



PC Server 320

**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 273. Also read the general information under "Product Warranties and Notices" in the *User's Reference*.

Third Edition (January 1996)

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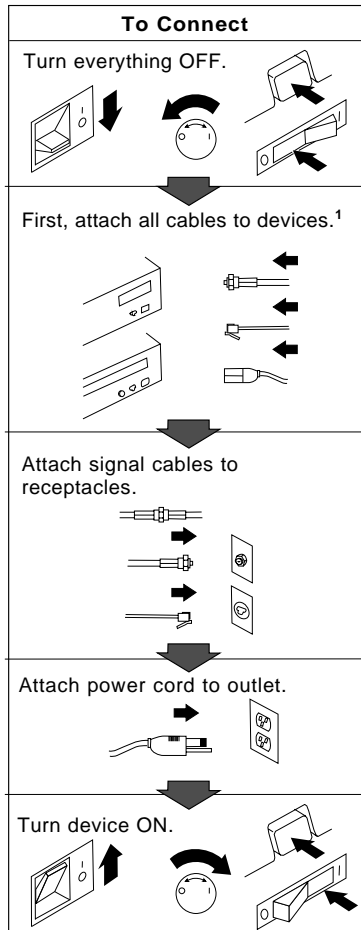
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Safety Information

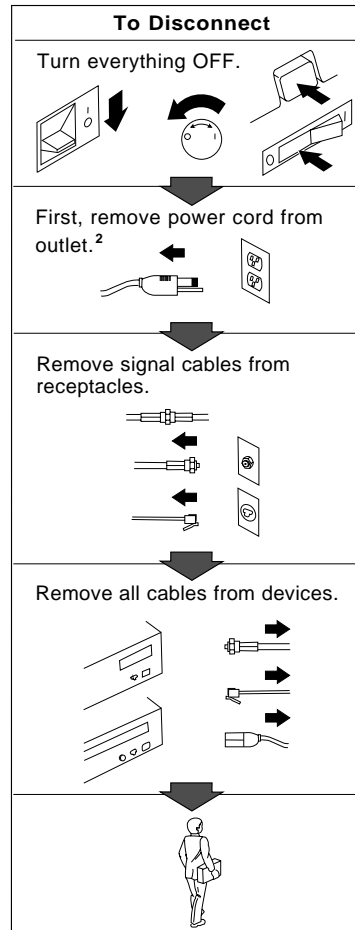


DANGER:

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.

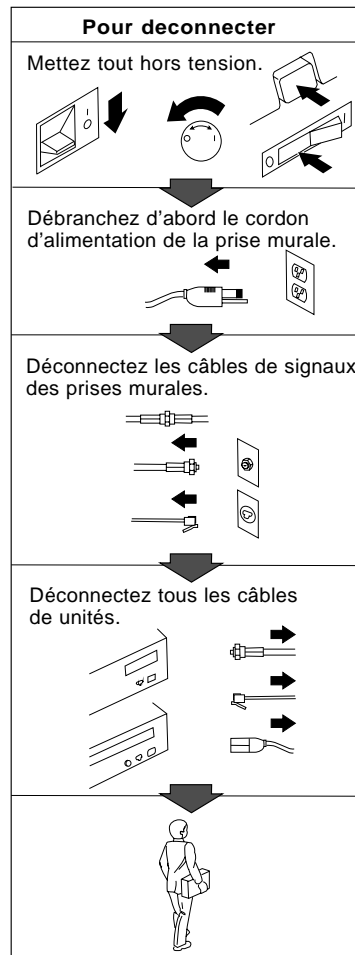
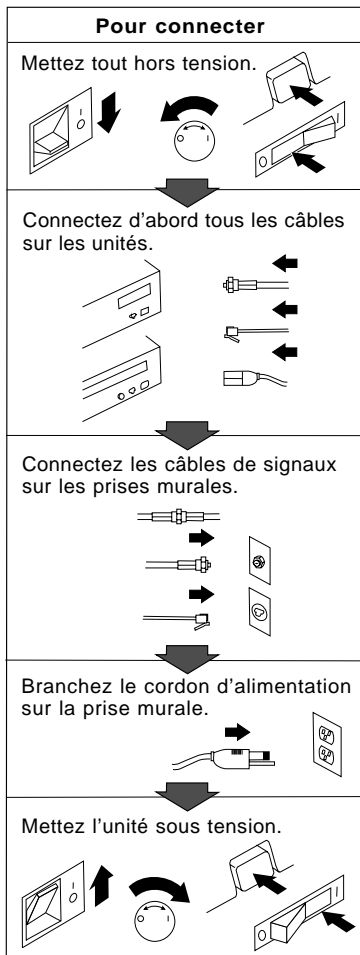


² In the U.K., by law, the power cord must be disconnected after the telephone line cable.



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 320 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 320 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 320 has an internal Class 1 gallium-arsenide laser that is nominally 0.14 milliwatts at 765 to 815 nanometers wavelength.

This book contains the information needed to install options, configure, modify, and troubleshoot your server. 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 19 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 320,” introduces and describes the PC Server 320. 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 the factors that you might want to consider before installing hardware and software in your server. This chapter also contains information about device drivers and describes how to install operating systems. Also included are instructions for completing your installation and using some of the programs that are provided on compact discs (CDs) in the IBM ServerGuide package.

Chapter 3, “Configuring the Disk Array,” applies only to disk-array models. This chapter provides instructions for configuring models that come with a disk-array adapter. 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 device drivers.

Chapter 4, “Installing Options,” contains step-by-step instructions for installing and removing hardware options, such as memory-module kits, adapters, and internal drives. Instructions for setting jumpers and connecting external options are also included in this chapter.

About This Book

Chapter 5, “Configuring Your Server,” contains instructions for configuring your server. This chapter describes how to use the configuration program and other utility programs. This chapter also contains instructions for changing resource allocations.

Chapter 6, “Solving Problems,” contains information to help you solve simple problems that you might have with your server. This chapter includes an overview of the diagnostic tools, instructions for testing the server, lists of error messages, and troubleshooting charts. This chapter also contains information about checking the server for damage, and resolving configuration conflicts.

Chapter 7, “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 320 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.

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 *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 reseller.

Welcome and Thank You

We appreciate your decision to purchase an IBM PC Server 320. 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 xiii for a complete description of the *User's Handbook*. The *User's Reference* contains detailed information about the advanced features of your PC 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. 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 320 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 320

Your IBM PC Server 320, with an Intel Pentium microprocessor and symmetric multiprocessing (SMP) upgradability, along with a peripheral component interconnect (PCI) advanced bus and an IBM PC Server SCSI-2 Fast/Wide PCI Adapter or IBM PC Server SCSI-2 Fast/Wide PCI-Bus RAID Adapter, create a high-performance local area network (LAN) server platform to handle heavy file-server applications or moderate database applications. Your server offers super video graphics array (SVGA) graphics and 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 320 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 320 running cool to improve reliability and accommodate the full configurations necessary in today's LAN server solutions.

Your PC Server 320 comes with a full three-year, on-site warranty, plus IBM PC HelpWare and PC Server Startup Support.

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 19 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 267 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.

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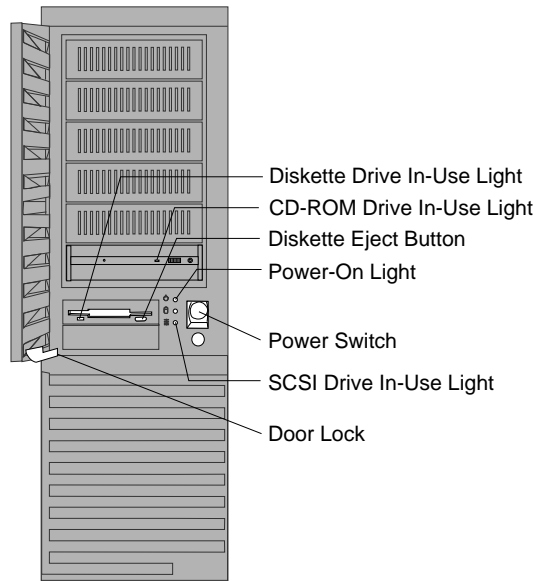
Features at a Glance

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 320.

<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"> • 256 KB of level-2 cache, upgradable to 512 KB <p>Memory</p> <ul style="list-style-type: none"> • Standard: 16 MB minimum, parity memory, expandable to 256 MB • Amount of memory is model dependent • Eight 72-pin, single-inline memory-module (SIMM) sockets • 70 ns speed memory-module kits <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 • Disk-Array models support up to seven hard disk drives, six of them hot-swappable • Non-Disk-Array models support up to six non-hot-swap hard disk drives 	<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 • 10 drive bays on all models • Hot-swap bays standard on some models; available on all models • Number of hot-swap bays varies by model <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 Server SCSI-2 Fast/Wide PCI-Bus RAID 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 <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

The most commonly used controls and indicators are on the front of the server.



Diskette-Drive In-Use Light: This light is on when the drive is accessing a diskette.

CD-ROM Drive In-Use Light: This light is on whenever the CD-ROM drive is accessed.

Diskette Eject Button: Push this button to release the diskette from the drive.

Power-On Light: This light comes on when you turn on your server.

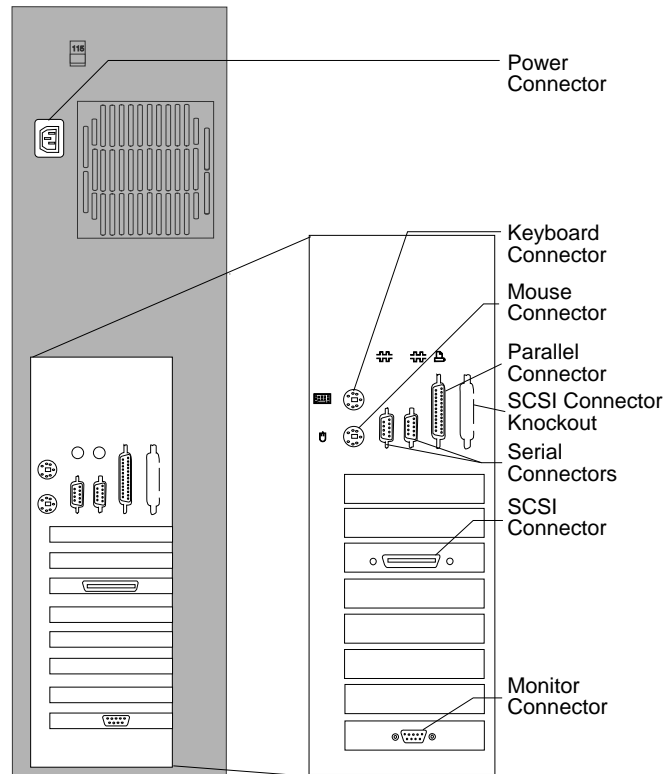
Power Switch: Press this switch to turn your server on or off. Do not turn off your server if a drive In-Use light is on. This might damage the information stored on a hard disk or diskette.

SCSI Drive In-Use Light: This light is on when your server is accessing a SCSI device.

Door Lock: Use the key to lock the door, to help prevent tampering with the internal components.

Input/Output Connectors

The following illustration shows the input/output ports (connectors) on the PC Server 320.



Note: For details about these connectors, see the *User's Reference*. Use the Setup program to configure serial and parallel port assignments, as described in "Using the Setup Program" on page 191.

Input/Output Connectors

Power Connector: The power cable connects here.

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



Keyboard Connector: The keyboard cable connects here. Connect the other end of the keyboard cable to the server by aligning the flat side of the cable connector so that it faces the keyboard icon.



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



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

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



Serial Connectors: The server has two 9-pin, serial connectors, A (COM1) and B (COM2). The serial signal cable for a modem or other serial device usually connects here. Serial connector A is located next to the parallel port. If you are using a 25-pin signal cable, you need a 9-pin-to-25-pin adapter cable.



SCSI Connector: External SCSI devices attach here.

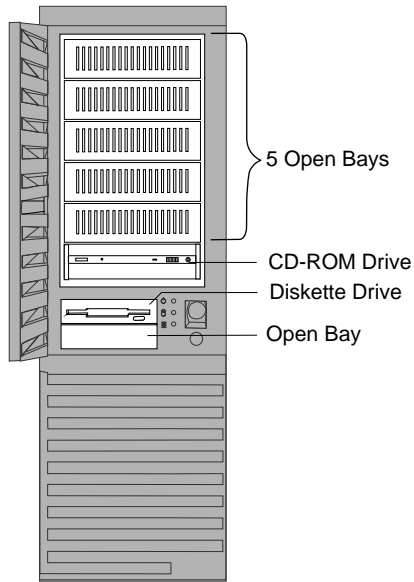


Monitor Connector: The monitor signal cable attaches to the connector on this adapter.

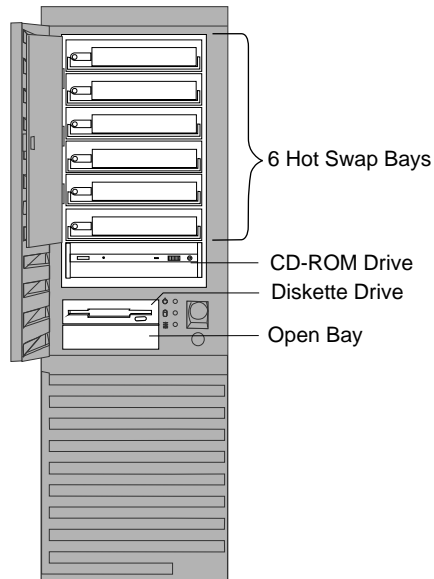
If your monitor has a separate signal cable, connect one end of the signal cable to the monitor. Connect the other end of the signal cable to the monitor connector on the server.

Expansion Bays

Non-Disk-Array Model



Disk-Array Model



Open Bays: Your server's special design gives you the flexibility to use combinations of 3.5-inch or 5.25-inch hard disk, tape, and rewritable optical disk drives. In some models, your server can use up to six hot-swap, 3.5-inch hard disk drives. For installation instructions and information on the types of drives that you can install in each bay, see Chapter 4, "Installing Options" on page 77.

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 or 2 MB diskettes.

Hard Disk Drive: All models come with a SCSI-2 connector. The number and capacities of the hard disk drives vary according to the model that you purchased.

Note: See the *User's Reference* for additional information about the drives. 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. Detailed instructions are located on the Setup 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.

Note: For information about arranging your PC for comfort and ease-of-use, see “Arranging Your Workspace” on page 35.

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.

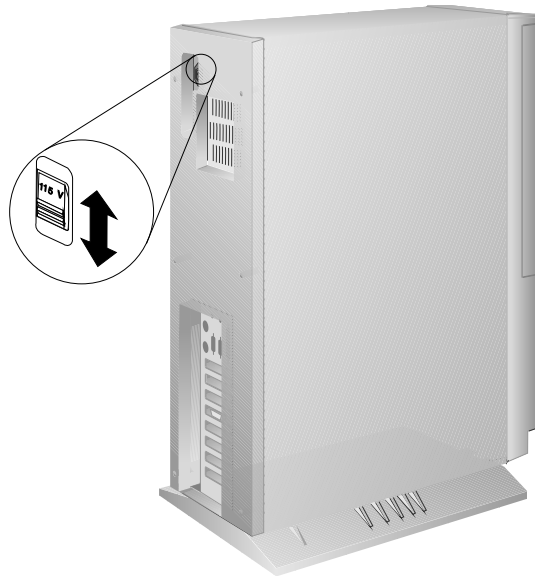
Checking the Voltage Setting

Check the voltage-selection switch and verify that it is in the correct position.

Attention: If you set the voltage switch to the wrong position, you might permanently damage your server when you turn it on.

- If the voltage range in your country is between 90 and 137 volts, check to see that 115 is visible. (Use the 115-volt setting in the U.S. and Canada.)
- If the voltage range in your country is between 180 and 265 volts, check to see that 230 is visible.

If you need to adjust the voltage setting, slide the switch to the correct position.

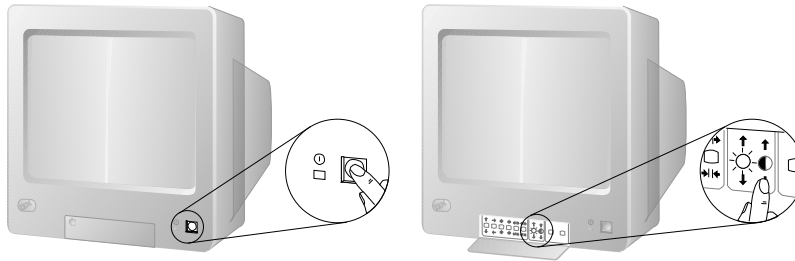


Starting the Server

Starting the Server

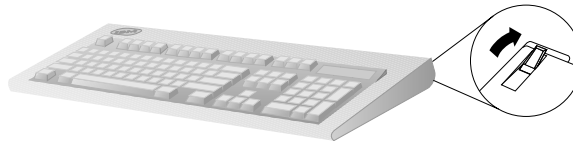
1. Turn on your monitor and adjust the Brightness and Contrast controls to the approximate midpoint.

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



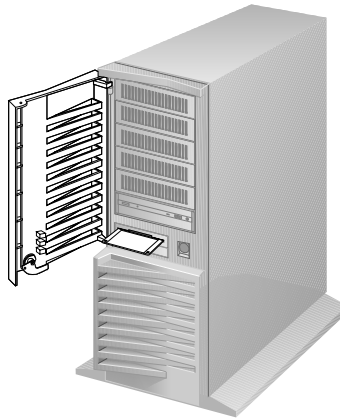
Note: The locations of the Power Switch and the Brightness and Contrast controls on your monitor might be different from those shown above.

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. If the diskette drive contains packing material or a diskette, remove it from the drive.

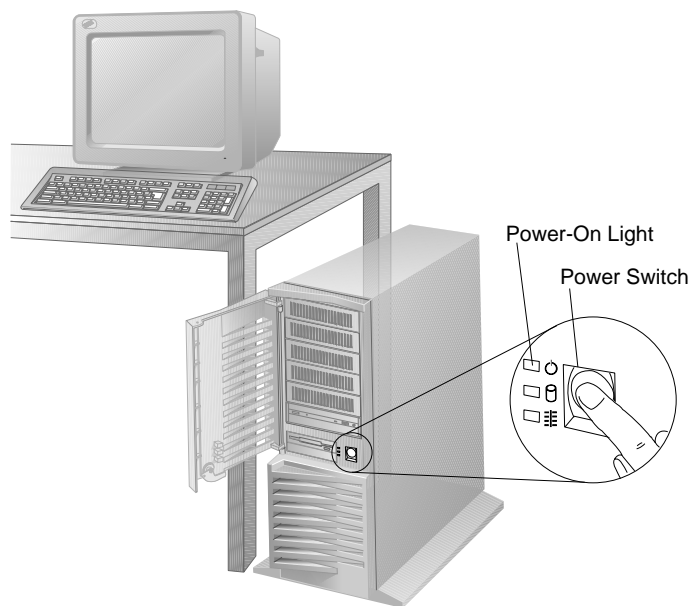


4. If the server is turned on, turn it off.
To turn off the server, press the Power On/Off switch.
5. If you installed any external devices, such as printers, plotters, or modems, turn them on now.

Starting the Server

6. Turn on the server.

To turn on the server, press the Power On/Off switch. The power-on light comes on, and the *power-on self-test (POST)* begins.



7. 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.

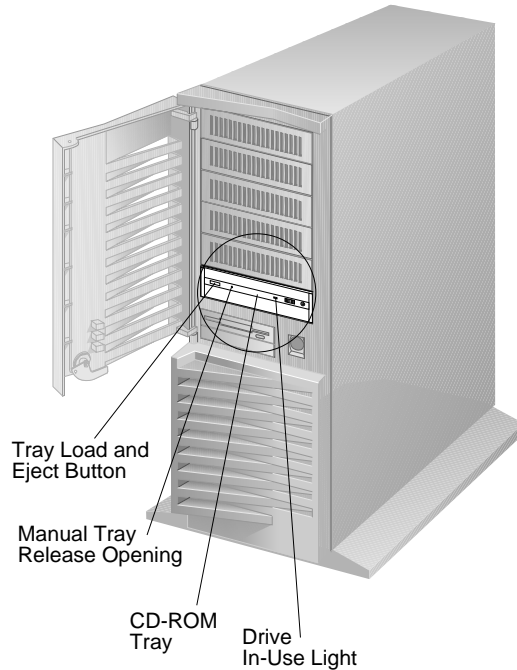
Notes:

- 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 6, “Solving Problems” on page 215.
- 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 read 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 320 models. To use the CD-ROM drive:

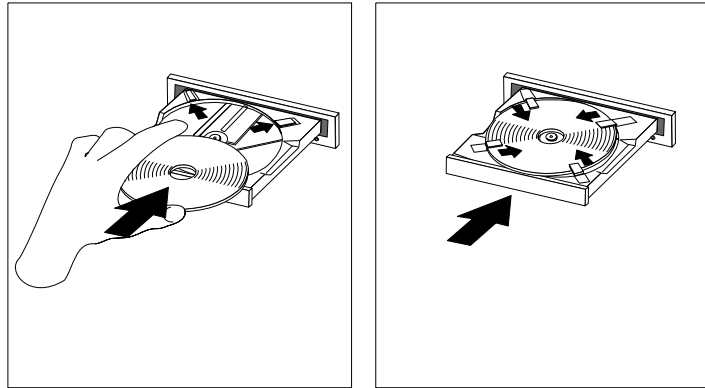
1. Have the CD ready.
2. Press the CD-ROM tray-release button. The CD-ROM tray will extend out approximately 25 mm (1 in.) from the server. Pull the tray straight out until it stops.



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.

Using the CD-ROM Drive

3. With the label information facing up, center and place the CD on the tray as shown.



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

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 that the IBM PC Server Startup Support program supports, 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 7, “Getting Help, Service, and Information” on page 257.

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 option diskette, such as an IBM redundant array of independent disks (RAID) Adapter Option 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. 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. See Chapter 1, "Introducing the PC Server 320" on page 1 for a description of your server features. That chapter also includes instructions for using the CD-ROM drive.

Note: If you need service or assistance, see Chapter 7, "Getting Help, Service, and Information" on page 257.

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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 Personal Software Solutions Center. These software updates are called FixPaks, ServicePaks, or corrective-service diskettes (CSDs). In the U.S., you can call the IBM Personal Software Solutions Center at 1-800-992-4777.

For the latest information about hardware device drivers and SMP operating systems supported by your PC Server 320:

- 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.

Installing an Operating System

The IBM PC Server 320 combines powerful microprocessor performance, large data-storage capacity, and system expandability, so that your server can adapt 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 RAID diskette is included. Before you install an operating system on a disk-array model, use the configuration programs on the SCSI-2 Fast/Wide PCI-Bus RAID Adapter Configuration Option Diskette to view or change the existing disk-array configuration. See Chapter 3, “Configuring the Disk Array” on page 39 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 4, “Installing Options” on page 77 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.
- 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 33.

- If you are installing *your own* operating system:
 1. Review “Software Considerations” on page 21 and “Installing an Operating System” on page 21; then, return here.
 2. Follow the installation instructions that come with your operating system; then, go to “Installation Checklist” on page 33.

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 SMP Installation

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

If you have an OS/2 2.11 SMP license and you want to install OS/2 2.11 SMP on your PC Server 320 without using ServerGuide, call the IBM Personal Software Solutions Center and request authorized program analysis report (APAR) II08627. You must provide your OS/2 license information. IBM will send you the required CD and installation diskettes.

- In the U.S. and Puerto Rico, call 1-800-992-4777.
- In Canada, call 1-800-565-3344.
- In all other countries, contact your IBM reseller or IBM marketing representative.

OS/2 LAN Server 4.0 Installation

If you install OS/2 LAN Server 4.0, you must install the latest NETBEUI.OS2 file. Request APAR IC10307 from the IBM Personal Software Solutions Center.

- In the U.S. and Puerto Rico, call 1-800-992-4777.

Installing an Operating System

- In Canada, call 1-800-565-3344.
- In all other countries, contact your IBM reseller or IBM marketing representative.

If you experience network errors, change the following parameters in the IBMLAN.INI file.

Parameter	From	To
MAXCMDS	16	64
MAXTHREADS	10	32
NUMWORKBUFS	15	40
SRVHEURISTICS BIT 19=0		

Anywhere in the PROTOCOL.INI file, add the following parameter:

SIDEBAND=0

OS/2 LAN Server 4.0 Fixpaks

Several Fixpaks are 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 Personal Software Solutions 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.

Depending on your installation, you might require one or more of the following Fixpaks:

- Fixpak LS40REQ
- Fixpak LS40GUI
- Fixpak LS40ESRV
- Fixpak LS40RIPL

Novell NetWare Installation

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

SCO OpenServer Installation

If you are installing Santa Cruz Operation (SCO) OpenServer 5.0 in a disk-array model, you must obtain from SCO an additional device driver, `mdac`. The Boot-Time Loadable Driver is required for the preinstalled RAID adapter in your PC Server 320.

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

If 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 and then install Windows NT.

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

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 320. 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 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.

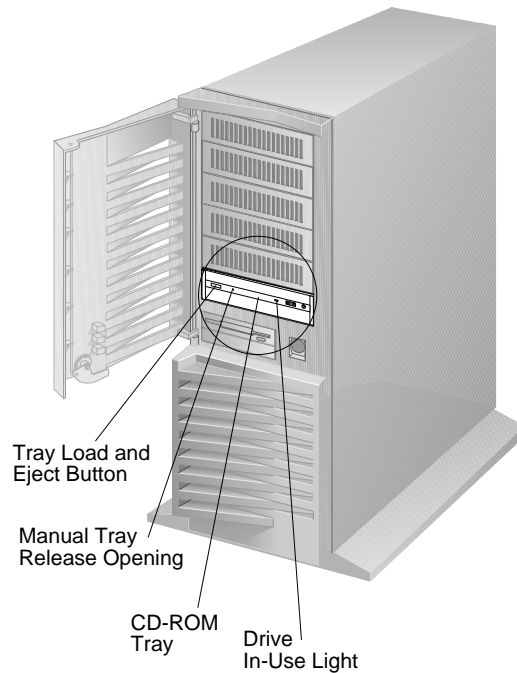
For additional considerations regarding device drivers and operating systems, be sure to read “Software Considerations” on page 21, “Installing an Operating System” on page 21, and “Device Drivers” on page 29.

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:

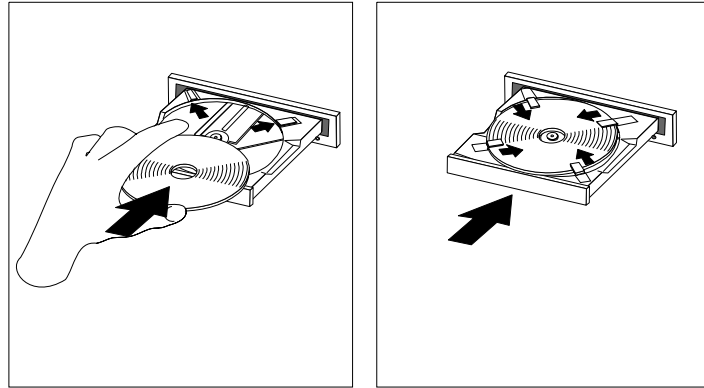
1. If you have not already done so, turn on the server (see “Starting the Server” on page 12).
2. Locate the ServerGuide CD package and diskettes.
3. Have the main CD ready.
4. Press the CD-ROM tray-release button. The CD-ROM tray will extend out approximately 25 mm (1 in.) from the server. Pull the tray straight out until it stops.



Using ServerGuide

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.

5. With the label information facing up, center and place the ServerGuide Main CD on the tray as shown.



6. Locate the tabs in the corners of the tray.
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 server 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 requires the installation of device drivers.

With OS/2, Novell NetWare, Microsoft Windows NT, and SCO UNIX, you must run the administration programs to monitor the drive status. 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 PC Server SCSI-2 Fast/Wide PCI-Bus RAID Adapter Support 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 PC Server SCSI-2 Fast/Wide PCI-Bus RAID Adapter Support Diskette that comes with your server for detailed instructions.

Network Adapter Device Drivers

If you are using OS/2 LAN Server and you want to install a network adapter in your PC Server 320 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 16/4 Busmaster extended industry standard architecture (EISA) Adapter, which appear on the ServerGuide device driver installation menus, are not

Device Drivers

supported in the IBM PC Server 320. However, the IBM PC Server 320 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.CMD C:\
9. Press **Enter**.
10. Perform a Shutdown of your server.
11. Restart your server. This will enable OS/2 LAN Server to install with the device driver configuration that you selected in step 5.

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

Hardware Device Drivers

For the latest information about hardware device drivers for the IBM PC Server 320, 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.

Hardware Considerations

The following sections contain information about hardware updates and modifications.

2.88 MB Diskette Drives

PC Server 320 systems with a basic input/output system (BIOS) level of M54Pe-07, or lower, might experience problems reading 1.44 MB and 720 KB formatted diskettes in 2.88 MB diskette drives. If you are having this problem, for the latest BIOS update, contact:

- In the U.S., call IBM HelpWare 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.

