
Mouse Connector	<u>IBM Mouse</u> <input type="checkbox"/> Other: _____		
Keyboard Connector	<u>Space Saving</u> <input type="checkbox"/> <u>Enhanced</u> <input type="checkbox"/> Other: _____		
		EISA ²	PCI
Expansion Slot 1	_____	✓	<input type="checkbox"/>
Expansion Slot 2	<u>SVGA (Monitor) Adapter (all models)</u>	✓	<input type="checkbox"/>
Expansion Slot 3	_____	✓	<input type="checkbox"/>
Expansion Slot 4	_____	✓	<input type="checkbox"/>
Expansion Slot 5	_____	✓	<input type="checkbox"/>
Expansion Slot 6 (shared EISA slot 6/PCI slot 1)	_____	<input type="checkbox"/>	<input type="checkbox"/>
Expansion Slot 7 (PCI slot 2)	<u>SCSI-2 Adapter (non-disk-array models only)</u>	<input type="checkbox"/>	✓
Expansion Slot 8 (PCI slot 3)	<u>SCSI-2 Adapter (disk-array models only)</u>	<input type="checkbox"/>	✓
Parallel Port	_____		
Serial Port A	_____		
Serial Port B	_____		

Installed Device Records

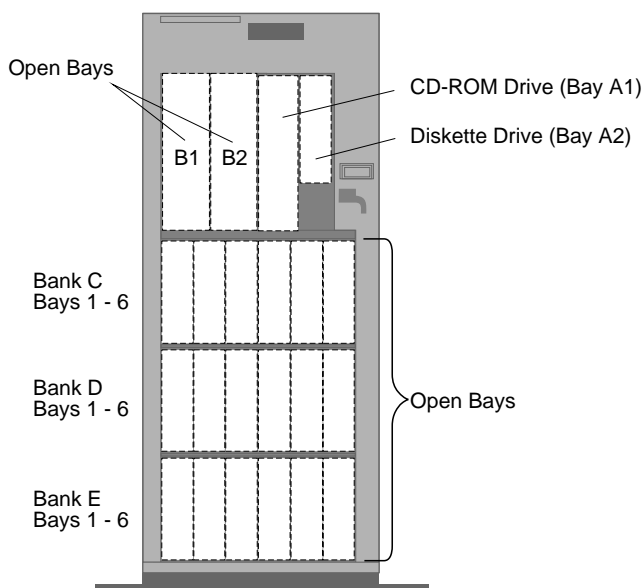
Table 5 (Page 2 of 2). Internal and External Options

Notes:

1. You must add SIMMs in matched pairs. Inside your server is a label that lists all of the available memory-module configurations.
2. EISA represents both EISA and ISA adapters.

Installed Device Records

Refer to the following illustration of your server bays when completing Table 6 on page 384.



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 Table 6 on page 384.
- Your model might have more preinstalled drives than shown in this table.

Installed Device Records

Location	Drive Description
Bay A1	<u>CD-ROM Drive</u>
Bay A2	<u>3.5-Inch 1.44 MB Diskette Drive</u>
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 6. Internal Drives and Devices

Installed Device Records

Location	Device Description
<p><i>Note:</i> If you attach a drive or other device to an adapter, be sure to record the descriptive information in the appropriate column in Table 4 on page 380 (in the same row as the expansion-slot number of the adapter).</p>	

Table 7. External Devices

Installed Device Records

Table 8 shows the default cable connections from the ServeRAID adapter Channels to each bank in the server.

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	_____

Notes:

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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