



PC Server 320

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

Note

Before using this information and the product it supports, be sure to read the general information under Appendix B, “Notices” on page 297. Also read the general information under “Product Warranties and Notices” in the *User's Reference*.

Second Edition (January 1996)

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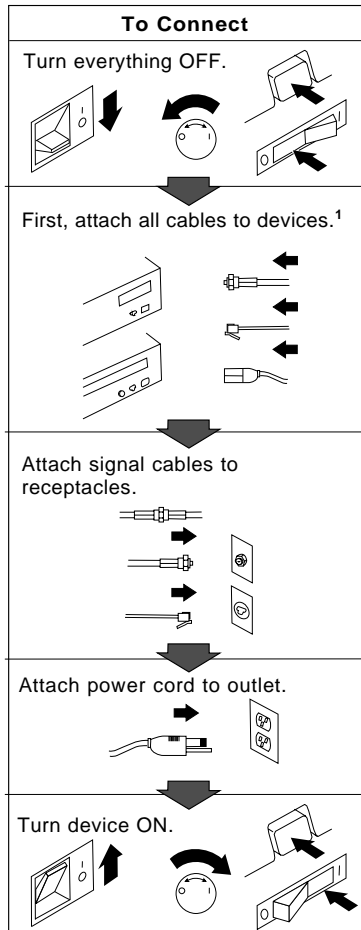
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Safety Information

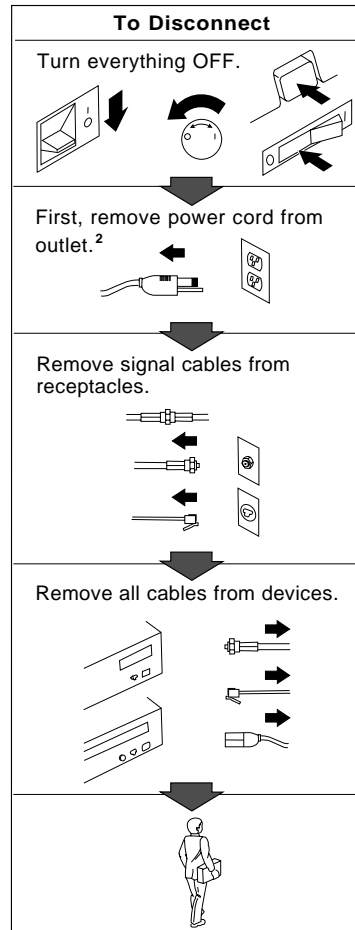


DANGER:

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.

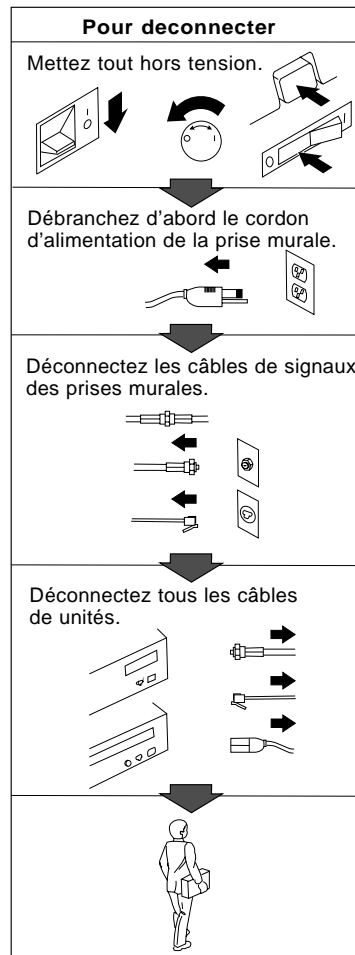
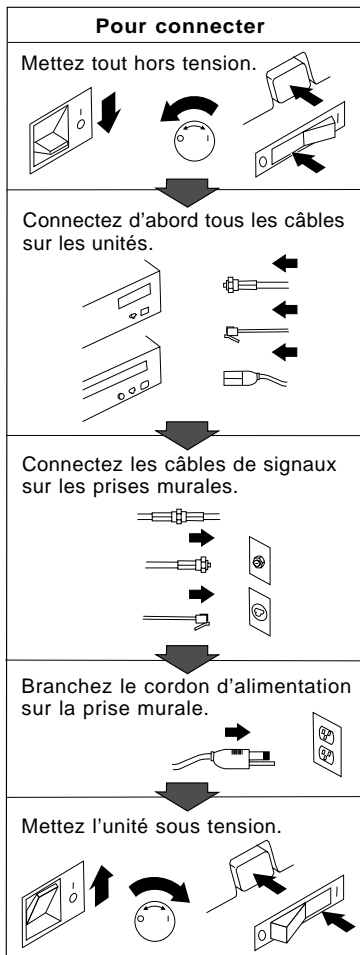


² In the U.K., by law, the power cord must be disconnected after the telephone line cable.



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

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

The IBM CD-ROM drive is certified in the U.S. to conform to the requirements of the Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J for Class 1 laser products.

Elsewhere, the drive is certified to conform to the requirements of EN60825.



CAUTION:

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

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

Lithium Battery Notice

CAUTION:

Danger of explosion if battery is incorrectly replaced.

When replacing the battery, use only IBM Part Number 76H7632 or an equivalent type battery recommended by the manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100° C (212° F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

ATTENTION

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

Remplacer uniquement par une batterie IBM de type 76H7632 ou d'un type équivalent recommandé par le fabricant. La batterie contient du lithium et peut exploser en cas de mauvaise utilisation, de mauvaise manipulation ou de mise au rebut inappropriée.

Ne pas :

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

Mettre au rebut les batteries usagées conformément aux règlements locaux.

This book provides instructions on how to configure the server and install and remove options. This book also provides information to help you solve some of the simpler problems that might occur. If you have not yet set up your server, refer to the Setup sheet for detailed information on unpacking the server and attaching cables. Refer to the *User's Reference* for more detailed information on the features of the server.

How This Book is Organized

Chapter 1, "Getting Started with PC Server 320," provides a general introduction to using your server, such as how to use the CD-ROM drive.

Chapter 2, "Installing Software," provides information about the tasks you need to complete the installation. This includes installing the operating system using ServerGuide. This chapter also includes important suggestions on arranging your work area for comfort.

Chapter 3, "Configuring the Disk Array," provides information about configuring models that come with a disk-array adapter. This chapter provides step-by-step instructions to perform the tasks necessary to configure, add, change, or delete one or more disk arrays.

Chapter 4, "Configuring Your Server," provides instructions for using the system programs and the configuration utility programs. This chapter includes information about using the configuration utility program includes setting passwords and configuring devices and adapters.

Chapter 5, "Installing Options," contains instructions for installing and removing options, such as memory, adapters, and internal drives. Instructions for setting jumpers, installing a second microprocessor, replacing the battery, and connecting external options are also included in this chapter.

Notices Used in This Book

Chapter 6, “Solving Problems,” includes an overview of the diagnostic tools, instructions for testing the server, lists of error messages, and troubleshooting charts. The chapter also contains information about checking the server for damage, resolving configuration conflicts, and getting service.

Appendix A provides a section to record and update important information about your server, including serial numbers, key number, and device records. Whenever you add options to your server, be sure to update the information in this appendix.

Appendix B contains product notices and trademarks.

An index follows the appendixes.

Notices Used in This Book

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

- **Notes**

These notices provide important tips, guidance, or advice.

- **Attention**

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

- **Caution**

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

Related Publications

The following publications are included with your PC Server 320:

- The PC Server 320 Setup sheet provided with your server contains information about setting up your server.
- The *PC Server 320 User's Reference*, included with your server, contains detailed information about the advanced features of your server.
- The ServerGuide *User's Guide* describes the advantages of IBM ServerGuide and operating system installation.

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

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

Welcome and Thank You

Welcome and Thank You

We appreciate your decision to purchase an IBM PC Server 320. Your server offers speed, power, expandability, and compatibility.

Your PC Server library consists of the following documents: the *Setup* sheet, the *User's Reference*, this *User's Handbook*, and the *PC Server Service and Support* pamphlet. The *Setup* sheet contains instructions to help you unpack and attach cables to your IBM PC Server. The *User's Reference* contains detailed information about the advanced features of your PC Server. This *Handbook* contains detailed information about completing the installation, installing options, configuring your server, and solving problems.

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

Also included is the ServerGuide package, which contains a number of CDs. These CDs contain operating systems, application programs, utility programs, online documentation, and more. Refer to the *ServerGuide* documentation for more information.

The PC Server 320 also comes with a full three-year on-site warranty. In addition, IBM's PC Server Startup Support 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 non-IBM vendors. In the U.S., call IBM at 1-800-772-2227, or in Canada, call 1-800-565-3344 if you need assistance.

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

Chapter 1. Getting Started with PC Server 320

Your server combines powerful microprocessor performance, large data-storage capacity, and improved system expandability. This server is specifically designed by IBM to support the demands of today's network environment. Using Micro Channel and peripheral component interconnect (PCI) architectures, it provides compatibility with a wide range of existing hardware and software.

Your server offers dual-processor capability through a second microprocessor connector. Super video graphics array (SVGA) support provides compatibility with many existing application programs.

Refer to the Setup sheet for instructions on 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. This book also describes how to configure and use the server, how to install and remove options, and how to solve some of the simpler problems that might occur.

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

This chapter contains:

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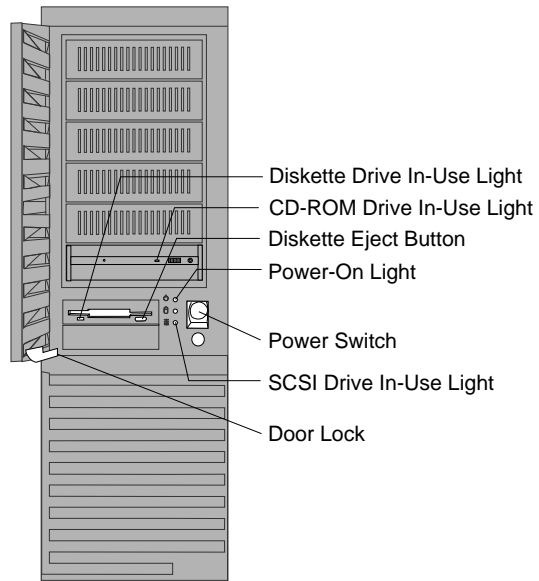
Features at a Glance

The following table summarizes the features of 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 <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 • 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, 2.88 MB – 3.5-inch, 1.44 MB <p>Hard Disk Drive</p> <ul style="list-style-type: none"> • Number and capacity of standard drives varies by model • Supports up to six internal hard disk drives • Hot-swap bays standard on some models; available on all models 	<p>CD-ROM Drive</p> <ul style="list-style-type: none"> • Standard: SCSI-2 <p>Keyboard and Mouse</p> <ul style="list-style-type: none"> • 101-key keyboard • Mouse <p>Expansion</p> <ul style="list-style-type: none"> • Six 32-bit Micro Channel slots, two 32-bit PCI slots • Six 5.25-inch drive bays • One 3.5-inch drive bay <p>Video</p> <ul style="list-style-type: none"> • Super video graphics (SVGA) connector • Compatibility: <ul style="list-style-type: none"> – Video graphics adapter (VGA) – Color graphics adapter (CGA) – Multicolor graphics array (MCGA) <p>Security Features</p> <ul style="list-style-type: none"> • Bolt-down capability • Door lock • Administrator and power-on passwords • Selectable startup drive • Security cover (optional) 	<p>Integrated Functions</p> <ul style="list-style-type: none"> • Video port • Two serial ports • Parallel port • Auxiliary device port • Keyboard port • Battery-backed clock and calendar • SCSI-2 <ul style="list-style-type: none"> – 1 16-bit external connector – 2 internal connectors (one 8-bit and one 16-bit) <p>IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter (disk-array system)</p> <ul style="list-style-type: none"> • Two 16-bit internal connectors • One 16-bit external connector <p>Power Supply</p> <ul style="list-style-type: none"> • 300 watt with voltage switch (115–230 V ac) • Built-in overload and surge protection <p>Upgradable Power-on Self-test (POST) and Basic Input/Output System (BIOS)</p> <ul style="list-style-type: none"> • Upgradable electrically erasable programmable read-only memory (EEPROM) on the system board • POST/BIOS upgrades (when available)
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Controls and Status Indicators

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 comes on whenever the CD-ROM drive is accessed.

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

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

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

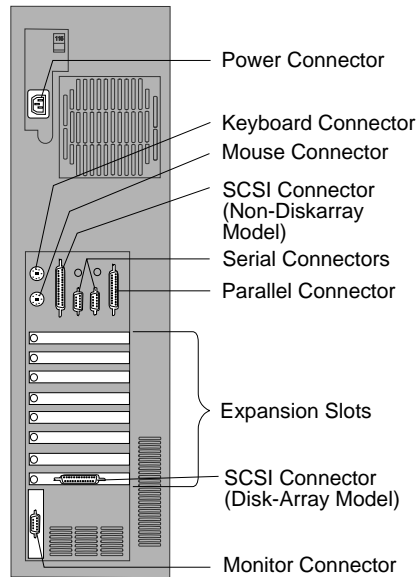
SCSI Drive In-Use Light: This light comes on when your server is accessing a SCSI device.

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

Input/Output Connectors

Input/Output Connectors

The following illustration shows the input/output connectors on your PC Server 320.



Note: For pin assignments and other details about these connectors, see the *User's Reference*.

Input/Output Connectors

Power Connector: The server power cable connects here.

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



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



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



SCSI Connector: External SCSI devices attach here.



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. For port assignments, see “Configuring Devices and I/O Ports” on page 82.



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.



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

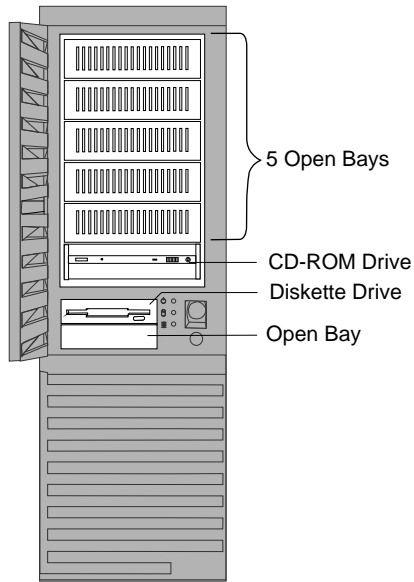
If your monitor has a separate signal cable, connect one end of the signal cable to the monitor. Connect the other end of the signal cable to the monitor connector on the server.

When all cable connections are secured, plug the monitor power cord and the server power cord into properly grounded electrical outlets.

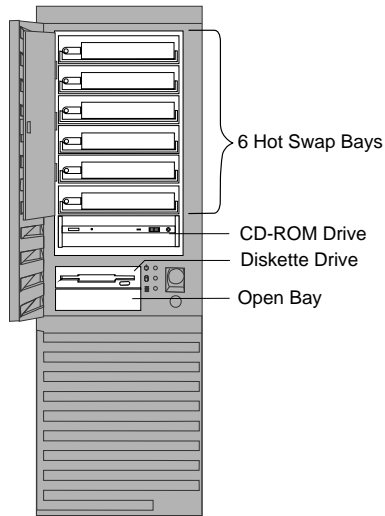
Expansion Bays

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-swappable 3.5-inch hard disk drives. For installation instructions and information on the types of drives that you can install in each bay, see “Installing Internal Drives” on page 134.

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

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

Hard Disk Drive: 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.
- 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 32.

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.

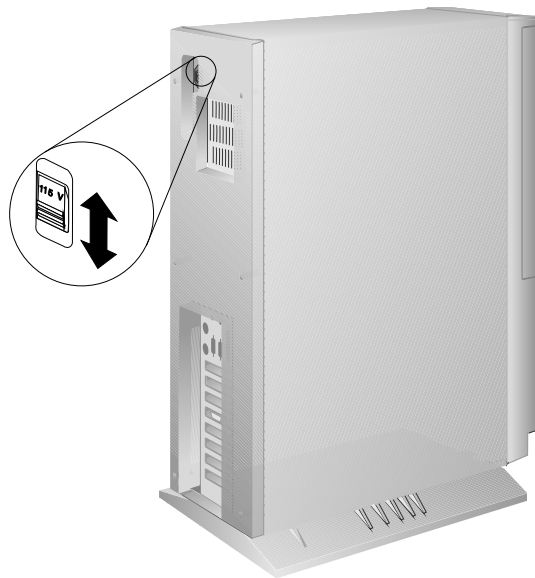
Checking the Voltage Setting

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.

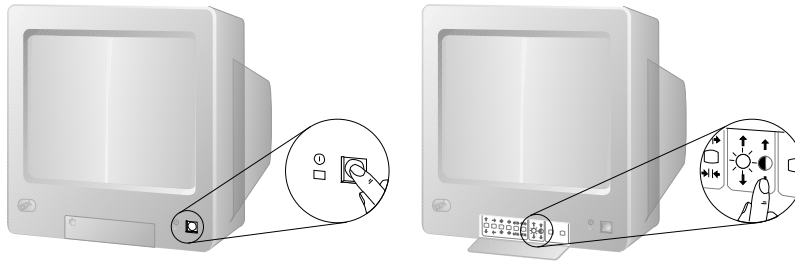
If you need to adjust the voltage setting, slide the switch to the correct position.



Starting the Server

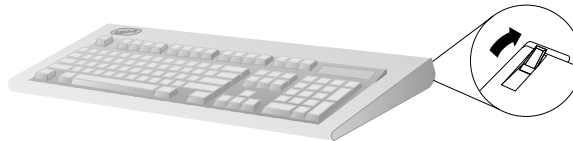
1. Turn on your monitor and adjust the Brightness and Contrast controls to the approximate midpoint.

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



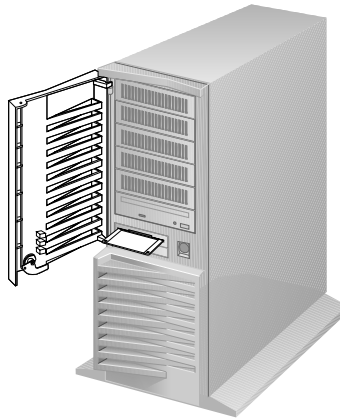
Note: The locations of the Power Switch and the Brightness and Contrast controls on your monitor might be different from those shown above.

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.

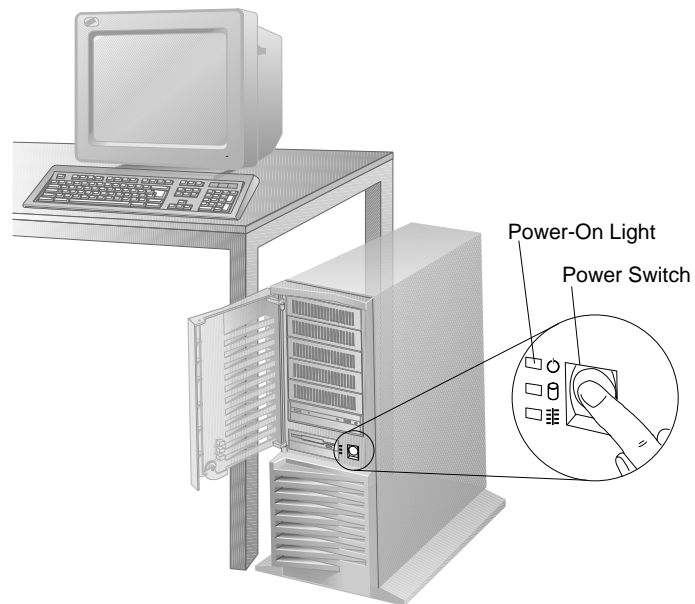


4. If the server is turned on, turn it off.
To turn off the server, press the Power On/Off switch.
5. If you installed any external devices, such as printers, plotters, modems, or an external storage enclosure, turn them on now.