SCSI Hard-Disk-Drive Startup Sequence

The BIOS code locates the startable (bootable) hard disk drive by checking adapters as follows:

- ISA/EISA SCSI adapters start up before PCI SCSI adapters.
- ISA/EISA Adapters — The adapter with the lowest ROM address (starting at hex C8000) starts up first. The system BIOS scans for SCSI option ROMs from hex C8000 up to hex DFFFF and initializes each one as it finds it.
- PCI Adapters — PCI SCSI adapters start up depending on which slot they are plugged into. The order is Slot 3, Slot 2, and Slot 1. That is, the adapter in Slot 3 starts before the adapter in Slot 2, and the adapter in Slot 2 starts before the adapter in Slot 1. See “Installing Adapters” on page 95 for an illustration that shows the adapter slot locations.

Note: PC Server 320 systems with a BIOS level of M54Pe-07, or lower (based on the last two digits), *do not* follow the PCI startup sequence based on slot locations. In those systems, the PCI startup sequence is based on which adapter has the lowest ROM address. The BIOS level appears on the copyright screen when the system is powered on.

IDE Label on System Board

The integrated drive electronics (IDE) port on the system board is labeled Secondary. If you add an IDE adapter to your system and, using the Setup utility program, configure that adapter as your Primary port, configure the IDE port on the system board as your Secondary port. Otherwise, configure the IDE port on the system board as your Primary port.

PC Server 320 Disk-Array Systems

Logical Drive Limitation

In a disk-array configuration, logical drives may be any size, except the startup drive. The startup drive must be less than 2046 MB if you use the high-performance file system (HPFS), or 1024 MB if you use the file-allocation table (FAT).

Setup Tip

Early versions of the EISA Configuration program do not display the configuration setting for the PCI RAID adapter. Keep a record of configuration settings for your PCI adapters when running the EISA Configuration program. Be sure that adapters do not share interrupts.

RAID Data Stripe Change

When the RAID stripe size is changed, *data will be lost*. There is no warning message.

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 5, “Configuring Your Server” on page 189 for information about configuring your server and using these utility programs. See Chapter 6, “Solving Problems” on page 215 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 39. Follow the instructions to back up your disk-array configuration information.

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 267 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.

Install options

If you decided earlier to delay installing your options, you might want to complete these installations now. See

Installation Checklist

Chapter 4, “Installing Options” on page 77 for step-by-step installation instructions.

Complete setting up your PC Server 320

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 191.

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.

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

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.

Arranging Your Workspace

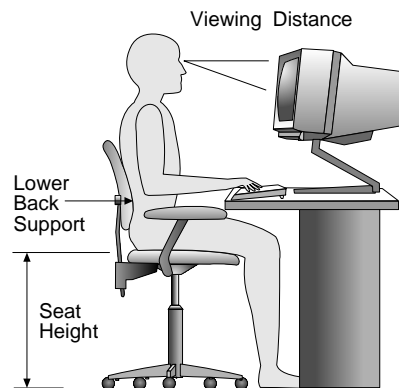
To get the most from your server, arrange both the equipment you use and your work area to suit your needs and the kind of work you do. Your comfort is of foremost importance, but light sources, air circulation, and the location of electrical outlets also can affect the way you arrange your workspace.

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.

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*.

What to Do Next?

- If you have a disk-array model, you must configure your server first, as described in Chapter 3, “Configuring the Disk Array” on page 39, before proceeding with the instructions that are given in the remainder of this handbook. That chapter also contains instructions for what to do after you have configured your disk arrays.
- If you have a non-disk-array model, go to Chapter 4, “Installing Options” on page 77 if you need to install optional hardware or security features in your server. After you complete the instructions in Chapter 4, or if you have no options to install, go to Chapter 5, “Configuring Your Server” on page 189 for instructions for configuring your server, and a description of your server configuration and utility programs.

Chapter 3. Configuring the Disk Array

The information in this chapter applies only to disk-array models. This chapter contains information about configuring the redundant array of independent disks (RAID) adapter and maintaining drives in the disk-array models of the IBM PC Server 320. In addition, this chapter outlines step-by-step procedures for some of the more common disk-array configuration and maintenance tasks, such as adding, changing, or deleting one or more disk arrays.

First, install your hard disk drives, as described in “Installing Internal Drives” on page 109. Return to this chapter and follow the instructions for configuring your disk arrays. After you complete the instructions in this chapter, you must install an operating system. Follow the instructions in your operating system-documentation, and note the software and operating system-considerations in Chapter 2, “Installing Software” on page 19. Then go to Chapter 5, “Configuring Your Server” on page 189 for details about your server configuration and utility programs. If you have not already done so, see “Using the Setup Program” on page 191 for instructions for setting passwords. See Chapter 4, “Installing Options” on page 77 if you need to install additional optional hardware or security features in your server.

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Before You Begin

1. Familiarize yourself with the information in this chapter and the RAID information in the *User's Reference*.
2. Verify the disk-array configuration. Your disk-array model comes configured as one logical drive.
 - To view the disk-array configuration, follow the directions in “Viewing the RAID Configuration” on page 49.
 - To create a disk array, follow the directions in “Creating a Disk Array” on page 51.
3. After you configure the disk array, you can complete setup by installing your operating system (from the ServerGuide CD that is shipped with your server or from the diskettes that come with your operating system). To install your operating system from the ServerGuide CD, follow the instructions in “About ServerGuide” on page 26.
4. After you install your operating system, back up the disk-array configuration. See “Backing Up the Disk-Array Configuration” on page 69.

Note: The SCSI-2 Fast/Wide PCI-Bus RAID Adapter is also called the IBM RAID adapter.

Device Drivers

The RAID adapter requires the installation of device drivers. See the README file on the SCSI-2 Fast/Wide PCI-Bus RAID Adapter Configuration Option Diskette for detailed instructions.

If you install an operating system from the ServerGuide CD, the device drivers will be installed automatically. If, however, you install your operating system from diskettes, you will need to install the device drivers. See the README file on the RAID Adapter Option Diskette for installation instructions.

Administration Monitoring Utilities

The RAID Adapter Option Diskette contains RAID monitoring utility programs for several operating systems that your disk-array model supports. The monitoring programs are:

- OS/2 RAID Controller Administration and Monitor
- OS/2 RAID NetFinity Alert Manager
- OS/2 RAID Controller Administration for Novell NetWare
- RAIDADMN.EXE for Windows NT
- SCO400.EXE and OPS5400.EXE for SCO UNIX

These programs include many of the functions that are in the IBM RAID configuration program, but unlike that program, they reside on top of your operating system and do not require you to start the program from a startable diskette or from a startable CD. You can start these programs from your active operating system desktop.

Each of these monitoring programs allows you to view the RAID configuration, reconfigure the array when replacing a defunct drive, and perform tuning tasks such as changing the write policy.

To monitor the drive status with OS/2, Novell NetWare, Microsoft Windows NT, and SCO UNIX, you must run the administration programs. The RAID Adapter Option Diskette contains files that you must install when you run these programs.

See the README file on the RAID Adapter Option Diskette for installation and use instructions for these monitoring utilities. For OS/2 RAID NetFinity Alert Manager, also see the ServerGuide CD documentation.

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. The defunct drive can be replaced (*hot-swapped*) without turning off the server. For more information about hot-swap hard disk drives, see “Installing Internal Drives” on page 109. See the *User's Reference* for further details about RAID technology.

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 that 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:

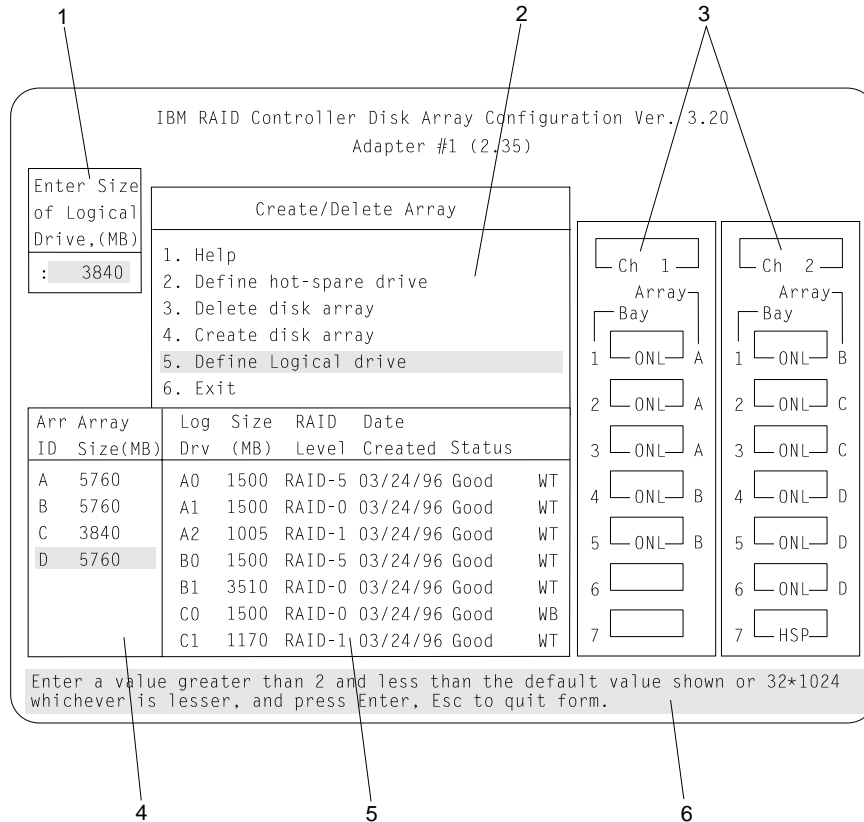
- The total capacity of the array without protection would be 4 GB. With RAID level 5, the usable data capacity would be 3 GB.
- 1 GB equals approximately 1 000 000 000 bytes.

Additional Storage Capacity

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 51). You also can create an array with only one drive.

The RAID Configuration Program Screens

When you configure your disk array, or even just view its configuration, you will be using the IBM RAID configuration program on the SCSI-2 Fast/Wide PCI-Bus RAID Adapter Configuration Option Diskette (also called the IBM RAID Adapter Option Diskette). The following figure is a compilation of many of the IBM RAID Controller Disk Array Configuration (also called the IBM RAID configuration program) screens. The list that follows the figure describes the numbered areas of the figure.



1. This pop-up allows you to select the RAID level that you want to assign to the logical drive that you are defining, and it allows you to select the logical drive size. You can enter the size, in megabytes, or you can accept the default value shown.

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 each bay in the server (for each channel) numbered 1 through 7. The abbreviation in the bay indicates the status of the drive installed in the bay. Selections are made from this list to determine which bays (hard disk drives) are in your arrays. The letter to the right of the bay identifies the array in which the hard disk drive in that bay is grouped.

Note: The Channel/Bay/Array area on the screen does not reflect the physical configuration of the server. In your server, the hot-swap hard disk drives are numbered 1 through 6 (from top to bottom). See “Installing Internal Drives” on page 109 to see the physical location of the hard disk drives.

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), the size of the logical drive, the RAID level assigned to the logical drive, the date it was created, and the write policy.

The status of the logical drive also is shown. **Good** means that no problem conditions are associated with the drive. **Critical** means that you must replace the drive or do a rebuild operation. (You will have received a message telling you the drive is in a **Critical** state during startup time.) **Offline** 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.

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

RAID Technology

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

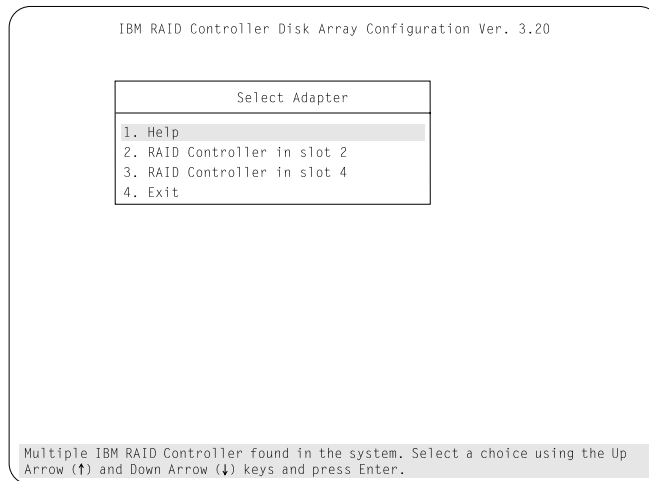
RAID Adapter Configuration Program

The Configuration program allows you to view the current disk-array configuration, change or delete existing arrays, create and initialize new arrays, and perform other array functions.

Starting the RAID Configuration Program

To start the Configuration program:

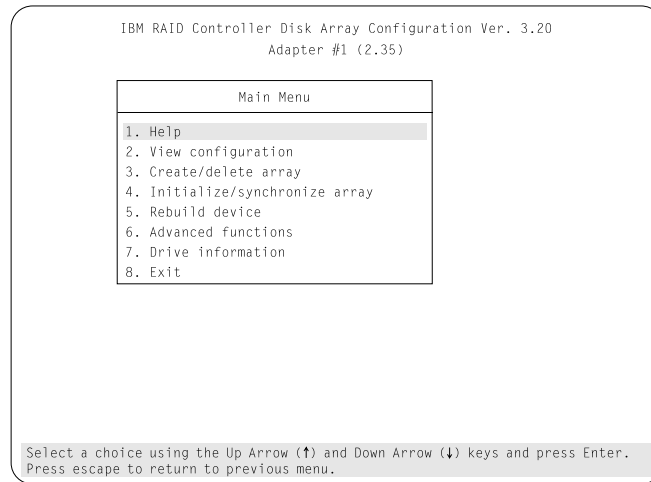
1. Insert the SCSI-2 Fast/Wide PCI-Bus RAID Adapter Configuration Option Diskette into the primary diskette drive and turn on the system.
If the system is already on, press **Ctrl+Alt+Del**.
2. The Startup Menu screen appears with option 1, Start Option Diskette (Driver Install) and option 2, Start RAID Configuration Program (Array Configuration). Select option 2, **Start RAID Configuration Program (Array Configuration)**.
3. If you have more than one RAID adapter, you get a screen similar to the following for adapter selection. To select a RAID adapter for configuration, follow the instructions on the screen. If you have only one RAID adapter, the Main Menu appears.



The version numbers and slot numbers on your screens might be different.

RAID Adapter Configuration Program

The Main Menu of the IBM RAID Configuration Program is as follows.



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

The Main Menu offers the following items:

- Select **Help** when you need information about the choices on the screen.
- Select **View configuration** to see the existing disk-array configuration.
- Select **Create/delete array** to define a hot-spare drive, select the drives for an array that you want to create, or delete an existing array. This item also has choices for defining a logical drive and formatting a drive.

Whenever you make changes to the configuration and then select **Exit**, the Confirm pop-up window appears. You must select **Yes** to save and activate the changes.

- Select **Initialize/synchronize array** after you create your array:
 - If you are using RAID level 5 or level 1, *you must select **Initialize logical drive for proper operation***. This sets the drive to a predetermined state. Any data that exists on the drive is overwritten with zeros, and corresponding parity is initialized to the correct value.

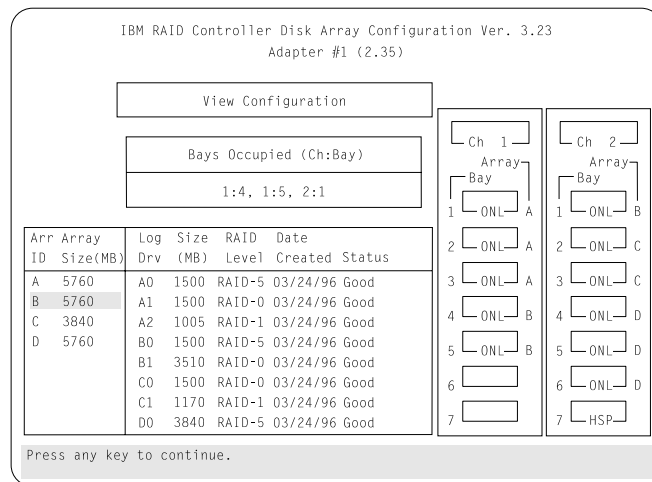
You can initialize more than one logical drive at a time. You can interrupt the initialization process at any time by pressing the **Esc** key. Then, you can restart the initialization process by pressing **Enter**, or you can end the process by pressing **Esc** again.
 - Select **Synchronize logical drive** to recompute and rewrite the parity data on the drive. You select this choice to recompute parity data for RAID level 5. This choice does not alter data on the drive. You can synchronize more than one logical drive at a time.
- Select **Rebuild device** if you want to rebuild logical drives. The Rebuild operation is supported only for RAID levels 1 and 5.
- Select **Advanced functions** to save your configuration information to a diskette or restore it from a diskette, and to change RAID parameters. You also can perform a low-level format of hard disks from this choice.
- Select **Drive information** to view information about the SCSI devices (hard disk, CD-ROM, tape, and so on) connected to the RAID adapter.
- Select **Exit** to leave the Main Menu.

Viewing the RAID Configuration

To view the configuration of your disk array:

1. Start the Configuration program (see “Starting the RAID Configuration Program” on page 47 if you need help).
2. Select option 2, **Start RAID Configuration Program (Array Configuration)**.

3. Select **View configuration**. The current disk-array configuration information appears on the screen.
4. Press **Enter** to show the stripe order. Stripe order shows how data is accessed in sequential stripes. In the following example of sequential data access, data is accessed from a stripe from channel 1 bay 4, then channel 1 bay 5, and then channel 2 bay 1, respectively.



5. Press any key to return to the View Configuration menu.
6. Press **Esc** to return to the Main Menu.

Performing Common Tasks

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

- “Creating a Disk Array” on page 51
- “Defining Logical Drives” on page 52
- “Defining a Hot-Spare Drive” on page 57
- “Deleting a Disk Array” on page 59

Creating a Disk Array

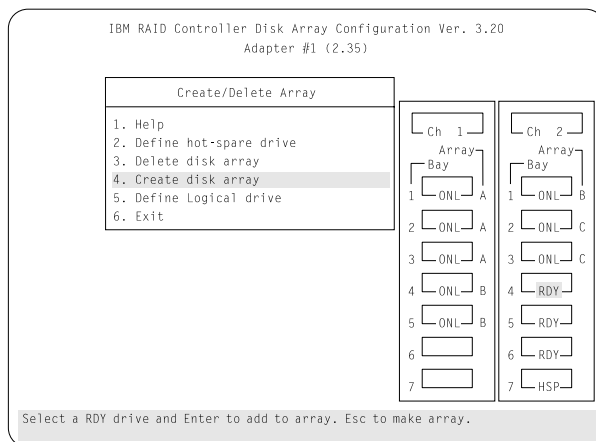
To create a disk array:

1. Start the Configuration program (see “Starting the RAID Configuration Program” on page 47 if you need help).

Note: If you want to create an array using hard disks in an existing array, refer to “Redefining Space in an Array” on page 61.

2. Select option 2, **Start RAID Configuration Program (Array Configuration)**.
3. Select **Create/delete array** from the Main Menu.
4. Select **Create disk array** from the Create/Delete Array menu.

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



Note: In the following step, when you press **Enter** to select a drive for an array, you cannot change your selection by pressing Enter again, as you can with the hot-spare selection process. Carefully determine which drives you want 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 begin again.

5. Select each drive that you want in the array by using the Up Arrow (↑) or Down Arrow (↓) key to highlight the drive and then pressing **Enter**. As you select each drive, the status changes from **RDY** (Ready) to **ONL** (Online).
6. When you have selected all the drives you want in the array, press **Esc**. The cursor becomes active in the menu.
7. If you have drives you did not use in this array and you want to create another array, you can do either of the following:
 - Define the logical drive or drives for this array; then, create another array and its logical drives.
 - Create another array by repeating steps 2 through 5 in this procedure; then, define logical drives for both arrays.

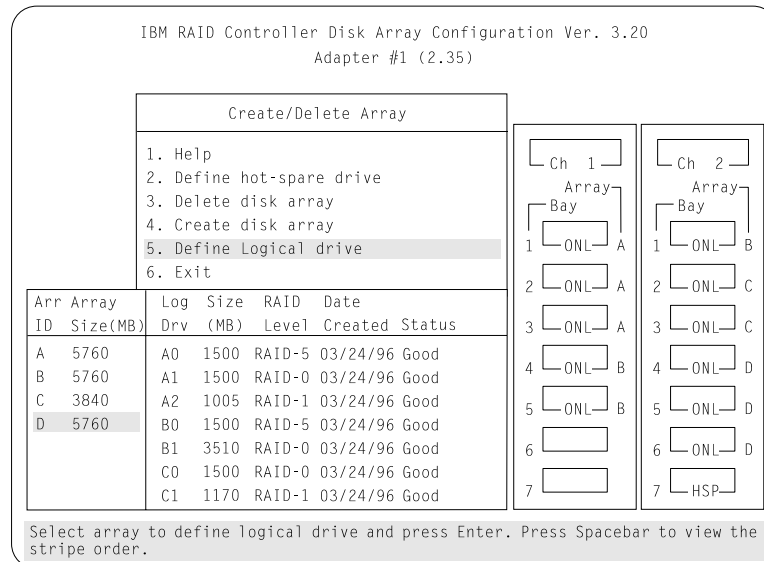
If you do not want to create another array, continue with “Defining Logical Drives.”

Note: You must define at least one logical drive for each created array before you can exit the Configuration Program.

Defining Logical Drives

After you have created an array, you must define a logical drive. (You cannot leave the Configuration Program until you define the logical drives for any created arrays.)

1. Select **Define Logical drive** from the Create/Delete Array menu. The following screen appears. The cursor is active in the Array list.

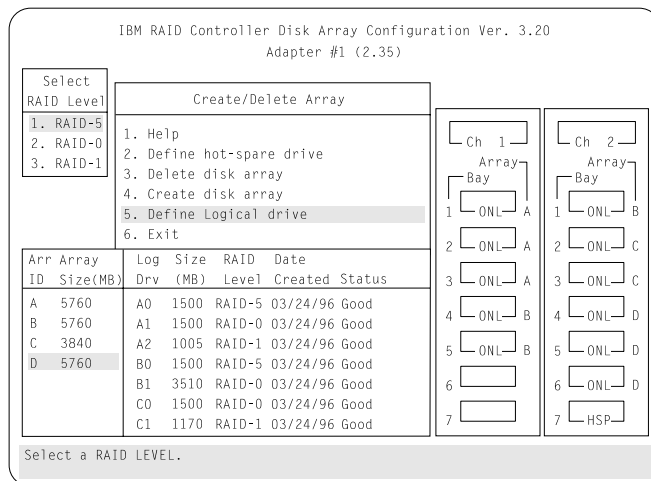


2. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the array that you want to define; then, press **Enter**. The Select RAID Level pop-up window appears. The cursor becomes active in the window.

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 does 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. You must have at least three hard disk drives in an array to assign RAID level 5 to one of the logical drives. Remember that you can define more than one logical drive for your array. The only restriction is that the total number of logical drives you can define is eight.

3. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the RAID level that you want to assign to this logical drive; then, press **Enter**.

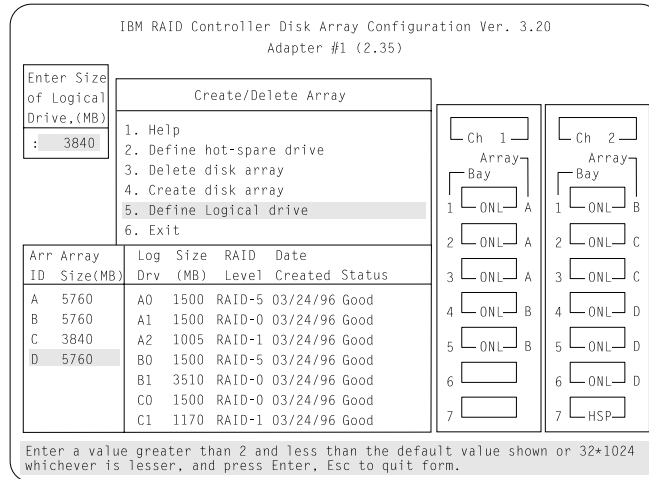


Note: Because the level that you assign can influence the space needed for the drive, you must assign a RAID level before you enter the size of the logical drive.

The logical drive information appears in the Logical Drive list. The Logical Drive list shows you the logical drive ID, the size of each logical drive, the RAID level you assigned to that logical drive, and the date created.

The status of the logical drive also is shown. **Good** means that no problem conditions are associated with the drive. **Critical** means that you must replace the hard disk drive and rebuild the logical drive. (You receive a message telling you what has happened to the drive during startup time.) **Offline** means that the logical drive is irrecoverable; the data in that drive is lost.

The Logical Drive Size pop-up window shows the space in this array that is available for logical drives. Type any size that you want within this size limitation.



4. 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 that appears in the Logical Drive list might be different from the size that you typed. The size of a logical drive is determined by several factors, but basically the size must be divisible by the number of data drives in the array.

Consider the following scenarios:

Scenario 1:

The array contains three drives. You assign RAID level 0 (which uses all the drives in the array with no parity storage), and type 1000MB. The size shown in the Size (MB) column is 999, which is the number closest to and lower than 1000, and divisible by 3.

Scenario 2:

The array contains three 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 size shown in the Size (MB)

column 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 four disk arrays.

5. To return to the menu, press **Esc**. If you want to define more logical drives, repeat steps 1 through 5 of this procedure.
6. To leave this menu, select **Exit** or press the **Esc** key. A pop-up window appears asking you to confirm your action.
7. To save your changes, select **Yes**. To maintain the configuration that was in place before you selected changes, select **No**.
8. If you are using RAID level 5 or level 1, *you must select **Initialize logical drive** for proper operation.* This sets the drive to a predetermined state. Any data that exists in the drive is overwritten with zeros, and corresponding parity is initialized to the correct value.
 - a. Select **Initialize/synchronize array** 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 drives become highlighted as you press the Spacebar). 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 on the logical drive is 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.** 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.

You need a 3.5-inch, formatted diskette for the following backup procedure.

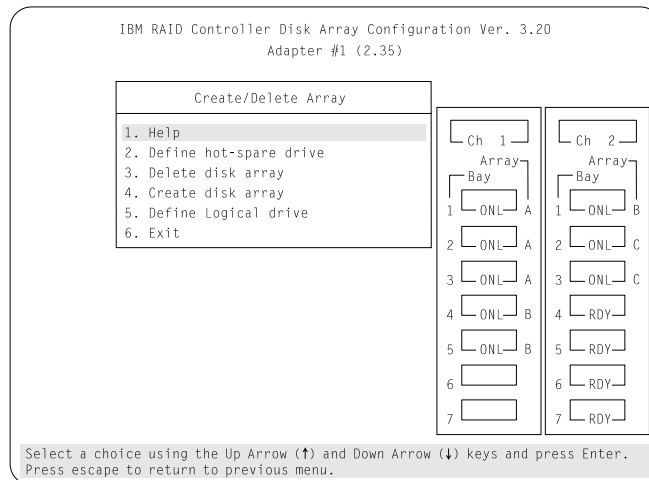
9. Back up the configuration information to diskette:
 - a. Select **Advanced functions** from the Main Menu.
 - b. Select **Backup config. to diskette**.

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 extension added is *.dmc*

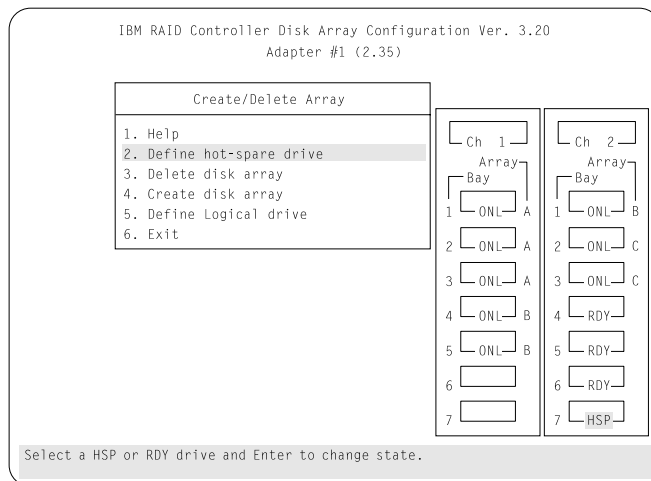
Defining a Hot-Spare Drive

To define a drive as a hot-spare drive:

1. Start the Configuration program (see “Starting the RAID Configuration Program” on page 47 if you need help).
2. Select **Create/delete array** from the Main Menu. The following screen appears.



3. Select **Define hot-spare drive**. The cursor becomes active in the Bay-Array selection lists.



Note: Only disk drives are shown as RDY, ONL, DDD, OFL, or HSP state. Tape and CD-ROM drives are not shown. They appear when you select drive information.

The numbers to the left are the bay IDs. See “Bay/Array Selection List” on page 65 for the drive status meanings.

4. Use the Up Arrow (↑) or 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 alternate between **HSP** and **RDY**.
5. Press **Esc** when you have finished. The cursor becomes active in the Create/Delete Array menu.
6. If you want to create a disk array, go to “Creating a Disk Array” on page 51.

If you are finished:

- a. Select **Exit** or press the **Esc** key. A pop-up window appears asking you to confirm your change.

Note: The changes that 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 that you selected to be a hot spare; select **Yes** to define it as a hot-spare drive.

- c. Back up the configuration information to diskette. Refer to “Backing Up the Disk-Array Configuration” on page 69 for instructions.

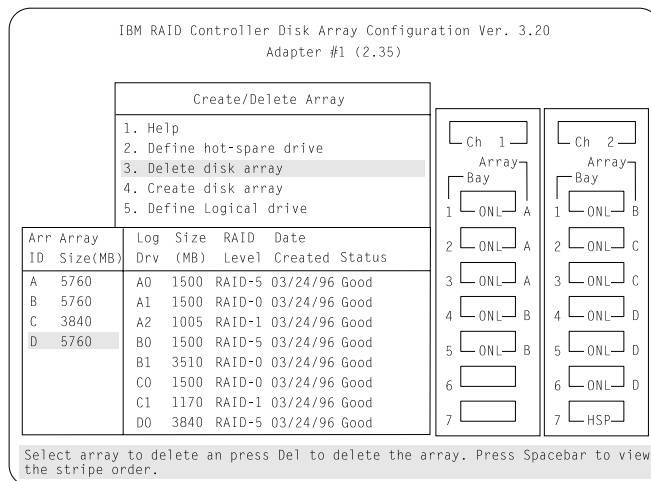
Deleting a Disk Array

The last array that you created must be the first array that you delete.

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.

1. Start the Configuration program (see “Starting the RAID Configuration Program” on page 47 if you need help).
2. Select **Create/delete array** from the Main Menu.
3. Select **Delete disk array** from the Create/Delete Array menu.
The cursor becomes active in the Array list.
4. Review the Date Created column in the Logical Drive list; then, press the Up Arrow (↑) or Down Arrow (↓) key to highlight the most recently defined array.
5. Press **Del**. The Confirm pop-up window appears.

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



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

Note: To use hard disks from the existing array when creating a new array, you must confirm the deletion of the existing array.

If a defunct drive is still in a bay, the status shows a blank bay, as though there were no drive in that bay. When you replace the drive, the status shows **RDY** after the reconfiguration is completed and you have selected **Yes** in the Confirm pop-up window.

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

Adding Drives to Create an Additional Array

The following procedure shows you how to add storage capacity to your server without disturbing existing data.

1. Install the additional hard disk drive or drives. (See “Installing Hard Disk Drives in Hot-Swap Bays” on page 148 for information about installing drives.)
2. Insert the SCSI-2 Fast/Wide PCI-Bus RAID Adapter Configuration Option Diskette into the primary drive; then, press **Ctrl+Alt+Del**. If your system is turned off, turn it on.

3. Create a new disk array and define logical drives (see “Creating a Disk Array” on page 51 for detailed instructions).

Redefining Space in an Array

You can redefine space in a disk array in several ways. For example, you can combine a number of small logical drives to create a larger one; you can redefine the existing logical drive into several smaller drives; or you can add hard disk drives and use them along with the existing drives to create a logical drive that is larger than was possible with your existing storage capacity.

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

Before you can redefine the space in a disk array, you must first delete the array. The last disk array that you defined must be the first array that you delete.

Attention: 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, you must back up and then restore this information. To save time, you might want to use a high-speed backup device, such as a tape drive.

Follow this procedure to redefine the space in an array:

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

Refer to “Hard Disk Drive Capacities” on page 43 for information about selecting drive sizes. See “Installing Hard Disk Drives in Hot-Swap Bays” on page 148 for information about installing drives.

3. Insert the SCSI-2 Fast/Wide PCI-Bus RAID Adapter Configuration Option Diskette diskette into the primary drive; then, press **Ctrl+Alt+Del** to start the Configuration program.
4. Delete the existing array:
 - a. Select **Create/delete array** from the Main Menu. The Create/Delete Array menu appears.
 - b. Select **Delete disk array**. The cursor is then active in the Array list.
 - c. Review the Logical Drive List Date Created column; then press the Up Arrow (↑) or Down Arrow (↓) key to highlight the most recently defined array.

Note: You must delete disk arrays in descending order; the last disk array that you created must be the first disk array that you delete.
 - d. Press **Del**. The Confirm pop-up window appears.

Attention: All the data in the array is 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 in the new array, you must confirm the deletion of the existing array.

After you make your selection, the Confirm pop-up window is no longer displayed, and the cursor becomes active in the menu.
5. If you want to define a drive as a hot-spare drive, refer to “Defining a Hot-Spare Drive” on page 57 for detailed instructions.
6. Create a new disk array and define logical drives.

See “Creating a Disk Array” on page 51 for detailed instructions on creating a disk array and defining logical drives.

7. After you have created the new array and logical drive or drives, select **Initialize/synchronize array** 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, and corresponding parity is initialized to the proper value.
8. You need a 3.5-inch, formatted diskette for this backup procedure. If you want to have a backup of this configuration information, select **Advanced functions** from the Main Menu, and then select **Backup config. to diskette**. Follow the instructions on the screen.
9. Exit from the Configuration program by pressing the **Esc** key while on the Main Menu, or by selecting **Exit** from the Main Menu. A pop-up window appears, asking you to confirm your action.
10. Reinstall your operating system and device drivers; then, restore your data and programs.

Drive Maintenance

This section includes information about logical and hard disk drive status indicators, and about the results of a hard disk drive failure.

It also has procedures for replacing defunct drives and for redefining the space in an array by replacing logical drives.

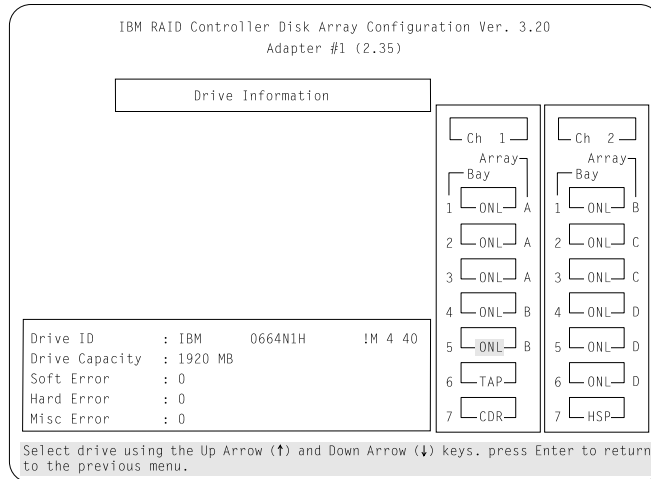
Obtaining Drive Status

To see the ID, capacity, and other information about your hard disk drives:

1. Start the Configuration program (see “Starting the RAID Configuration Program” on page 47 if you need help).

Drive Maintenance

2. Select **Drive information**.



3. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight each of the drives shown in the Bay/Array selection list. As you highlight each drive, the information for that drive appears at the bottom of the screen.

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

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

Any of the following circumstances can cause the status area to be blank:

- No hard disk drive is installed in that bay.
- The bay contains a hard disk drive, but the drive is not inserted correctly.
- An array was deleted and a defunct drive is still in the bay.
- A new drive was installed, but the configuration program has not been restarted. (The status changes to **RDY** when the configuration program is restarted.)

Bay/Array Selection List

The status of the drives in the Bay/Array selection list is defined as follows:

Status	Meaning
CDR	CD-ROM. A CD-ROM drive is installed.
DDD	Defunct Disk Drive. The drive is an online or hot-spare drive that does not respond to commands. (If a RDY drive is defunct or powered down, it shows as an empty bay (a blank status), not a DDD status).
FMT	ForMaT. The drive is being reformatted.
HSP	Hot SPare. The drive will replace a similar drive that becomes defunct in real time. At that time, its status changes to ONL , and its array association appears.
OFL	OffLine. The drive is a good drive that has replaced a defunct drive in a RAID level 1 or level 5 array. It is associated with an array, but does not contain any valid data. The drive state remains OFL during the rebuild phase.
ONL	ONLine. The drive is part of an array. If this drive fails, logical drives defined in the array in which this drive is grouped will have a status of Offline (if the logical drive is assigned RAID level 0 with a good status) or Critical (if the logical drive is assigned RAID level 1 or level 5 with a good status).
RDY	ReaDY. The drive is recognized by the adapter and is available for definition.
TAP	TAPe Drive. A tape drive is installed.
UFM	UnForMatted. The hard disk requires a low-level format before it can be used in an array.

Results of a Hard Disk Drive Failure

Depending on the circumstances, a drive failure can generate several results.

- If only one disk drive fails, and you have a hot-spare drive defined that is the same as or greater than the size of the failed drive, and the logical drives in the array are assigned RAID level 1, level 5, or a combination of these two levels, the hot spare takes over immediately.

Note: The hot-spare drive does not function for an array containing a logical drive assigned RAID level 0; the data in the logical drives assigned levels 1 and 5 is not lost, even though the drives function with reduced performance.

- If only one disk drive fails, and you do not have a hot-spare drive defined, and the logical drives in the array are assigned RAID level 1, level 5, or a combination of these two levels, no data is lost. However, the system operates at a reduced level of performance until the defunct drive is replaced and rebuilt.
- If more than one drive fails among the drives that are grouped in one array, all the logical drives of that array lose all the data that is stored within them. For this reason, it is important that you replace and rebuild the data from 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, causes logical drives in that array that are assigned levels 1 and 5 to have a **Critical** status. Good data remains in logical drives with a **Critical** status, but you must replace the defunct hard disk drive promptly to avoid losing all data in the array in the event of another disk drive failure.

After you install a new hard disk drive, the Replace process changes the drive status from **DDD** to **OFL** if there is a **Critical**

logical drive. After the Rebuild process, the hard disk drive status changes from **OFL** to **ONL**.

- A single or multiple hard disk drive failure generates an **Offline** status for the logical drives in an array that are assigned level 0. Your server loses the data in the logical drives that have an **Offline** status. However, with a *multiple* disk drive failure, when the defunct drives are part of the same array, logical drives in that array have an **Offline** status. This means that your server loses the data in all the logical drives in that array, regardless of which RAID level is assigned.

Replacing a Faulty Drive

Note: Hot-swap drives have a green light on the knob of the tray that contains the drive. If the drive has a good electrical connection upon installation, a solid green light illuminates on the knob of the drive tray. When a hard disk drive fails and needs to be replaced (**DDD** status only), a blinking green light illuminates on the knob of the drive tray.

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, and then restart the system.

If the light on the drive tray blinks, the drive is faulty. Do the following steps:

1. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive and turning on the system. If the system already is turned on, press **Ctrl+Alt+Del**.
2. Select **Start RAID Configuration Program** from the PC DOS start-up menu. (See “Starting the RAID Configuration Program” on page 47 if you need help.)

If the drive failed while the system was powered down, a screen appears the next time the system is powered on, showing you which drive is defunct.

Drive Maintenance

3. If the drive is not damaged:

- a. Turn off the system.
- b. Correct the problem.

Make sure that the cables to the power supply and the RAID controller are connected correctly. Check the RAID controller, and the SCSI-2 connector on the RAID Adapter. See Chapter 6, “Solving Problems” on page 215 for troubleshooting information.

4. If the drive is defunct:

- a. Press **Y** (Yes) to reconfigure the system.
- b. Press **Ctrl+Alt+Del** when instructed to restart the system. The Main Menu appears.
- c. Select **Rebuild device**.

At this point, the drive status shows **DDD**.

Attention: Removing the wrong hard disk drive can cause loss of data. Make sure you know which drive is the defunct drive before removing a drive.

- d. Replace the defunct drive. See “Installing Hard Disk Drives in Hot-Swap Bays” on page 148 for instructions on replacing the drive.
- e. After you have replaced the drive, press **Enter**. The system is reconfigured to include the drive, and the drive status changes to **OFL** if the state of the logical drive is **Critical** or, to **ONL** if the state of the logical drive is **Offline**.
- f. Allow the system to complete the configuration (the screen displays a completion message); then, select **Rebuild drive**.
- g. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the **OFL** drive you want to rebuild; then, press **Enter**.

The progress of the rebuilding process appears on the screen.

- h. When the rebuilding process is complete, press **Esc** to return to the Main Menu. The system saves the new configuration.
- i. Select **Exit** to end the Configuration program.
- j. Remove the diskette and press **Ctrl+Alt+Del** to restart the system.

Advanced Functions

This section contains procedures for performing additional, less common, disk-array tasks. You can perform these tasks by selecting the appropriate utility programs from the Advanced Functions menu. These include:

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

This section gives the procedures for using these advanced functions.

Attention notices about these procedures appear throughout this section to alert you about potential loss of data. Similar warnings appear on the screen. Read these warnings carefully before answering yes to the confirmations requested by the RAID configuration program.

Backing Up the Disk-Array Configuration

The disk-array configuration is *vital information*.

The PC Server 320 maintains a record of the array configuration information in its electrically erasable programmable read-only memory (EEPROM) module. To protect this information, back up the information to diskette as soon as you complete your tasks. You need a blank, formatted, 3.5-inch 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.

Advanced Functions

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

1. Label the blank diskette “Disk Array Configuration Backup,” and date it.
2. Start the Configuration program (see “Starting the RAID Configuration Program” on page 47 if you need help). The Main Menu appears.
3. Select **Advanced functions**.
4. Select **Backup config. to diskette**.
5. Remove the RAID adapter diskette from the primary 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 RAID adapter EEPROM module, use the Configuration program and an up-to-date Disk Array Configuration Backup diskette. To restore the configuration information:

1. Start the Configuration program (see “Starting the RAID Configuration Program” on page 47 if you need help).
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 cache memory, but *before* the data is actually written to the storage device.

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

cache memory, but *before* data is actually written to the storage device.

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.

To change the write policy:

1. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive and turning on the system. If the system already is turned on, press **Ctrl+Alt+Del**.
2. Select **Start RAID Configuration Program** from the PC DOS start-up menu and press **Enter**.
3. Select **Advanced functions** from the Main Menu.
4. Select **Change write policy** from the Advanced Functions menu. The cursor will be active in the Logical Drive list.
5. Select the logical drive whose write policy you want to change. A screen similar to the following appears:

IBM RAID Controller Disk Array Configuration Ver. 3.20
Adapter #1 (2.35)

Advanced Functions

1. Help
2. Back-up config. to diskette
3. Restore config. from diskette
4. Change write policy
5. Format drive

Arr ID	Array Size(MB)	Log Drv	Size (MB)	RAID Level	Date Created	Status	Wrt pol
A	5760	A0	1500	RAID-5	03/24/96	Good	WB
B	5760	A1	1500	RAID-0	03/24/96	Good	WT
C	3840	A2	1005	RAID-1	03/24/96	Good	WT
D	5760	B0	1500	RAID-5	03/24/96	Good	WT
		B1	3510	RAID-0	03/24/96	Good	WT
		C0	1500	RAID-0	03/24/96	Good	WT
		C1	1170	RAID-1	03/24/96	Good	WT
		D0	3840	RAID-5	03/24/96	Good	WT

Ch 1

Array Bay

1 ONL A

2 ONL A

3 ONL A

4 ONL B

5 ONL B

6

7

Ch 2

Array Bay

1 ONL B

2 ONL C

3 ONL C

4 ONL D

5 ONL D

6 ONL D

7 HSP

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

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

Chapter 3. Configuring the Disk Array **71**

Advanced Functions

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 that you created it.

The status of the logical drive is also shown. **Good** means that no problem conditions are associated with the drive. **Critical** means that you must replace the hard disk drive and rebuild the logical drive. (You will have received a message telling you what has happened to the drive.) **Offline** means that the logical drive is irrecoverable; the data in that drive is lost.

6. 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).

7. Use the Up Arrow (↑) or Down Arrow (↓) key to 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.

8. Press **Enter** to change the write policy.

Notice that **WT** changes to **WB**. You can press **Enter** to alternate between **WT** and **WB**.

9. When you have made your choice, press **Esc** to return to the Advanced Functions menu.
10. Select **Exit**. The Confirm pop-up window appears, asking you to confirm your action.
11. To return the setting to its original state, select **No**. To save your changes, select **Yes**.
12. Back up the disk-array model configuration information to diskette. Refer to “Backing Up the Disk-Array Configuration” on page 69 for more information.

Formatting Drives

You can perform a low-level format on drives with **RDY** (ready), **OFL** (offline), or **UNF** (unformatted) status.

Note: The **Format drive** choice on the Advanced Functions 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 Format program is provided in the IBM RAID Configuration program so that you can perform a low-level format on a drive controlled by the RAID adapter. To perform a low-level format:

1. Start the Configuration program (see “Starting the RAID Configuration Program” on page 47 if you need help).
2. Select **Advanced functions** from the Main Menu.

Attention: A low-level format erases all data and programs from the drive.

3. Select **Format drive**. The low-level format program starts.

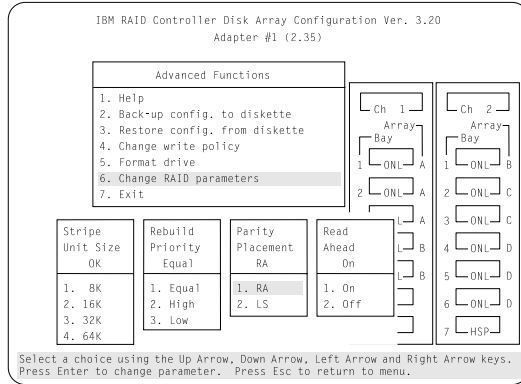
Follow the directions on the screen. You can perform a low-level format on more than one drive at a time.

Changing RAID Parameters

To change the RAID parameters:

1. Start the Configuration program (see the “RAID Adapter Configuration Program” on page 47 if you need help).
2. Select **Advanced Functions** from the Main Menu.
3. Select **Change RAID parameters**.

Advanced Functions



RAID parameters are performance tuned and should be set in a user environment.

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 on the logical drives.

The stripe unit size is the amount of data written on a given disk before writing on the next disk. This stripe unit should be chosen such that the stripe-unit size is close to the size of the system I/O request to maximize the overall performance. The default is set to 8 K data bytes.

- Rebuild priority — Equal.

Rebuild priority can be set to equal, high, or low. When the rebuild priority is set to equal, the rebuild I/O request and system I/O request get equal priority in the execution order.

When the rebuild priority is set to high, the rebuild I/O request will get a higher priority than a system I/O request. In a heavily loaded system (with a high rate of system I/O requests), the high-priority rebuild can significantly reduce the disk rebuild time at the expense of handling I/O requests.

When the rebuild priority is set to low, the rebuild I/O requests can execute only if no pending system I/O requests exist. In a

moderately to heavily loaded system, low rebuild priority significantly increases the disk rebuild time and gains higher system performance.

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

- Parity placement — RA.

Attention: Once a parity placement scheme is chosen and data stored, it cannot be changed without destroying data.

Parity placement defines how parity is placed in the disk array with respect to data. The following illustration shows both the Right Asymmetric (RA) and the Left Symmetric (LS) parity placement in a four-drive disk array. Here AAA, BBB, CCC are the data stripe units, and PP0 is the corresponding parity. Similarly DDD, EEE, FFF are the data stripe units, and PP1 is the corresponding parity.

Right Asymmetric (RA)				Left Symmetric (LS)			
Disk	Disk	Disk	Disk	Disk	Disk	Disk	Disk
1	2	3	4	1	2	3	4
PP0	AAA	BBB	CCC	AAA	BBB	CCC	PP0
DDD	PP1	EEE	FFF	EEE	FFF	PP1	DDD
GGG	HHH	PP2	III	III	PP2	GGG	HHH
JJJ	KKK	LLL	PP3	PP3	JJJ	KKK	LLL

In some situations you may want to try LS parity placement to improve performance. The default parity placement is RA.

Advanced Functions

- Read ahead — On.

Normally the RAID 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 results 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 on a logical drive.
2. When configuration is saved on the diskette, the RAID parameters are also saved.

Chapter 4. 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 98 for the installation sequence when installing a combination of industry standard architecture (ISA), extended industry standard architecture (EISA), and peripheral component interconnect (PCI) adapters in your server.

Before you start, be sure you are familiar with the safety and handling guidelines in “Safety Information” on page ix, “Electrical Safety” on page 79, and “Handling Static-Sensitive Devices” on page 80. These guidelines will help you work safely with your server or options.

This chapter contains:

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Handling Static-Sensitive Devices	80
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Removing Memory-Module Kits	91
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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.

Note: 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, reconnect the telephone line *after* you plug in the power cords.

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: Do not reconnect any cables or power cords until you reassemble the server and put the covers back on.

CAUTION:

Never remove the cover on the power supply. If you have a problem with the power supply, have your system serviced.

Handling Static-Sensitive Devices

Static electricity 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.

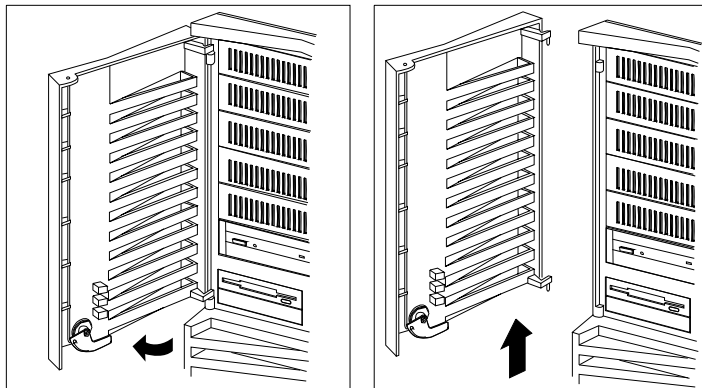
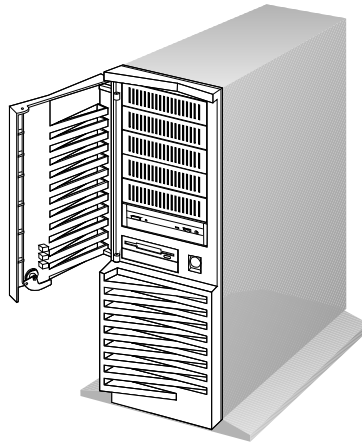
When you handle options and other computer components, take these precautions to avoid damage from static electricity:

- 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 an unpainted metal surface on the server for at least two seconds. (This reduces static electricity from the package and from your body.)
- When possible, remove the option and install it directly into the server without setting the option down. When this is not possible, place the static-protective package that the option comes in on a smooth, level surface and place the option on it.
- Do not place the option on the server cover or other metal surface.

Preparing to Install Options

Note: Before you begin, be sure you have read “Electrical Safety” on page 79 and “Handling Static-Sensitive Devices” on page 80.

1. Unlock and open the door.
2. To remove the door, lift the door up and off its hinges. Store the door in a safe place.

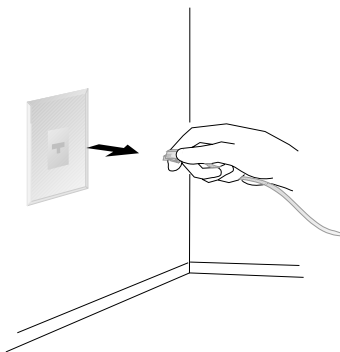


Preparing to Install Options

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

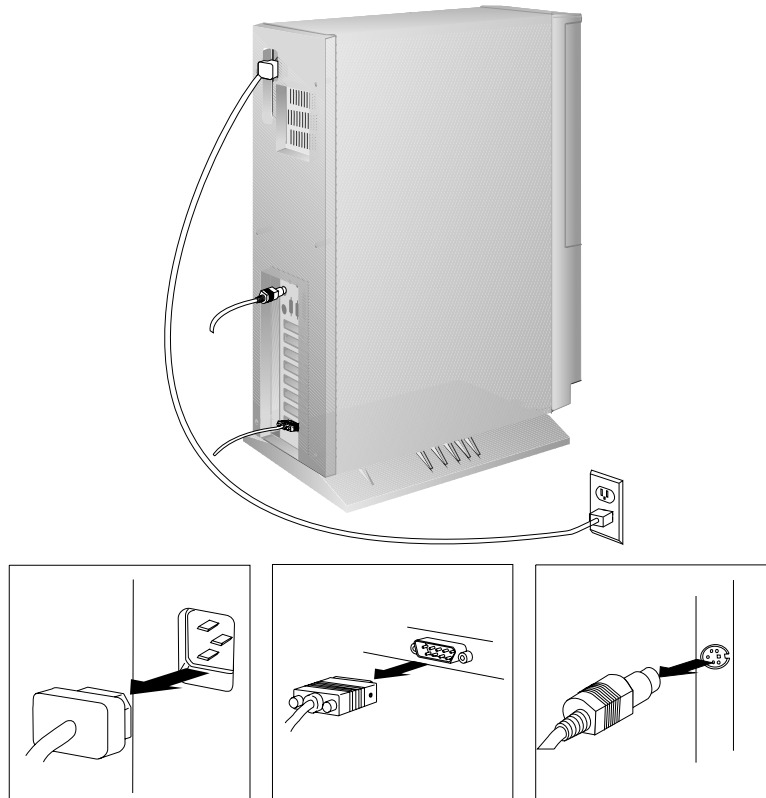


4. If you have a modem or fax machine attached to the server, disconnect the telephone line from the wall outlet and the server.



Preparing to Install Options

5. Unplug all power cords (cables) from electrical outlets.
6. 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

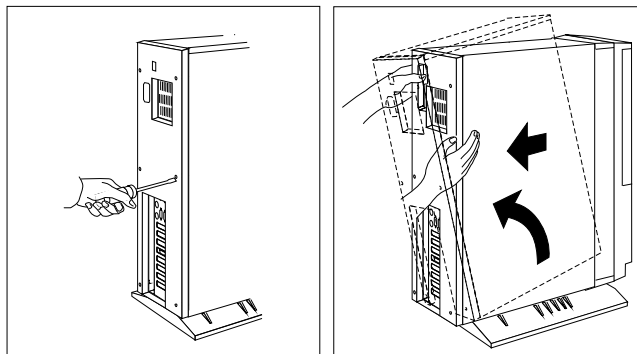
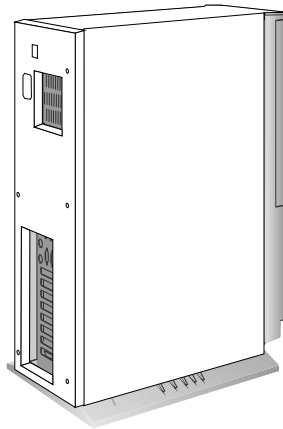


Preparing to Install Options

7. Remove the cover:

Note: The screws stay in place; do not attempt to remove them.

- a. Loosen the six screws in the recessed holes on the back of the cover.
- b. Grasp the sides of the cover and tilt it back a few inches.
- c. Grasp the cover at the top front edge with one hand, and just above the I/O slots with the other hand.
- d. Carefully remove the cover, in a rotating motion, as shown.



- e. Store the cover in a safe place.

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 86.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 91.
- Installing an adapter? — Go to “Installing Adapters” on page 95.
- Removing an adapter? — Go to “Removing Adapters” on page 105.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 109.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 151.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 165.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 167.
- Installing a security feature? — Go to “Security Procedures” on page 173.

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 industry-standard, 72-pin, parity, single-inline, memory modules (SIMMs) to increase system memory. The server does not support nonparity memory.

You can order and install Error Correcting Code on SIMM (EOS) memory modules to increase system reliability. EOS memory detects 1-bit memory errors and corrects 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 memory in your server. The memory-module kit sizes available for your server are 4 MB, 8 MB, 16 MB, and 32 MB. The correct speed for these kits is 70 ns.

Notes:

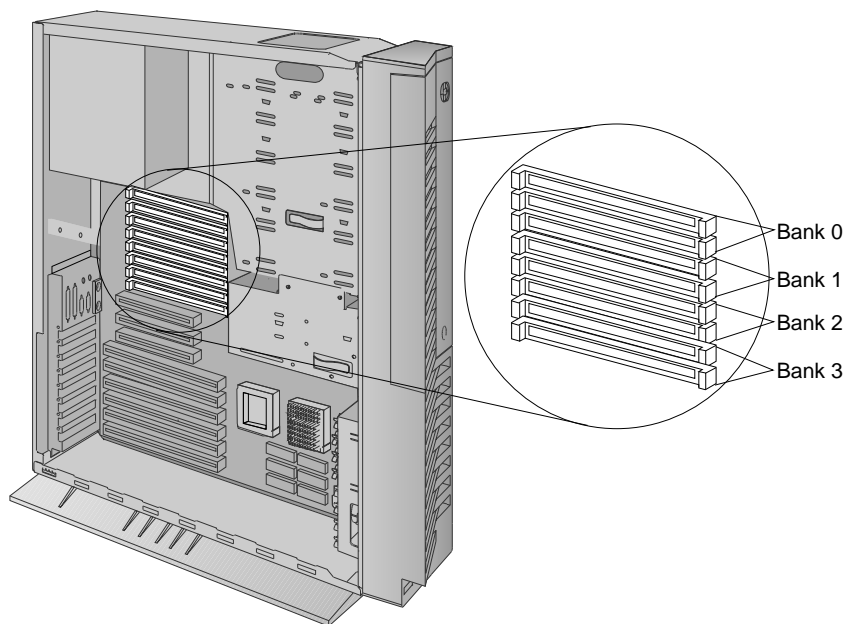
1. It is possible to install SIMMs in combinations where the total amount of memory installed does not appear on the memory configuration screen. In the unlikely event that this occurs, select the next lower setting on the memory configuration menu, and all of the installed memory will be supported on your server.
2. The PC Server 320 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 79 and “Handling Static-Sensitive Devices” on page 80.
- Removed the server cover (see “Preparing to Install Options” on page 81).