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 225.
 - If your server stops running during testing or normal operation, call for service. Describe the problem to the service technician.
8. If no operating system is installed, you will be prompted to insert a startable diskette or a startable compact disc (CD). *Don't insert anything yet.* Review this information before proceeding further.

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

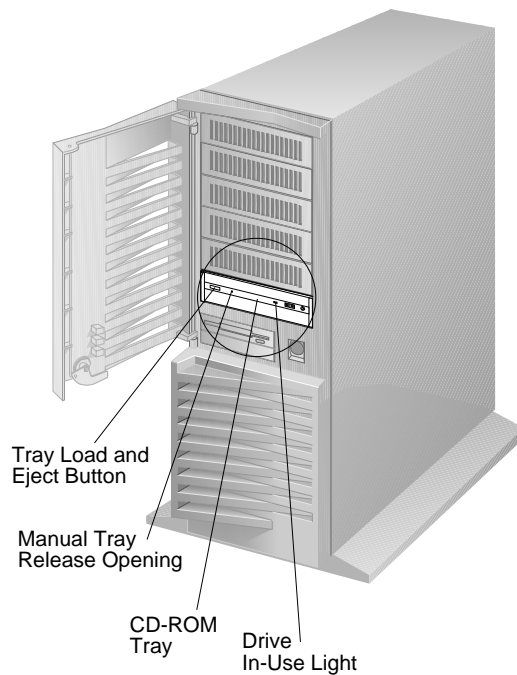
Note: Review the information in “About ServerGuide” on page 25.

Using the CD-ROM Drive

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:

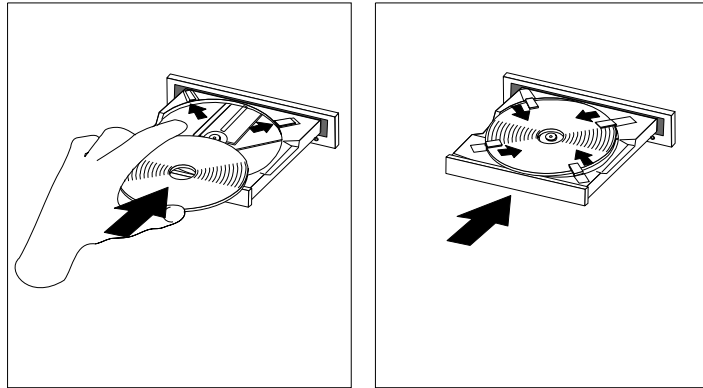
1. Have the CD ready.
2. Press the CD-ROM tray-release button. The CD-ROM tray will extend out.



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.



4. Locate the tabs in the corners of the tray.
5. Insert your fingertip or a small, blunt object such as the tip of a pen into the depression on each tab; then slide the tab 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 279.

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, "Getting Started with 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 279.

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Hardware Considerations

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).

RAID Data Stripe Change

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

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 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, ensuring that your server adapts to handle ever-changing operating requirements. The operating system that you select allows you to optimize some of the features in your server. Your server offers dual-processor capability through a second processor socket, using SMP technology. You can maximize the benefits of this technology, provided that you have an SMP-capable operating system, such as one of the following, installed in your server:

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

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

Before You Begin

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

- 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 IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter Option Diskette to view or change the existing disk-array configuration. See Chapter 3, “Configuring the Disk Array” on page 35 for detailed instructions; then, return here.
- If you have not already installed your options, do so now, before you install your operating system. Installing your options now enables ServerGuide to install the necessary device drivers during the operating-system installation process. See Chapter 5, “Installing Options” on page 101 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 30.
- If you are installing *your own* operating system:
 1. Review “Software Considerations” on page 21 and “Installing an Operating System” on page 22; then, return here.
 2. Follow the installation instructions that come with your operating system; then, go to “Installation Checklist” on page 30.

The following operating systems require special considerations.

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

These considerations are discussed in the following sections.

OS/2 and Novell NetWare Installation

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

If you have 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 IBM HelpWare at one of the following numbers and request authorized program analysis report (APAR) II08627.

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

Installing an Operating System

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

OS/2 LAN Server 4.0 Fixpaks

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.

SCO OpenServer Installation

If you are installing Santa Cruz Operation (SCO) OpenServer 5.0 in a disk-array system, 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 a SCO operating system, you might need updated device drivers for full compatibility with the latest hardware used in IBM servers. Refer to the **Start Here** section on the ServerGuide Main CD for information on how to obtain the latest device drivers that are available from SCO. To install a SCO operating system, follow the installation instructions that come with the SCO operating system.

Windows NT

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

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.

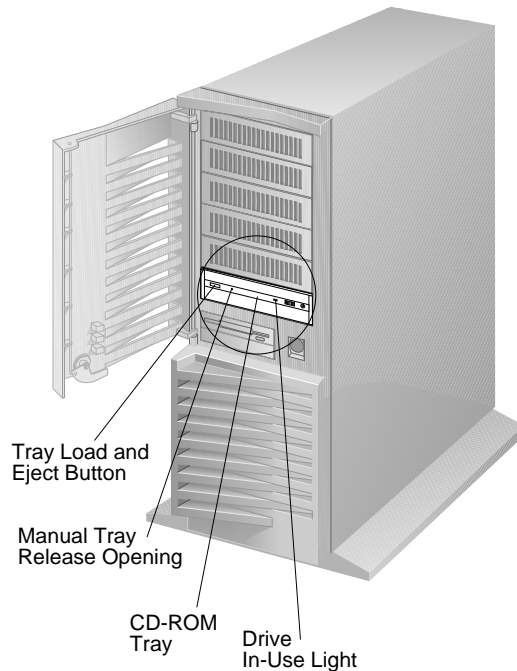
For additional considerations regarding device drivers and operating systems, be sure to read “Software Considerations” on page 21, “Installing an Operating System” on page 22, and “Device Drivers” on page 28.

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.

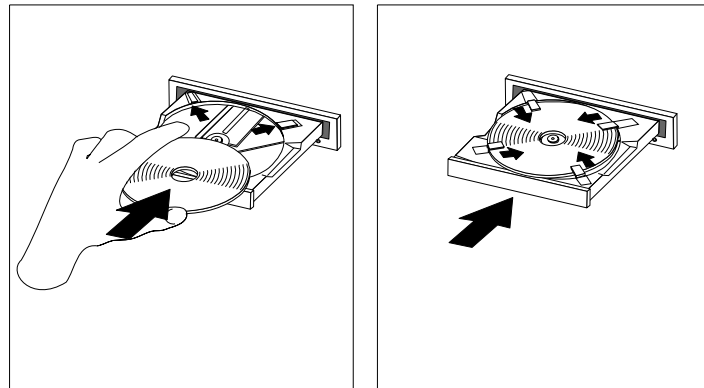
To start the ServerGuide Main CD:

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.



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.



6. Locate the tabs in the corners of the tray.
7. Insert your fingertip or a small, blunt object such as the tip of a pen into the depression on each tab; then slide the tab over the CD.
8. Push the CD-ROM tray back into the server or press the CD-ROM tray-release button.
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 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 system, 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 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 you want to install other products provided on ServerGuide, install them now.
2. When the list of network adapters appears in the window box, select **None**.
3. When the installation has completed, restart the server.
4. Press **Enter** to bypass the BIND error messages.

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

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

Note:

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

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

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

7. Press **Enter**.

8. At the operating system prompt, type:

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

9. Press **Enter**.

10. Perform a Shutdown of your server.

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

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

Hardware Device Drivers

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

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 4, “Configuring Your Server” on page 75 for information about configuring your server and using these utility programs. See Chapter 6, “Solving Problems” on page 225 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 35. 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 289 shows where to find these numbers, and provides space to record and retain information. Be sure to record your ServerGuide License Diskette serial number.

Install options

If you decided earlier to delay installing your options, you might want to complete these installations now. See Chapter 5, “Installing Options” on page 101 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 Chapter 4, “Configuring Your Server” on page 75.

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

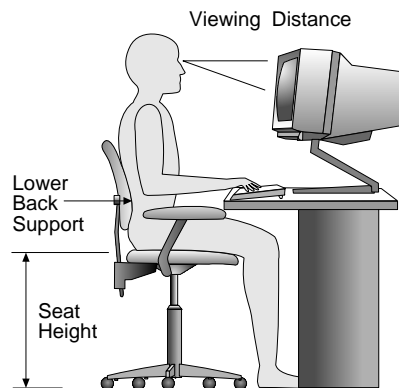
To get the most from your server, arrange both the equipment you use and your work area to suit your needs and the kind of work you do. Your comfort is of foremost importance, but light sources, air circulation, and the location of electrical outlets also can affect the way you arrange your workspace.

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 35, 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 5, “Installing Options” on page 101 if you need to install optional hardware or security features in your server. After you complete the instructions in Chapter 5, or if you have no options to install, go to Chapter 4, “Configuring Your Server” on page 75 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 systems. 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 134. 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 4, “Configuring Your Server” on page 75 for details about your server's configuration and utility programs.

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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 45.
 - To create a disk array, follow the directions in “Creating a Disk Array” on page 46.
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 25.
4. After you install your operating system, back up the disk-array configuration. See “Backing Up Your Disk-Array Configuration” on page 65.

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 IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter 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 system 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. 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. You can replace the defunct drive without turning off the server (*hot-swap*). For more information about hot-swappable hard disk drives, see “Internal Drive Bays (Disk-Array Models)” on page 138.

Hard Disk Drive Capacities

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

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

Notes:

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

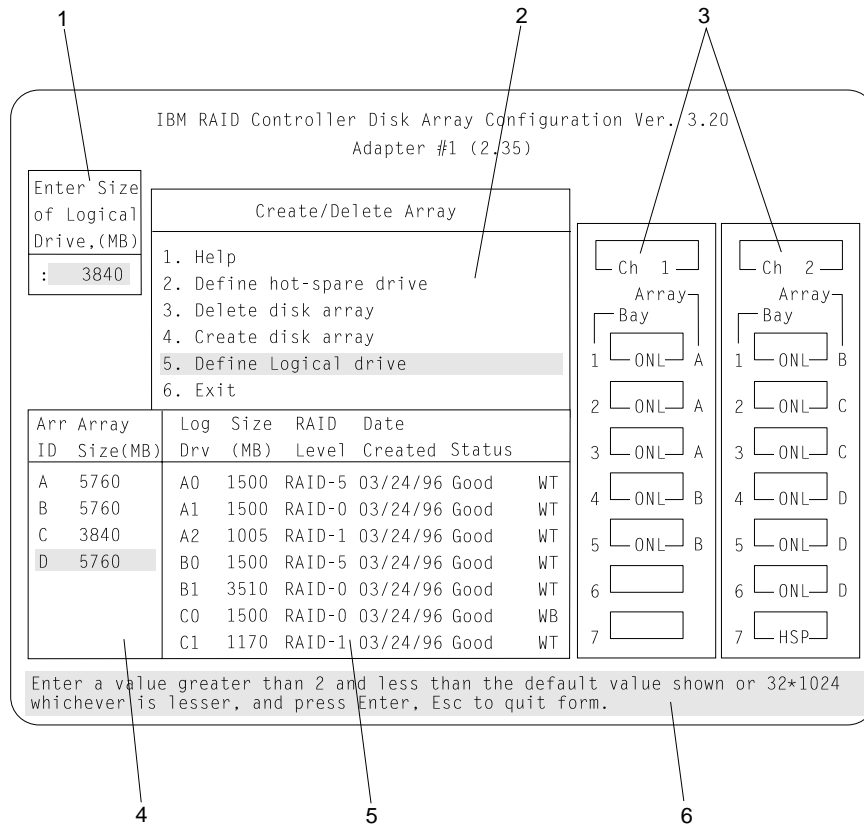
Additional Storage Capacity

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 46). 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 IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter 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 gives explanations of 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-swappable hard disk drives are numbered 1 through 6 (from top to bottom). See “Internal Drive Bays (Disk-Array Models)” on page 138 for 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. (The server displays a message during system startup when the drive is in a **Critical** state.) **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.

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

Starting the RAID Configuration Program

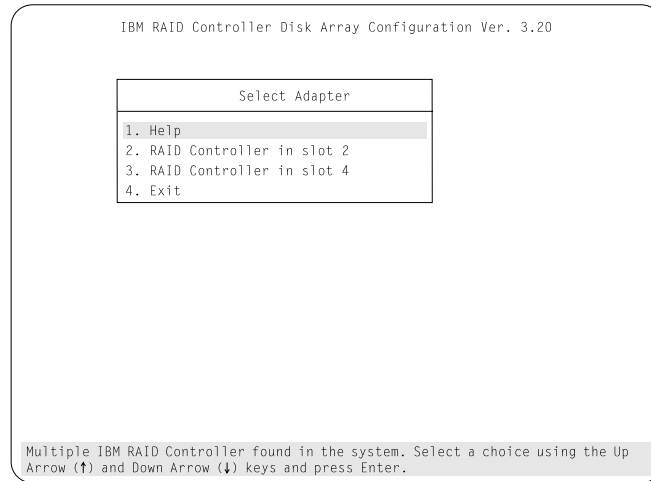
Starting the RAID Configuration Program

To start the RAID configuration program, insert the IBM RAID Adapter Option Diskette into the primary diskette drive and turn on the system. If the system already is turned on, press **Ctrl+Alt+Del**. From the PC DOS start-up menu, select **Start RAID Configuration Program**, then press **Enter**.

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

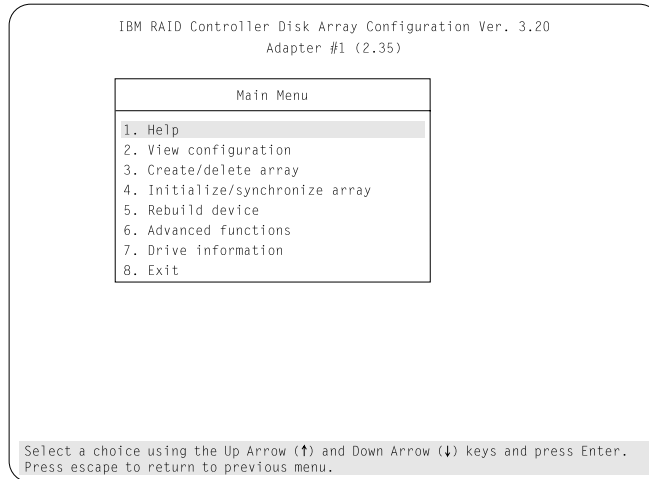
Note:

1. The version numbers and slot numbers on your screens might be different.
2. The primary diskette drive is the first diskette drive that your system tries to start from.



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

Starting the RAID Configuration Program



The Main Menu contains the following choices:

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

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

Starting the RAID Configuration Program

- **Initialize/synchronize array:** Select this choice after creating an array to:
 - Set the drive to a predetermined value. For proper operation of RAID levels 1 and 5, you *must* select Initialize/synchronize array. Any data existing on the drive is overwritten with zeros, and the corresponding parity information is initialized to the correct value.

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

Viewing the RAID Configuration

Before creating or changing a disk array, you can look at the current configuration by selecting **View Configuration** from the Main Menu of the RAID configuration program.

To view the disk-array configuration:

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; the Main Menu appears.
3. Select **View configuration**. The current disk-array configuration information appears on the screen.
4. Press **Enter** to see the stripe order in the Bays Occupied (Ch:Bay) field. In the following example, data for the B array is striped across Channel 1 bay 4, Channel 1 bay 5, and Channel 2 bay 1.

IBM RAID Controller Disk Array Configuration Ver. 3.23
Adapter #1 (2.35)

View Configuration

Bays Occupied (Ch:Bay)

1:4, 1:5, 2:1

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

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

Press any key to continue.

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

Performing Common Tasks

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

- “Creating a Disk Array”
- “Defining Logical Drives” on page 48
- “Defining a Hot-Spare Drive” on page 53
- “Deleting a Disk Array” on page 55
- “Redefining Space in an Array” on page 57

Creating a Disk Array

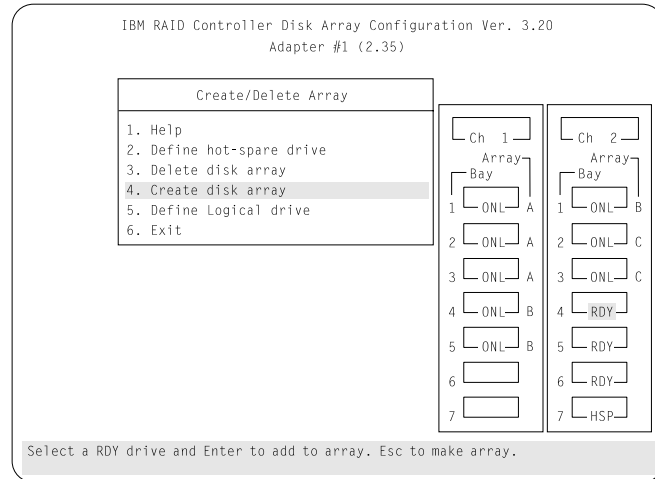
You can create disk arrays from your existing drives. Later, you can add storage capacity to your server without disturbing existing data by installing additional hard disk drives and creating additional arrays.

To create a disk array:

1. Insert the IBM RAID Adapter Option Diskette into the primary diskette drive and turn 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; the Main Menu appears.
Note: To create an array using hard disks in an existing array, refer to “Redefining Space in an Array” on page 57.
3. Select **Create/delete array** from the Main Menu.
4. Select **Create disk array** from the Create/Delete Array menu.

The cursor will be active in the Bay/Array selection list.

Performing Common Tasks



5. Select each drive 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 will change from **RDY** (Ready) to **ONL** (Online).

If you change your mind after selecting the drives for an array, you can delete the array (by selecting **Delete disk array** from the Create/Delete Array menu) and then begin again.

6. When you have selected all the drives you want to include in the array, press **Esc**. The cursor will become 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 one of the following:
 - Define the logical drive or drives for this array; then create another array and its logical drives. See “Defining Logical Drives” on page 48.
 - Create another array now by repeating steps 2 through 5 in this procedure; then define logical drives for both arrays.