Installing Memory-Module Kits

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



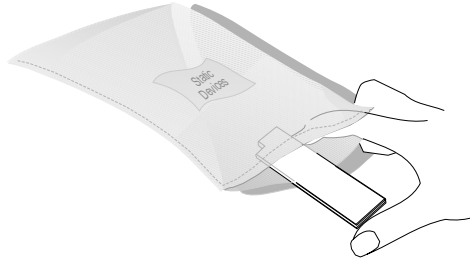
1. Locate the memory connectors on the system board.

When you are instructed to install the kits (in step 3 on page 88), 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 top 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 91, 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

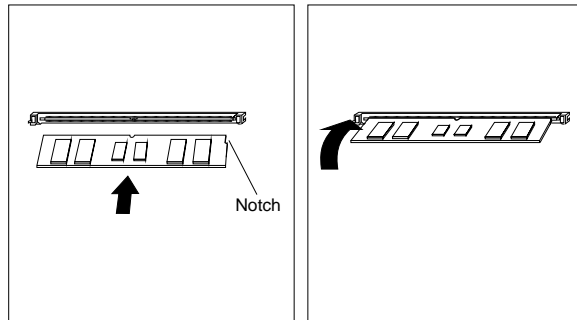
2. Touch the static-protective package to any unpainted metal surface on the server. Then remove the memory-module kit from the package.



3. Install the 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 right.



- b. Insert the kit into the connector, downward at a 45-degree angle.
 - c. Pivot the kit toward the top of the server, until it snaps into place.
 - d. Repeat these steps for each kit that you install.
4. Go to "Configuring Memory" on page 203 to reconfigure your PC Server 320 after you have installed all of the memory-module kits. Then return here.

5. Go to Table 7 on page 269 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 89 to determine your next step.



What to do next?

- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 91.
- Installing an adapter? — Go to “Installing Adapters” on page 95.
- Removing an adapter? — Go to “Removing Adapters” on page 105.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 109.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 151.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 165.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 167.
- Installing a security feature? — Go to “Security Procedures” on page 173.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 177.

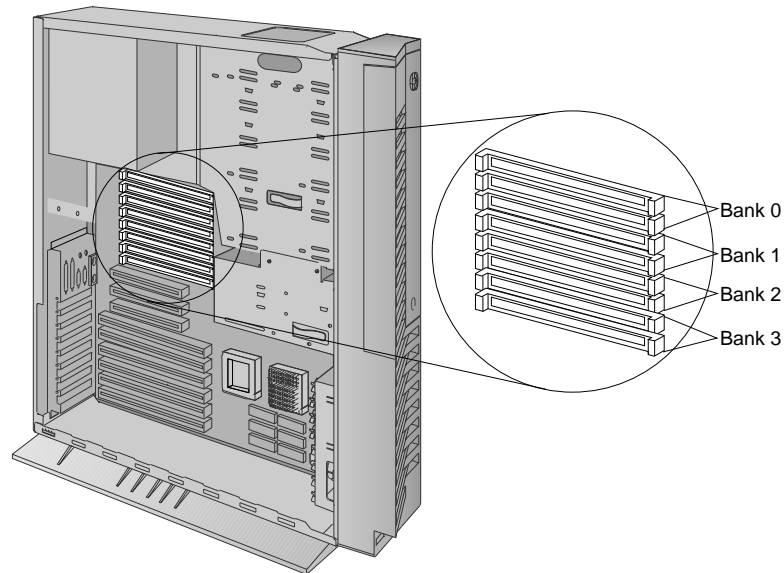
Installing Memory-Module Kits

- Installing an external option? — Go to “Connecting External Options” on page 180.

Removing Memory-Module Kits

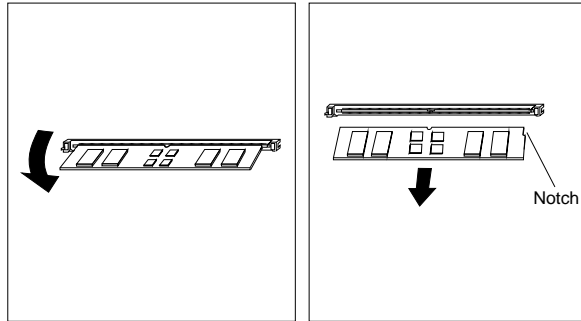
1. Locate the memory-module kit connectors and determine which memory-module kits you want to remove.

Note: You must remove the memory-module kits in pairs, starting with the kits installed in the two bottom connectors (bank 3).

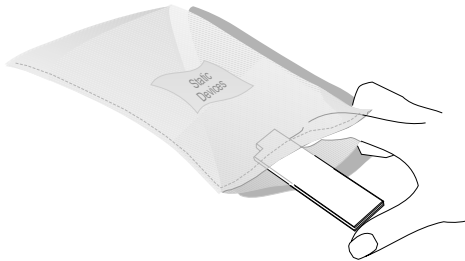


Removing Memory-Module Kits

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



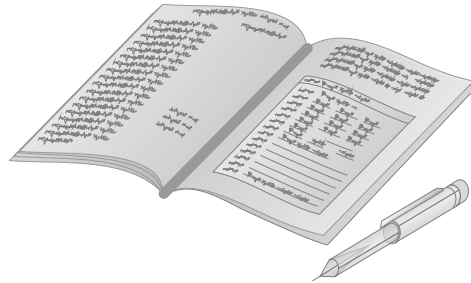
3. Store any memory-module kits you are no longer using in a static-protective package. Make a note of the kit size and speed for future reference.



Removing Memory-Module Kits

4. If you are installing memory-module kits in the empty connectors, go to “Installing Memory-Module Kits” on page 86.

If you are not installing memory-module kits in the empty connectors, go to Table 7 on page 269 to update the memory information; then, return here.



5. After you finish removing the memory-module kits, reinstall the cover (see “Completing the Installation” on page 177), and run the EISA Configuration program (see Chapter 5, “Configuring Your Server” on page 189). The next time you start the server, a message will appear, indicating that memory has been added or removed.

Removing Memory-Module Kits

What to do next?

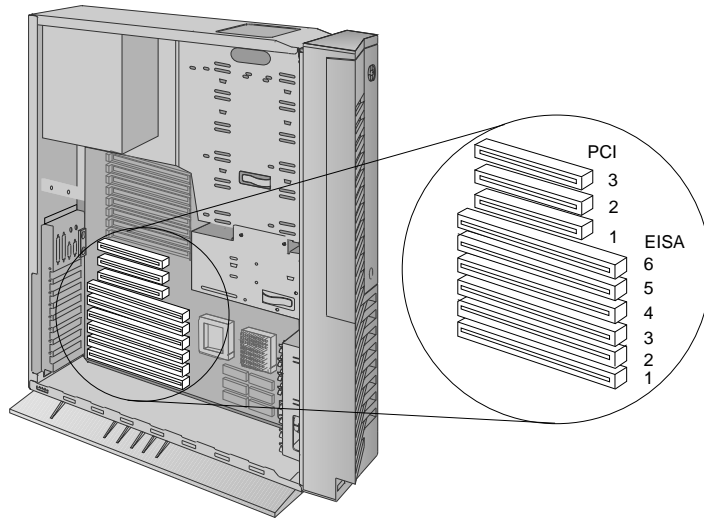
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 86.
- Installing an adapter? — Go to “Installing Adapters” on page 95.
- Removing an adapter? — Go to “Removing Adapters” on page 105.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 109.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 151.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 165.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 167.
- Installing a security feature? — Go to “Security Procedures” on page 173.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 177.
- Installing an external option? — Go to “Connecting External Options” on page 180.

Installing Adapters

Before you begin, be sure you have:

- Read “Electrical Safety” on page 79 and “Handling Static-Sensitive Devices” on page 80.
- Read the instructions that come with the adapter.
- Removed the server cover (see “Preparing to Install Options” on page 81).

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.

Installing Adapters

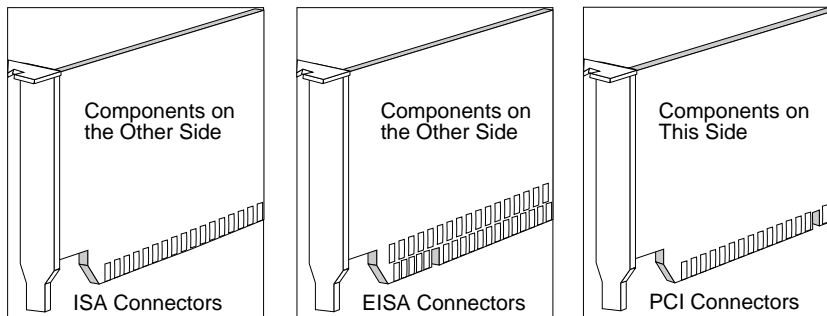
Note: If you have four bus master adapters, install them in slots 1, 2, 3, and 4. Slots 4, 5, and 6 share requests for system resources.

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 199 for information about creating ISA Configuration files. If your operating system supports this feature, 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 320:

- ISA
- EISA
- PCI



- 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 1 (bottom slot).
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.
- EISA slot 6 and PCI slot 1 are shared slots. That is, if you install an EISA or ISA adapter in EISA slot 6, you cannot install a PCI adapter in PCI slot 1, and vice versa. This means that only eight expansion slots can be occupied at any given time, although the server has nine expansion slots.
- Your server comes with a SCSI-2 Fast/Wide PCI Adapter preinstalled in PCI slot 1 (disk-array models come with a SCSI-2 Fast/Wide PCI-Bus RAID Adapter preinstalled in PCI slot 3).
- You can install full-size EISA or ISA adapters in EISA expansion slots 1–4.
- You can install full-size PCI adapters in PCI expansion slots 2 and 3.
- Your PC Server 320 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 that 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.

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 320 supports a new Plug and Play feature. This feature requires a configuration file (.CFG) for each installed ISA adapter. See “Configuration Files” on page 199.

2. Reinstall the cover (see “Completing the Installation” on page 177) and reconnect the cables (see step 2 on page 178).
3. Configure the ISA adapters (see Chapter 5, “Configuring Your Server” on page 189).

Note: ISA interrupts cannot be shared.

4. Disconnect the cables (see step 5 on page 83) and remove the cover (see “Preparing to Install Options” on page 81).
5. Install the EISA adapters.
6. Reinstall the cover (see “Completing the Installation” on page 177) and reconnect the cables (see step 2 on page 178).
7. Configure the EISA adapters by running the EISA Configuration program (see Chapter 5, “Configuring Your Server” on page 189).
8. Disconnect the cables (see step 5 on page 83) and remove the cover (see “Preparing to Install Options” on page 81).
9. Install the PCI adapters.
10. Reinstall the cover (see “Completing the Installation” on page 177) and reconnect the cables (see step 2 on page 178).

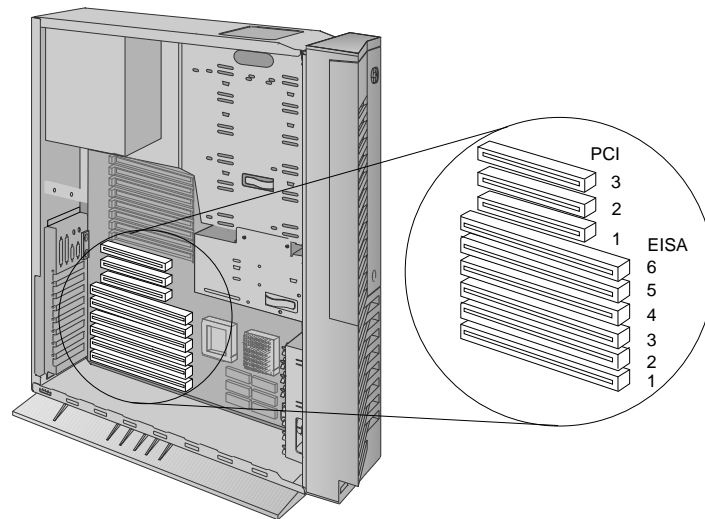
Note: During POST, your server automatically configures all currently installed ISA Plug and Play and PCI devices.

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 using the instructions given in “Configuration Conflicts” on page 209.

Installation Procedure

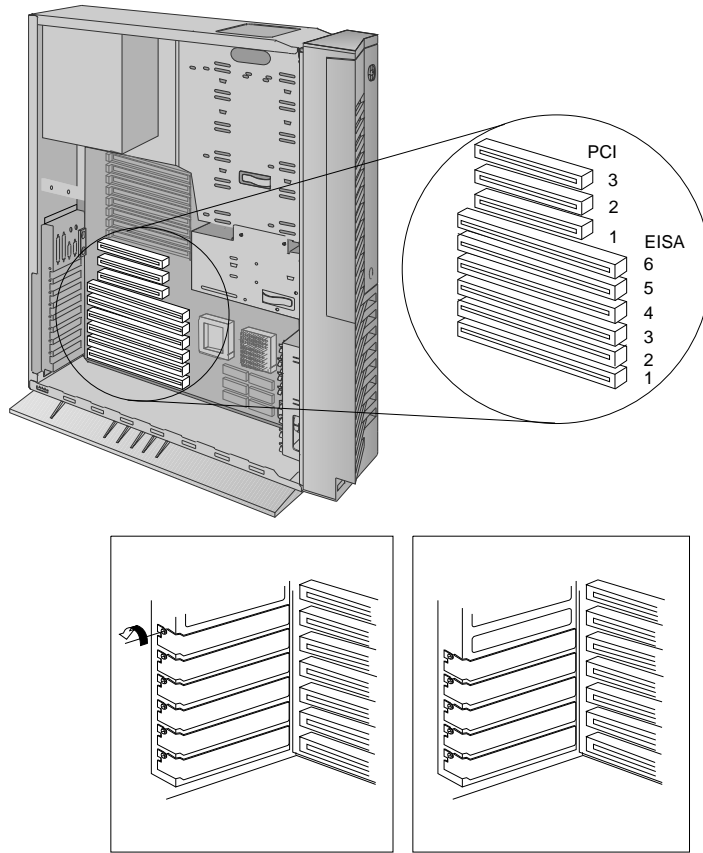
1. Determine which expansion slot you will use for the adapter.
The bottom six slots are for EISA or ISA adapters, and the top three slots are for PCI adapters. EISA slot 6 and PCI slot 1 are the shared slots. If you use one of these slots, you cannot use the other.

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



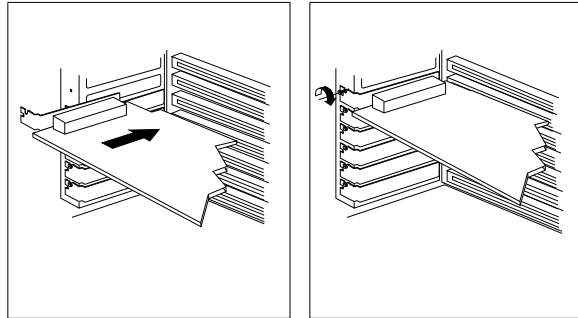
Installing Adapters

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. Install the adapter:
 - a. Carefully grasp the adapter and align it with the expansion slot.
 - b. Support the server with one hand, and slide the adapter straight into the expansion slot with the other hand. Press the adapter *firmly* into the expansion slot.
 - c. Tighten the expansion-slot screw on the top of the adapter bracket.



Installing Adapters

4. Go to Table 8 on page 270 to write the adapter name next to the slot into which it is installed; then, return here.



Note: If you installed an ISA or EISA adapter, you must run the EISA Configuration program. See Chapter 5, “Configuring Your Server” on page 189 for instructions on running these programs.

Verifying Compatibility between Network Adapters and Device Drivers

Table 1 on page 103 lists the network adapters and device drivers that support dual processors and have been verified to work with the IBM PC Server 320, OS/2 for SMP 2.11, and OS/2 LAN Server 4.0.

If OS/2 LAN Server provides a device driver for your network adapter, use Table 1 on page 103 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 network driver interface specification (NDIS) device driver on the diskettes that come with the adapter. (Check the adapter documentation for installation instructions.)

Installing Adapters

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 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 320

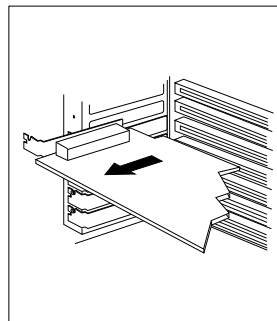
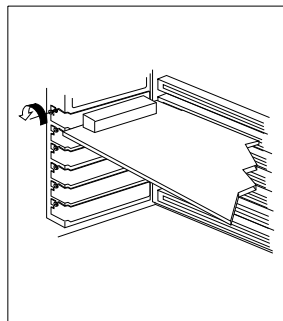
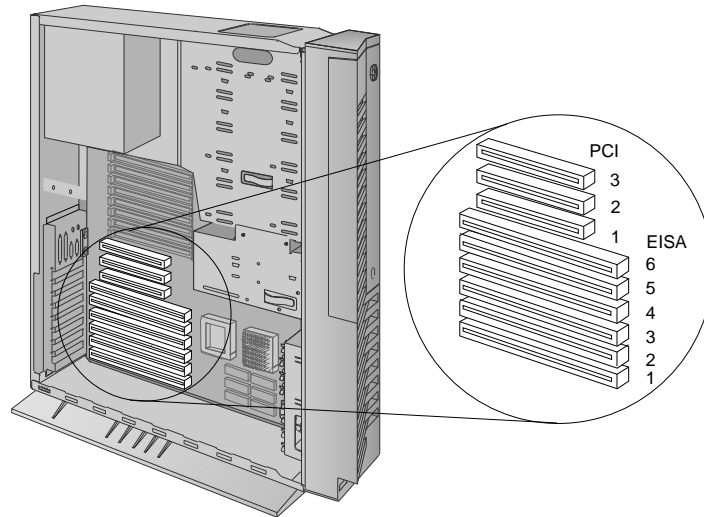
Installing Adapters

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 86.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 91.
- Removing an adapter? — Go to “Removing Adapters” on page 105.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 109.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 151.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 165.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 167.
- Installing a security feature? — Go to “Security Procedures” on page 173.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 177.
- Installing an external option? — Go to “Connecting External Options” on page 180.

Removing Adapters

1. Remove the adapter:
 - a. Note the slot number of the adapter you are removing.
 - b. Loosen and remove the screw on top of the adapter's bracket.
 - c. If there are any internal cables attached to the adapter, disconnect them.
 - d. Put one hand on top of the server for support, and with the other hand, carefully pull the adapter out of the slot.

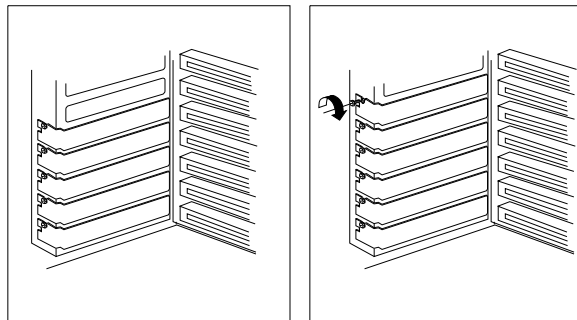
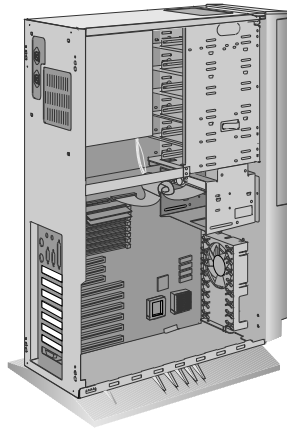


Removing Adapters

2. If you are installing another adapter in this expansion slot, see “Installing Adapters” on page 95 for instructions.

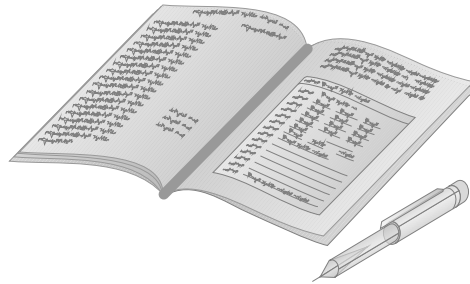
If you are not installing another adapter in this expansion slot, replace the expansion-slot cover:

- a. Locate the expansion-slot cover that you removed when you installed your adapter.
- b. Slide the cover over the open expansion slot.
- c. Tighten the expansion-slot screw on the top of the expansion-slot cover.



Removing Adapters

3. Go to Table 8 on page 270 and delete the name of the adapter you removed; then, return here.



Note: If you removed an ISA or EISA adapter, you must run the EISA Configuration program. See Chapter 5, “Configuring Your Server” on page 189 for instructions on running these programs.

Removing Adapters

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 86.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 91.
- Installing an adapter? — Go to “Installing Adapters” on page 95.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 109
- Removing an internal drive? — Go to “Removing Internal Drives” on page 151.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 165.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 167.
- Installing a security feature? — Go to “Security Procedures” on page 173.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 177.
- Installing an external option? — Go to “Connecting External Options” on page 180.

Installing Internal Drives

Several types of drives are available for installation in the PC Server 320, such as:

- Diskette
- Hard disk
- Rewritable-optical disc
- Tape

Before you install internal drives in your PC Server 320, see “Internal Drive Bays (Non-Disk-Array Models)” on page 110 or “Internal Drive Bays (Disk-Array Models)” on page 113 for information on the following:

- Types of drives
- Preinstalled drives
- Numbering of bays
- Cabling information

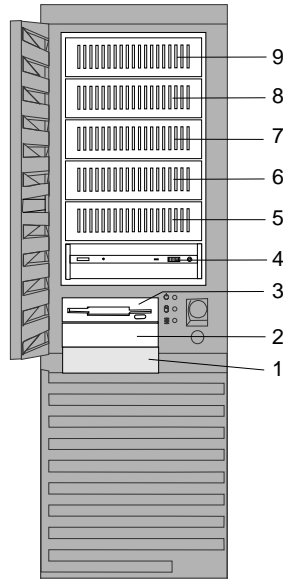
Note: Also see Table 5 on page 183 for maximum SCSI cable lengths.

- Basic installation information

Installing Internal Drives

Internal Drive Bays (Non-Disk-Array Models)

Internal drives are installed in *bays*. The bays are numbered 1 through 9.



Cover plates (sometimes called *bezels*) cover the front of some installed drives. If you install a drive that uses removable media (diskette, optical disc, or tape), you might need to remove or change the cover plate.

Installing Internal Drives

- Bay 1 is for 3.5-inch, hard disk drives only. Some models are shipped with a hard disk drive preinstalled in bay 1.
- Bays 2 and 3 are for 3.5-inch, diskette-interface devices, such as a diskette drive or tape backup unit that uses the diskette cable. All models are shipped with a diskette drive preinstalled in bay 3.
- Bay 4 has a preinstalled SCSI CD-ROM drive.
- Bays 5–9 are for 3.5-inch or 5.25-inch drives.
- The system board in your server supports a maximum of two diskette-interface devices. You can install a second 3.5-inch, diskette-interface device in bay 2. Be sure the screw holes in the device line up with the screw holes in bay 2.
- Bays 5–9 contain trays for housing 3.5-inch drives. If you want to install a 5.25-inch drive in one of these bays, you must remove screws and the tray before you attempt to install the drive.
- You can install a full-high drive between bays 6 and 7 by removing the trays from these bays. You cannot install full-high drives between bays 4 and 5, or between bays 8 and 9.
- If you are installing one or two integrated drive electronics (IDE) drives, you must purchase an IDE cable, such as in the PC Server Cable Kit. Contact your IBM reseller or IBM marketing representative.
- If you are connecting two hard disk drives to the IDE controller, you must reset the jumpers on one of the drives, as specified in the documentation that comes with the drive.
- If your server did not come with a preinstalled hard disk drive, and you plan to have more than four 8-bit internal SCSI drives (including the CD-ROM drive), you might need additional cables. Earlier models come with a 4-drop SCSI cable; to connect five or more drives, use an optional 7-drop SCSI cable in place of the 4-drop cable. More recent models come with a 7-drop SCSI cable.

If you install 16-bit devices, you must use a 16-bit cable. If you have an earlier model and you want to connect the CD-ROM

Installing Internal Drives

drive to a 16-bit cable, you must purchase and install the 16-bit to 8-bit SCSI Internal Converter. To order cables and a converter, contact your IBM reseller or IBM marketing representative. See "SCSI Drives" on page 115 for additional information.

- The IBM 3.5-inch, rewritable-optical disc drive requires a special mounting bracket. Contact your IBM reseller or IBM marketing representative for more information.

If you have a SCSI drive in bay 1, you can have up to four drives in the 5.25-inch bays (bays 5–9). If bay 1 does not contain a SCSI drive, you can have up to five drives in the 5.25-inch bays (bays 5–9).

Attention: Before you remove a drive, back up all data.

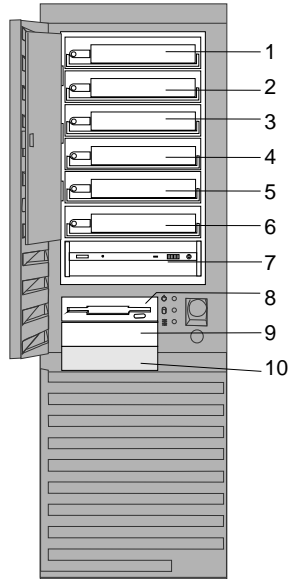
Drives come in a variety of sizes and types. The following table shows the widths, types, and maximum heights for the drives that you can install in each bay.

Bay	Drive Width	Drive Type	Maximum Drive Height
1	3.5-inch	Hard disk	25.4 mm (1 inch), with a drive in bay 2 41.3 mm (1.6 inches), with no drive in bay 2
2, 3	3.5-inch	Diskette ¹	25.4 mm (1 inch)
4	5.25-inch	CD-ROM	41.3 mm (1.6 inches)
5–9	3.5-inch or 5.25-inch	Hard disk, removable media ²	41.3 mm (1.6 inches)
<i>Notes:</i> 1. Or a drive that connects to the diskette cable. Be sure that the holes in the drive align with the drive housing. 2. Removable media include CD-ROMs, optical discs, and tapes.			

Table 2. Maximum Allowable Drive Sizes (Non-Disk-Array Models)

Internal Drive Bays (Disk-Array Models)

Internal drives are installed in *bays*. The bays are numbered 1 through 10.



Cover plates (sometimes called *bezels*) cover the front of some installed drives. If you install a drive that uses removable media (diskette, optical disc, or tape), you might need to remove or change the cover plate.

Installing Internal Drives

- Bays 1–6 are for 3.5-inch, hot-swappable hard disk drives.
To install a hard disk drive in a hot-swap bay, see “Installing Hard Disk Drives in Hot-Swap Bays” on page 148.
- Bay 7 has a preinstalled SCSI CD-ROM drive.
- Bays 8 and 9 are for 3.5-inch, diskette-interface devices, such as a diskette drive or a tape backup unit that uses the diskette cable.
The system board in your server supports a maximum of two diskette-interface devices. You can install a second 3.5-inch, diskette-interface device in bay 9. Be sure the screw holes in the device line up with the screw holes in bay 9.
- Bay 10 is for a 3.5-inch, hard disk drive only. Be sure the screw holes in the device line up with the screw holes in bay 9.
If you are installing an integrated drive electronics (IDE) hard disk drive in bay 10, you must purchase an IDE cable. Contact your IBM reseller or IBM marketing representative.
- Disk-array models come with a 2-drop SCSI cable.

Drives come in a variety of sizes and types. The following table shows the widths, types, and maximum heights for the drives that you can install in each bay.

Bay	Drive Width	Drive Type	Maximum Drive Height
1-6	3.5-inch	Hard disk	41.3 mm (1.6 inches)
7	5.25-inch	CD-ROM	41.3 mm (1.6 inches)
8, 9	3.5-inch	Diskette, 1/4-inch SCSI tape backup unit*	25.4 mm (1 inch)
10	3.5-inch	Hard disk	25.4 mm (1 inch), with a drive in bay 9 41.3 mm (1.6 inches), with no drive in bay 9
<p><i>Note:</i></p> <p>* Or a drive that connects to the diskette cable. Be sure the holes in the drive align with the drive housing.</p>			

Table 3. Maximum Allowable Drive Sizes (Disk-Array Models)

SCSI Drives

Your server supports *small computer system interface* (SCSI) drives. You can attach multiple SCSI drives to the preinstalled SCSI-2 adapter.

All PC Server 320 non-disk-array models come with a SCSI-2 Fast/Wide PCI Adapter. All PC Server 320 disk-array models come with a SCSI-2 Fast/Wide PCI-Bus RAID Adapter.

If you install additional SCSI devices in a non-disk-array model, you must set a unique identification (ID) for each SCSI device that you connect to the SCSI-2 Fast/Wide PCI 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.

The SCSI IDs in disk-array models with the SCSI-2 Fast/Wide PCI-Bus RAID Adapter are hard-coded in the backplane of the hot-swap bay and preset for the CD-ROM drive. Do not attempt to change the SCSI IDs for internal SCSI devices on disk-array models.

Installing Internal Drives

Refer to Table 4 on page 116 before setting SCSI IDs. Do not set the SCSI IDs for other devices to these values.

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

SCSI IDs

For non-disk-array models, Fast/Wide (16-bit) devices support SCSI IDs 0 to 15; narrow (8-bit) devices support SCSI IDs 0 to 7. For disk-array models, the external channel connector supports SCSI IDs 0 to 7; the internal channel connector also supports SCSI IDs 0 to 7.

SCSI ID	Bay	Device
Non-Disk-Array Models		
0	1	Hard Disk Drive ¹
3	4	CD-ROM Drive
7	N/A	SCSI-2 Fast/Wide PCI Adapter
Disk-Array Models ²		
0-5 ³	1-6	Hot-Swappable Hard Disk Drives ⁴
6	7	CD-ROM Drive
7	N/A	SCSI-2 Fast/Wide PCI-Bus RAID Adapter
<i>Note:</i> <ol style="list-style-type: none">1. This only applies to models with a hard disk drive preinstalled in bay 1.2. Or non-disk-array models with the hot-swap bay option installed.3. SCSI IDs are hard-coded into the hot-swap bay backplane.4. Two hard disk drives are preinstalled in some disk-array models in bays 1 and 2. The SCSI IDs for the two hard disk drives are 0 and 1.		

The drive from which you will start your non-disk-array server (also known as the boot or startup drive) should have a SCSI ID of 0. Therefore, if your server did not come with a preinstalled hard disk drive and you install hard disk drives, set the SCSI ID of your first drive (the boot drive) to 0.

Note: If your BIOS is version M54Pe-08 or earlier and you have two PCI SCSI adapters installed in the PCI slots, the system will start from the hard disk drive attached to the SCSI adapter with the least amount of read-only memory (ROM) and the lowest ROM address space. (In the case of equal ROM size, the system scans from slot 1 to 3 and assigns slot 1 as the lowest ROM address.) Therefore, in order for the system to load the operating system correctly, connect your startup drive to the SCSI adapter with the lowest ROM address space. If your version of BIOS is later than M54Pe-08, and you have two PCI SCSI adapters installed in the PCI slots, the system will start from the hard disk drive attached to the SCSI adapter in descending order from slot 3 to slot 1.

If your disk-array model comes with a preinstalled hard disk drive in bay 1, this drive is your startup drive, and it already has a SCSI ID of 0. The SCSI ID of the preinstalled hard disk drive in bay 1 of non-disk-array models is set to 0.

Refer to the instructions that come with the SCSI devices for information about setting a SCSI ID.

The SCSI-2 adapter in your server has two internal connectors and one external connector:

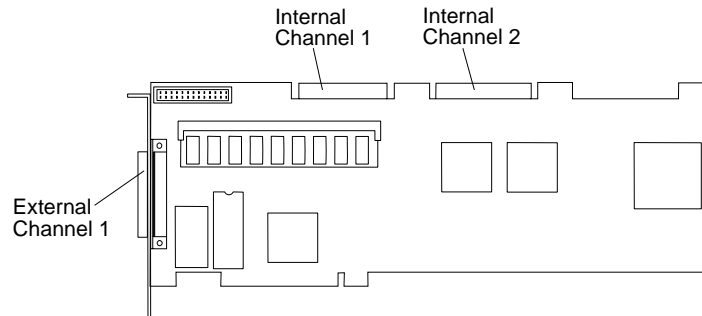
- On the non-disk-array models, the SCSI-2 adapter has one internal connector for an 8-bit cable, and one internal connector for a 16-bit cable.

Non-disk-array models that come with a preinstalled wide hard disk drive use a 16-bit internal connector. Non-disk-array models that do not come with a preinstalled hard disk drive or come with a narrow hard disk drive use an 8-bit internal connector.

Installing Internal Drives

- On the disk-array models, the SCSI-2 adapter has two internal connectors for 16-bit cables.

Note: To keep the external channel available for use on the preinstalled RAID adapter, use Channel 2 for connecting internal SCSI devices.



- On all models, the external connector is for 16-bit cable.

The SCSI-2 Fast/Wide PCI Adapter supports a total of seven 8-bit or fifteen 16-bit SCSI devices. The SCSI-2 Fast/Wide PCI-Bus RAID Adapter supports a total of fourteen 16-bit SCSI devices.

Note: If you plan to install both internal and external SCSI devices, you must follow the instructions given in “Connecting External Options” on page 180 in addition to the instructions in this section.

Termination (Internal SCSI Devices)

The devices at both ends of the SCSI bus must be terminated. If you attach SCSI devices (internal or external), you must terminate the last device in the chain. You must remove the termination from the other devices within the chain. If you attach external devices to a non-disk-array model with internal devices attached, you must also change the termination setting of the SCSI-2 adapter from the default in the SCSISelect utility program, as described in “Using the SCSISelect Utility Program” on page 213.

Note: Read the README file on the SCSI-2 Fast/Wide PCI-Bus RAID Adapter Configuration Option Diskette for updated information. Select **Option Diskette** from the first menu.

Termination on disk-array models is automatically set.

The requirements for terminating internal SCSI devices on non-disk-array models are:

- If you attach internal SCSI devices to only one of the SCSI-2 adapter internal connectors, you must terminate the last internal device on the bus (cable) and disable the termination on the other devices connected to the internal SCSI connector. The SCSI-2 adapter is already terminated.
- If you attach internal SCSI devices to both of the SCSI-2 adapter internal connectors, you must terminate the last internal device on each internal cable and disable the termination on the other devices connected to the internal SCSI connectors. You must also change the termination setting of the SCSI-2 adapter from the default in the SCSISelect utility program, as described in “Using the SCSISelect Utility Program” on page 213.

Note: You can use only one of the two internal SCSI connectors on the SCSI-2 adapter if you connect both internal and external devices.

A CD-ROM drive is installed in bay 4 of non-disk-array models and bay 7 of disk-array models. In earlier non-disk-array models that come with a narrow hard disk drive, a narrow (8-bit) cable is provided. More recent non-disk-array models come with a wide (16-bit) cable. In non-disk-array models that do not come with a hard disk drive:

- The CD-ROM drive is terminated.
- Earlier models come with a 4-drop, narrow (8-bit) cable. More recent models come with a 7-drop, wide (16-bit) cable.

If you install 8-bit or 16-bit drives above the CD-ROM drive in bays 5–9, remove the termination from those drives.

- If you install a drive in bay 1, you must terminate that drive and remove the termination from the CD-ROM drive (see “Removing the Termination on the CD-ROM Drive” on page 137 for instructions).

Installing Internal Drives

If you install 16-bit devices, you must use a 16-bit cable. If you have an earlier model and you want to connect the CD-ROM drive to a 16-bit cable, you must purchase and install the 16-bit to 8-bit SCSI Internal Converter. To order the cable and converter, contact your IBM reseller or IBM marketing representative.

Refer to the instructions that come with the SCSI device for more information about termination. Refer to the *User's Reference* for additional information about the SCSI subsystem.

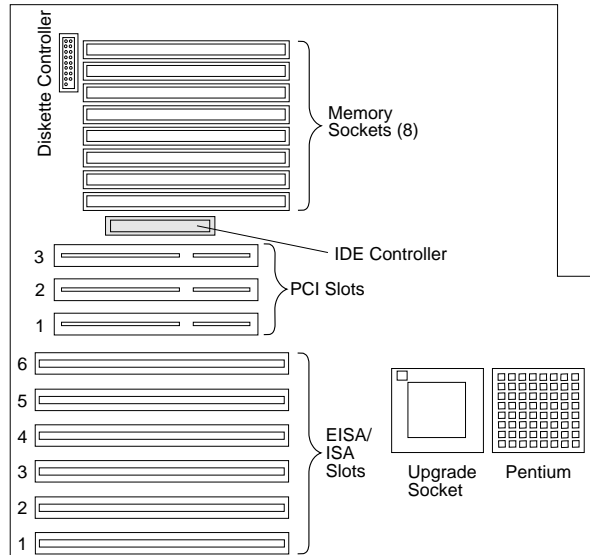
IDE Controllers

The server has one IDE controller (all models also have a SCSI-2 adapter). You can connect two drives to the IDE controller on non-disk-array models, and one drive to the IDE controller on disk-array models. If you plan to do this, you must purchase an IDE cable. Contact your IBM reseller or IBM marketing representative for details.

The IDE controller is for low-speed devices, such as tape drives, but you can connect hard disk drives.

When you connect two drives to the IDE controller, one drive is the primary (master), and the other is the secondary or alternate (subordinate). To set your jumpers to the secondary mode, follow the instructions in the documentation that comes with the drives, or contact your IBM reseller or IBM marketing representative.

The following illustration shows the location of the IDE controller connector.

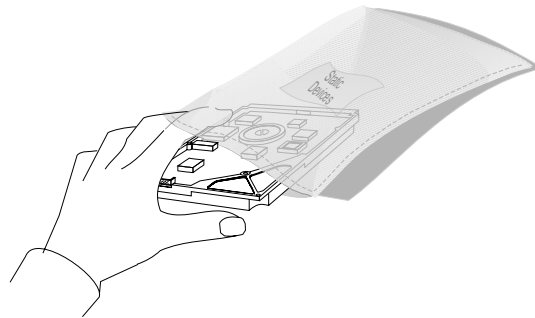


Preinstallation Steps (All Bays)

Before you begin, be sure you have:

- Read “Electrical Safety” on page 79 and “Handling Static-Sensitive Devices” on page 80.
- Removed the server cover (see “Preparing to Install Options” on page 81).
- Read the manual that comes with the internal drive.
- Read “Installing Internal Drives” on page 109.

1. Choose the bay in which you want to install the drive. (Refer to Table 2 on page 112 for the drive types and sizes available for each bay in the non-disk-array models, and Table 3 on page 115 for the drive types and sizes available for each bay in the disk-array models.
2. Touch the static-protective bag containing the drive to any unpainted metal surface on the server; then, remove the drive from the bag.



3. Check the instructions that come with the drive or contact your IBM reseller or IBM marketing representative to see if you need to set any switches or jumpers on the drive. Change them if necessary.

Note: The SCSI ID on the CD-ROM in models with the hot-swap bay installed is preset to 6. The SCSI ID on the CD-ROM in non-disk-array models is 3. If you upgrade your non-disk-array server by installing a hot-swap bay,

make sure that you change the SCSI ID on the CD-ROM from 3 to 6 to avoid a conflict between devices if you install a hard disk drive in bay 4 of the hot-swap bay. A hard disk drive installed in bay 4 of the hot-swap bay is automatically assigned SCSI ID 3. If two devices are assigned the same SCSI ID, your server will not recognize either device.

4. If your server did not come with a preinstalled hard disk drive, and you plan to have more than four 8-bit internal SCSI drives (including the CD-ROM drive), you might need additional cables. Earlier models come with a 4-drop SCSI cable; to connect five or more drives, use an optional 7-drop SCSI cable in place of the 4-drop cable. More recent models come with a 7-drop SCSI cable.
5. If you are connecting two hard disk drives to the IDE controller, you must reset the jumpers on one of the drives, as specified in the documentation that comes with the drive.

For non-disk-array models, when adding IDE drives, set the first drive that is attached to the IDE controller as the primary (master) drive. Set the second IDE drive as the secondary or alternate (subordinate) drive.

Note: Only one IDE drive can be attached to the IDE controller in disk-array models.

Installing Internal Drives

Select the appropriate item from the following list.

- Installing a diskette or IDE hard disk drive? — Go to “Installing Diskette and IDE Hard Disk Drives.”
- Installing a CD-ROM drive? — Go to “CD-ROM Drive Considerations” on page 136.
- Installing a hard disk drive in a non-disk-array model? — Go to “Installing Hard Disk Drives” on page 137.
- Installing a hard disk drive in a disk-array model? — Go to “Installing Hard Disk Drives in Hot-Swap Bays” on page 148.

Installing Diskette and IDE Hard Disk Drives

The following information is important. Read the information completely before you install diskette drives or IDE hard disk drives in the bottom three bays (1–3 of the non-disk-array models or 8–10 of the disk-array models) of your PC Server 320.

The following information is important. Read this information completely before you install any drives.

Your server was shipped with a 1.44 MB diskette drive installed in the third bay from the bottom (bay 3 on non-disk-array models or bay 8 on disk-array models). The system board supports two diskette-interface devices. Therefore, you can install an additional 3.5-inch diskette-interface device in the second bay from the bottom (bay 2 on non-disk-array models or bay 9 on disk-array models). Each diskette-interface device connects to one cable (already attached to the preinstalled diskette drive).

If you install 16-bit devices, you must use a 16-bit cable. If you have an earlier model and you want to connect the CD-ROM drive to a 16-bit cable, you must purchase and install the 16-bit to 8-bit SCSI Internal Converter. To order the cable and converter, contact your IBM reseller or IBM marketing representative.

If your non-disk-array server was shipped without a hard disk drive, you can install the first hard disk drive (3.5-inch only) in bay 1, the bottom bay. Additional hard disk drives may be installed in

bays 5–9. If you install the drives in bays 5–9, and you do not install a drive in bay 1, you do not have to remove the termination from the CD-ROM drive.

Earlier non-disk-array models that come with a preinstalled narrow SCSI hard disk drive in bay 1 come with a 4-drop, narrow (8-bit) cable. More recent non-disk-array models that come with a preinstalled narrow SCSI hard disk drive in bay 1 come with a 7-drop, Fast/Wide (16-bit) cable.

Non-disk-array models that are shipped with a preinstalled wide SCSI hard disk drive in bay 1 come with a 7-drop, Fast/Wide (16-bit) cable. Use this cable to install up to five more Fast/Wide devices. The CD-ROM drive is connected to this cable through the 16-bit to 8-bit SCSI Internal Converter.

Note: If you install any 8-bit devices, you need the 16-bit to 8-bit SCSI Internal Converter.

Earlier non-disk-array models that are shipped without a hard disk drive come with a 4-drop, SCSI narrow (8-bit) cable connected to the CD-ROM drive. That cable has three additional connectors for 8-bit drives. More recent non-disk-array models that are shipped without a hard disk drive come with a 7-drop, SCSI Fast/Wide (16-bit) cable connected to the CD-ROM drive through the 16-bit to 8-bit SCSI Internal Converter. That cable has six additional connectors for 16-bit or 8-bit devices.

The CD-ROM drive in these non-disk-array models is terminated. If you install a SCSI drive in bay 1, you must remove the termination from the CD-ROM drive (see “Removing the Termination on the CD-ROM Drive” on page 137), and terminate the new drive in bay 1.

Before installing drives, make sure that you have enough cables to accommodate all of the drives. If you need additional cables, contact your IBM reseller or IBM marketing representative.

For information specific to the drives that you are installing, see the instructions in the documentation that comes with the drives,

Installing Internal Drives

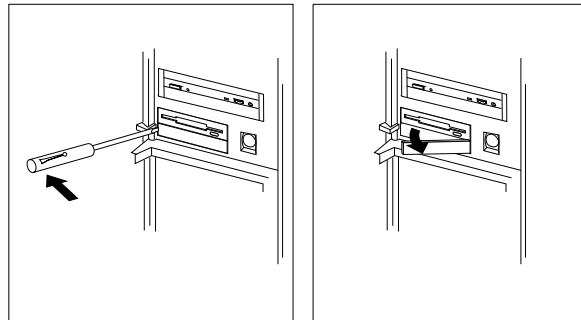
including those that describe how to set jumpers and switches, and how to remove termination.

If a tray is attached to an IDE drive that you intend to install, you must remove the tray before installing the drive. Follow the instructions in the documentation that comes with the drive.

If you are installing an IDE drive, you must purchase and install an optional 2-drop cable. To order the cable, contact your IBM reseller or IBM marketing representative.

To install a diskette drive in bay 2 on a non-disk-array model or bay 9 of a disk-array model:

1. Remove the cover plate:
 - a. Insert a small flat-blade screwdriver under the side of the cover plate.
 - b. Lift the cover plate and remove it from the server front panel. (Save the cover plate for future use.)

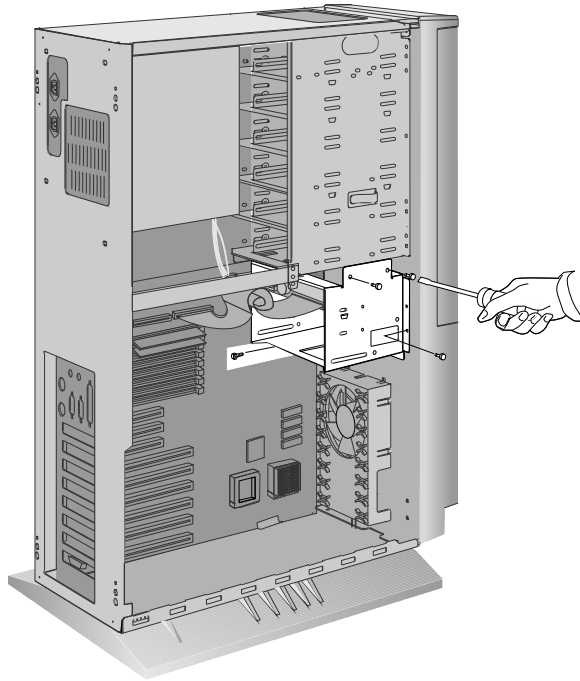


2. Remove four screws from the drive housing containing bays 1–3 (non-disk-array) or 8–10 (disk-array).

Note: Three screws are shown near the screwdriver in the following illustration. The fourth screw is located under the housing, on the left side.

Installing Internal Drives

3. Remove the flat metal plate from the front of the bay. Remove the two screws (one on each side of the housing) that connect the metal plate to the housing.

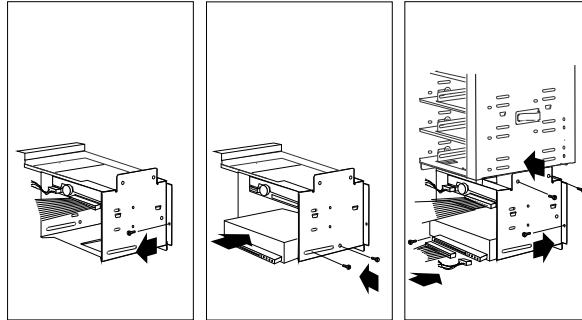


4. Locate the cable connector that you will attach to the drive.
5. Position the drive so the drive connector is facing the rear of the server.
6. Align the drive with the guides on the bottom of the bay and slide it into the bay.

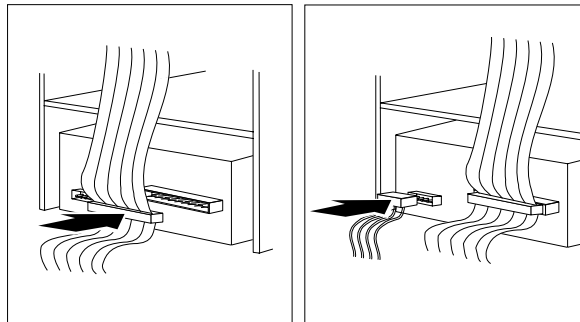
Installing Internal Drives

7. Attach the drive to the housing, using the screws that came with the drive kit.

Attention: To ensure that the drive functions properly, do not overtighten the screws.



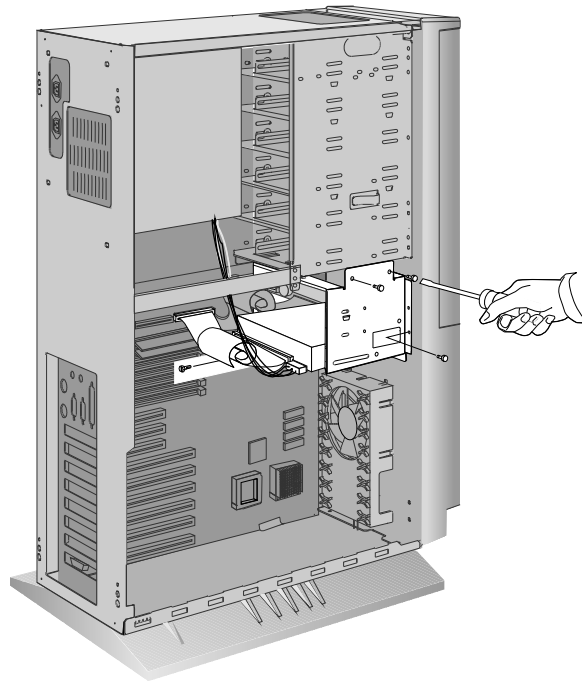
8. Connect the drive to one end of the signal cable.
9. Connect the other end of the cable to the appropriate connector on the system board. (See the locations of the IDE controller connectors shown in the illustration under “IDE Controllers” on page 121.)
10. Connect one of the 4-pin power cables to the drive.



11. Reinstall the drive housing, making sure to align the far side properly over the two brackets located under the bay that contains the CD-ROM drive.

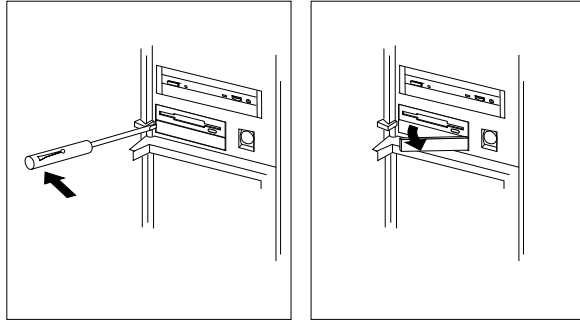
Installing Internal Drives

12. Reinstall and tighten the four screws that you removed in step 2 on page 126.



Installing Internal Drives

To install an IDE hard disk drive in bay 1 (non-disk-array models) or bay 10 (disk-array models):

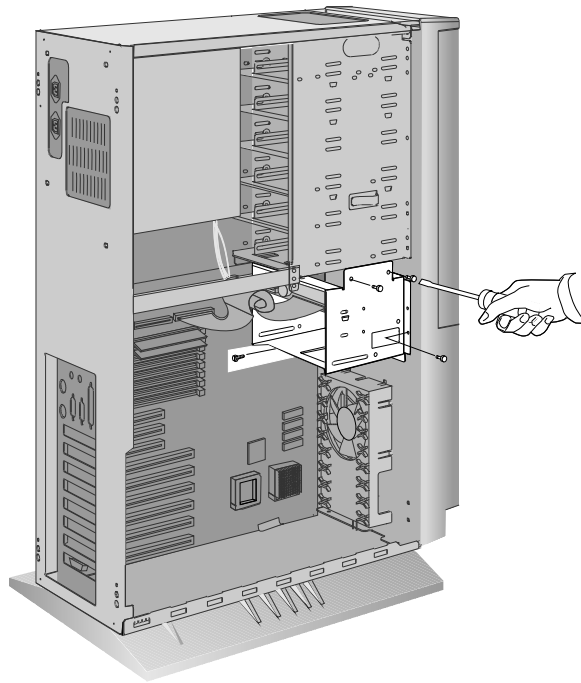


1. Remove four screws from the drive housing that contains bays 1-3 (non-disk-array models) or 8-10 (disk-array models).

Note: Three screws are shown near the screwdriver in the following illustration. The fourth screw is located under the housing, on the left side.

Installing Internal Drives

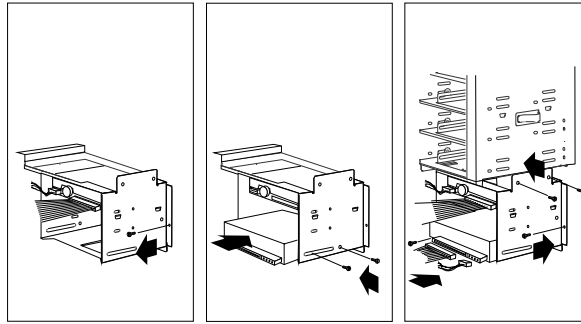
2. Remove the flat metal plate from the front of the bay. Remove the two screws (one on each side of the housing) that connect the metal plate to the housing.



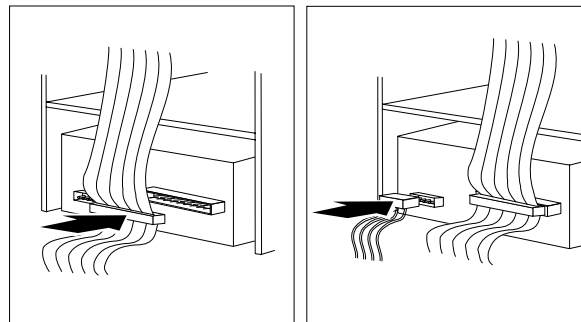
Installing Internal Drives

3. Locate the cable connector that you will attach to the drive.
4. Position the drive so the drive connector is facing the rear of the server.
5. Align the drive with the guides on the bottom of the bay and slide it into the bay.
6. Attach the drive to the housing, using the screws that came with the drive kit.

Attention: To ensure that the drive functions properly, do not overtighten the screws.

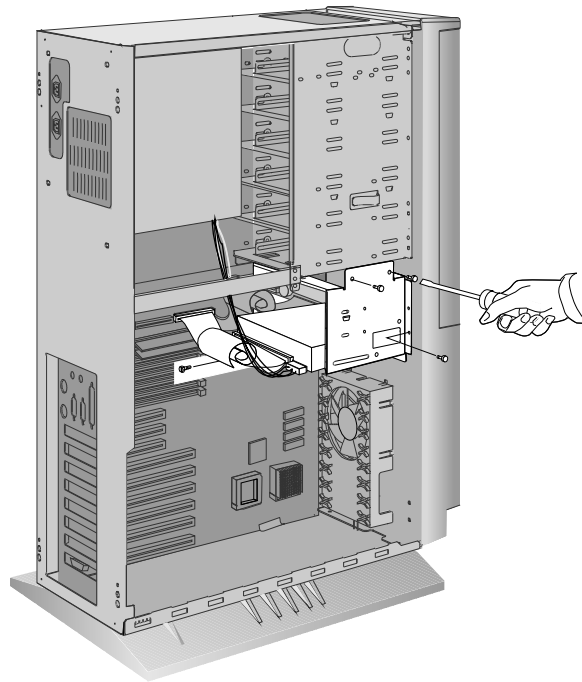


7. Connect the drive to one end of the signal cable.
8. Connect the other end of the cable to the appropriate connector on the system board. (See the locations of the IDE controller connectors shown in the illustration under “IDE Controllers” on page 121.)
9. Connect one of the 4-pin power cables to the drive.



Installing Internal Drives

10. Reinstall the drive housing, making sure to align the far side properly over the two brackets located under the bay containing the CD-ROM drive.
11. Reinstall and tighten the four screws that you removed in step 1 on page 130.



Installing Internal Drives

If you are installing another internal drive, return to step 1 on page 122.

If you are not installing another internal drive, go to Table 9 on page 271 to record the drive location, and if applicable, the SCSI ID that you assigned to the drive (diskette drives 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 86.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 91.
- Installing an adapter? — Go to “Installing Adapters” on page 95.
- Removing an adapter? — Go to “Removing Adapters” on page 105.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 151.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 165.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 167.
- Installing a security feature? — Go to “Security Procedures” on page 173.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 177.
- Installing an external option? — Go to “Connecting External Options” on page 180.

CD-ROM Drive Considerations

All models of the PC Server 320 come with a CD-ROM drive preinstalled in bay 4 (non-disk-array models) or bay 7 (disk-array models).

Disk-array models come with a 2-drop cable connected to the CD-ROM drive. Earlier non-disk-array models that are shipped with a narrow hard disk drive or without a hard disk drive come with a 4-drop, SCSI narrow (8-bit) cable connected to the CD-ROM drive. That cable has three additional connectors for 8-bit drives. More recent non-disk-array models that are shipped with a narrow hard disk drive or without a hard disk drive come with a 7-drop, SCSI Fast/Wide (16-bit) cable connected to the CD-ROM drive. That cable has six additional connectors for 16-bit drives.

The CD-ROM drive in these non-disk-array models is terminated. If you install a SCSI drive in bay 1 of a non-disk-array model, you must remove the termination from the CD-ROM drive (see “Removing the Termination on the CD-ROM Drive” on page 137), and terminate the new drive in bay 1.

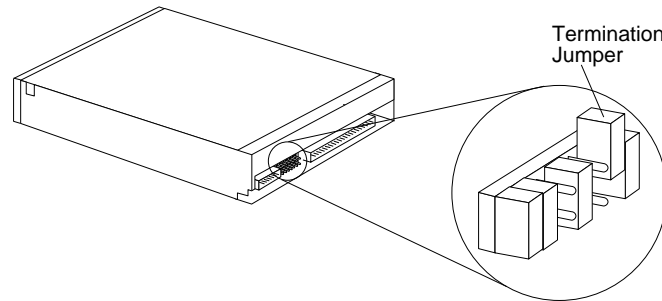
If you install 16-bit devices, you must use a 16-bit cable. If you have an earlier model and you want to connect the CD-ROM drive to a 16-bit cable, you must purchase and install the 16-bit to 8-bit SCSI Internal Converter. If you want to install 8-bit devices in one of the more recent models, you must purchase and install the 16-bit to 8-bit SCSI Internal Converter. To order cables or a converter, contact your IBM reseller or IBM marketing representative.