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

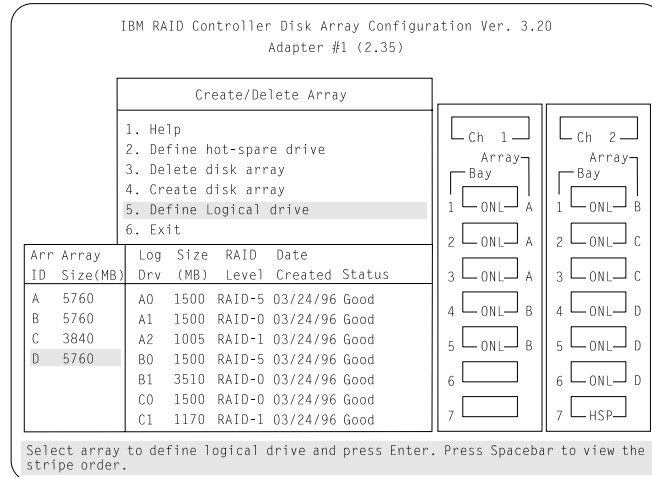
Performing Common Tasks

Defining Logical Drives

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

To define a logical drive:

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, and the cursor is active in the window.

Note: The system automatically assigns RAID level 0 to any logical drives defined in an array that contains only one hard disk drive. When this is the case, the Select RAID Level pop-up window will not appear.

If you have only two hard disk drives in the array, the Select RAID Level pop-up window appears. However, RAID level 5 is not selectable because you need at least three hard disk drives in an array to assign RAID level 5 to one of the logical drives.

You can define more than one logical drive for your array. The only restriction is that the maximum number of logical drives you can define is eight.

- Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the RAID level you want to assign to these logical drives; then, press **Enter**.

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

Select RAID Level	Create/Delete Array		Ch 1 Array Bay		Ch 2 Array Bay	
1. RAID-5	1. Help		1 ONL A	1 ONL B		
2. RAID-0	2. Define hot-spare drive		2 ONL A	2 ONL C		
3. RAID-1	3. Delete disk array		3 ONL A	3 ONL C		
	4. Create disk array		4 ONL B	4 ONL D		
	5. Define Logical drive		5 ONL B	5 ONL D		
	6. Exit		6	6 ONL D		
			7	7 HSP		

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

Select a RAID LEVEL.

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

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

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

Performing Common Tasks

The Logical Drive Size pop-up window shows the space in the array that is available for logical drives.

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

Enter Size of Logical Drive.(MB)
: 3840

Create/Delete Array

1. Help
2. Define hot-spare drive
3. Delete disk array
4. Create disk array
5. Define Logical drive
6. Exit

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

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

Enter a value greater than 2 and less than the default value shown or 32*1024 whichever is lesser, and press Enter, Esc to quit form.

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

Consider the following scenarios:

Scenario 1:

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

Scenario 2:

The array consists of three 1 GB drives, 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 parity storage. Therefore, if you type 1000MB, the number in the Size (MB) field remains 1000 because it is divisible by 2 (drives), which is the space available for data.

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

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

Performing Common Tasks

8. If you are using RAID level 1 or RAID level 5, *you must select **Initialize logical drive** for proper operation.* This sets the drive to a predetermined state. Any data existing on 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 selected drives will appear highlighted). To start the initialization, press **Enter**. A pop-up window appears asking you to confirm your action.

Attention: If you select **Yes** in the Confirm pop-up window, information in the logical drive will be overwritten with zeros.

- c. Select **Yes** to confirm that you want to initialize this logical drive.

The initialization process begins, and you can see its progress in the **Pct. Int.** (Percent Initialized) column of the Logical Drive list.

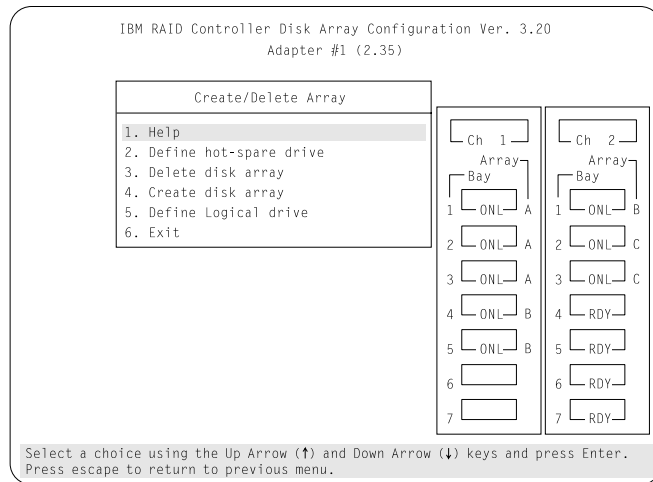
- d. To stop the initialization at any time, press **Esc**. Then press **Esc** again to return to the menu, or press **Enter** to continue initializing the drive.
9. To back up the disk-array configuration to diskette, you will need a 3.5-inch formatted diskette. To back up the disk-array configuration:
 - a. Select **Advanced functions** from the Main Menu.
 - b. Select **Backup config. to diskette**.

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

Defining a Hot-Spare Drive

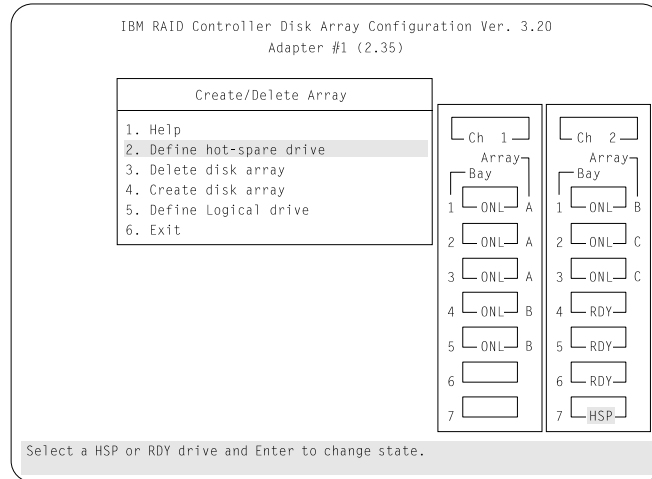
To define a drive as a hot-spare drive:

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; the Main Menu appears.
3. Select **Create/delete array** from the Main Menu. The following screen appears.



Performing Common Tasks

4. Select **Define hot-spare drive**. The cursor will become active in the Bay/Array selection list.



Note: Only SCSI hard disk drives are shown as RDY, ONL, DDD, OFL, or HSP state. SCSI tape and CD-ROM drives are not shown. They appear when you select drive information. Refer to “Bay/Array Selection List” on page 60 for the drive status meanings.

The numbers shown on the left in the Bay/Array selection list area in the previous figure are the bay IDs. See “Installing Internal Drives” on page 134 for an explanation of the bay IDs.

5. 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 toggle between **HSP** and **RDY**.
6. Press **Esc** when you have finished. The cursor will become active in the Create/Delete Array menu.

7. If you want to create a disk array, go to “Creating a Disk Array” on page 46.
8. If you are finished:
 - a. Select **Exit** or press **Esc**. A pop-up window will appear asking you to confirm your change.

Note: The changes you make are not saved until you confirm them by selecting **Yes** in the Confirm pop-up window.
 - b. Select **No** if you do not want the drive you selected to be a hot spare; select **Yes** to define it as a hot-spare drive.
 - c. Back up the disk-array configuration information to diskette. Refer to “Backing Up Your Disk-Array Configuration” on page 65 for instructions.

Deleting a Disk Array

The last array created must be the first deleted.

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

To delete a disk array:

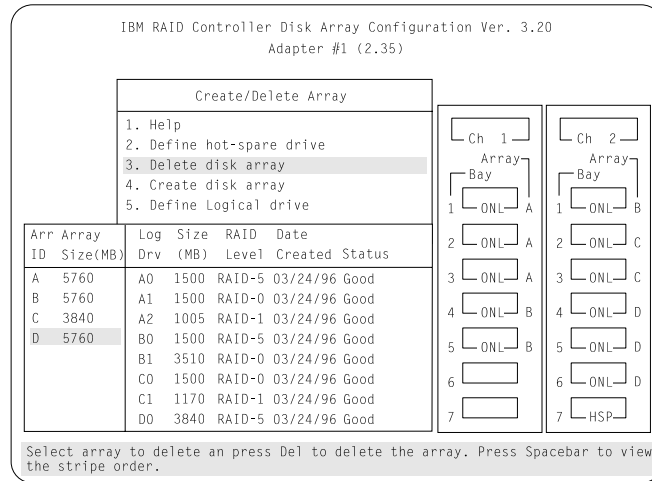
1. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive and turning on the system. If the system already is turned on, press **Ctrl+Alt+Del**.
2. Select **Start RAID Configuration program** from the PC DOS start-up menu; the Main Menu appears.
3. Select **Create/delete array** from the Main Menu.
4. Select **Delete disk array** from the Create/Delete Array menu. The cursor will be active in the Array list.

Performing Common Tasks

- 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.

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

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



- 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 if the bay did not contain a drive. When you replace the drive, the status will show **RDY** after you reconfigure and select **Yes** in the Confirm pop-up window.

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

Redefining Space in an Array

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

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

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

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

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 the *User's Reference* for information about selecting drive sizes.

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

3. Insert the IBM RAID Adapter Option Diskette into the primary diskette drive; then, press **Ctrl+Alt+Del** to start the RAID configuration program.
4. Select **Start RAID Configuration Program** from the PC DOS start-up menu; the Main Menu appears.

Performing Common Tasks

5. Delete the existing array:
 - a. Select **Create/delete array** from the Main Menu. The Create/Delete Array menu will disappear.
 - b. Select **Delete disk array**. The cursor will be active in the Bay/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 one created must be the first one deleted.
 - d. Press **Del**. The Confirm pop-up window appears.

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

Note: To use the hard disks from the existing array when creating a new array, you must confirm the deletion of the existing array. After you make your selection, the Confirm pop-up window will disappear, and the cursor will be active in the menu.
6. If you want to define a hot spare drive, refer to “Defining a Hot-Spare Drive” on page 53 for step-by-step instructions.
7. Create a new disk array and define logical drives.

See “Creating a Disk Array” on page 46 for instructions on creating a disk array and defining logical drives.
8. After you have established 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.

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

Drive Maintenance

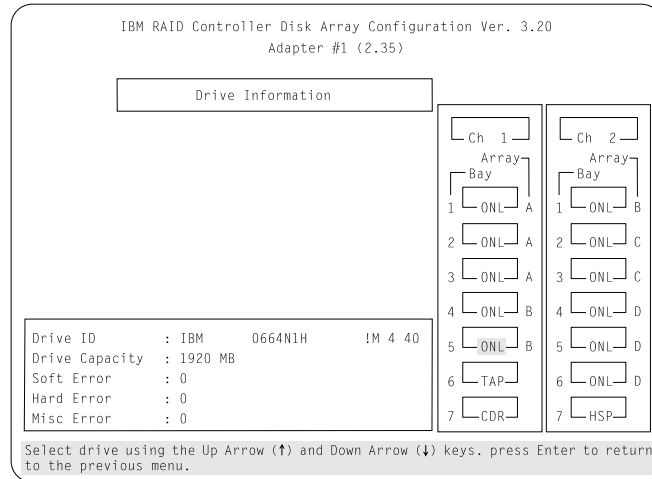
The following section provides information about status indicators for logical and hard disk drives, and the results of a hard disk drive failure. It also contains procedures for replacing defunct drives and for redefining the space in an array by replacing logical drives.

Obtaining Drive Status

To see the ID, capacity, and other information about each of the hard disk drives attached to the RAID adapter:

1. Start the RAID configuration program by inserting the IBM RAID 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; then, press **Enter**.
3. Select **Drive information** from the Main Menu.

Drive Maintenance



4. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight each of the drives shown in the Bay/Array selection list. As a drive is highlighted, the information for that drive appears at the bottom of the screen.
5. 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.

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.

Blank Status

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 and the configuration program has not been restarted. (The status will change to **RDY** when the RAID configuration program is restarted.)

Results of a Hard Disk Drive Failure

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

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. Data remains in logical drives with a **Critical** status, but you must replace the one defunct hard disk drive promptly, because if two hard disk drives were to fail, all of the data in the array would be lost.

After you install a new hard disk drive, the Replace process changes the drive status from **DDD** to **OFL** if the array contains 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 causes logical drives in that array that are assigned level 0 to have an Offline status. Data in logical drives with an Offline status is lost. However, with a *multiple* disk drive failure, when the defunct drives are part of the same array, logical drives in that array will have an Offline status. This means that data is lost in all the logical drives in that array, regardless of which RAID level is assigned.

Replacing a Faulty Drive

To replace 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.

1. Start the RAID configuration program by inserting the IBM RAID Adapter Option Diskette into the primary diskette drive

Drive Maintenance

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.

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.

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 adapter are connected correctly. Make sure that the RAID adapter is seated correctly. See Chapter 6, "Solving Problems" on page 225 for troubleshooting information.

- c. Remove the RAID diskette or ServerGuide CD from the drive.
 - d. Restart the system.
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 indicates **DDD**.

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

- d. Replace the defunct drive. Refer to "Removing Hard Disk Drives from Hot Swap Bays" on page 186.
 - e. After you have replaced the drive, press **Enter**; the system will be reconfigured to include the drive. The drive's status will change, according to the state of the logical drive. If the state of the logical drive is Critical, the drive status changes to **OFL**. If the state of the logical drive is Offline, the drive status changes to **ONL**.

- f. When you see the configuration completion message, select **Rebuild drive**.
- g. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the **OFL** (Offline) drive you want to rebuild; then press **Enter**.

Information and status messages about each stage of the rebuilding process appears on the screen.
- h. When the rebuilding process is completed, press **Esc** to return to the Main Menu. The new configuration will be saved automatically.
- i. Backup the new configuration (see “Backing Up Your Disk-Array Configuration”).
- j. Select **Exit** to end the RAID configuration program.
- k. Remove the diskette and press **Ctrl+Alt+Del** to restart the system.

Advanced Functions

You can select several utility programs from the Advanced Functions menu. These include:

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

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

Backing Up Your Disk-Array Configuration

The RAID adapter maintains a record of the disk-array configuration information in its electrically erasable programmable read-only memory (EEPROM) module. The disk-array configuration

Advanced Functions

is *vital information*. To protect this information, back up the information to diskette as soon as you have completed your tasks. You need a blank, formatted, 3.5-inch diskette.

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

1. Label a blank diskette "Disk Array Configuration Backup," and date it.
2. 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**.
3. Select **Start RAID Configuration Program** from the PC DOS start-up menu and press **Enter**.
4. Select **Advanced functions** from the Main Menu.
5. Select **Backup config. to diskette**.
6. Remove the RAID Adapter Option Diskette from the drive and insert the blank diskette.
7. 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 RAID Adapter Option Diskette and an up-to-date Disk Array Configuration Backup diskette.

Note: Because dynamic changes in the configuration of your disk array occur due to hot-spare drive replacement or other drive maintenance activity, the configuration backup information on the diskette might be different from that in the adapter. It is important that you back up the disk-array configuration information frequently, to keep the backup information on the diskette current.

To restore the RAID configuration information:

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 **Restore config. from diskette**.
5. 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.

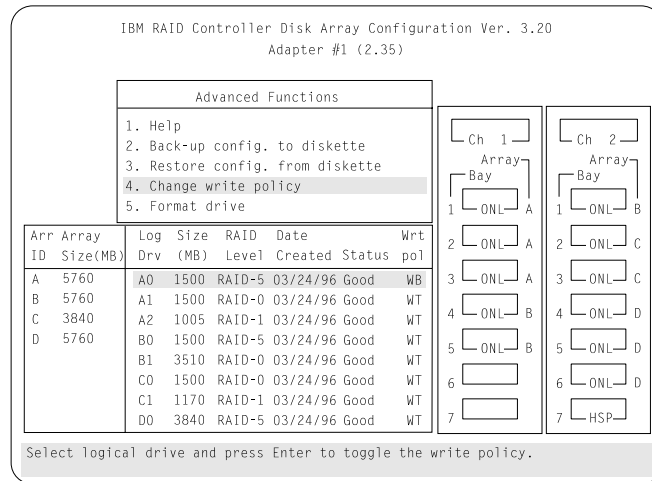
If you change the write policy to write-back, wait at least 10 seconds after your last operation before you turn off the server. It takes that long for the system to move the data from the cache memory to the storage device. Failure to follow this practice can result in lost data.

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.

Advanced Functions

- Select **Change write policy** from the Advanced Functions menu. The cursor will be active in the Logical Drive list.
- Select the logical drive whose write policy you want to change. A screen similar to the following appears:



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

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

The status of the logical drive is also shown. **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.

- 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 configuration information to diskette. Refer to “Backing Up Your Disk-Array Configuration” on page 65 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 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; the Main Menu appears.
3. Select **Advanced functions** from the Main Menu.

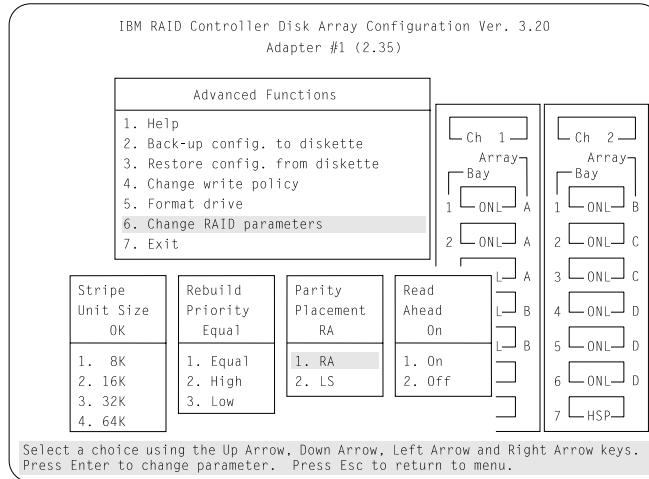
Attention: A low-level format erases all data and programs from the hard disk drive. Before proceeding, back up any data and programs that you want to save.

4. Select **Format drive**. The low-level format program starts.
5. Follow the instructions on the screen.

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

Changing the RAID Parameters

You can change the RAID parameters using the advanced functions by selecting **Change RAID parameters**.



The default settings are:

- Stripe unit size — 8K

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

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

- Rebuild priority — Equal

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

Advanced Functions

When the rebuild request 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 degraded handling of 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 are pending. In a moderate to heavily loaded system, low rebuild priority will increase the disk rebuild time significantly and provide better 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 Left Symmetric (LS) and Right Asymmetric (RA) parity placement in a four-drive disk array. Here AAA, BBB, and CCC are the data stripe units, and PP0 is the corresponding parity. Similarly DDD, EEE, and FFF are the data stripe units, and PP1 is the corresponding parity.

Right Asymmetric (RA)				Left Symmetric (LS)			
Disk 1	Disk 2	Disk 3	Disk 4	Disk 1	Disk 2	Disk 3	Disk 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.

- Read ahead — On

Normally the IBM SCSI-2 Fast/Wide PCI-Bus 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 will result in a wasted SCSI bus bandwidth and wasted disk utilization. When read-ahead is set to Off, the size of data transfer from the disk to local cache is equal to the system I/O request size, and no read-ahead to the end of the stripe unit is performed.

Notes:

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

Advanced Functions

Chapter 4. Configuring Your Server

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

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

The PC Server 320 Reference Diskette and the PC Server 320 Diagnostic Diskettes that come with the server provide additional configuration and diagnostic support for the system board, disk drives, and other system components. The PC Server 320 Micro Channel Diagnostic Diskette supports the Micro Channel adapters.