The CD-ROM drive is connected to the 7-drop, Fast/Wide cable in the earlier non-disk-array models, or to the 2-drop, Fast/Wide cable in the earlier disk-array models, through the 16-bit to 8-bit SCSI Internal Converter. In the more recent non-disk-array models and disk-array models, the CD-ROM drive is connected to the 7-drop, Fast/Wide cable through the 16-bit to 8-bit SCSI Internal Converter.

Removing the Termination on the CD-ROM Drive

To remove the termination from the CD-ROM drive:

1. Remove the preinstalled CD-ROM drive. See “Removing CD-ROM Drives” on page 157. After you remove the drive, return to this section.



2. The termination jumper covers both pins (second pair of pins from the right side).
3. Remove and reinstall the termination jumper so that the jumper covers only one pin, as shown.
4. Slide the CD-ROM drive into the open bay, connector end first.
5. Connect the cables (flat and power) to the rear of the drive.
6. Insert the screws (two on each side; one high, one low on the drive). Tighten the screws.

Installing Optical Disc Drives and Tape Drives

To install rewritable-optical disc drives or tape drives, follow the procedure for installing hard disk drives in non-disk-array models in the following section.

Installing Hard Disk Drives

The following information is important. Read the information completely before you install any hard disk drives in bays 5–9 in non-disk-array models without the hot-swap bay option.

Installing Internal Drives

For information about installing hard disk drives in servers with the hot-swap bay option, see “Installing Hard Disk Drives in Hot-Swap Bays” on page 148.

Note: All disk-array models are shipped with the hot-swap bay option. The hot-swap bay option is also available for non-disk-array models. For information about ordering a hot-swap bay, contact your IBM reseller or IBM marketing representative.

- Non-disk-array models that are shipped with a preinstalled SCSI hard disk drive in bay 1 come with a 7-drop, Fast/Wide (16-bit) cable.

Note: A 7-drop cable has eight connectors: one for attaching the cable to the SCSI-2 adapter, and seven for attaching the cable to the SCSI devices.

Use this cable to install up to five more Fast/Wide devices. The CD-ROM drive is connected to this cable through the 16-bit to 8-bit SCSI Internal Converter.

Note: If you install any additional 8-bit devices, you need the 16-bit to 8-bit SCSI Internal Converter.

- Earlier non-disk-array models that are shipped without a hard disk drive come with a 4-drop, SCSI narrow (8-bit) cable connected to the CD-ROM drive. That cable has three additional connectors for 8-bit drives.

If you install 16-bit devices, you must use a 16-bit cable.

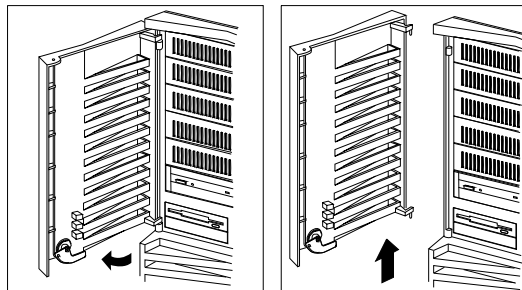
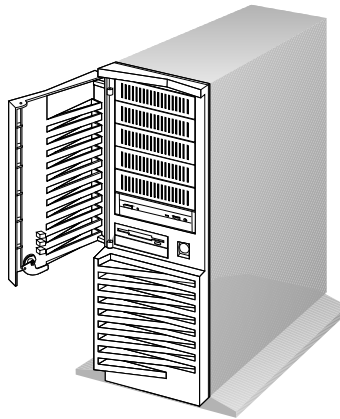
- Before installing drives, make sure that you have enough cables to accommodate all of the drives. If you need additional cables, contact your IBM reseller or IBM marketing representative.
- For information specific to the drives that you are installing, see the documentation that comes with the drives, including those that describe how to set jumpers and switches, and how to remove termination.
- If a tray is attached to a drive that you intend to install, you must remove the tray before installing the drive. Follow the instructions in the documentation that comes with the drive.

Installing Internal Drives

- If you are installing an IDE drive, you must purchase and install an optional, 2-drop IDE cable. To order the cable, contact your IBM reseller or IBM marketing representative. To install an IDE hard disk drive, see “Installing Diskette and IDE Hard Disk Drives” on page 124.

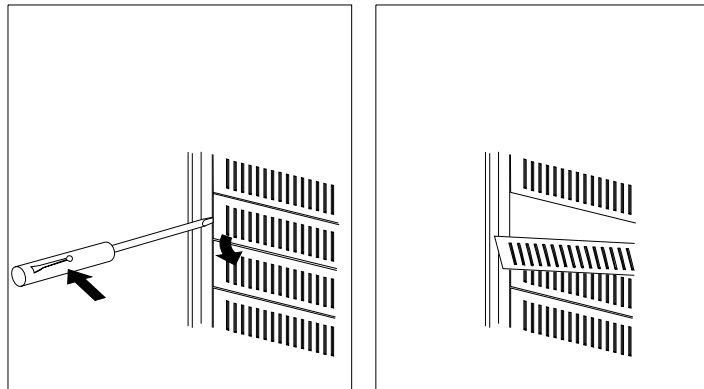
To install a drive in a non-disk-array model:

1. Unlock and open the door.
2. Remove the door:
 - a. Lift the door up and off its hinges.
 - b. Store the door in a safe place.



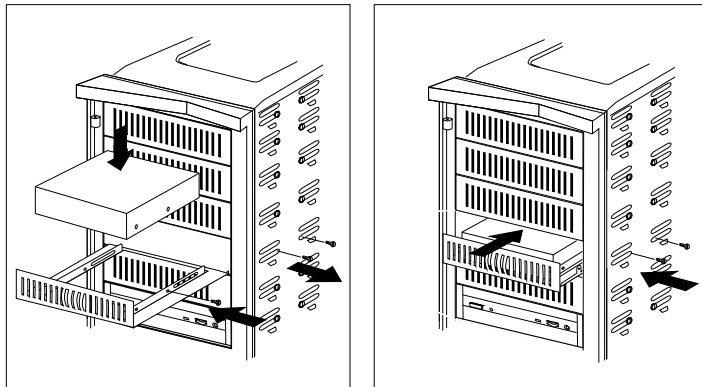
Installing Internal Drives

3. Remove the cover plate from the target bay:
 - a. Insert a small flat-blade screwdriver under the side of the cover plate.
 - b. Lift the cover plate and remove it from the server front panel. (Save the cover plate for future use.)



Installing Internal Drives

4. Remove the screws that secure the tray (from both sides of the tray housing) in the target bay. Then, slide the tray out of the bay.
 5. If you are installing a 5.25-inch drive, go to step 9 on page 142.
If you are installing a 3.5-inch drive, place the drive on the tray, with the connectors facing the rear of the tray.
- Attention:** To ensure that the drive functions properly, do not overtighten the screws.
6. Insert the screws that come with the drive into the holes on the tray. Tighten the screws.
 7. Slide the drive and tray into the target bay.
 8. Reinstall and tighten the four screws that you removed in step 4. Go to step 10 on page 143.



Installing Internal Drives

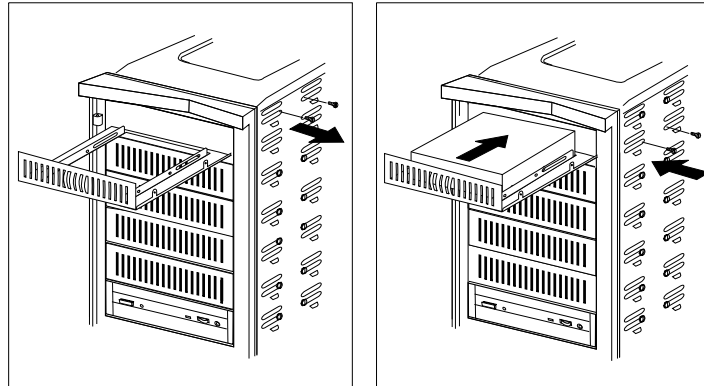
9. If you are installing a 5.25-inch drive, complete the following steps:

Note: Do not use the tray, but store it for future use. If this is a rewritable-optical disc drive, a special tray kit is required. (Contact your IBM reseller or IBM marketing representative for additional information.)

- a. Position the drive with the connectors facing the rear of the server.
- b. Slide the drive to the rear until it stops.
- c. Loosely reinstall the four screws that you removed from the tray housing in step 4 on page 141.

Attention: To ensure that the drive functions properly, do not overtighten the screws.

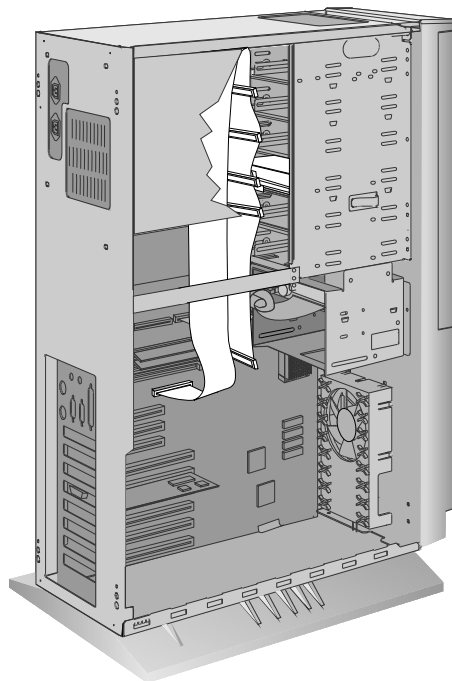
- d. Align the drive and tighten the screws.



Installing Internal Drives

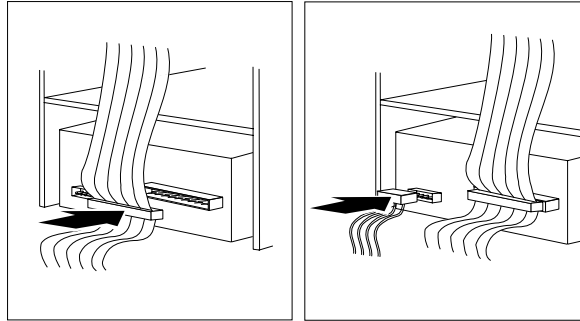
10. Connect the drive to a connector on the appropriate flat cable.
11. If this is the first IDE drive, connect the other end of the flat cable to the IDE controller (see “IDE Controllers” on page 121).

If this is a SCSI drive, use the other internal connector on the SCSI-2 adapter to attach the 16-bit cable. (See the following illustration for an example of SCSI cable-routing.)



Installing Internal Drives

12. Connect one of the 4-pin power cables to the drive.



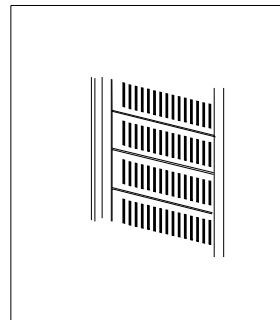
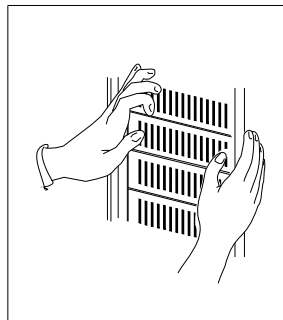
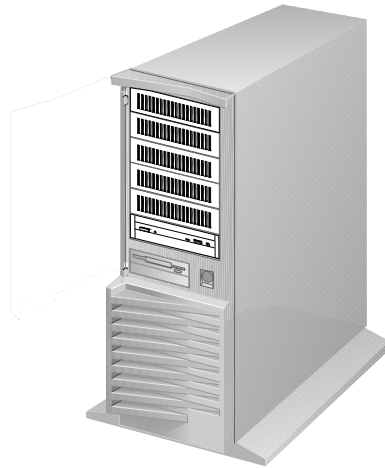
13. If you are installing another internal drive, return to step 1 on page 122.

If you are not installing another internal drive, continue with the next step.

14. If necessary, replace the cover plate at the front of the bay:
 - a. If you installed a removable-media drive, do not install a cover plate; instead, go to step 15 on page 146.
 - b. If you installed a nonremovable-media drive, use the cover plate that you removed in step 3 on page 140.

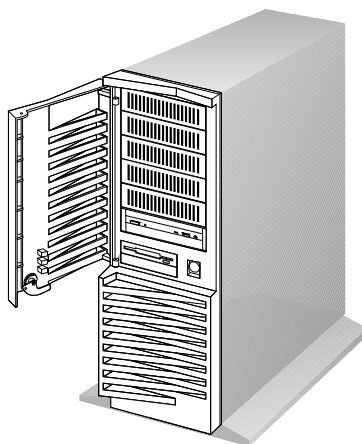
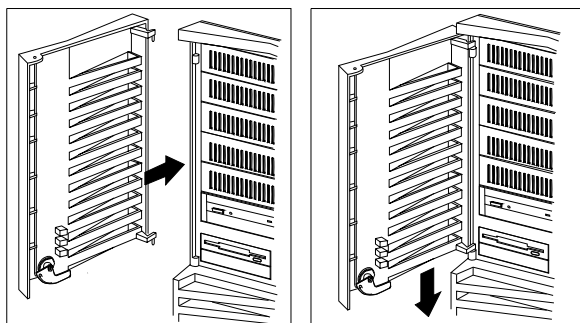
Installing Internal Drives

- c. Insert the tabs on the right end of the cover plate into the slots on the right side of the panel in front of the drive that you just installed.
- d. Pivot the plate and press it into place.



Installing Internal Drives

15. Reinstall the door at the front of the server by aligning the pins with the hinges and sliding the door down.
16. Close and lock the door.



17. Go to Table 9 on page 271 to record the drive location, and if applicable, the SCSI ID that you assigned to the drive (diskette drives 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 86.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 91.
- Installing an adapter? — Go to “Installing Adapters” on page 95.
- Removing an adapter? — Go to “Removing Adapters” on page 105.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 151.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 165.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 167.
- Installing a security feature? — Go to “Security Procedures” on page 173.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 177.

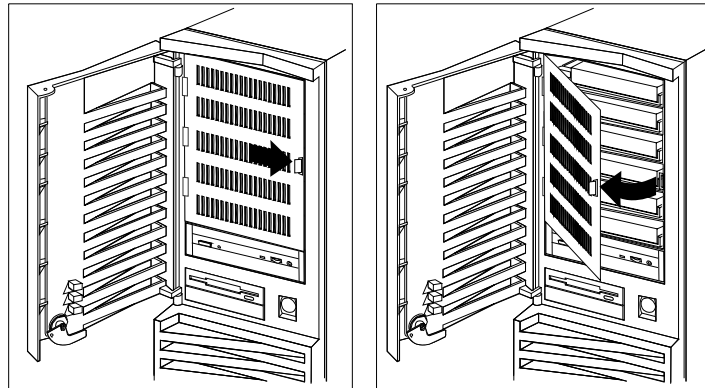
Installing Internal Drives

- Installing an external option? — Go to “Connecting External Options” on page 180.

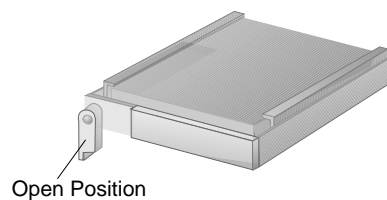
Installing Hard Disk Drives in Hot-Swap Bays

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

1. Unlock and open the exterior door.
2. Unlatch and open the interior door that covers the the hot-swap bays.

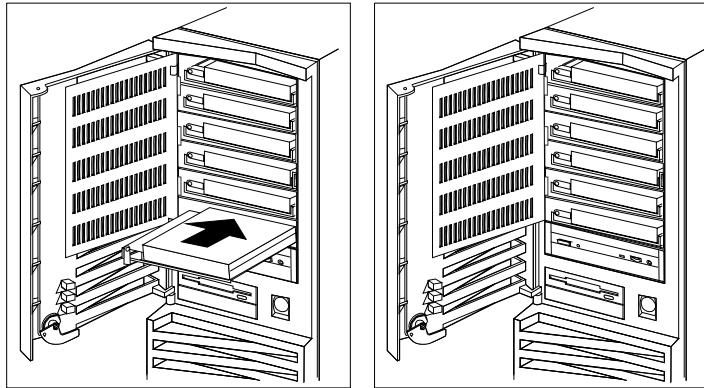


3. Turn the blue locking-lever located on the front of the hot-swap drive clockwise until it is pointing straight down in the open position.

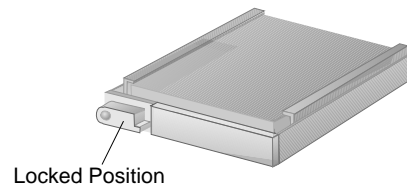


Installing Internal Drives

4. Slide the hot-swap hard disk drive into any open hot-swap bay.



5. Turn the locking-lever back, counter-clockwise, to secure the hot-swap drive in the locked position.



6. Go to “RAID Adapter Configuration Program” on page 47, for instructions on configuring your system after installing hard disk drives.

Installing Internal Drives

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 86.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 91.
- Installing an adapter? — Go to “Installing Adapters” on page 95.
- Removing an adapter? — Go to “Removing Adapters” on page 105.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 151.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 165.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 167.
- Installing a security feature? — Go to “Security Procedures” on page 173.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 177.
- Installing an external option? — Go to “Connecting External Options” on page 180.

Removing Internal Drives

— Before you begin, be sure you have: —

- Read “Electrical Safety” on page 79 and “Handling Static-Sensitive Devices” on page 80.
- Removed the server cover (see “Preparing to Install Options” on page 81).

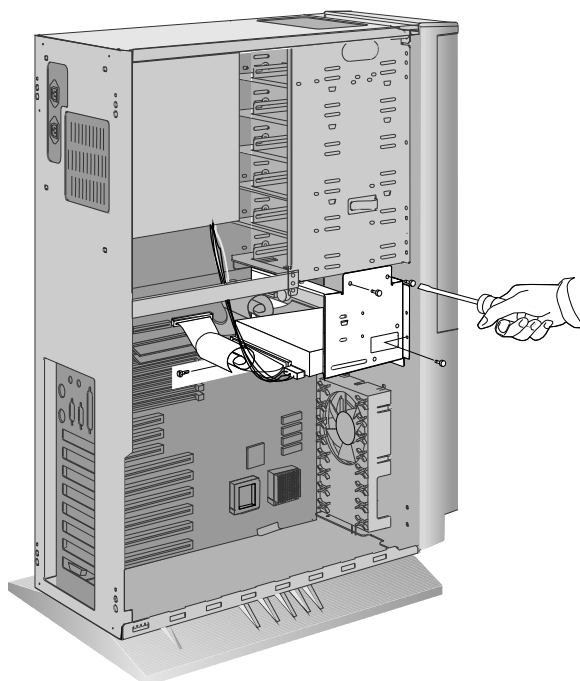
Removing Diskette and IDE Hard Disk Drives

1. Remove the four screws from the drive housing containing the lower three bays.

Note: Three screws are shown near the screwdriver in the following illustration. The fourth screw is located under the housing, on the left side.

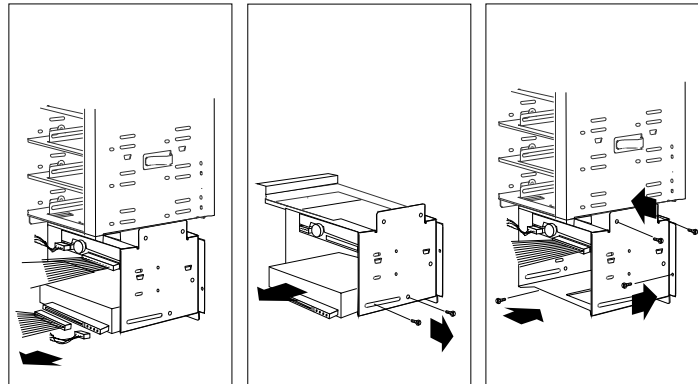
Removing Internal Drives

2. Gently pull the housing away from the bracket that holds its other side in place.



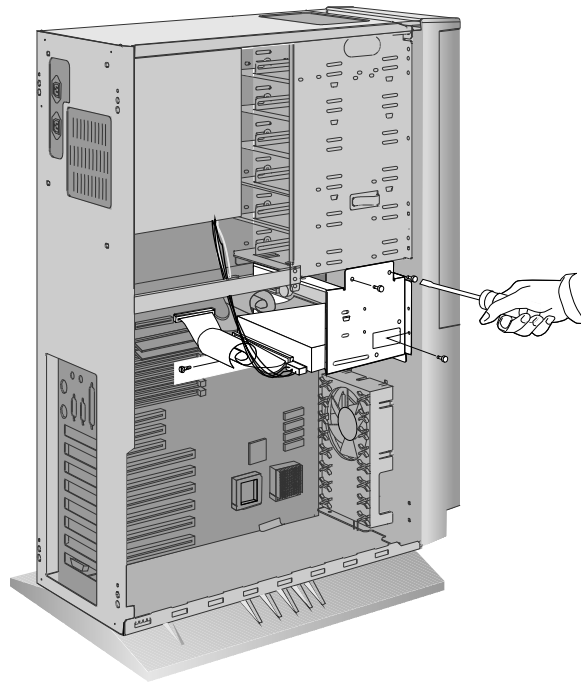
Removing Internal Drives

3. To remove a drive from bays 1–3 (non-disk-array models) or bays 8–10 (disk-array models):
 - a. Find the drive that you plan to remove.
 - b. Disconnect the cables (flat and power) from the rear of the drive.
 - c. Remove the screws that hold the drive in the housing.
 - d. Slide the drive out of the bay and store it in a safe place.



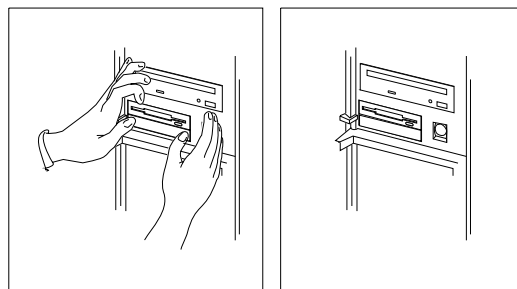
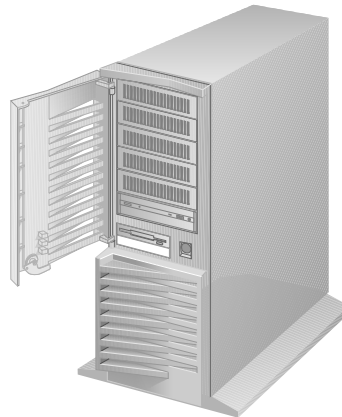
Removing Internal Drives

- e. Reinstall the drive housing, making sure to align it properly over the two brackets located under bay 4 (non-disk-array models) or bay 7 (disk-array models).
- f. If you are not installing another drive in place of the one you've removed, reinstall and tighten the four screws you removed in step 1 on page 151. Otherwise, return to "Installing Diskette and IDE Hard Disk Drives" on page 124.



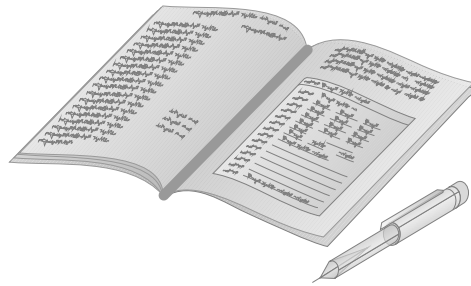
Removing Internal Drives

4. Replace the cover plate (bay 2 on non-disk-array models or bay 9 on disk-array models):
 - a. Locate the original blank cover plate that was shipped with your server.
 - b. Insert the tabs on the right end of the cover plate into the opening in front of bay 2 (non-disk-array models) or bay 9 (disk-array models) in the server's front panel.
 - c. Pivot the plate and press it into place.



Removing Internal Drives

5. Update your records in Table 9 on page 271; then, return here to determine your next step.



What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 86.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 91.
- Installing an adapter? — Go to “Installing Adapters” on page 95.
- Removing an adapter? — Go to “Removing Adapters” on page 105.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 109.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 165.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 167.
- Installing a security feature? — Go to “Security Procedures” on page 173.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 177.
- Installing an external option? — Go to “Connecting External Options” on page 180.

Removing CD-ROM Drives

To remove a CD-ROM drive from bay 4 in non-disk-array models or bay 7 in disk-array models:

1. Unlock and open the door.
2. Remove the cover (see “Preparing to Install Options” on page 81).
3. Remove the screws (two on each side; one high, one low on the drive).
4. Disconnect the cables (flat and power) from the rear of the drive.
5. Slide the CD-ROM drive out of the open bay.

Removing Optical Disc Drives and Tape Drives

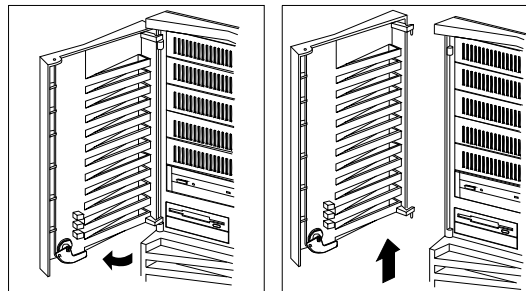
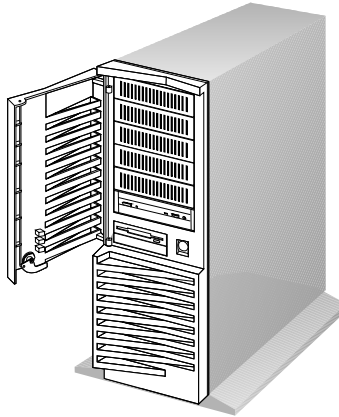
To remove a rewritable-optical disc drive or tape drive, follow the procedure for removing hard disk drives in non-disk-array models in the following section.

Removing Internal Drives

Removing Hard Disk Drives

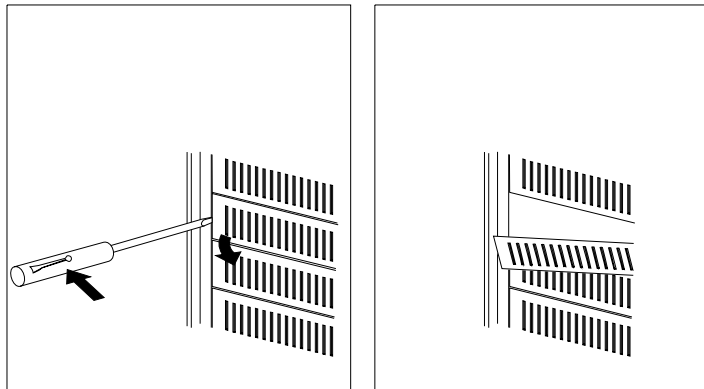
To remove hot-swap hard disk drives from bays 1–6 in disk-array models, see “Removing Hot-Swappable Hard Disk Drives” on page 164. To remove hard disk drives from bays 5–9 on non-disk-array models:

1. Unlock and open the door.
2. Remove the door:
 - a. Lift the door up and off its hinges.
 - b. Store the door in a safe place.



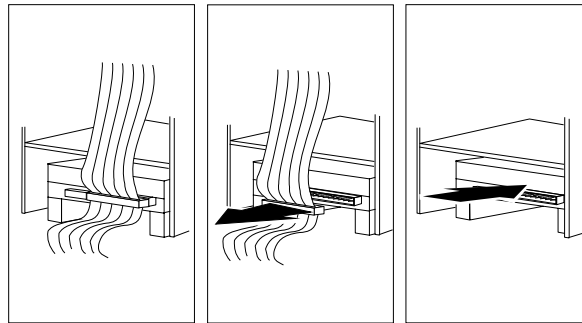
Removing Internal Drives

3. Remove the cover plate from the target bay:
 - a. Insert a small flat-blade screwdriver under the side of the cover plate.
 - b. Lift the cover plate and remove it from the server front panel. (Save the cover plate for future use.)



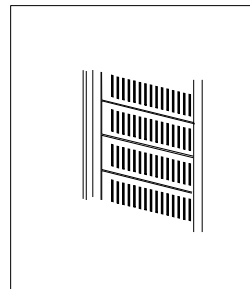
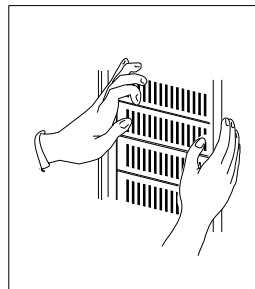
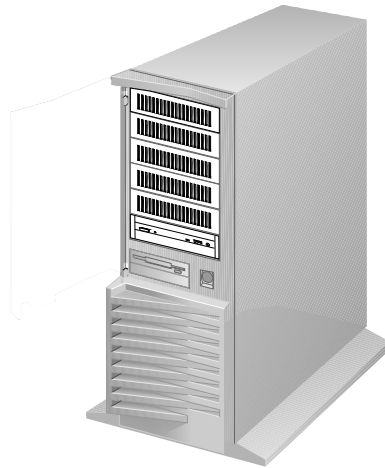
Removing Internal Drives

4. Complete the following steps:
 - a. Locate the drive that you plan to remove.
 - b. Disconnect the cables (flat and power) from the rear of the drive.
 - c. If you are removing a 3.5-inch drive, remove the screws that hold the drive tray in place. Then remove the drive from the tray and store the drive in a safe place.
 - d. If you are removing a 5.25-inch drive, slide the drive out of the bay and store it in a safe place.
 - e. If you are removing a rewritable-optical disc drive, also remove the special mounting bracket that you installed when you installed the drive, and store it with the optical disc drive.



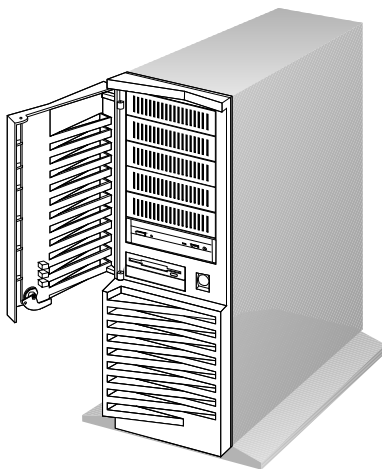
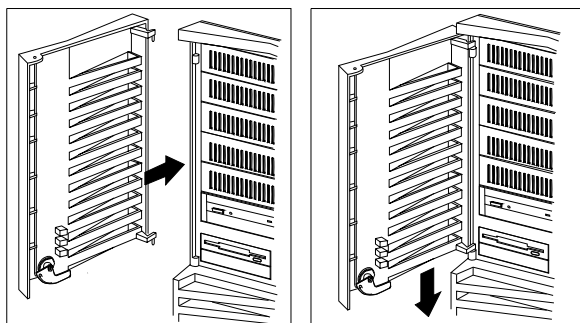
Removing Internal Drives

5. Replace the cover plate:
 - a. Locate the original blank cover plate that was shipped with your server.
 - b. Insert the tabs on the right end of the cover plate into the slots on the right side of the panel in front of the empty drive bay.
 - c. Pivot the plate and press it into place.

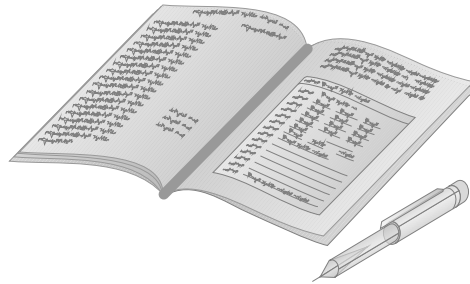


Removing Internal Drives

6. Reinstall the door at the front of the server by aligning the pins with the hinges and sliding the door down.
7. Close and lock the door.



8. Update your records in Table 9 on page 271; then, return here to determine your next step.



What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 86.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 91.
- Installing an adapter? — Go to “Installing Adapters” on page 95.
- Removing an adapter? — Go to “Removing Adapters” on page 105.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 109.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 165.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 167.
- Installing a security feature? — Go to “Security Procedures” on page 173.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 177.

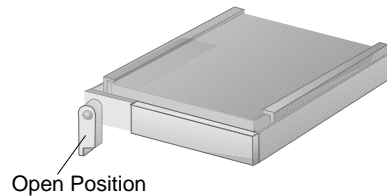
Removing Internal Drives

- Installing an external option? — Go to “Connecting External Options” on page 180.

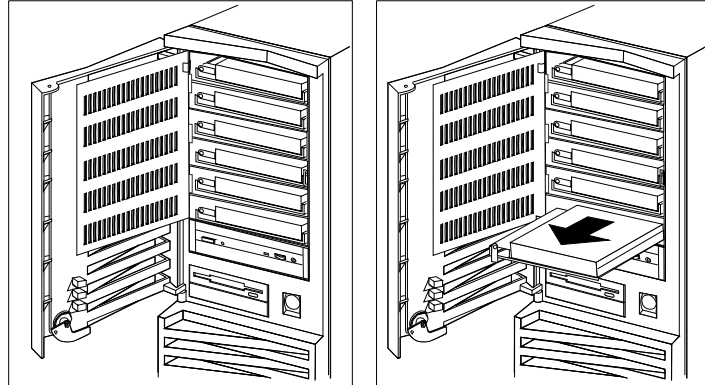
Removing Hot-Swappable Hard Disk Drives

To remove a drive from a hot-swap drive in a disk-array model:

1. Turn the blue locking-lever, located on the front of the hot-swap drive, clockwise until it is pointing straight down.



2. Slide the hot-swap hard disk drive out of the hot-swap bay.



3. If you are installing another hard disk drive in this bay, go to “Installing Hard Disk Drives in Hot-Swap Bays” on page 148.

If you are not installing another hard disk drive in this bay, close the interior door.

4. Close and lock the exterior door.
5. Configure the system as needed. Go to “RAID Adapter Configuration Program” on page 47, for instructions.

Changing Jumper Settings

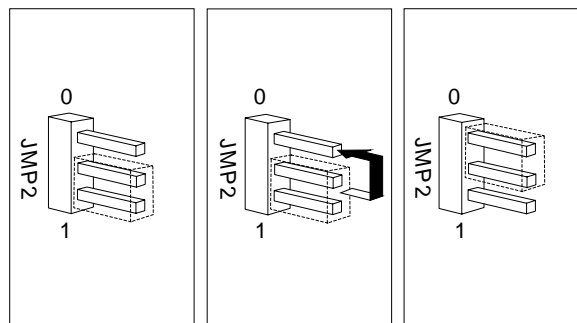
The system board and the system-board jumper settings for your model appear on a label inside your server. These values are preset. If you need to change them, follow the instructions given in “How to Set Jumpers.” You will see the label when you remove the cover. (To remove the cover, go to “Preparing to Install Options” on page 81.)

You might also need to change jumper settings on other devices, such as adapters. 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.



Jumper Settings

To change a jumper setting:

1. Lift the jumper straight up off the pin block.
2. Slide the jumper down over the correct pins.

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 86.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 91.
- Installing an adapter? — Go to “Installing Adapters” on page 95.
- Removing an adapter? — Go to “Removing Adapters” on page 105.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 109.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 151.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 167.
- Installing a security feature? — Go to “Security Procedures” on page 173.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 177.
- Installing an external option? — Go to “Connecting External Options” on page 180.

Installing a Microprocessor

You can install a second microprocessor in your PC Server 320. This microprocessor works with the Pentium microprocessor of the same speed that is in your PC Server 320.

After you install the second microprocessor, your PC Server 320 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 79 and “Handling Static-Sensitive Devices” on page 80.
- Removed the front and side covers (see “Preparing to Install Options” on page 81).
- 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

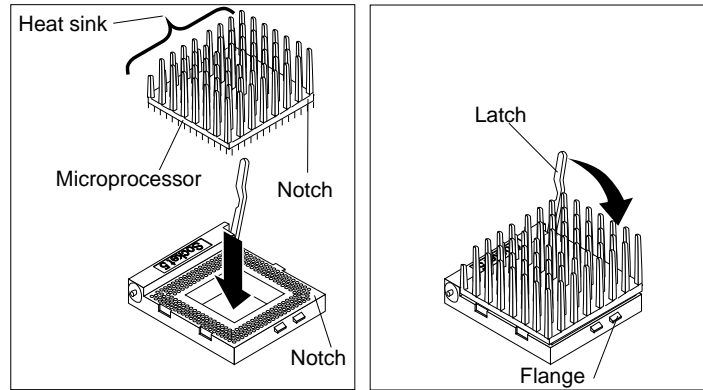
Notes:

- 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 server to locate the primary and secondary microprocessor sockets 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.
 5. Center the microprocessor over the socket.

Installing a Microprocessor

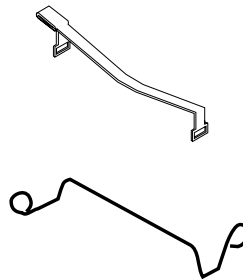
- Carefully put the microprocessor into place. Ensure that the pins on the microprocessor align with the holes in the socket.

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



- Note the heat-sink clip that comes with the microprocessor, and match it to one of the following figures.

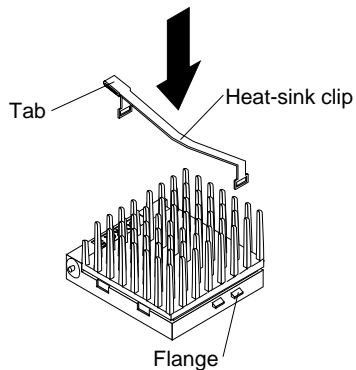
- If it is the top clip, go to step 8 on page 170.
- If it is the bottom clip, go to step 12 on page 171.



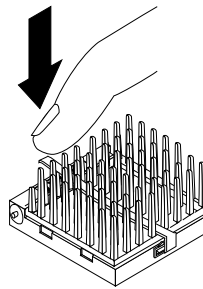
Installing a Microprocessor

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.



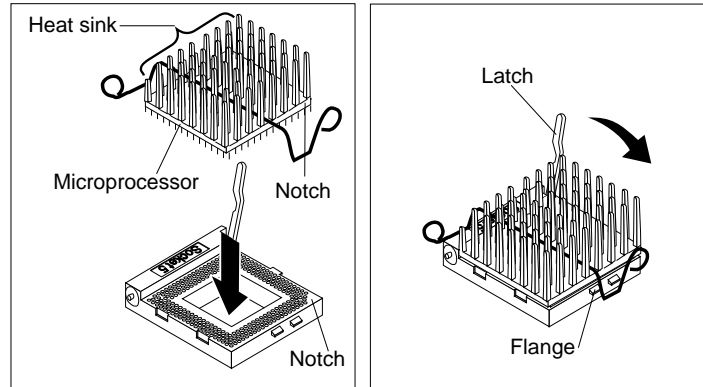
10. Clip one end of the heat-sink clip over the flange. Then, place the clip on top of the heat sink and press down until it is secure on both sides of the socket.



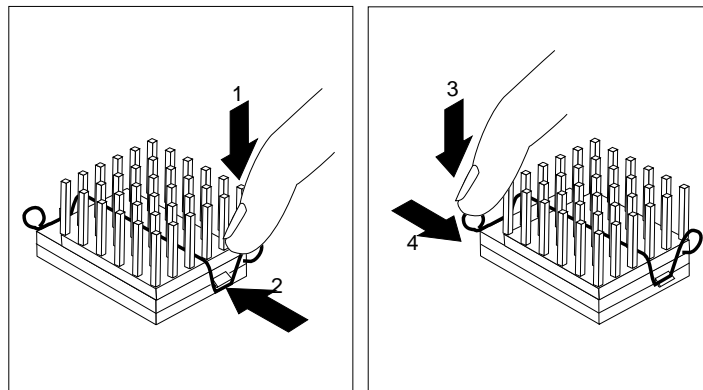
11. Go to step 14 on page 172.

Installing a Microprocessor

12. Move the latch downward until the microprocessor is completely locked into the socket. Make sure the latch is in the fully closed position.



13. Push down on one of the rounded ends of the heat-sink clip 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.



Installing a Microprocessor

14. If you have no other options to install, replace the cover on the server (see “Completing the Installation” on page 177) and reconnect the cables and power cord (see step 2 on page 178).
15. 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 note the software and operating system-considerations in Chapter 2, “Installing Software” on page 19.
 - b. Run the Setup program. See “Using the Setup Program” on page 191 for instructions.
 - c. If applicable, record your updated configuration information in the appropriate tables in “Installed Device Records” on page 268. Then, return here to determine your next step.

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 86.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 91.
- Installing an adapter? — Go to “Installing Adapters” on page 95.
- Removing an adapter? — Go to “Removing Adapters” on page 105.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 109.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 151.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 165.

- Installing a security feature? — Go to “Security Procedures” on page 173.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 177.
- Installing an external option? — Go to “Connecting External Options” on page 180.

Security Procedures

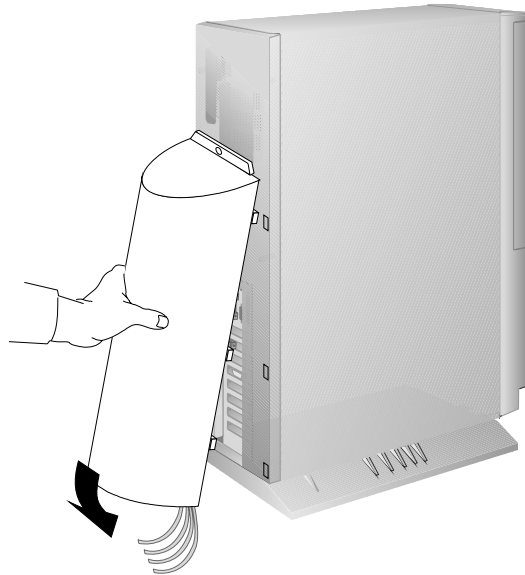
Your server is equipped with security features to help prevent theft or unauthorized use of your server. Your *User's Reference* contains a complete explanation of these features. To use or change some of these features, you might need to remove the server's cover.

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 193.

Security Procedures

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 300 Security Cover II restricts cable access while creating a sleek, streamlined profile. Your *User's Reference* describes this feature. Instructions for installing this option are in a separate booklet that comes with the security cover option.



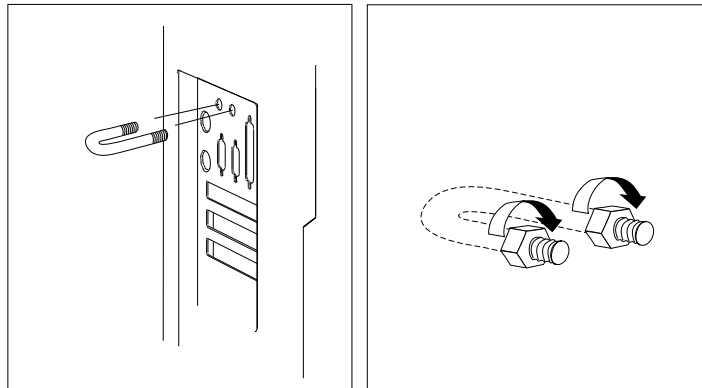
If you want to purchase this option, contact your IBM reseller or IBM marketing representative for additional information.

Installing a U-Bolt

Before you begin, make 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 79 and “Handling Static-Sensitive Devices” on page 80.
- Removed the server cover (see “Preparing to Install Options” on page 81).

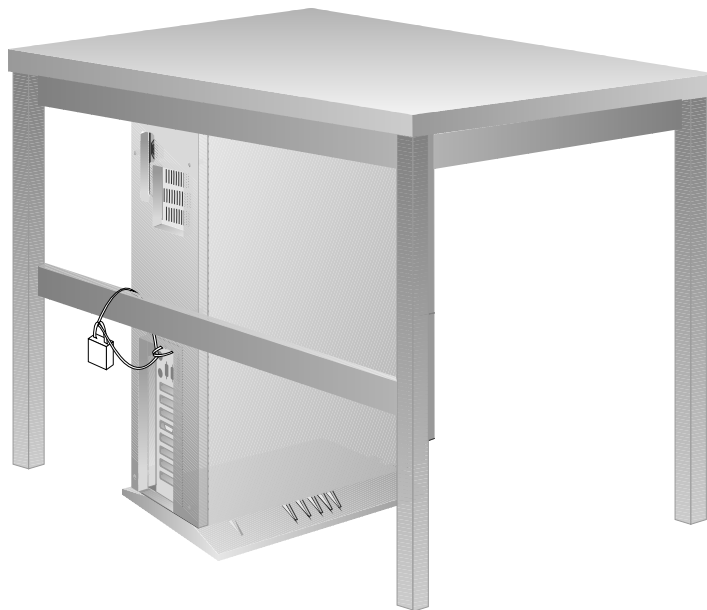
1. Install the U-bolt:
 - a. Locate the two holes for the U-bolt in the rear panel of the server.
 - b. Insert the U-bolt through the holes and secure it in place with the nuts.



2. Replace the server cover and attach the cables (see “Completing the Installation” on page 177).

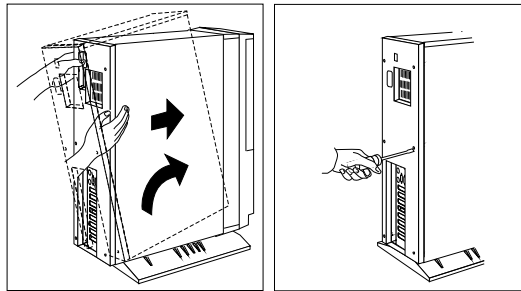
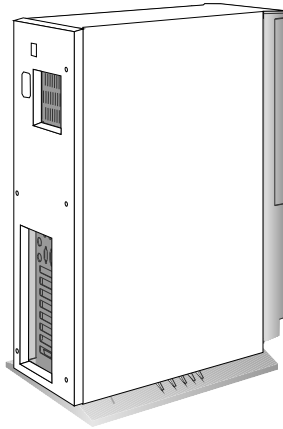
Security Procedures

3. Insert the security cable through the U-bolt. Loop the cable around (or through) an object from which it cannot be removed; then, fasten the cable ends together with the lock.



Completing the Installation

1. Replace the cover:
 - a. Align the cover over the frame of the server and slide the cover in place.
 - b. Tighten the six screws in the recessed holes on the cover.

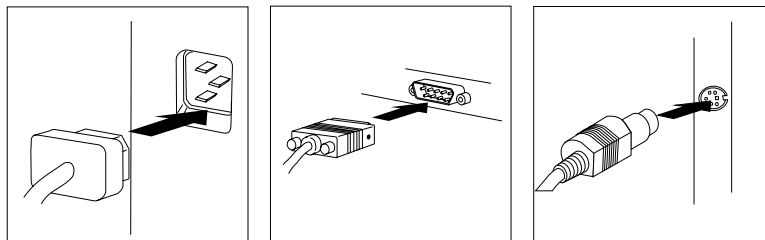
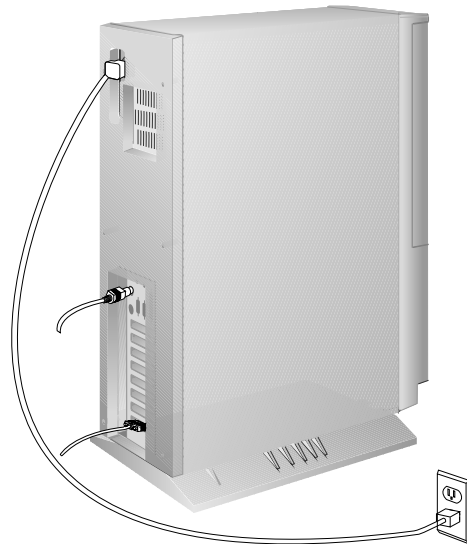


Attention: Be sure to maintain a clearance of at least 51 mm (2 in.) around the front and rear of the server to allow for air circulation.

Completing the Installation

2. 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 180.
- No external options to install?
 - If you installed options during the initial setup of your server, go to Chapter 2, “Installing Software” on page 19 to complete the installation procedure. Then return here.
 - If you installed hot-swap drives, you might need to update your server's configuration parameters. Go to Chapter 3, “Configuring the Disk Array” on page 39 to see if you need to configure your server.

If your server is a non-disk-array model, go to Chapter 5, “Configuring Your Server” on page 189 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 191 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 205 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 don't need to install any device drivers or configure the system, your server is ready to use.

Connecting External Options

Your PC Server 320 supports external devices, that is, devices that connect to the connectors on the back of the server. These external options include SCSI-2 drives and storage enclosures, printers, scanners, modems, and other serial and parallel devices, and an uninterruptible power supply (UPS).

The information in this section supplements the instructions that come with external options. To connect external options to your PC Server 320, see the documentation that comes with the options.

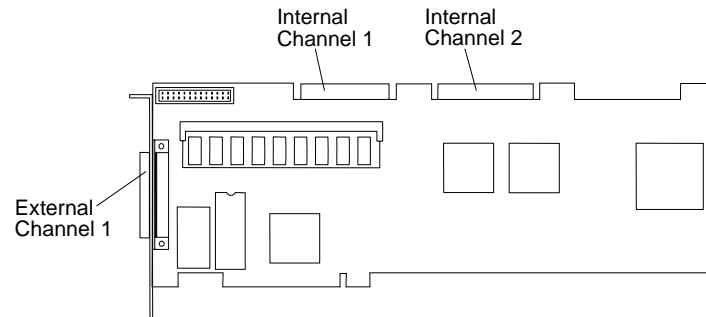
Connecting External SCSI Devices

The IBM DASD Hot-Swap Storage 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.



Note: You cannot use both internal connectors on the SCSI-2 adapter and also use the external connector. For disk-array models with the SCSI-2 Fast/Wide PCI-Bus RAID Adapter, 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 termination setting of the SCSI-2 adapter in the SCSISelect utility program, as described in “Using the SCSISelect Utility Program” on page 213, 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

Before you install external SCSI devices, you must have the correct external SCSI cables. See Table 5 on page 183 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 SCSI-2 Fast/Wide PCI-Bus RAID Adapter can support a

Connecting External Options

total of 14 devices, provided that you do not exceed the maximum cable lengths listed in Table 5 on page 183.

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.

Connecting External Options

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 4-drop, SCSI narrow cable = 1 meter (3.3 ft.) Length of 7-drop, SCSI Fast/Wide cable = 1.5 meters (4.9 ft.)• When a narrow internal cable is used, the maximum length of the SCSI external cable = 5 meters (16.4 ft.) 6 meters – 1 meter = 5 meters, or 19.7 ft. – 3.3 ft. = 16.4 ft.• When a Fast/Wide internal cable is used, the maximum length of the SCSI external cable = 4.5 meters (14.8 ft.) 6 meters – 1.5 meter = 4.5 meters, or 19.7 ft. – 4.9 ft. = 14.8 ft.
Greater Than 5 MB Per Second Data Transmission Rate
<p><i>Note:</i> Maximum cable length – internal cable length = external cable length.</p> <ul style="list-style-type: none">• Maximum Length of SCSI cable = 3 meters (9.8 ft.) Length of 4-drop, SCSI narrow cable = 1 meter (3.3 ft.) Length of 7-drop, SCSI Fast/Wide cable = 1.5 meters (4.9 ft.)• When a narrow internal cable is used, the maximum length of the SCSI external cable = 2 meters (6.5 ft.) 3 meters – 1 meter = 2 meters, or 9.8 ft. – 3.3 ft. = 6.5 ft.• When a Fast/Wide internal cable is used, the maximum length of the SCSI external cable = 1.5 meters (4.9 ft.) 3 meters – 1.5 meter = 1.5 meters, or 9.8 ft. – 4.9 ft. = 4.9 ft.

Table 5. Maximum External SCSI Cable Lengths

Connecting External Options

Setting SCSI IDs for External Devices

The internal channel connector (you can only use one of the two internal channel connectors) and the external channel connector on the SCSI-2 Fast/Wide PCI-Bus RAID Adapter accept SCSI IDs from 0 through 7. Each device attached to the external channel connector must have a unique SCSI ID and each device attached to the internal channel connector must have a unique SCSI ID.

For example, you can have a SCSI ID of 0 on a device attached to the channel 1 connector and a SCSI ID of 0 on a device attached to the channel 2 connector of the same SCSI-2 Fast/Wide PCI-Bus RAID Adapter. However, you cannot have a SCSI ID of 0 on two devices attached to the same channel connector.

Note: Read the README file on the SCSI-2 Fast/Wide PCI-Bus RAID Adapter Configuration Option Diskette for updated information. Select **Option Diskette** from the first menu screen.

Connecting External Options

The following table shows an example of using one internal and one external channel on the RAID adapter. Channel 2 is connected to bank A and Channel 1 is attached to an external DASD storage enclosure. Refer to the documentation that came with the storage enclosure for physical locations.

Displayed Channel Number	Displayed Bay Number	Bank and Bay Physical Location	SCSI ID
1	1	External	0
1	2	External	1
1	3	External	2
1	4	External	3
1	5	External	4
1	6	External	5
1	7	External	6
2	1	A1	0
2	2	A2	1
2	3	A3	2
2	4	A4	3
2	5	A5	4
2	6	A6	5
2	7	(CD-ROM)	6

Table 6. One Internal and One External Channel Mapping

You must set a unique SCSI ID for each external SCSI device that is connected to the SCSI-2 Fast/Wide PCI Adapter. Therefore, do not set the SCSI IDs for external devices to the values that you use for internal devices. (See “SCSI Drives” on page 115 for additional SCSI IDs.) Refer to the instructions that come with the SCSI devices for more information about setting a SCSI ID. The default ID for the SCSI-2 adapter is 7. The ID for the preinstalled CD-ROM drive is 3 on non-disk-array models, and 6 on disk-array models. If your disk-array server comes with a preinstalled hard disk drive in bay 1, the ID is 0.

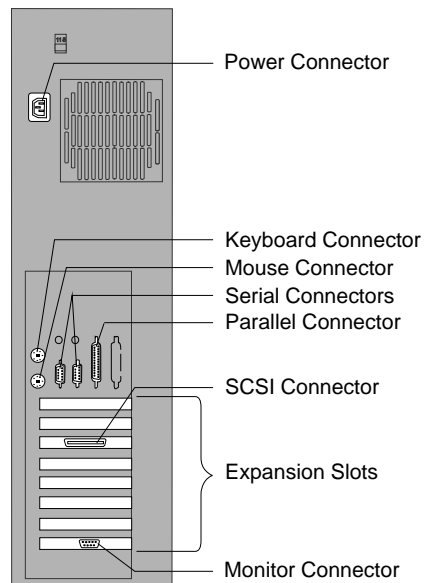
Note: If you install a second SCSI-2 adapter, you can use the same SCSI IDs that you use for the preinstalled SCSI-2 adapter.

Connecting External Options

Installation Procedure

To attach an external drive:

1. Turn off the server and all attached devices.
2. Follow the instructions that came with the option to prepare it for installation and to connect it to the server.
3. Go to Table 9 on page 271 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 188 to determine your next step.



Installing an Uninterruptible Power Supply

A 9-pin, serial-port cable comes with your server. You can use this cable to attach an American Power Conversion (APC) UPS to your floor-standing PC Server 320.

After you purchase and install an APC UPS, you must load the APC support software that comes with ServerGuide onto your server. To do this:

1. Start the main ServerGuide CD.
2. Go to the Diskette Factory; then, select **PowerChute for NetFinity**.
3. Follow the instructions on the screen to install the PowerChute for NetFinity software.

Connecting External Options

What to do next?

- If you installed options during the initial setup of your server, go to Chapter 2, “Installing Software” on page 19 to complete the installation procedure. Then return here.
- If you installed hot-swap drives, you might need to update your server's configuration parameters. Go to Chapter 3, “Configuring the Disk Array” on page 39 to see if you need to configure your server. Then go to Chapter 5, “Configuring Your Server” on page 189 for additional details about configuration.

If your server is a non-disk-array model, go to Chapter 5, “Configuring Your Server” on page 189 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 191 for instructions.
- If you installed or removed an ISA or EISA adapter, you must run the EISA Configuration program. See Chapter 5, “Configuring Your Server” on page 189 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 don't need to install any device drivers or configure the system, your server is ready to use.

Chapter 5. Configuring Your Server

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

For information about configuring the IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter, see “Starting the RAID Configuration Program” on page 47.

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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 are shipped with your server. The built-in Setup program configures system board functions, such as the integrated drive electronics (IDE) controller and serial and parallel port assignments that you install. It also allows you to set passwords for starting up and accessing the Setup program. Use the PC Server 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 provided on the SCSI-2 Fast/Wide PCI-Bus RAID Adapter Configuration Option 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 or IDE 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 192) 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 Standard System Parameters screen to set the System Time and Date. This screen also allows you to view or change configuration settings for diskette drives, IDE drives, memory, video, and cache.

Advanced: The Advanced selection allows you to enable boot (startup) options and to set up integrated peripherals.

Security: Use the Security Selection screen 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

Setup Program

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, an Item specific help panel appears 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: Never start the Setup program while 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 doesn't 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 209).

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 menu** option on the menu bar.
6. Select **Exit menu** 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 the “Installed Device Records” on page 268. 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 menu** 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 320. 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 7 on page 269.

After you set the supervisor password, Enter password appears on the screen each time 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.) When you enter the correct password, Password accepted appears on the screen. If you enter the wrong password, Incorrect password appears on the screen, and Enter password appears again. After three incorrect attempts, you must turn off the server and start again.

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

Setup Program

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 197.

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 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** to save it.

The password becomes effective immediately after you enter it. You are prompted to enter the user password each time that 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 selected 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 doesn't 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 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 192.

2. Backup the EISA Configuration Diskette.

See “Backing Up the EISA Configuration Diskette” on page 205.

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 199.

See “Recording EISA Configuration Settings” on page 207 and “Starting the EISA Configuration Diskette” on page 207.

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

See “Changing Jumper Settings” on page 165.

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 95.

7. Install software programs.

See the installation instructions that came with the software.

8. Resolve configuration conflicts.

See “Configuration Conflicts” on page 209.