This chapter contains:

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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 the following standards:

- Peripheral Component Interconnect (PCI)
- Micro Channel Architecture

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

Three hardware configuration utility programs come with your server:

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

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

The built-in SCSI-2 utility program, SCSISelect, allows you to configure the SCSI devices that you install in your server. You can use SCSISelect to change default values, resolve configuration conflicts, and perform a low-level format on a SCSI hard disk drive in a non-disk-array model.

The PC Server 320 Reference and Diagnostic Diskettes provide additional support for configuration and diagnostic activities. The Reference Diskette provides options for backing up and restoring the system diskettes, copying option diskettes, configuring Micro Channel adapters, and testing the computer. The PC Server 320 System Board Diagnostic Diskette provides diagnostic tests for the system board, disk drives, and other system components. The PC Server 320 Micro Channel Diagnostic Diskette provides diagnostic tests for Micro Channel adapters.

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

1. Run the Configuration/Setup utility program and record the current configuration settings.
2. Set jumpers or switches on the server's system board.
See "Changing Jumper Settings" on page 195.
3. Set jumpers or switches on the device.
See the device installation instructions.
4. Install the device in the server.
See Chapter 5, "Installing Options" on page 101.
5. Start the Reference Diskette and:
 - a. Record the current settings.
 - b. Install any adapter description files (.ADF).
6. Install software programs.
See the installation instructions that come with the software.
7. Resolve configuration conflicts.
See "Configuration Conflicts" on page 95.

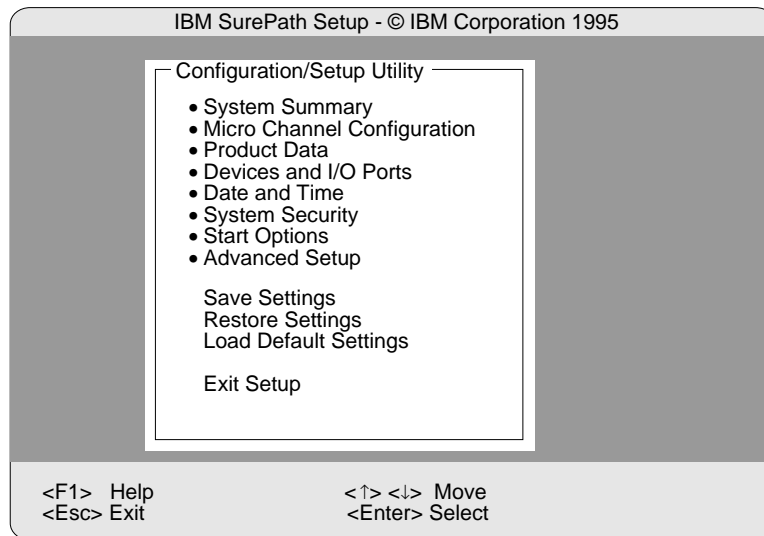
Using the Configuration/Setup Utility Program

Using the Configuration/Setup Utility Program

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

Run the Configuration/Setup utility program if you have added or removed any hardware option, or if you receive an error message instructing you to do so. Review this chapter and the information that comes with the device before making changes. Also, record the current settings (see Table 7 on page 291) before making any changes.

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



Note: Depending on the level of password protection, a limited version of the menu might be displayed. See "Password Overview" on page 84 for more information.

Using the Configuration/Setup Utility Program

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

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

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

Starting the Configuration/Setup Utility Program

Note: If a configuration error occurs, a prompt appears before the operating system starts (see “Configuration Conflicts” on page 95).

To access the Configuration/Setup utility program:

1. Turn on the server and watch the screen.
2. When the message Press F1 to enter Configuration/Setup appears, press **F1**.
3. Follow the instructions on the screen to view or change the configuration.
4. Select **Exit Setup** and press **Enter**.

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

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

Using the Configuration/Setup Utility Program

System Summary

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

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

Note: The PC Server 320 comes with parity memory kits. You can order and install optional memory kits with Error Correction Code on SIMM (EOS) memory. EOS memory appears to the system setup program as parity memory. However, EOS offers increased data protection by detecting and correcting single bit memory errors. To order EOS memory kits, contact your IBM reseller or IBM marketing representative.

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

Micro Channel Configuration

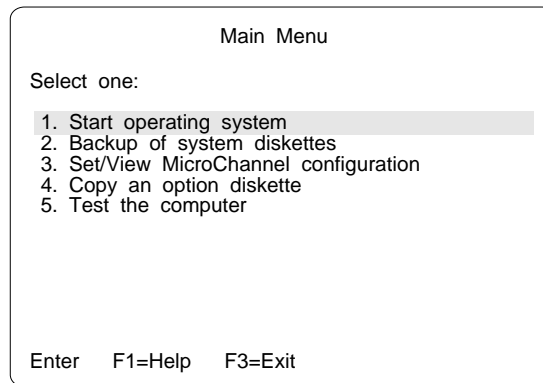
Select **Micro Channel Configuration** to view or change the configuration of Micro Channel devices.

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

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

Using the Configuration/Setup Utility Program

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



The Set/View Micro Channel Configuration utility program allows you to work with the configuration information for Micro Channel adapters. See “Using the System Diskettes” on page 91 for additional instructions.

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

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

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

Product Data

Select **Product Data** to view specific information about your PC Server 320, such as the machine type and model, the system serial number, the system board identifier, and the revision level or issue date of the flash EEPROM and BIOS.

Using the Configuration/Setup Utility Program

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

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

Configuring Devices and I/O Ports

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

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

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

Assigning Serial Ports

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

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

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

Using the Configuration/Setup Utility Program

Configuring Video Options

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

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

Date and Time

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

The system time is in a 24-hour format: hour/minute/second.

The system date is in standard format for your country, for example, in the United States, the format is **Month/Day/Year**.

Select **Date and Time**; then use the Left Arrow (←) or Right Arrow (→) keys to advance through each data field. Type the new information; the system saves the information as you type it.

The **Date and Time** choice appears only on the full Configuration/Setup menu.

Using the Configuration/Setup Utility Program

Defining System Security

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

Note: The default values for all security-related data fields are given in Table 7 on page 291.

Password Overview

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

The server displays the Enter password prompt when:

- You enter Configuration/Setup utility program
- You start the server from a diskette
- An administrator password is the only password set
- A power-on password is the only password and the password prompt is set to **On**
- Both an administrator and power-on password are set and the password prompt is set to **On**

The server does not display a password prompt when:

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

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

The passwords do not appear on the screen as you type them.

When you enter the correct password, OK appears on the screen. If you enter the wrong password, Incorrect password appears on the screen, and Enter password is again displayed. After three incorrect attempts, you must turn off the server and start again.

Using the Configuration/Setup Utility Program

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

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

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

Setting an Administrator Password

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

Using the Configuration/Setup Utility Program

Notes:

1. To control access to the server, the administrator and power-on passwords should be different. The system displays a warning message if you attempt to set the administrator password to a previously set power-on password.
2. Before you set an administrator password, you must set the administrator password jumper to the change position. (For instructions, see “Setting the Administrator Password Jumper” on page 207.)
3. Only someone with administrator privileges, such as a supervisor, can change the administrator password.

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

To set an administrator password:

1. Select **Administrator Password** on the System Security screen; then press **Enter**.
The **Administrator Password** screen appears.
2. Type the password in the **Enter Administrator Password** data field.
3. Verify that you typed the correct password. If you did not type the correct password, press **Esc**, and type the correct password.
4. Repeat steps 2 through 3 for the **Enter Administrator Password Again** data field.
5. Select **Set or Change Administrator Password** to save the new password; then press **Enter**. The system prompts you to change the administrator password jumper to the locked position after changing the password. (For instructions, see “Setting the Administrator Password Jumper” on page 207.)

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

Using the Configuration/Setup Utility Program

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

To delete an administrator password:

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

The **Administrator Password** screen appears.

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

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

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

The **Administrator Password** screen appears.

2. Select **Power-on password changeable by user**. Press the Left Arrow (←) or Right Arrow (→) key to toggle the entry to **Yes**.

When this choice is enabled, **System Security** appears on the limited Configuration/Setup menu. The System Security menu contains the **Power-on Password** choice.

Using the Configuration/Setup Utility Program

Setting a Power-on Password

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

If you forget the power-on password, and an administrator password has been set, use the administrator password at the power-on prompt; then start the Configuration/Setup utility program and change the power-on password. If no administrator password has been set, you must remove the battery before you can set a new password. For instructions, see “Removing an Unknown Power-On Password” on page 205.

To set a power-on password:

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

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

To delete a power-on password:

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

Defining a System Owner's Name

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

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

The **System Owners Name** screen appears.

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

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

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

Restricting Access to Diskette Drives

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

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

Using the Configuration/Setup Utility Program

Defining the Start Options

Start options take effect when you start your server.

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

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

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

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

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

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

Advanced Setup

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

Reference and Diagnostic Diskettes

Select **Advanced Setup**; then use the Left Arrow (←) or Right Arrow (→) key to advance through each data field.

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

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

Reference and Diagnostic Diskettes

The Reference Diskette and Diagnostic Diskettes, which come with your system, contain a copy of the system programs. Collectively, these diskettes are referred to as the *System Diskettes*.

The System Diskettes normally are used under the following conditions:

- To configure and test Micro Channel adapters
- To test system hardware

Using the System Diskettes

Note: Always use the backup copy of the system diskettes when configuring and troubleshooting your server.

To start the System Diskettes:

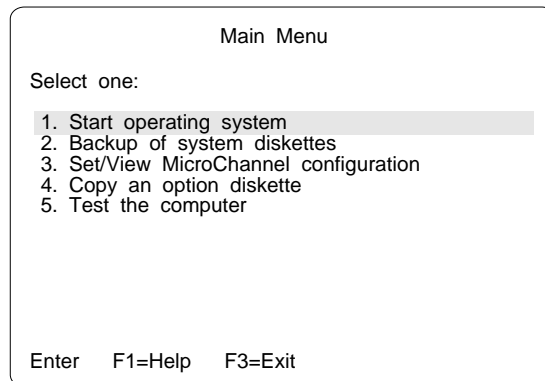
1. Insert the backup copy of the Reference Diskette into the primary diskette drive.
2. Turn on the system. Or, if the system is turned on, insert the Reference Diskette and press **Ctrl+Alt+Del**.

The system begins the power-on self test. If a power-on or administrator password is set, the system prompts to enter it.

Note: If an administrator password is set, you *must* enter it to access the Reference and Diagnostic Diskettes.

Reference and Diagnostic Diskettes

After a few moments, the system programs Main Menu appears, and displays the following choices.



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

You can get help about any selection by highlighting it and pressing F1. The active keys are shown at the bottom of the screen.

When you finish making changes:

1. Press **F3** to exit without saving the changes.
2. Press **Enter** to save the changes. You are prompted to restart the computer so that the changes will take effect.

You can get online help for each task by pressing F1.

Starting the operating system

To start the operating system:

1. Select **Start operating system** from the Main Menu, and then follow the instructions on the screen.
2. When prompted, remove the Reference Diskette; then press **Enter** to restart the computer from a diskette or hard disk drive.

The server restarts.

Backing Up System Diskettes

Select **Backup of system diskettes** from the Main Menu to backup the System Diskettes or to restore the configuration information from the System Diskettes. This is useful in case the battery fails or a change that you made to the configuration information causes a problem and you need to change it back to its previous setting.

Note: Store the original system diskettes in a safe place. Always use the backup copies when configuring and troubleshooting your server.

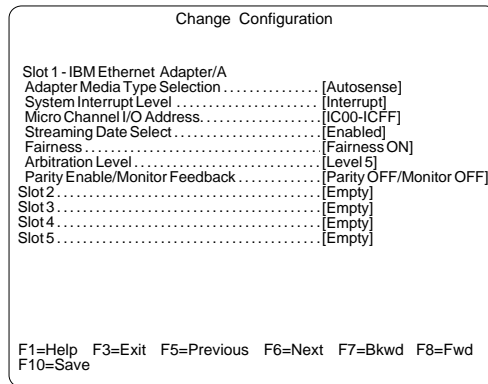
The system prompts you to switch the diskettes and label the diskette.

Note: You will need to have a formatted diskette for each system diskette that you copy.

Setting Micro Channel Configuration

Select **Set/View Micro Channel Configuration** from the Main Menu to view, change, backup, or restore system configuration of Micro Channel adapters. Follow the instructions on the screen.

The following figure shows a Micro Channel configuration screen.



Press **F3** to return to the Main Menu.

Reference and Diagnostic Diskettes

Copying an Option Diskette

Some options come with a diskette that includes test and configuration information. Select **Copy an option diskette** from the Main Menu to copy this information to the system diskettes.

To copy an option diskette:

1. Select **Copy an option diskette** from the Main Menu, and follow the instructions on the screen.
2. Remove the option diskette from the diskette drive.
3. Repeat the preceding steps until all option diskettes have been copied.
4. Press **Esc** to return to the Main Menu.

Testing the Computer

The Test the computer utility program tests the system board and installed options.

To verify that your server is working correctly:

1. Select **Test the computer** from the Main Menu.
2. To test the system board, disk drives, video, and other system components, select **System board diagnostics**; then press **Enter**. When prompted, remove the Reference Diskette and insert the System Board Diagnostic Diskette. Follow the instructions on the screen.
3. To test Micro Channel adapters, select **Option diagnostics**; then press **Enter**. When prompted, remove the Reference Diskette and insert the Micro Channel Diagnostic Diskette.
4. When all tests are completed, the system prompts you to remove the Diagnostic Diskette and press **Enter** to restart the system.

To get help information about any of the diagnostic tests, press **F1**.

For more information about testing the server, see "Testing the System" on page 232.

Configuration Conflicts

The resources used by your server consist of interrupt request levels (IRQs), direct memory access channels (DMAs), I/O ports (for example, serial and parallel), and memory. This information is useful when a resource configuration conflict occurs.

Conflicts in the configuration occur if:

- An installed device requires the same resource as another device. (For example, a conflict occurs when two adapters try to write to the same address space.)
- A device resource is changed (for example, changing jumper settings).
- A device function is changed (for example, assigning *COM 1* to two different serial ports).
- An installed software program requires the same resource as a hardware device (for example, an expanded memory specification (EMS) device driver that uses the address required by the SVGA video controller).

The steps required to resolve a configuration error are determined by the number and variety of hardware devices and software programs you install. If a hardware configuration error is detected, a *configuration error* message appears after the server completes POST and before the operating system is loaded. You can bypass the error by pressing **Esc** while the error message is displayed.

The Configuration/Setup utility program configures only the system hardware. The program does not consider the requirements of the operating system or the application programs. See “Resolving Software Configuration Conflicts” on page 97 for additional information.

Resolving Hardware Configuration Conflicts

Use the following information to help resolve hardware configuration conflicts:

1. Run the Configuration/Setup utility program to view and change the resources that are used by the system board functions. Record the current settings before making any changes. (See “Starting the Configuration/Setup Utility Program” on page 79 for instructions.)
2. Determine which adapter or device is causing the error.
3. Change configuration resource allocations. Use the built-in Configuration/Setup utility program to view or change system board resource allocations.
4. Change adapter jumpers or switches. Jumpers and switches define the system resources that a device uses. If the settings are incorrect or set to use a resource that cannot be shared, a conflict occurs and the device will remain deactivated by the configuration program.
5. Change system board jumpers or switches. Remove the cover (see “Preparing to Install Options” on page 106). Then refer to the system-board diagram inside your server.
6. Remove the device or adapter. Some configurations are not supported (for example, you cannot operate the server with two PCI SVGA adapters installed). If you must remove an adapter, see “Removing Adapters” on page 130.

Resolving Software Configuration Conflicts

The memory-address space and interrupt levels (IRQs) used by some hardware options might conflict with addresses defined for use through application programs or the EMS. (EMS is used only with DOS.)

If a conflict exists, one or more of the following conditions might exist:

- The system cannot load the operating system.
- The system does not work.
- An application program does not operate, or it returns an error.
- Screen messages indicate a conflict exists.

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

Notes:

- Start the Configuration/Setup utility program to view the addresses used by your system board functions.
- Interrupt Level 12 is reserved for the mouse.

Changing the Software Configuration

The best way to resolve memory-address conflicts is to change the addresses used by the application program or the device driver. This can be done by using the Configuration/Setup utility program.

If a device driver is causing a memory-address conflict, refer to your operating-system documentation or the documentation comes with the device drivers.

Using the SCSISelect Utility Program

The SCSI-2 controller has a built-in menu-driven configuration utility program that allows you to view and change SCSI settings.

You can use the SCSISelect Utility program to:

- Change the default values
- Verify and change configuration conflicts
- Format a new SCSI hard disk

Starting the SCSISelect Utility Program

You can access this program when you start the server. The SCSISelect prompt appears after the IBM PC Server screen appears briefly and then disappears. Press **Ctrl+A** immediately after the SCSISelect prompt appears.

Use the Up Arrow (↑) or Down Arrow (↓) key to highlight a choice. Press **Esc** to return to the previous menu. Also, you can press **F5** to switch between color and monochrome modes (if your display permits). To change the current settings of the items displayed in the menus, follow the directions on the screen.

SCSISelect Utility Program Options

The following options are displayed on the SCSISelect Utility program menu:

- Configure/View Host Adapter Settings
- SCSI Disk Utilities

Configure/View Host Adapter Settings

To view or change the SCSI-2 controller settings, select **Configure/View Host Adapter Settings** and follow the directions on the screen. Refer to the following table for information on the choices on this menu.

SCSI Controller Settings	Description
Host Adapter SCSI ID	Changes the SCSI ID of the SCSI-2 controller from its default value of 7.
SCSI Parity Checking	Enables or disables parity checking on the SCSI-2 adapter or controller. The default value is <i>Enabled</i> .
Host Adapter SCSI Termination	Configures SCSI-2 adapter or controller termination. The default value is <i>Low On / High On</i> .
SCSI Device Configuration	Configures SCSI device parameters. Before you can make updates, you must know the ID of the device whose parameters you want to configure.
Advanced Configuration Options	Allows you to view or change the settings for advanced configuration options. These include: <ul style="list-style-type: none">• Startable CD-ROM drive. When set to <i>On</i>, the CD-ROM drive can be included as a startup device (see "Defining the Start Options" on page 90 for more information). For this option to take effect, you must insert a startable CD in the CD-ROM drive.• Init13Extensions. When set to <i>On</i>, these BIOS extensions are enabled.

SCSI Disk Utilities

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

To use the utility program, select a drive from the list. Read the screens carefully before making a selection.

Using the SCSISelect Utility Program

Using the Low-Level Format Program

On non-disk array models, you can format your hard disk using the *Low-Level Format* feature of the SCSISelect Utility program.

Depending on the hard disk capacity, the Low-Level Format program could take up to two hours.

Note: For disk-array models, you must use the programs provided on the RAID Configuration diskette to format your hard disk drives. Refer to Chapter 3, “Configuring the Disk Array” on page 35 for instructions.

When To Use the Low-Level Format Program

Use the Low-Level Format program:

- When you are installing software that requires a low-level format
- When you get recurring messages from the diagnostic tests directing you to run the Low-Level Format program on the hard disk
- As a last resort before replacing a failing hard disk drive

Note: For information about backing up all of your files, see your operating-system documentation.