Configuring ISA or EISA Features and Options

Some ISA and most EISA devices are shipped 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 EISA Configuration Diskette to create a unique *.CFG* file for each adapter.

Note: The unique *.CFG* files are slot sensitive. That is, do not use these files to configure identical adapters in multiple systems unless you install the adapters in the same expansion slots within each system.

To create a unique *.CFG* file for an ISA adapter:

1. Insert the IBM PC Server EISA Configuration Diskette into diskette drive A.

ISA/EISA Configuration

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 will install 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.

Notes:

- Normally, ISA adapters do not use every parameter. Most adapters require only a PORT address.
- 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 252 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 199 for important information about configuring ISA adapters.
3. Start the EISA Configuration Diskette (see “Starting the EISA Configuration Diskette” on page 207).
4. Record the new configuration information (see “Recording EISA Configuration Settings” on page 207).
5. Save the new configuration settings to the EISA Configuration Diskette and to the NVRAM (see “Starting the EISA Configuration Diskette” on page 207).
6. Set any jumpers or switches on the adapter.
7. Install the adapter in the server (see “Installing Adapters” on page 95).

Configuring PCI Features and Options

PCI devices automatically communicate with the server's configuration information. This usually results in automatic configuration of a PCI device. If a conflict does occur, refer to “Configuration Conflicts” on page 209.

Assigning Interrupt Levels

Your PC Server 320 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 IBM PC Server 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 320 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 the IDE controller (Interrupt 14) or 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 207).
2. Select **Step 3: View or edit details**. The system information appears.
3. Under **Advanced System Feature Setup**, select **Total System Memory**.
4. Select the correct amount of memory; then, press **F10**.

Configuring Memory

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 that 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 that 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 EISA Configuration Diskette, an introductory screen appears. Type **CF** at the prompt. After you press Enter, 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's configuration diskette into the diskette drive. The *.CFG* file is copied to your diskette. If the adapter's *.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 268.

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 205).

To start the EISA Configuration Diskette:

1. Insert 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 machine.
3. When the first screen appears, type **CF** and press **Enter**. 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 installed in your server appear automatically on the EISA Configuration screens *after* you copy the adapter's configuration file (file with an extension of *.CFG*) to the EISA Configuration Diskette. If you want to manually add an adapter that you have not yet installed in your server, add it using Step 2 from the menu. To configure ISA adapters, follow the instructions on the screen.

Using EISA Configuration Diskette Advanced Function

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 EISA Configuration Diskette (see "Starting the EISA Configuration Diskette" on page 207).
2. At the main menu, select **Step 3**. The View or edit details screen appears.
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:

- A device is installed that 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 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 configure only 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 211 for additional information.

Resolving Hardware Configuration Conflicts

Use the following information to help resolve hardware configuration conflicts:

1. Run the Setup program to view and change resources used by the system board functions. Record the current settings before making any changes. (See “Starting the Setup Program” on page 192 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 EISA Configuration Diskette Advanced Function” on page 208).

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's system configuration information file (see “Using EISA Configuration Diskette Advanced Function” on page 208).

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 EISA Configuration Diskette Advanced Function" on page 208). 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 205). If a change is required, see "Preparing to Install Options" on page 81, 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 81, 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 VGA adapters installed). If you must remove an adapter, see "Removing Adapters" on page 105.

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 EISA Configuration Diskette Advanced Function” on page 208 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

Using the SCSISelect Utility Program

To view or change the SCSI-2 adapter settings, select **Configure/View Host Adapter Settings** and follow the directions on the screen. This menu has five selections:

- **Host Adapter SCSI ID**
Select this choice to change the SCSI ID of the SCSI-2 Fast/Wide PCI Adapter from its default value of 7.
- **SCSI Parity Checking**
Select this choice to enable or disable SCSI-2 adapter parity checking. The default value is *Enabled*.
- **Host Adapter SCSI Termination**
Select this choice to configure SCSI-2 adapter termination. The default value is *Low On / High On*.
- **SCSI Device Configuration**
Select this choice to configure SCSI device parameters. Before you can make updates, you must know the ID of the device whose parameters you want to configure.
- **Advanced Configuration Options**
Select this choice to view the advanced configuration option settings. Change these values only if necessary.

To see the SCSI device IDs or to format a drive, select **SCSI Disk Utilities** from the SCSISelect Utility program menu.

When using the utility program, read the screens carefully before making a selection.

Chapter 6. Solving Problems

This chapter contains information to help you solve some of the simpler problems you might have with your IBM PC Server 320. If you encounter more complex technical problems, see Chapter 7, “Getting Help, Service, and Information” on page 257.

This chapter contains:

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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 233.
- If you want to verify that the system is operating correctly, go to “About the Test Programs” on page 221.
- 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 242.

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

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 320. 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.

Overview of the Diagnostic Tools

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's 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, low-level format program, and a diskette format program.

Error Messages

Error messages indicate that a problem exists; they are not intended to be used to identify a failing part. Troubleshooting and servicing of complex problems indicated by error messages should be performed by a trained service technician. Hardware error messages that appear on the screen can be text, numeric, or both.

Messages generated by your software—the operating system or application programs—generally are text messages, but they also can be numeric. Basically, there are four types of error messages. These include POST error messages, diagnostic error messages, POST beep codes, and software-generated messages.

POST Error Messages

POST error messages appear when, during startup, POST finds problems with the hardware or detects a change in the hardware configuration. A list of these error messages is given in “POST Error Message Table” on page 233.

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 a problem was found by the POST. A list of the beep error codes is given in “Beep Codes” on page 241.

Overview of the Diagnostic Tools

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 242 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 4, “Installing Options” on page 77 for instructions on installing the configuration or see “Installing Additional Test Programs” on page 252 for installing diagnostic files.

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 320. 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 228 for more information about running the module tests.

About the Test Programs

- **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 230.
- **System Info:** When you select this choice from the Main Menu, the System Info Menu appears. The System Info Menu allows you to view the server's hardware and software configuration information. For example, you can view the IRQ/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 Hard Disk Utilities. For more information about the File Editor, see “Using the File Editor” on page 254.
- **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 left off.
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: <ul style="list-style-type: none">• Test Options serves as a shortcut to accessing and changing the test options

About the Test Programs

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.

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 (for example, MBD/MEM/VID/HDU/FDU /KBD/COM/LPT, and so on), omits the designated test group from testing. |
| /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 that you start the diagnostic programs (using the QAPRO command), 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

To start the test programs from diskette:

Note: Use your backup copy of the Diagnostic Diskette to run the diagnostic programs.

1. Insert the Diagnostic Diskette into the primary diskette drive (usually drive A).
2. Turn on the system. The IBM PC Server 320 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 225 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**.

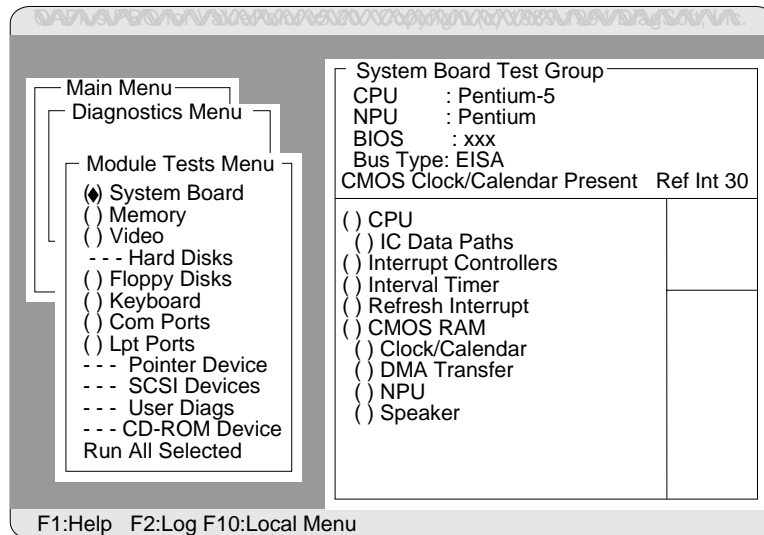
Note: To stop running a specific test or stop testing after you have started a test, press Esc while the test is running. The test pauses at the first possible opportunity, and the Skip/Abort Test Menu appears.

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 226.
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 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 229 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.
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>
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>

POST Error Messages

POST Message	Description
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>
1701 1702 1726	<p>A hard disk drive failure occurred.</p> <p><i>Action:</i> Press F1 to restart the system. If the problem recurs, have the system serviced.</p>
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 items above 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 115 for more SCSI chain information.) • The SCSI devices are configured correctly. <p>If the items above are correct, run the diagnostics for additional information about the failing device. If the error recurs, have the system serviced.</p>

RAID Adapter Message Table

This table lists, in alphabetic order, messages associated with the IBM SCSI-2 Fast/Wide Streaming-RAID Adapter/A.

Where the “Action” information tells you to start the IBM RAID Configuration program, insert the RAID Adapter Option Diskette into the primary diskette drive (usually drive A) and press **Ctrl+Alt+Del**. The action column also provides general information about the message.

Where *m* or *n* are used in these messages, a number will appear in the actual message displayed by the server.

RAID Adapter Message	Action
<i>n</i> logical drives are installed.	<i>n</i> represents the number of logical drives that are defined. Information only; no action is required.
Controller cannot recover from data inconsistencies.	The controller does not have a complete list of all pending operations from the last system use. Start the IBM RAID Configuration program and synchronize all logical drives.
Controller firmware error. Reload firmware.	The controller is not operational. Have the system serviced.
Controller hardware error; run RAID Controller diagnostics program.	The controller is not operational. Have the system serviced.
Controller is not responding to commands. No logical drives are installed.	The controller is not operational. Have the system serviced.
Data on critical logical drive is inconsistent.	A power loss occurred when the logical drive was in <i>Critical</i> state. Data is lost. Replace the defunct drive and re-create the data.

RAID Adapter Message	Action
Drive identified for channel <i>n</i> bay <i>m</i> found at channel <i>x</i> bay <i>y</i> .	<p>A hard disk drive is installed in the incorrect bay.</p> <p>Install the drive in the correct bay, or leave it where it is and reassign it to its present bay. Data in the logical drive will be lost when you reassign it to a new bay.</p> <p>To reassign the drive:</p> <ol style="list-style-type: none"> 1. Start the IBM RAID Configuration program. 2. Select Create/delete array from the Main Menu. The Bay/Array selection list will appear and you can reassign the drive.
Drive in channel <i>n</i> bay <i>m</i> does not respond.	<p>The drive in this bay does not respond to commands from the controller.</p> <p>Insert the RAID Adapter Option Diskette and press Ctrl+Alt+Del to restart the system. A screen will appear to help you decide whether to declare the drive irrecoverable. If you declare the drive irrecoverable, start the IBM RAID Configuration program to resolve the problem.</p>
Installation stopped.	<p>The controller cannot be accessed.</p> <p>This message is a follow-on to a preceding message. Follow the <i>Action</i> instructions for the preceding message you received to resolve the problem.</p>
Irrecoverable configuration error; run Configuration program.	<p>An error exists in the configuration data stored on the RAID controller.</p> <p>Restore the configuration from your Disk Array Configuration Backup diskette.</p> <ol style="list-style-type: none"> 1. Start the IBM RAID Configuration Program. 2. Select Advanced functions from the Main Menu; then, select Restore config. from diskette. 3. Follow the instructions on the screen. <p>If the configuration stored on your Disk Array Configuration Backup diskette is not current (or if you do not have a backup of your configuration information), have the system serviced.</p>
Irrecoverable controller error - memory parity failure.	<p>The controller is not operational.</p> <p>Have the system serviced.</p>
No drives are available to be formatted.	<p>You can only perform a low-level format on a hard disk drive with the status of RDY (Ready), OFL (Offline), or UNF (Unformatted).</p>

RAID Adapter Message	Action
No free RAM found; no logical drives are installed.	The controller could not initialize its BIOS. Have the system serviced.
No logical drives found; none are installed.	No logical drives are defined. Start the IBM RAID Configuration program and define a logical drive.
RAID firmware version <i>x.yy</i>	This is the version level. Information only; no action is required.
Recoverable configuration error; run Configuration program.	An error exists in the configuration data stored on the controller. Insert the IBM RAID Adapter Option Diskette and press Ctrl+Alt+Del to restart the system. Follow the instructions on the screen.
Recovery from data inconsistency is in progress.	The most likely cause is a sudden power loss during the last operation. No action is required.
Starting drives...	The controller is starting drives in the array. Information only; no action is required.
Unidentified drive found in channel <i>n</i> bay <i>m</i> .	The drive in this bay is not recognized by the system. Information only; the system will assign it to that bay.
WARNING: <i>n</i> logical drives are critical; <i>n</i> logical drives are offline.	One or more drives have failed. Replace the defunct drives as soon as possible to prevent data loss.
WARNING: The firmware flash EEPROM is failing and must be replaced.	The EEPROM on the controller is reaching the end of its life and must be replaced. Have the system serviced.
WARNING: Too many entries in the change list. Reset the system to clear it.	Temporary tables in the controller are full; the controller needs to be reset. Press Ctrl+Alt+Del to restart the system; then, follow the instructions on the screen.
IBM RAID BIOS - System in protect mode; cannot continue. System halted	The system is operating in protect mode without a device driver. Update the CONFIG.SYS file with the proper device drivers and restart the system.

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 226. 	
If the problem recurs, have the system serviced.	

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 doesn't 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 supplied with the monitor for adjusting and testing instructions.</p> <p>If you still cannot find the problem, have the monitor and system serviced.</p>
Monitor Problems	Action
<p>Wavy, unreadable, rolling, distorted screen, or screen jitter.</p>	<p>If the monitor self-tests show the monitor is OK, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor.</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>
<p>The monitor works when you turn on the system, but goes blank when you start some application programs.</p>	<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 115 for more information about SCSI terminators.) If the items above are correct, have the system serviced.
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 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 data-bbox="648 420 1087 444">1. The memory modules are seated properly.<li data-bbox="648 447 1155 520">2. Memory modules must be installed in pairs. See “Installing Memory-Module Kits” on page 86 for more information.<li data-bbox="648 524 1148 657">3. You updated the configuration information. Whenever memory or an option is changed, you must update the configuration. Run the EISA Configuration program (see “Starting the EISA Configuration Diskette” on page 207). <p>If the items above are correct, have the system serviced.</p> <p>Run the memory test program from your Diagnostic Diskette (see “Starting the Test Programs” on page 226). 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 to 32 MB from 16 MB (default).

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 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. <p>Whenever memory or an option is changed you must update the configuration by running the EISA Configuration program. press F2 quickly, when prompted, to enter Setup.</p> <p>If you are using an expanded- or enhanced-memory manager, such as the DOS Expanded Memory Specification (EMS) driver, go to Chapter 4, "Installing Options" on page 77.</p> <p>If all of the items above 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 came 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 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 115 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. <p>If the items above are correct, have the system serviced.</p>

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. <p>If the items above are correct, have the system serviced.</p>

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 the <i>User's Reference</i>.) <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. <p>If the items above are correct and the printer still does not work, run the tests described in the manual that came with your printer. If the tests show the printer is OK, have the system serviced.</p>

Troubleshooting Charts

Software Problems	Action
Is your software program OK?	<p data-bbox="669 373 1211 433">To determine if problems are caused by the software, verify that:</p> <ol data-bbox="677 445 1211 809" style="list-style-type: none"><li data-bbox="677 445 1211 555">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 data-bbox="700 564 1211 664">Note:</i> If you have just installed an adapter or memory, you might have a memory address conflict (see "Configuration Conflicts" on page 209).<li data-bbox="677 682 1211 737">2. The software is designed to operate on your system.<li data-bbox="677 737 1211 764">3. Other software works on your system.<li data-bbox="677 764 1211 809">4. The software you are using works on another system. <p data-bbox="669 828 1211 937">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 data-bbox="669 946 1211 1030">If the items above are correct and the problem remains, contact your place of purchase or service technician for help.</p>

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 4, “Installing Options” on page 77 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. Refer to “Starting the Test Programs” on page 226 for instructions.

After Spilling Liquid on It

If liquid gets on the keyboard:

1. Turn off the system.
2. Unplug the keyboard from the back of the system.
3. Turn the keyboard upside down to drain excess liquid.
4. Dry off the keyboard with a lint-free cloth.

After the keyboard is completely dry, plug it in and turn on the system. If it does not work correctly, have the keyboard serviced.

If liquid gets inside the monitor:

1. Turn off the monitor.
2. Turn off the system.
3. Unplug the monitor from the system and the electrical outlet.
4. Have the monitor serviced immediately.

If liquid gets inside the system:

1. Turn off the system and all attached devices.
2. Unplug the system from the electrical outlet and all attached devices.
3. Have the system serviced immediately.

Installing Additional Test Programs

You can 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

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 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.

Installing Additional Test Programs

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
- 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

Format B: 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.

Using the Utility Programs

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.
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.

Chapter 7. 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 chapter 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 320, see “Troubleshooting Charts” on page 242, “POST Error Message Table” on page 233, “SCSI Messages” on page 237, and “RAID Adapter Message Table” on page 238). 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 226).

If you suspect a hardware problem, run the diagnostic tests and make a note of any error messages that you receive. Then look up the message in Chapter 6, “Solving Problems” on page 215, and take the appropriate action.

If you suspect a software problem, consult the documentation (including README files) for the operating system or application program.

Using the HelpWare Support Family

IBM HelpWare is the “full-service” 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.

Getting Help by Telephone

During the warranty period, you can get help and information by telephone through the IBM HelpWare PC Support Line. Expert technical-support representatives are available to assist you with questions you might have on the following:

- Setting up your server and IBM monitor
- Installing and setting up IBM options purchased from IBM or an IBM reseller
- 60-day, preinstalled-operating-system support
- Arranging for service (on-site or carry-in)
- Arranging for overnight shipment of customer-replaceable parts

In addition, your purchase of an IBM PC Server makes you eligible for 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

Your HelpWare representative can also fax or mail additional technical or product information to you, such as:

- Sales information
- Product brochures
- Locations of IBM resellers
- Services available through IBM

Please have the following information ready when you call:

- Serial and model 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.

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.

Using Electronic Support Services

If you have a modem, you can access public electronic bulletin boards and public messaging areas, electronic conferences, and

searchable databases available in several of the most popular online information services.

Bulletin boards and online services contain information on many topics, such as:

- PC user groups
- PC questions and answers
- OS/2 topics
- Solving problems
- Technical information
- Hardware and software configurations
- Networking

The IBM PC Company Bulletin Board System (BBS) can be reached 24 hours a day, 7 days a week. Modem speeds of up to 14 400 baud are supported. Long distance telephone charges might apply. To access the PC Company BBS:

- In the U.S., call 1-919-517-0001.
- In Canada:
 - In Markham, call 905-316-4255.
 - In Montreal, call 514-938-3022.
 - In Toronto, call 416-492-1823.
 - In Vancouver, call 604-664-6466.

Commercial online services that contain information about IBM products include:

- CompuServe
Use the following GO words: IBMPS1, 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**.

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 the operating system or application programs

- Tuning performance
- Installing device drivers remotely
- Setting up and using multimedia devices
- Identifying system problems
- Interpreting documentation

You can purchase this service for a single incident, for multiple incidents, or through a 900 number (you will be billed by the telephone company). For more information about purchasing Enhanced PC Support, see “Ordering Support Line Services” on page 263.

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 technical support for:

- 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 for a single incident or for multiple incidents. For more information about purchasing Network and Server Support, see “Ordering Support Line Services” on page 263.

Personal Computer Software Assistance Support Line

This service is an individual year-long subscription for assistance with desktop application programs installed in IBM and IBM-compatible computers. In Canada, this service is called PC Professional. Product experts will provide telephone assistance, 24 hours a day, 7 days a week, for application programs on the Supported Products list.

For more information about purchasing this service, see “Ordering Support Line Services” on page 263.

Ordering Support Line Services

Enhanced PC Support Line, Network and Server Support Line, and Personal Computer Software Assistance Support Line services are available for products on the Supported Products list. To receive a Supported Products list:

- In the U.S.:
 1. Call 1-800-772-2227.
 2. Select the automated fax system option.
 3. Select the service for which you would like a Supported Products list:
 - For Enhanced PC Support Line, select document 11682.
 - For Network and Server Support Line, select document 11683.
 - For Personal Computer Software Assistance Support Line, select document 11684.
- In Canada, contact IBM Direct at 1-800-465-7999, or:
 1. Call 1-800-465-3299.
 2. Select the HelpWare catalog.
- In all other countries, contact your IBM reseller or IBM marketing representative.

For more information or to purchase these services:

- In the U.S., call 1-800-772-2227.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your IBM reseller or IBM marketing representative.

Warranty and Repair Services

You can upgrade your standard hardware warranty service or extend the service beyond the warranty period.

Warranty upgrades in the U.S. include:

- Carry-in service to on-site service
If your warranty provides carry-in repair service, you can upgrade to on-site repair service, either standard or premium.

The standard upgrade provides a trained servicer within the next business day (9 a.m. to 5 p.m., local time, Monday through Friday). The premium upgrade provides 4-hour average response, 24 hours a day, 7 days a week.

- On-site service to premium on-site service

If your warranty provides for on-site service, you can upgrade to premium on-site service (4-hour average on-site response, 24 hours a day, 7 days a week).

You also can extend your warranty. HelpWare Warranty and Repair Services offers a variety of post-warranty maintenance options. 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.

Consulting

If you want to better understand and more effectively use IBM PC Servers and other Personal Computer products, in the U.S. you can purchase HelpWare Consult Line support. This service offers telephone access to experts for consultation on agreed-to topics. The experts provide recommendations and corrective actions, as appropriate.

For more information about HelpWare Consult Line, call 1-800-772-2227.

Custom Services

If you are setting up a network and need help installing the network or the application programs, in the U.S. you can purchase assistance from HelpWare Custom Services. The following services are available:

- LAN Startup Services

This service provides assistance with setting up and customizing your network, including:

- Unpacking equipment
 - Setting up and testing the hardware
 - Connecting systems to LAN cabling
 - Customizing the network operating system
 - Customizing the network printer server
- Connectivity Services

This service provides hardware installation and connection to support a server and five or more workstations, using token-ring or 10BaseT Ethernet cabling.

For more information about LAN Startup and Connectivity Services, call 1-800-772-2227.

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 259 for information on how to access this bulletin board system.
- IBM Software Solutions Center. In the U.S. or Canada, call 1-800-992-4777.
- IBM reseller or IBM marketing representative.

Ordering System Diskettes

If you have damaged Reference or Diagnostic Diskettes, you can order replacements from IBM.

To order replacements:

- In the U.S., call 1-800-845-4263.
- In Canada, call 1-800-565-3344.

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

Ordering Publications

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

- In the U.S. and Puerto Rico, call IBM PC Books at 1-800-426-7282.
- In Canada, call 1-800-465-1234.
- In other countries, contact your IBM reseller or IBM marketing representative.

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.

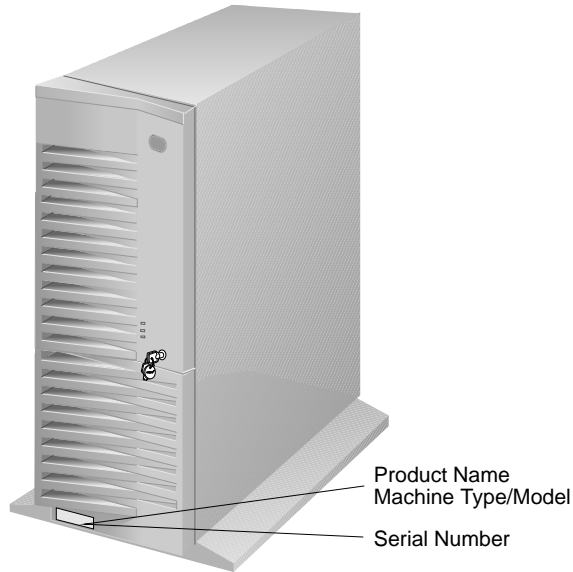
Recording the Server Serial Number

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 320
Machine Type	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 locations of the PC Server 320 identification numbers are shown in the following illustration. They are located near the bottom, on the front of the server.



Note: Two keys are provided with your server. Always store the keys in a safe place. If you lose them, you must order a replacement lock mechanism and keys from IBM.

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 server. 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.

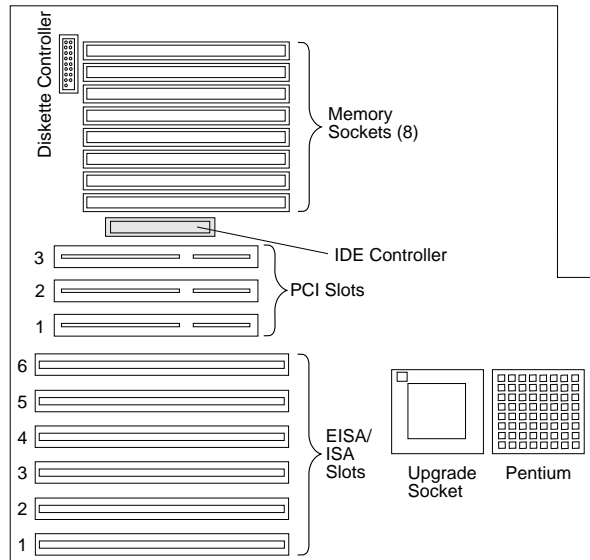
Installed Device Records

Option	Default Value	New Value	Additional Information
Diskette A	1.44 MB, 3.5 in.	_____	Record additional drive information in Table 9 on page 271.
Diskette B	Not installed	_____	
IDE Device 0 Master	None	_____	
IDE Device 0 Subordinate	None	_____	
Video System	SVGA	_____	Record additional information in Table 8 on page 270.
Video BIOS	Shadowed	_____	Select <i>Disabled</i> for adapters that cannot be shadowed.
System Memory	640 MB	_____	
<u>Extended Memory</u>	15 MB	_____	
Bank 0 Socket 1	8 MB Kit	_____	4 MB Kit <input type="checkbox"/> 8 MB Kit <input type="checkbox"/> 16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 0 Socket 2	8 MB Kit	_____	4 MB Kit <input type="checkbox"/> 8 MB Kit <input type="checkbox"/> 16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 1 Socket 3		_____	4 MB Kit <input type="checkbox"/> 8 MB Kit <input type="checkbox"/> 16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 1 Socket 4		_____	4 MB Kit <input type="checkbox"/> 8 MB Kit <input type="checkbox"/> 16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 2 Socket 5		_____	4 MB Kit <input type="checkbox"/> 8 MB Kit <input type="checkbox"/> 16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 2 Socket 6		_____	4 MB Kit <input type="checkbox"/> 8 MB Kit <input type="checkbox"/> 16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 3 Socket 7		_____	4 MB Kit <input type="checkbox"/> 8 MB Kit <input type="checkbox"/> 16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Bank 3 Socket 8		_____	4 MB Kit <input type="checkbox"/> 8 MB Kit <input type="checkbox"/> 16 MB Kit <input type="checkbox"/> 32 MB <input type="checkbox"/>
Total Memory	16 MB	_____	
Cache State	Enabled	_____	
COM1 Port	3F8, IRQ 4	_____	
COM2 Port	2F8, IRQ 3	_____	
LPT Port	378, IRQ 7	_____	
LPT mode	Output only	_____	
Diskette controller	Enabled	_____	
Integrated IDE bus adapter	Disabled	_____	
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	Disabled	_____	
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 7. Setup Program Configuration Defaults and Changes

Installed Device Records

Refer to the following system-board illustration when completing Table 8.



Slot	IRQ	DMA	I/O Port	ROM/RAM Address	Option Description and Additional Information
6	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____
1	_____	_____	_____	_____	Video: SVGA

Note: Do not use slot 6 if the adjacent PCI slot is occupied. Before setting values, review Chapter 4, "Installing Options" on page 77 and follow the instructions for avoiding configuration conflicts.

Table 8. EISA/ISA Expansion Slot Configuration Information

Installed Device Records

Location	Drive or Device Description
Bay 1	_____
Bay 2	_____
Bay 3	_____
Bay 4	_____
Bay 5	_____
Bay 6	_____
Bay 7	_____
Bay 8	_____
Bay 9	_____
Bay 10	_____
External Devices	
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____

Table 9. Internal and External Drives and Devices

Note: If you attach a drive or other device to an adapter, be sure to record the descriptive information in the appropriate column in Table 8 on page 270 (in the same row as the expansion-slot number of the adapter).

Installed Device Records

Appendix B. Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Subject to IBM's valid intellectual property or other legally protectable rights, any functionally equivalent product, program, or service may be used instead of the IBM product, program, or service. The evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, are the responsibility of the user.

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DiagSoft	DiagSoft, Inc.
EtherCard	Standard Microsystems Corporation
EtherExpress	Intel Corporation
EtherLink	3Com Corporation
Intel	Intel Corporation
Microsoft	Microsoft Corporation
NetWare	Novell, Inc.
Novell	Novell, Inc.
NT	Microsoft Corporation
OpenServer	The Santa Cruz Operation, Inc.
Pentium	Intel Corporation
PowerChute	American Power Conversion Corporation
PRODIGY	Prodigy Services Company
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