Starting the Low-Level Format Program

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

1. If the hard disk is working, make a backup copy of all the files and programs on the hard disk.
2. Select **Format disk** from the SCSISelect Disk Utilities menu; then follow the instructions on the screen.

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

3. To install an operating system, see “Installing an Operating System” on page 22.

Chapter 5. Installing Options

This chapter provides instructions to help you add options to your server. Some option-removal instructions are provided, in case you need to remove one option to install another. If you have several internal options to install, these instructions enable you to add them all at one time.

This chapter contains:

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Installing Memory-Module Kits	114
Removing Memory-Module Kits	120
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Before You Begin

- If your server is a disk-array model, you must configure your server before installing any options. Review Chapter 3, “Configuring the Disk Array” on page 35 for information about the RAID controller; then, see “Using the System Diskettes” on page 91 for additional details about configuration.
- Become familiar with the safety and handling guidelines specified under “Safety Information” on page vii, “Electrical Safety” on page 104, and “Handling Static-Sensitive Devices” on page 105. These guidelines will help you work safely while working with your server or options.

CAUTION:

Due to the weight of the server, do not attempt to lift the server by yourself. To avoid risking possible injury, get another person to help you.

- Make sure you have an adequate number of properly grounded electrical outlets for your server, monitor, and any other options you intend to install.
- Place your server in a location that is dry. Rain or spilled liquids might damage your server.
- Leave about 51 mm (2 in.) of space around the front and rear of the server to allow the server cooling system to work properly.
- Have a supply of 1 MB and 2 MB, 3.5-inch diskettes available. Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.

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, you must 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: Reconnect the cables or power cords only after you reassemble the server and put the covers back on.

CAUTION:

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

Handling Static-Sensitive Devices

Static electricity, although harmless to you, can seriously damage computer components or options.

Note: When you are adding an internal option, do not open the static-protective package containing the option until you are instructed to do so.

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

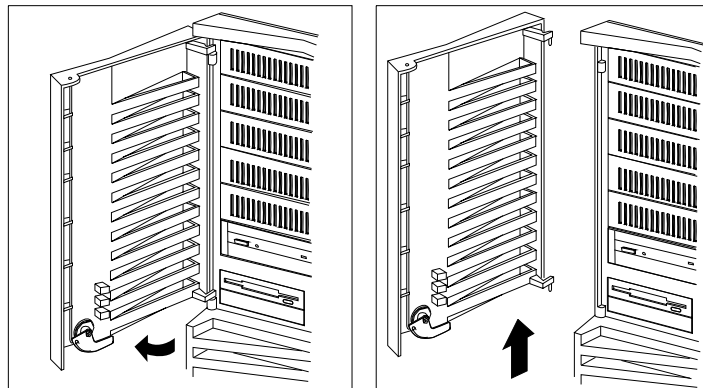
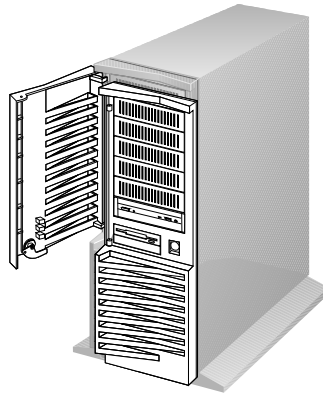
- Limit your movement. Movement can cause static electricity to build up around you.
- Always handle components carefully. Handle adapters, the memory riser card, and memory-module kits by the edges. Never touch any exposed circuitry.
- Prevent others from touching components.
- When you are installing a new option, touch the static-protective package containing the option to a metal expansion-slot screw or other unpainted metal surface on the server for at least two seconds. (This reduces static electricity from the package and from your body.)
- When possible, remove the option and install it directly into the server without setting the option down. When this is not possible, place the static-protective package that the option comes in on a smooth, level surface and place the option on it.
- Do not place the option on the server's covers or any metal surface.

Preparing to Install Options

Before you begin, be sure you have:

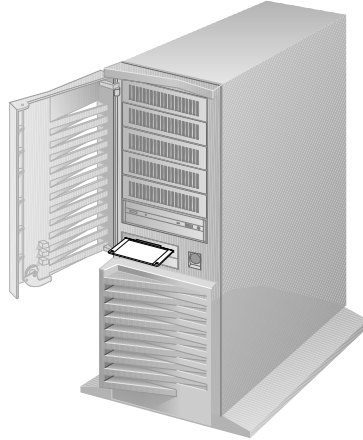
Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.

1. Unlock and open the door.
2. Remove the door by lifting it up and off the hinges. Store it in a safe place.

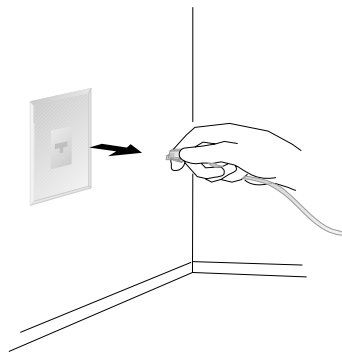


Preparing to Install Options

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.

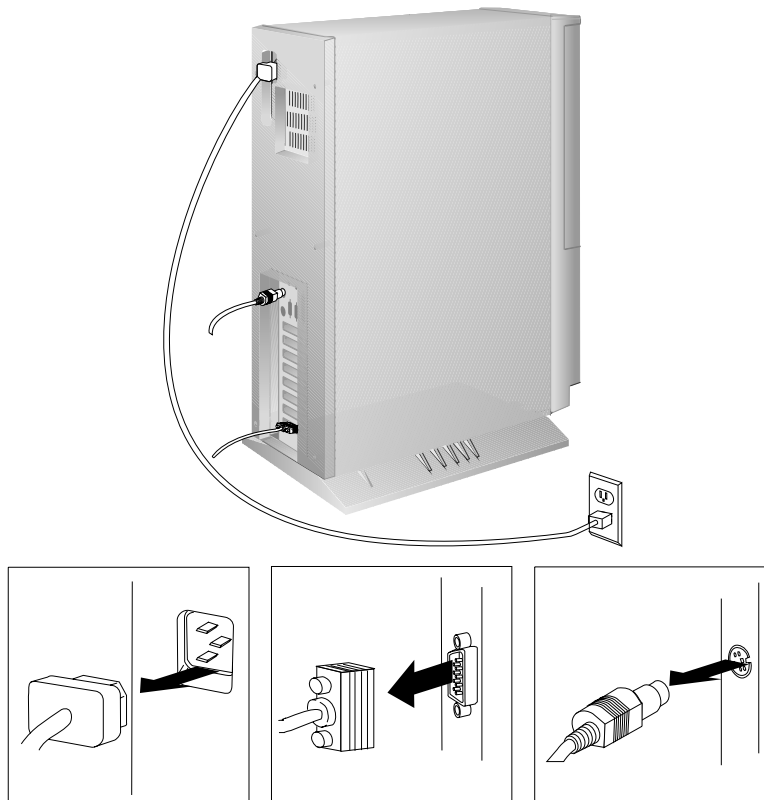


Preparing to Install Options

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

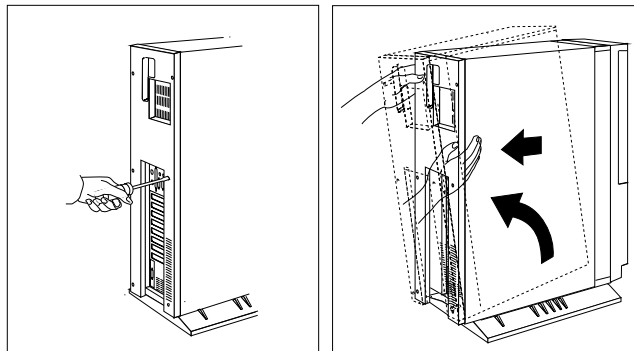
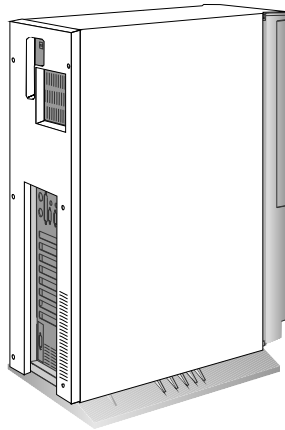
Note the locations of the following; then, disconnect them from the back of the server:

- Power cord
- Monitor cable
- Keyboard cable
- Any other cables and cords



6. Remove the cover:
 - a. Loosen the six screws in the recessed holes on the back of the cover.

Note: The screws stay in place; do not attempt to remove them.
 - 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 expansion slots with the other hand.
 - d. Remove the cover gently, in a rotating motion, as shown.
 - e. Store the cover in a safe place.



Preparing to Install Options

What to do next?

- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 134.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Installing a hot-swappable drive? — Go to “Installing Hard Disk Drives in Hot-Swap Bays” on page 168.
- Replacing the battery? — Go to “Replacing the Battery” on page 191.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing a security feature? — Go to “Security Procedures” on page 204.

Installing an L2 Cache Kit

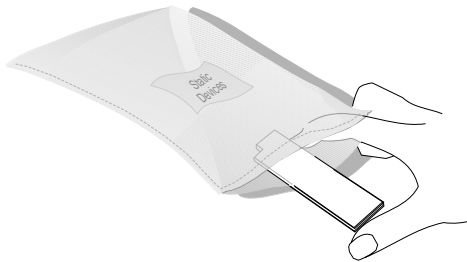
Your server comes with a cache kit that provides 256 KB of asynchronous level-2 (also known as L2) cache memory. The L2 cache kit is installed in a 160-pin, industry-standard connector on the system board. You can increase the amount of write-back level-2 cache memory by replacing this cache kit with a 512 KB L2 cache kit. This upgrade improves server performance when the server runs computer-intensive applications. The increased cache size is also suggested when you add a second microprocessor to your server.

Before you begin, be sure you have:

- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Removed the server cover (see “Preparing to Install Options” on page 106).

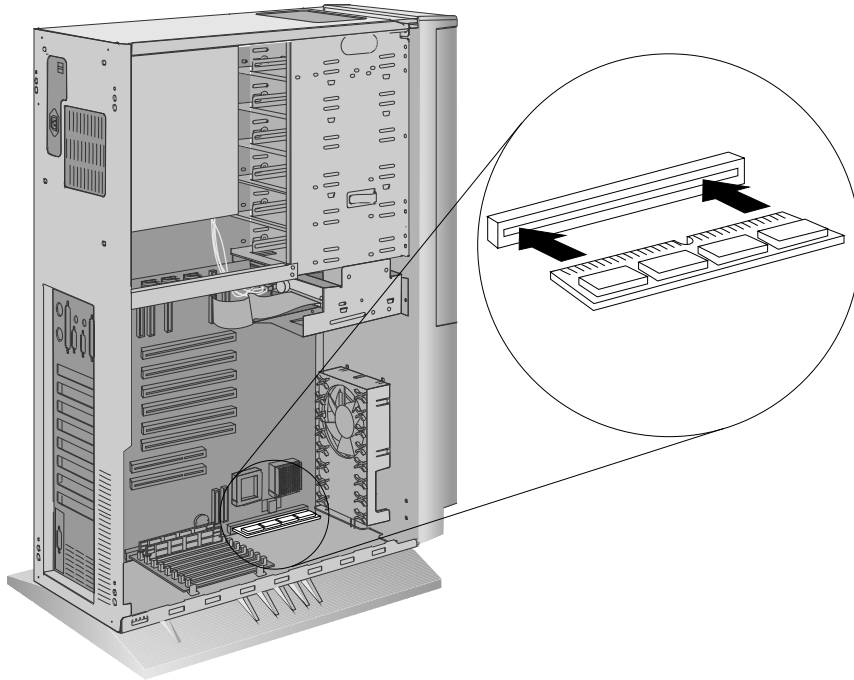
To install the L2 cache kit in your server:

1. Locate the level-2 cache connector on the system board.
2. If the level-2 cache connector contains an L2 cache kit, remove it by pulling alternately on the corners. Place the L2 cache kit on a flat surface.
3. Locate the replacement L2 cache kit.
4. Touch the static-protective package to any unpainted metal surface on the server. Then, remove the L2 cache kit from the package.



Installing an L2 Cache Kit

5. Grasp the L2 cache kit by the corners and align it with the level-2 cache connector.
6. Slide the L2 cache kit *firmly* into the level-2 cache connector.



7. If you removed an L2 cache kit, place it in the static-protective package. Then, store the L2 cache kit in a safe place.
8. Go to Table 7 on page 291 to record the cache size; then, return here to determine your next step.

Note: When you restart your server, you must enable the cache. See “Advanced Setup” on page 90.

What to do next?

- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 134.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Replacing the battery? — Go to “Replacing the Battery” on page 191.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing or removing a security feature? — Go to “Security Procedures” on page 204.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external drive? — Go to “Connecting External Options” on page 214.

Installing Memory-Module Kits

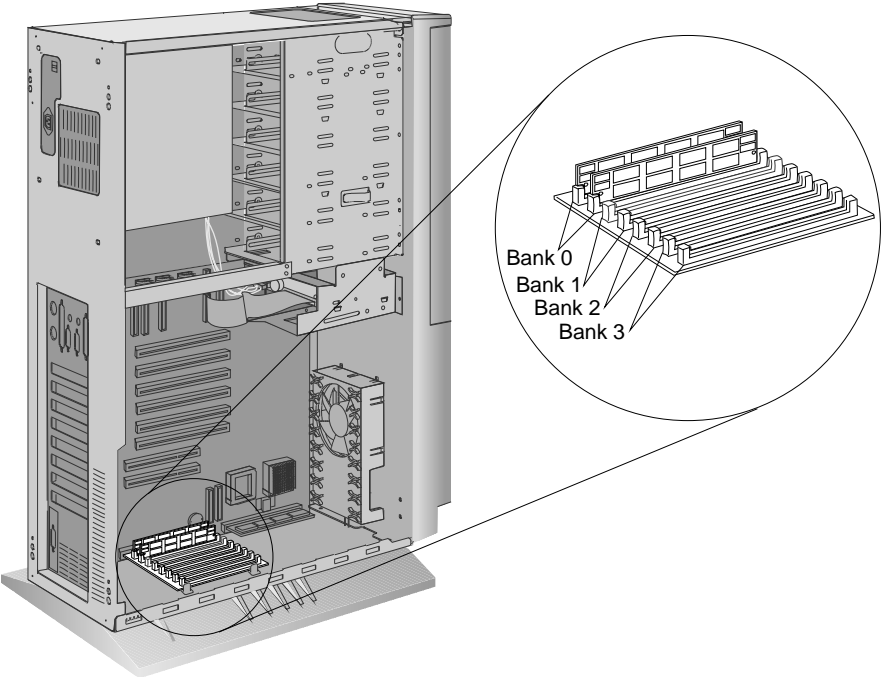
Adding memory to your server is an easy way to make programs run faster. You can increase the amount of memory in your server by installing *memory-module kits*. Your server uses industry-standard, 72-pin, parity, single-inline, memory modules (SIMMs) to increase system memory capacity. The server does not support nonparity memory.

You can order and install Error Correction Code on SIMM (EOS), single inline, memory modules to provide increased system reliability. EOS memory detects single-bit memory errors and corrects them in real time, without reducing system performance.

You install memory-module kits in connectors on a memory riser card inside the server. Memory-module kits *must* be installed in pairs of the same size and speed. All models have eight memory connectors on the memory riser card. 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.

The memory riser card that comes with your server contains at least two 8 MB memory-module kits preinstalled in bank 0. You can replace these memory-module kits with larger capacity memory-module kits to increase the server memory. You can also increase server memory by installing additional memory-module kits on the memory riser card.

Installing Memory-Module Kits



Notes:

- Parity memory-module kits *must not* be used in combination with EOS memory-module kits.
- The PC Server 320 does not support memory expansion adapters.

Installing Memory-Module Kits

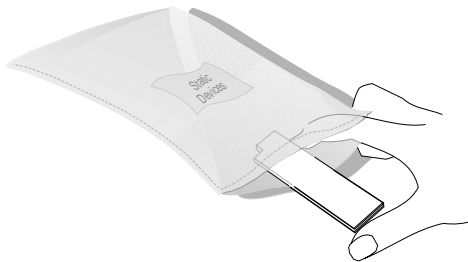
When you are instructed to install the kits (in step 2 on page 117), install them in pairs of adjacent memory connectors, with no vacant memory connectors in between. Each pair of connectors is a *bank*. The memory riser card has four banks: 0, 1, 2, and 3. Your server comes with at least two memory-module kits installed in bank 0, the bank located nearest to the memory riser card connector. Install additional memory-module kits in bank 1, and then continue with banks 2 and 3, in that order. If you need to install kits of a different size in bank 0, remove the preinstalled kits as described in “Removing Memory-Module Kits” on page 120, 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, both of the kits in that bank must be the same size.

Before you begin, be sure you have:

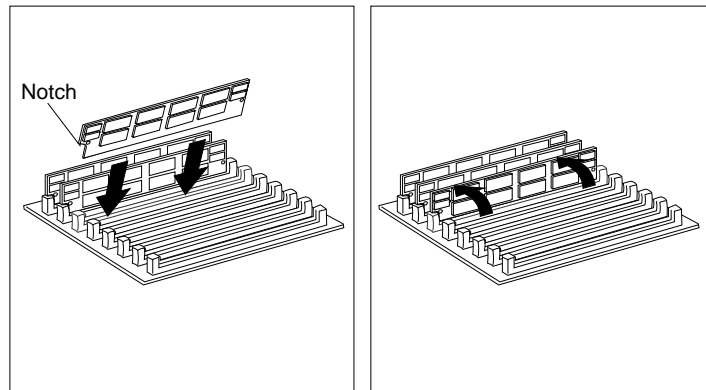
- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Removed the server cover (see “Preparing to Install Options” on page 106).

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



Installing Memory-Module Kits

2. Install the memory-module kit:
 - a. Turn the kit so that the notched end is on the left.
 - b. Hold the kit angled toward you at a 45-degree angle; then, insert the kit into the connector.
 - c. Pivot the kit away from you until it snaps into place.
 - d. Repeat these steps for each kit that you install.

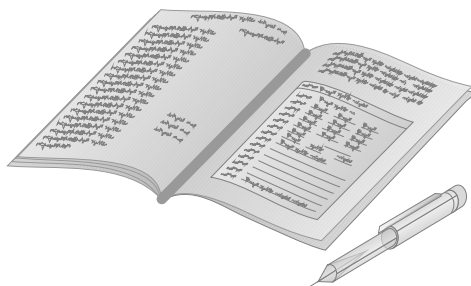


Note: You must install the memory-module kits in pairs of the same size.

Installing Memory-Module Kits

3. Go to Table 7 on page 291 to record the size of the memory-module kits and the connectors into which they are installed; then, return here to determine your next step.

Note: Adding or removing memory-module kits changes the configuration information in the server. When you restart the server, the system displays POST error 164. Start the Configuration/Setup utility program and select **Save the New Settings**.



What to do next?

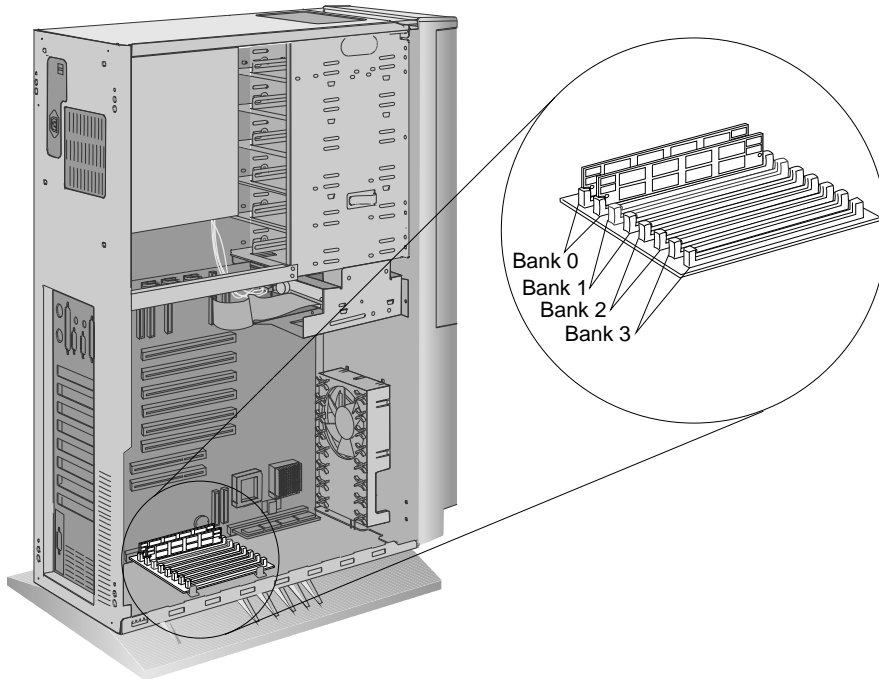
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 134.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Replacing the battery? — Go to “Replacing the Battery” on page 191.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing a security feature? — Go to “Security Procedures” on page 204.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external drive? — Go to “Connecting External Options” on page 214.

Removing Memory-Module Kits

Before you begin, be sure you have:

- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Removed the server cover (see “Preparing to Install Options” on page 106).

Note: Adding or removing memory-module kits changes the configuration information in the server. When you restart the server, the system displays POST error 164. Start the Configuration/Setup utility program and select **Save the New Settings**.

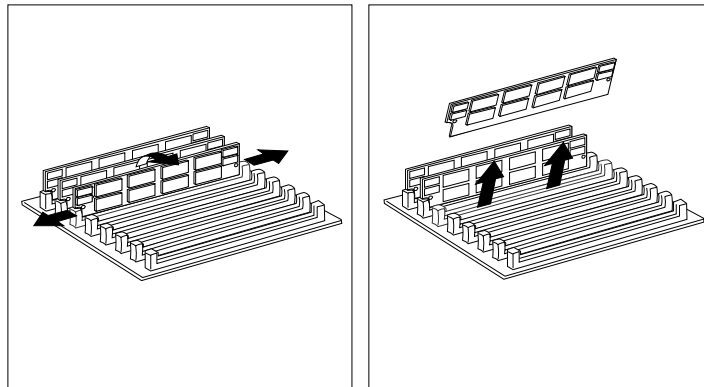


Removing Memory-Module Kits

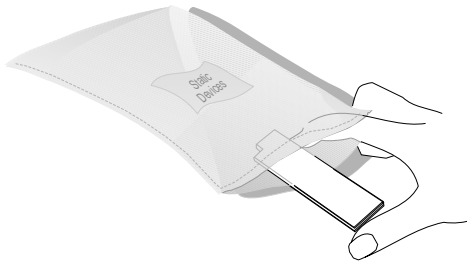
1. Determine which memory-module kits you want to remove.

Note: You must remove the memory-module kits in pairs, starting with the kits installed in the two connectors farthest away from the system board (bank 3). Remember that the memory-module kits must be positioned in pairs of adjacent memory connectors, with no vacant memory connectors in between.

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

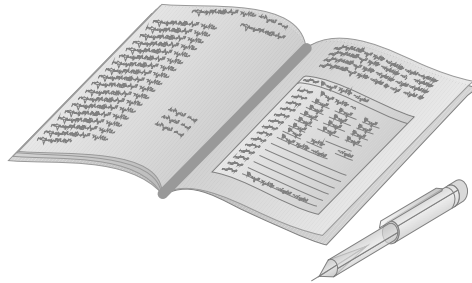


3. Store any memory-module kits you are no longer using in a static-protective package. Make a note of the kit size and speed for future reference.



Removing Memory-Module Kits

4. If you are not installing memory-module kits in the empty connectors, go to Table 7 on page 291 to update the memory information; then, return here to determine your next step.



What to do next?

- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 134.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Replacing the battery? — Go to “Replacing the Battery” on page 191.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external drive? — Go to “Connecting External Options” on page 214.

Installing Adapters

Adding an adapter, such as audio, communication, or specialized graphics, extends the capabilities and power of your server. Your server has eight *expansion slots* for connecting up to six Micro Channel and two PCI adapters. The expansion slots are numbered on the back of the server. You can install Micro Channel adapters designed for 16-bit or 32-bit expansion slots. (Your *User's Reference* contains more details about Micro Channel and PCI adapters.)

Note: Memory adapters cannot be installed in your server, because it does not support channel memory. Instead, you can add memory to your server by using memory-module kits. See “Installing Memory-Module Kits” on page 114.

Before you begin, be sure you have:

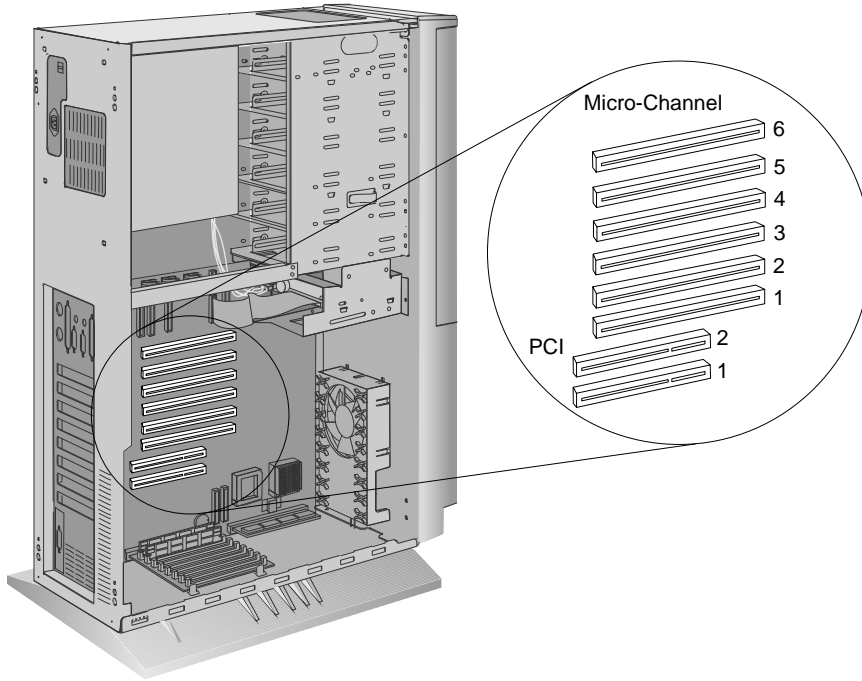
- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Read the instructions that come with the adapter.
- Removed the server cover (see “Preparing to Install Options” on page 106).

Considerations

Two types of adapters are available for your PC Server 320:

- Micro Channel adapters
- PCI adapters

Installing Adapters



Attention: To avoid possible damage to adapters and server components, be sure that the adapters you install do not touch each other or the components (such as the microprocessor) inside the server.

For example, if the adapter you are installing physically touches the microprocessor or another component, select a different expansion slot that can adequately accommodate the adapter's size. You can install full-size Micro Channel adapters in Micro Channel expansion slots 1–4.

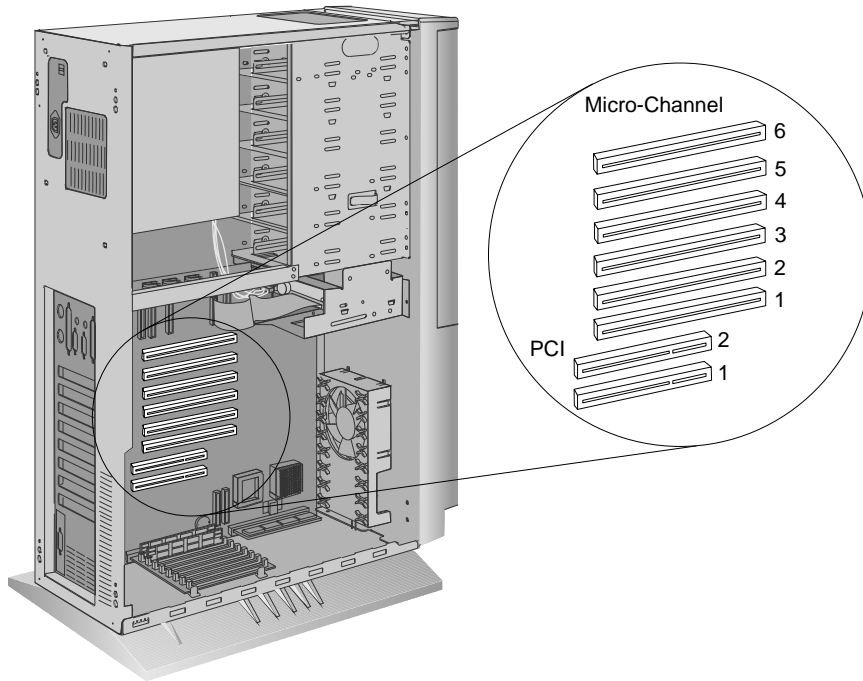
1. Review the documentation that comes with the adapter and follow those instructions in addition to the instructions given in this chapter. If you need to change the switch or jumper settings on your adapter, follow the instructions that come with the adapter documentation.
2. You can install Micro Channel adapters in Micro Channel adapter slots 1–6 only. Full-size Micro Channel adapters can be installed in Micro Channel adapter expansion slots 1–4.
3. After you install a Micro Channel adapter, you must configure it. (For instructions, see “Reference and Diagnostic Diskettes” on page 91.)
4. You can install PCI adapters in PCI slots only.
5. Your server has an integrated video connector on the system board. You can install a PCI video adapter in either PCI expansion slot, or install a Micro Channel video adapter in any open Micro Channel slot.
6. In a disk-array model, you must configure your disk array before installing any options. Review Chapter 3, “Configuring the Disk Array” on page 35 for information about the RAID adapter, and then see “Using the System Diskettes” on page 91 for additional details about configuration.
7. Some models ship with a preinstalled network adapter.

Installing Adapters

Installation Procedure

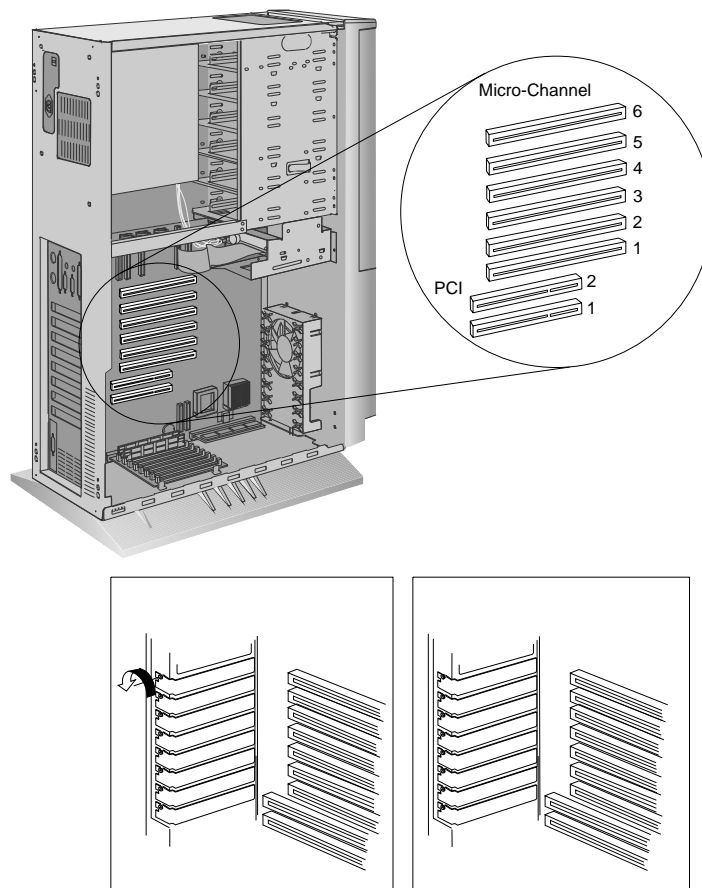
1. Determine which expansion slot you will use for the adapter.

Check the instructions that come with the adapter for any requirements or restrictions. If there are no restrictions other than those listed in “Considerations” on page 123, you can use any empty Micro Channel or PCI expansion slot.



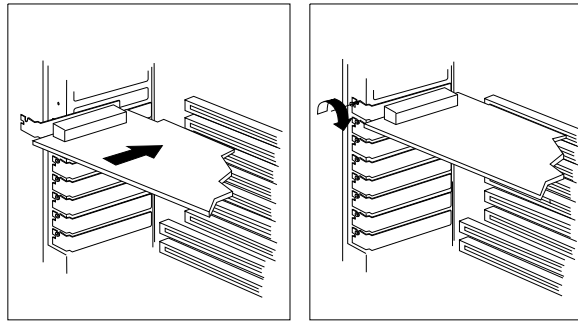
Note: Some models ship with a preinstalled network adapter.

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

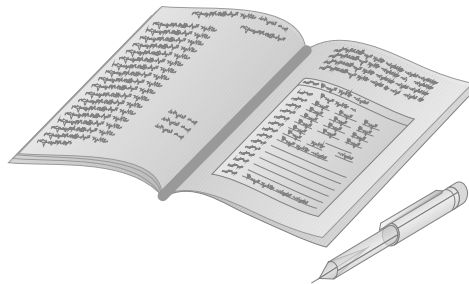


Installing Adapters

3. Install the adapter:
 - a. 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. On a PCI adapter, tighten the expansion-slot screw on the top of the adapter bracket on the inside back of the server.



- d. On a Micro Channel adapter, tighten the screw on the side of the expansion slot on the outside back of the server.
4. Go to Table 9 on page 293 to write the adapter name next to the slot into which it is installed; then, return here to determine your next step.



What to do next?

- Configuring a Micro Channel adapter? — go to “Micro Channel Configuration” on page 80.
- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 134.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Replacing the battery? — Go to “Replacing the Battery” on page 191.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing or removing a security feature? — Go to “Security Procedures” on page 204.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external drive? — Go to “Connecting External Options” on page 214.

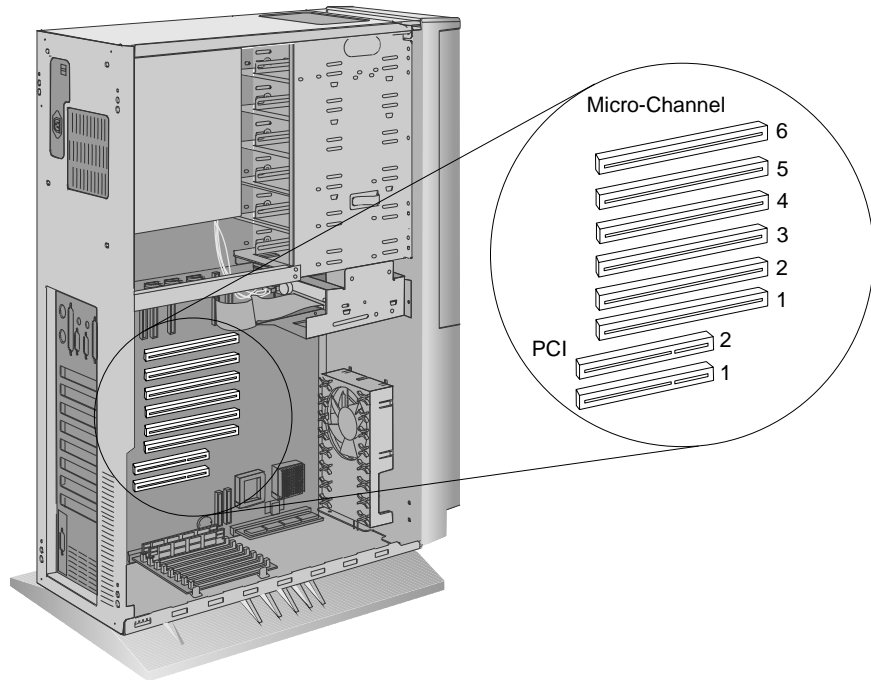
Removing Adapters

Before you begin, be sure you have:

- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Removed the server cover (see “Preparing to Install Options” on page 106).

1. Remove the adapter:

a. Note the slot number of the adapter you are removing.

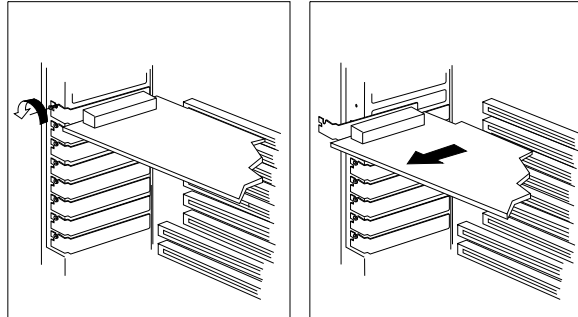


b. Loosen and remove the screw on the adapter, located on the outside back of the server.

c. If any internal cables are attached to the adapter, disconnect them.

Removing Adapters

- d. Support the server with one hand, and with the other hand, pull the adapter out of the slot.



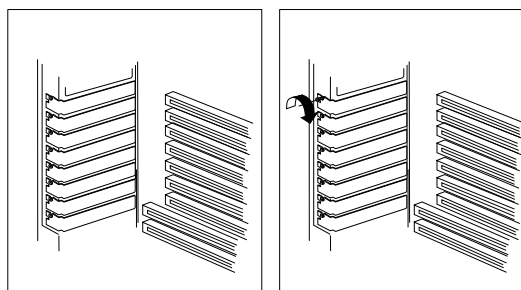
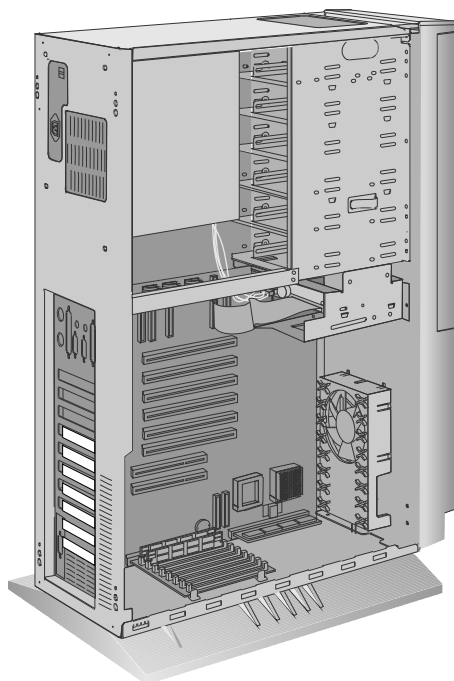
2. If you are installing another adapter in this expansion slot, see “Installing Adapters” on page 123 for instructions.

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

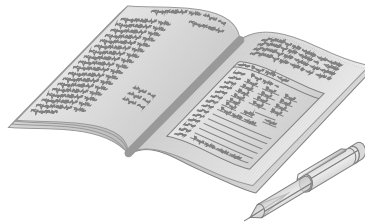
- a. Locate the expansion-slot cover that you removed when you installed the adapter.
- b. Slide the cover over the open expansion slot.

Removing Adapters

- c. Tighten the expansion-slot screw.



3. Go to Table 7 on page 291 and delete the name of the adapter that you removed; then, return here to determine your next step.



What to do next?

- Configuring after removing a Micro Channel adapter? — go to “Micro Channel Configuration” on page 80.
- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 134.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Replacing the battery? — Go to “Replacing the Battery” on page 191.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing or removing a security feature? — Go to “Security Procedures” on page 204.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external drive? — Go to “Connecting External Options” on page 214.

Installing Internal Drives

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

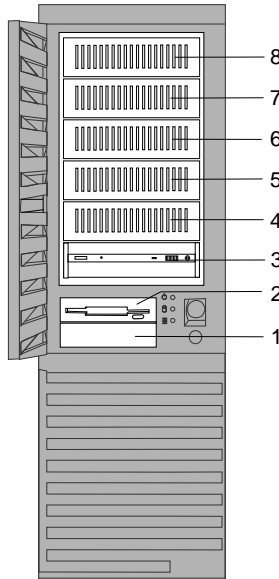
- Diskette
- Hard disk
- Rewritable optical disc
- Tape

Before you install internal drives in your server, see “Internal Drive Bays (Non-Disk-Array Models)” on page 135 and “Internal Drive Bays (Disk-Array Models)” on page 138 for information on the non-disk-array and disk-array models, respectively, for the following:

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

Internal Drive Bays (Non-Disk-Array Models)

Internal drives are installed in *bays*. The bays are numbered 1 through 8 in non-disk-array models.



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.

1. Bay 1 is for 3.5-inch drives. Some models come with a hard disk drive preinstalled in this bay. On some models, this bay can contain a 3.5-inch diskette or 1/4-inch SCSI tape backup drive. The standard hard disk drive is then installed in one of the upper bays.
2. Bay 2 is for 3.5-inch diskette-interface devices, such as a diskette drive or tape backup unit that uses the diskette cable. All models come with a diskette drive preinstalled in this bay.
3. Bay 3 has a preinstalled SCSI CD-ROM drive.

Installing Internal Drives

4. 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 1. Be sure the screw holes in the device line up with the screw holes in bay 1.
5. Bays 4–8 are for 3.5-inch or 5.25-inch disk drives.
6. Bays 4–8 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 attempting to install the drive.
7. You can install a full-high drive between bays 5 and 6, by removing the trays from these bays. You cannot install full-high drives between bays 4 and 5, or between bays 7 and 8.
8. Your server comes either a 4-drop or 7-drop internal SCSI cable (depending on the server model that you purchased).
9. 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 drive to a 16-bit cable, you must purchase and install the 8-bit to 16-bit SCSI Internal Converter. To order cables and a converter, contact your IBM reseller or IBM marketing representative. See “SCSI Drives” on page 141 for additional information.

10. 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 4–8). If bay 1 does not contain a SCSI drive, you can have up to five drives in the 5.25-inch bays (bays 4–8).

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

Installing Internal Drives

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 ¹ , diskette, or 1/4-inch SCSI tape backup drive	25.4 mm (1 inch)
2	3.5-inch	Diskette ²	25.4 mm (1 inch)
3	5.25-inch	CD-ROM	41.3 mm (1.6 inches)
4-8	3.5-inch or 5.25-inch	Hard disk, removable media ³	41.3 mm (1.6 inches)
<p><i>Notes:</i></p> <ol style="list-style-type: none"> 1. If a hard disk drive is preinstalled, it is the startup (or boot) drive. 2. Or a drive that connects to the diskette cable. Be sure the holes in the drive align with the drive housing. 3. Removable media include diskettes, optical discs, and tapes. You can install a 5.25-inch diskette drive in bay 4, but not in bays 5-8. 			

Table 2 summarizes the additional hardware that is needed to install some PC Server 320 options.

Option	Required hardware
3.5-inch drive rewritable optical disc drive	<ul style="list-style-type: none"> • Special mounting bracket
Internal drives, 3.5-inch	<ul style="list-style-type: none"> • 8-bit or 16-bit drive • Drive tray
16-bit devices (bays 4 to 8)	<ul style="list-style-type: none"> • 16-bit cable • 8-bit to 16-bit SCSI Internal Converter (if you want to connect the CD-ROM drive to the 16-bit cable).
8-bit devices	7-drop SCSI cable
<p><i>Note:</i> The 7-drop cable is required if the server did not come with a preinstalled hard disk drive and you plan to have more than four 8-bit internal SCSI drives.</p>	

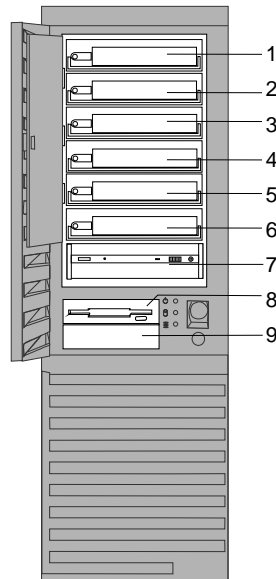
Installing Internal Drives

Internal Drive Bays (Disk-Array Models)

Some server models contain hardware that lets you replace a failed hard disk drive without turning off the server. This gives you the advantage of continuing to operate your system while a hard disk drive is removed or installed. These drives are also known as *hot-swappable* drives.

In these server models, you can install up to six hot-swappable drives. Hot-swappable drives have a green LED on the locking-lever on the tray containing the drive. If the drive has a good electrical connection upon installation, the LED illuminates. The LED blinks briefly during power-up. For disk-array models, the LED also blinks if the drive malfunctions. For non-disk-array models, the LED turns off if the drive malfunctions.

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.

1. 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 168.
2. Bay 7 has a preinstalled SCSI CD-ROM drive.
3. Bay 8 is for 3.5-inch diskette-interface devices, such as a diskette drive or tape backup unit that uses the diskette cable. All PC Server 320 models come with a preinstalled diskette drive.
4. 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.
5. Bay 9 comes without a device. You can install a 3.5-inch diskette, 1/4-inch SCSI tape backup drive, or hard disk drive in bay 9.
Note: You cannot install a hot-swappable hard disk drive in Bay 9.
6. 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.

Installing Internal Drives

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.

<i>Table 3. Maximum Allowable Drive Sizes (Disk-Array Models)</i>			
Bay	Drive Width	Drive Type	Maximum Drive Height
1-6	3.5-inch	Hard disk, hot-swappable	25.4 mm (1 inch)
7	5.25-inch	CD-ROM	41.3 mm (1.6 inches)
8	3.5-inch	DisketteSee note	25.4 mm (1 inch)
9	3.5-inch	Hard disk, optical disc, SCSI diskette, 1/4-inch SCSI tape backup	41.3 mm (1.6 inches)
<i>Note:</i> Or a drive that connects to the diskette cable. Be sure the holes in the drive align with the drive housing.			

Table 4 summarizes the additional hardware that is needed to install some options in a disk-array system.

<i>Table 4. Required Hardware for Options on a Disk-array Model</i>	
Option	Required hardware
3.5-inch drive rewritable optical disc drive	<ul style="list-style-type: none"> • Special mounting bracket
Internal drive, 3.5-inch (bay 9)	<ul style="list-style-type: none"> • 8-bit or 16-bit cable
16-bit devices (bays 1 to 6)	<ul style="list-style-type: none"> • Hot-swap drive tray • 16-bit cable • 8-bit to 16-bit SCSI Internal Converter (if you want to connect the CD-ROM drive to the 16-bit cable).
Storage enclosure or external drives.	External SCSI-2 cable
8-bit device	7-drop SCSI cable
<i>Note:</i> The 7-drop cable is required if the server did not come with a preinstalled hard disk drive and you plan to have more than four 8-bit internal SCSI drives.	

SCSI Drives

Some drives have a special design called *small computer system interface*, or “SCSI.” This design allows you to attach multiple drives to a single SCSI-2 connector.

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

The server comes with three SCSI-2 connectors. Some models come with an IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter. The number of preinstalled SCSI hard disk drives varies according to model.

If you install additional SCSI devices in a non-disk-array model, you must set a unique identification (ID) for each SCSI device that you connect to the integrated SCSI-2 connector. This enables the SCSI-2 controller to identify the devices and ensure that different devices do not attempt to transfer data at the same time.

The SCSI IDs in disk-array models with the IBM 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 hot-swap SCSI devices on disk-array systems.

Refer to Table 5 on page 142 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.

Installing Internal Drives

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 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 Controller
Disk-Array Models ²		
0-5 ³	1-6	Hot-Swappable Hard Disk Drives
6	7	CD-ROM Drive
7	N/A	IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter
<i>Note:</i>		
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 preset by the hot-swap bay backplane.		

On a non-disk-array model, the processing sequence for SCSI devices proceeds from the lowest SCSI ID to the highest (0 to 6, then 8 to 15). If your server comes with a preinstalled hard disk drive in bay 1, this is your startup drive, and it already has a SCSI ID of 0.

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

Installing Internal Drives

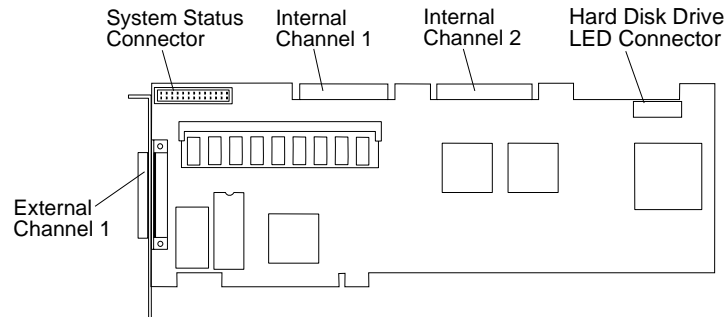
The SCSI-2 controller in your server has two internal connectors and one external connector:

- On non-disk-array models, one internal connector is used for an 8-bit cable; the other internal connector is used for a 16-bit cable.

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

- On the disk-array models, the IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter provides two internal connectors for 16-bit cables.

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



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

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

Installing Internal Drives

Notes:

1. Only one of the integrated 16-bit SCSI-2 connectors can be used when you are using the external SCSI-2 connector.
2. If you plan to install both internal and external SCSI devices, you must follow the instructions given in “Connecting External Options” on page 214 in addition to the instructions in this section.
3. If you connect devices to the internal or external integrated SCSI connectors in a disk-array system, the server might attempt to start from these non-disk-array devices. Refer to your operating system documentation.

Termination (Internal SCSI Devices)

The devices at both ends of the SCSI bus must be terminated. If you attach SCSI devices (internal or external), you must terminate the last device in the chain.

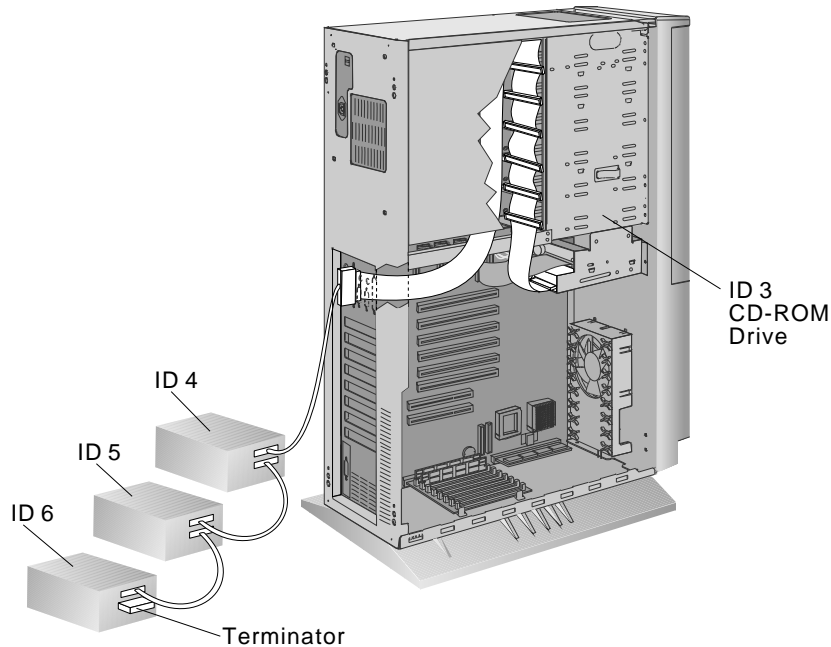
Note: All of the preinstalled hot-swappable drives in your server have automatic termination.

If you attach internal SCSI devices to one of the SCSI-2 internal connectors in a non-disk-array model, you must terminate the last internal device on the bus (cable) and disable the termination on the other devices connected to the internal SCSI controller. The SCSI-2 controller is already terminated.

The following illustration shows a non-disk-array model with a preinstalled hard disk drive in bay 1. The last device in the internal chain is the internal SCSI drive in bay 1. This internal SCSI drive already is terminated, so any additional internal SCSI devices do not need to be terminated as long as this drive remains in bay 1, at the end of the chain.

Note: A 16-bit cable connects the hard disk drive to the SCSI-2 controller. An 8-bit to 16-bit SCSI Internal Converter is used to connect the CD-ROM drive to the 16-bit cable. The external SCSI-2 connector requires a 68-pin external cable connector.

Installing Internal Drives



A CD-ROM drive is installed in bay 3 of non-disk-array models and bay 7 of disk-array systems. 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 4–8, 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 “Changing the Termination on the CD-ROM Drive” on page 155 for instructions).

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 8-bit to 16-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 your server's SCSI subsystem.

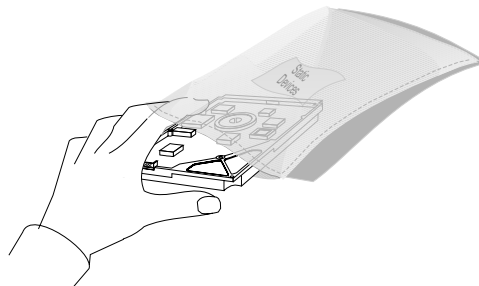
Preinstallation Steps (All Bays)

Before you begin, be sure you have:

- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Read the documentation that comes with the internal drive.
- Verified that you have all of the cables, drive trays, and any other equipment specified in the documentation that comes with the internal drive.
- Removed the server cover (see “Preparing to Install Options” on page 106).

Before you can install drives in your PC Server 320, you might need to perform certain preinstallation activities. Some of the steps are required only during the initial installation of an option.

1. Choose the bay in which you want to install the drive. (Refer to Table 1 on page 137 for the drive types and sizes available for each bay in the non-disk-array model, and Table 3 on page 140 for the drive types and sizes available for each bay in the disk-array systems.)
2. Touch the static-protective bag containing the drive to any unpainted metal surface on the server; then, remove the drive from the bag.



Installing Internal Drives

3. Check the instructions that come with the drive, or contact your IBM reseller or IBM marketing representative to see if you need to set any switches or jumpers on the drive, or if you need to attach a tray to the drive.

Note:

- The SCSI ID on the CD-ROM in models with the Hot Swap Bay Option installed is preset to 6. If you upgrade your server by installing a Hot Swap Bay Option, make sure that you change the SCSI ID on the CD-ROM drive from 3 to one of the unassigned SCSI IDs to avoid a conflict with a hard disk drive installed in bay 4 of the hot-swap bay. (A hard disk drive that is installed in bay 4 of the Hot-Swap Bay Option is automatically assigned SCSI ID 3.) Your server will not recognize either device if they are assigned the same SCSI ID and are connected to the same channel of the SCSI controller.
- Automatic SCSI ID settings apply only to hot-swappable hard disk drives installed in a hot-swap bay. Therefore, if you install a SCSI drive in bay 9 of disk-array models, you must set a SCSI ID for that drive.
- Remove the terminators from the drive you plan to install in bay 1 (non-disk-array models) or bay 9 (disk-array models). The cable that connects to the SCSI device in those bays already has a terminator.

What to do next?

- Installing a drive in bays 1-2? — Go to “Installing Diskette Drives” on page 149.
- Installing a non-hot-swappable drive in bays 3-8? — Go to “Installing Hard Disk Drives” on page 157.
- Installing a hot-swappable drive in bays 1-6? — Go to “Installing Hard Disk Drives in Hot-Swap Bays” on page 168.

Installing Diskette Drives

This procedure applies to drives installed in the bottom two bays in your PC Server 320.

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

- Your server comes with a 1.44 MB diskette drive installed in bay 2 (non-disk-array models) or bay 7 (disk-array models). The system board supports two diskette-interface devices. Therefore, you can install an additional 3.5-inch diskette-interface device in bay 1 (non-disk-array models) or bay 9 (disk-array models). Each diskette-interface device connects to one cable (already attached to the preinstalled diskette drive).
- Before installing drives, make sure you have enough cables to accommodate all of the drives. If you need additional cables, contact your IBM reseller or IBM marketing representative.
- 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 connect the CD-ROM drive to a 16-bit cable, you must purchase and use 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 came 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 can be installed in the 5.25-inch bays. If you install the drives in the 5.25-inch bays and you do not install a drive in bay 1, you do not need to remove the termination from the CD-ROM drive.

Installing Internal Drives

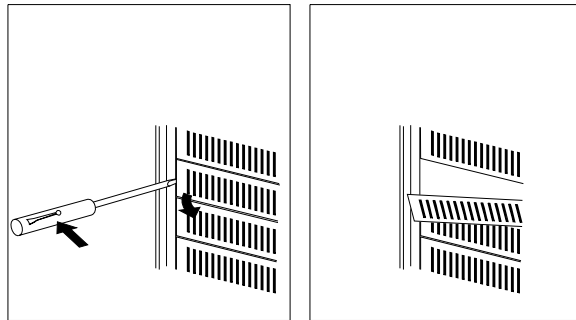
- Non-disk-array models with a preinstalled SCSI hard disk drive in bay 1 come with an 8-bit SCSI cable. Use this cable to install additional 8-bit devices.

Note: You cannot install 16-bit devices on an 8-bit cable.

- Follow the instructions in the documentation that comes with the drives. Pay particular attention to the information about setting jumpers and switches, and removing 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.

Note: If you plan to install a diskette drive in bay 2 (non-disk-array models) or bay 8 (disk-array models), you must remove the preinstalled drive from this bay, as described under “Removing Internal Drives” on page 173.

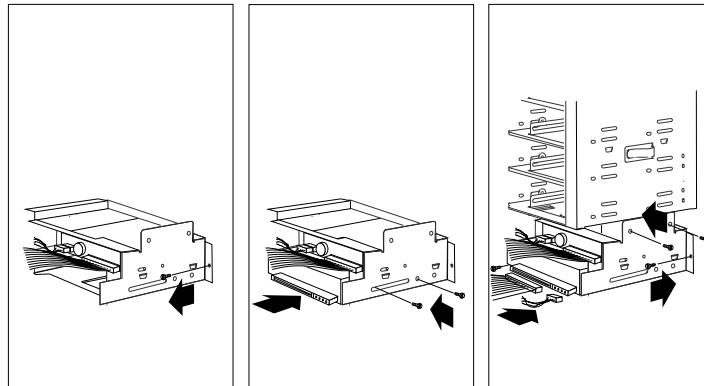
1. If you are installing a diskette drive in bay 2 (non-disk-array models) or bay 8 (disk-array models), go to step 2 on page 151. If you are installing a diskette drive or diskette-interface device in bay 1 (non-disk-array models) or bay 9 (disk-array models), remove the cover plate:
 - a. Insert a 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 the four screws from the drive housing containing the bottom two bays.

Notes:

- Three screws are shown near the screwdriver in the following illustration. The fourth screw is located under the housing, on the left-hand side.
- If you are installing a diskette drive or diskette-interface device in bay 1 (non-disk-array models) or bay 9 (disk-array models) you must also 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.

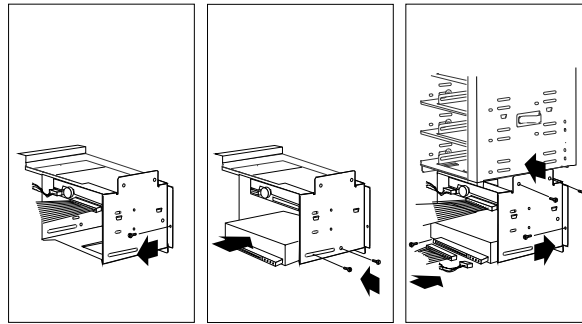


Installing Internal Drives

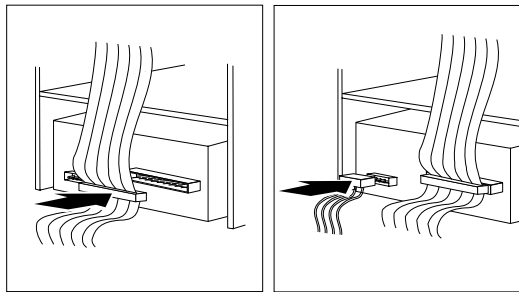
3. To install a drive in bay 1 or 2 (non-disk-array models) or bay 8 or 9 (disk-array models):
 - a. Locate the cable connector that you will attach to the drive.
 - b. Position the drive so the drive connector is facing the rear of the server.
 - c. Align the drive with the guides on the bottom of the bay and slide it into the bay.

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

- d. Attach the drive to the housing, using the screws supplied with the drive kit.



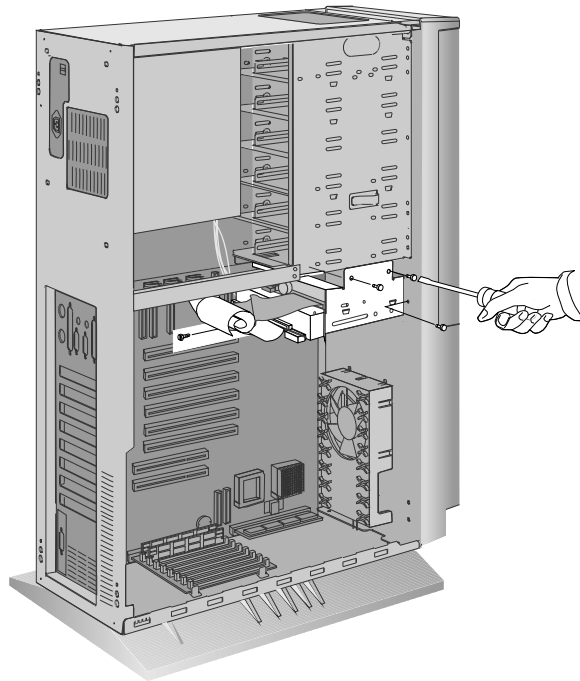
- e. Connect the drive to one end of the signal cable.
- f. Connect the other end of the cable to the SCSI-2 connector or the appropriate connector on the system board.
- g. Connect one of the 4-pin power cables to the drive.



- h. Reinstall the drive housing, making sure to align the far side properly over the two brackets located under bay 3 (non-disk-array models) or bay 7 (disk-array models).

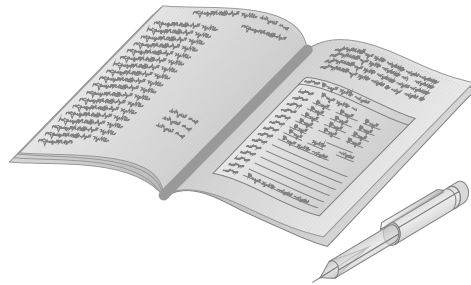
Installing Internal Drives

- i. Reinstall and tighten the four screws that you removed in step 2 on page 151.



Installing Internal Drives

4. Go to Table 10 on page 295 to record the drive location, and if applicable, the SCSI ID 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 another internal drive? — Go to step 1 on page 147.
- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing a security feature? — Go to “Security Procedures” on page 204.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external option? — Go to “Connecting External Options” on page 214.

CD-ROM Drive Considerations

Your server comes with a CD-ROM drive preinstalled in bay 3 (non-disk-array models) or bay 7 (disk-array models).

The following information is important. Read the information completely before you install any SCSI drive.

- Only a CD-ROM drive can be installed in bay 3 (non-disk-array models) or bay 7 (disk-array models).
- Before installing drives, make sure you have enough cables to accommodate all of the drives. If you need additional cables, contact your IBM reseller or IBM marketing representative.
- 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 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.

If you install 16-bit devices, you must use a 16-bit cable. To connect an 8-bit device to a 16-bit cable, you must purchase and use the 8-bit to 16-bit SCSI Internal Converter. If your server comes with a 16-bit cable, the CD-ROM drive in your server comes with this internal converter.

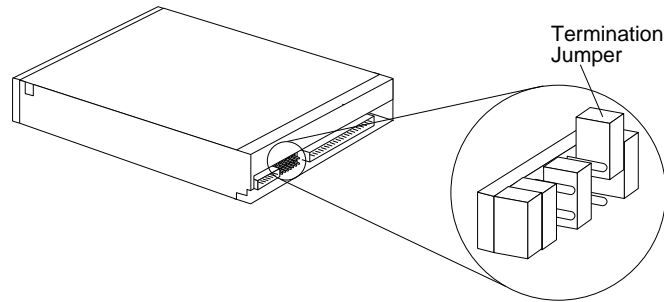
- Follow the instructions in the documentation that comes with the drives, including those that describe how to set jumpers and switches, and how to remove termination.
- If a tray is attached to a drive that you intend to install, you must remove the tray before installing the drive. Follow the instructions in the documentation that comes with the drive.

Changing the Termination on the CD-ROM Drive

1. Go to “Removing Hard Disk Drives” on page 178 and remove the CD-ROM drive. After you remove the drive, return to this section.

Installing Internal Drives

2. Locate the termination jumper. The jumper covers both pins (second pair of pins from the right-hand side).



3. Remove and reinstall the termination jumper so that the jumper covers only one pin, as shown.
4. Go to “Installing Hard Disk Drives” on page 157 and reinstall the CD-ROM drive. (The procedure for installing CD-ROM drives is the same as the procedure for installing hard disk drives in non-disk-array models without the hot-swap bay option.)

What to do next?

- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing a security feature? — Go to “Security Procedures” on page 204.

- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external option? — Go to “Connecting External Options” on page 214.

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

Note: To install hard disk drives in a hot-swap bay, see “Installing Hard Disk Drives in Hot-Swap Bays” on page 168.

By adding different hardware trays to the 5.25-inch bays in your server, you can install various types of drives that optimize your operating environment. For example, you can install up to six 3.5-inch SCSI drives. If you need a second diskette drive, you can install it in bay 1 (non-disk-array models) or bay 9 (disk-array models). If your server comes with a standard hard disk drive, move the hard disk drive to one of the 5.25-inch bays in models without the hot-swap bay, or replace the hard disk drive with a hot-swappable hard disk drive in models with a hot-swap bay.

Note: In models with the hot-swap bay option, you can install up to six 1-inch hot-swappable hard disk drives or three half-high (1.6-inch) hot-swappable hard disk drives (see “Installing Hard Disk Drives in Hot-Swap Bays” on page 168 for information on installing these drives).

Installing Internal Drives

The following information is important. Read the information completely before you install any drive.

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

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 8-bit to 16-bit SCSI Internal Converter.

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

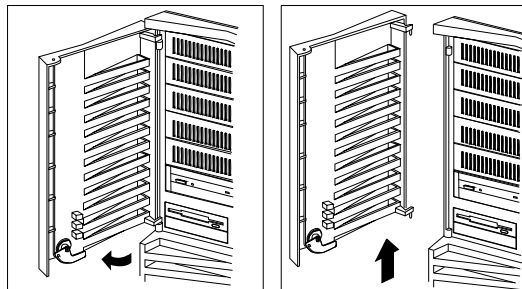
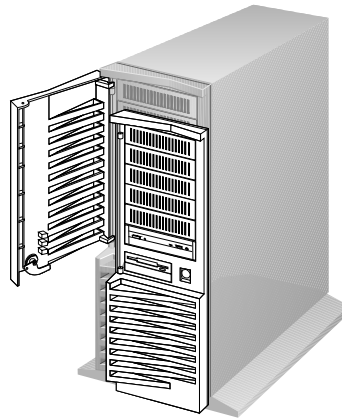
To order the cable and converter, contact your IBM reseller or IBM marketing representative.

- Models that come with a hot-swap bay have a 16-bit cable.
- See step 12 on page 163 for an illustration of SCSI cable-routing.
- Follow the instructions in 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.

Before you begin, be sure you have:

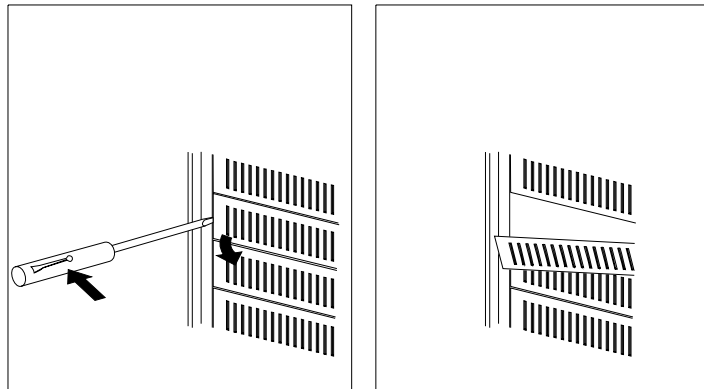
- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Removed the server cover (see “Preparing to Install Options” on page 106).

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

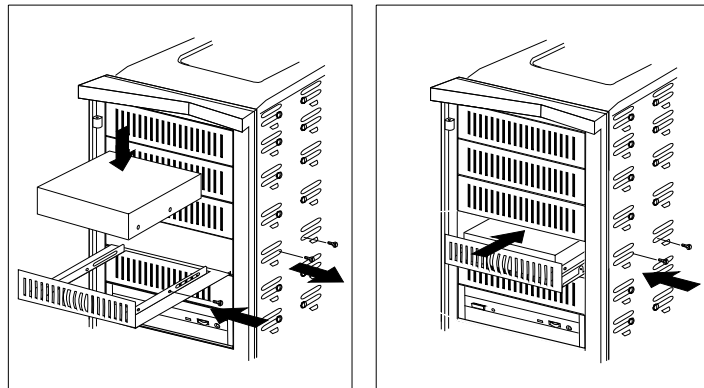
3. Remove the cover plate from the target bay:
 - a. Insert a small flat-blade screwdriver under the side of the cover plate.
 - b. Lift the cover plate and remove it from the server front panel. (Save the cover plate for future use.)



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. Install the appropriate drive:
 - If you are installing a 5.25-inch drive, go to step 10 on page 162.
 - If you are installing a 3.5-inch drive, go to the next step.

Installing Internal Drives

6. Place the drive on the tray, with the connectors facing the rear of the tray.
7. Insert the screws that come with the drive into the holes on the tray. Then, tighten the screws.
Attention: To ensure that the drive functions properly, do not overtighten the screws.
8. Slide the drive and tray into the target bay.
9. Reinstall and tighten the four screws that you removed in step 4 on page 160.



Installing Internal Drives

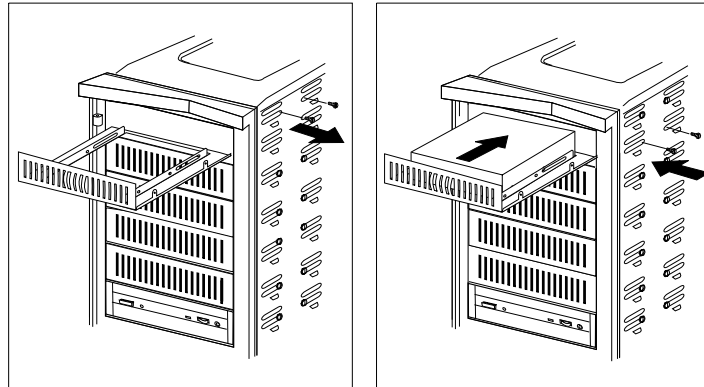
10. If you are installing a 5.25-inch drive, complete the following steps:

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 160.

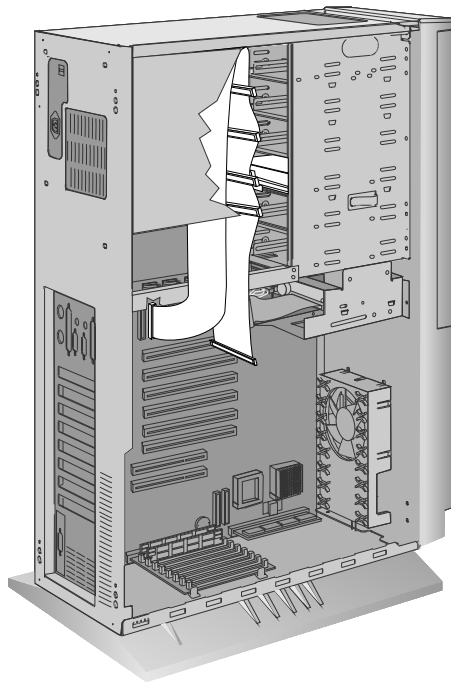
Attention: To ensure that the drive functions properly, do not overtighten the screws.

- d. Align the drive and tighten the screws.



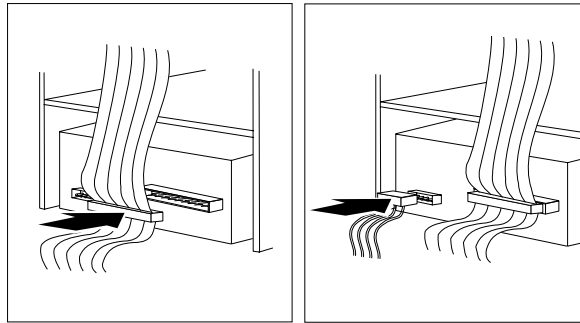
Installing Internal Drives

11. Connect the drive to a connector on the appropriate flat cable.
12. Connect the 16-bit cable to the 16-bit SCSI-2 internal connector.
(See the following illustration for an example of SCSI cable-routing.)



Installing Internal Drives

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



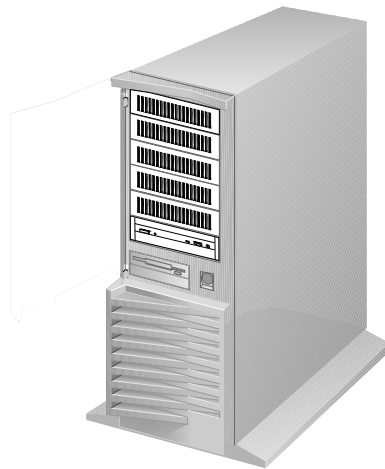
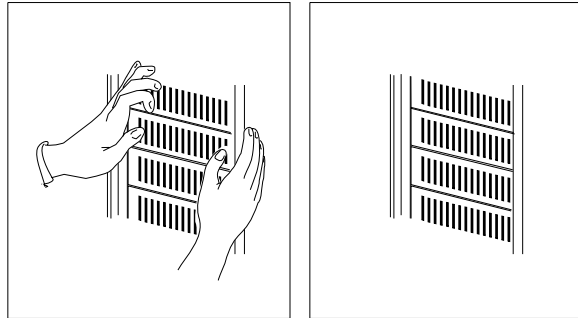
14. If you are installing another internal drive, return to step 1 on page 147.

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

15. If necessary, replace the cover plate at the front of the bay:
 - a. If you installed a nonremovable-media drive, use the cover plate that you removed in step 3 on page 160.
 - b. If you installed a removable-media drive, do not install a cover plate.

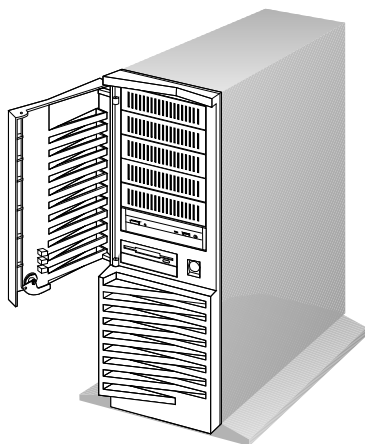
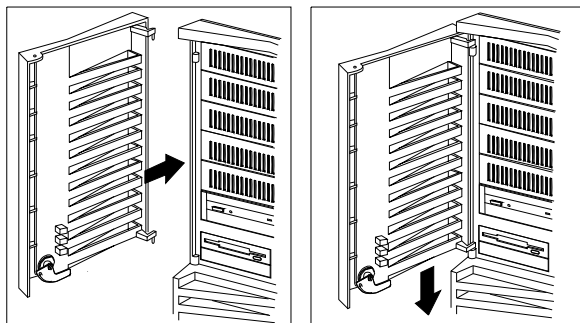
Installing Internal Drives

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



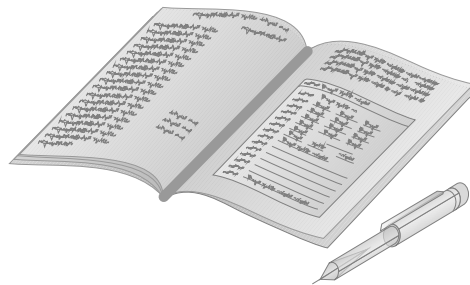
Installing Internal Drives

16. Reinstall the door at the front of the server by aligning the pins over the hinges and sliding the door down.



17. Close and lock the door.

18. Go to Table 10 on page 295 to record the drive location, and if applicable, the SCSI ID you assigned to the drive; then, return here to determine your next step.



Note: If your server is a disk-array model, you must configure the disk-arrays after installing hard disk drives.

What to do next?

- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Replacing the battery? — Go to “Replacing the Battery” on page 191.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing a security feature? — Go to “Security Procedures” on page 204.

Installing Internal Drives

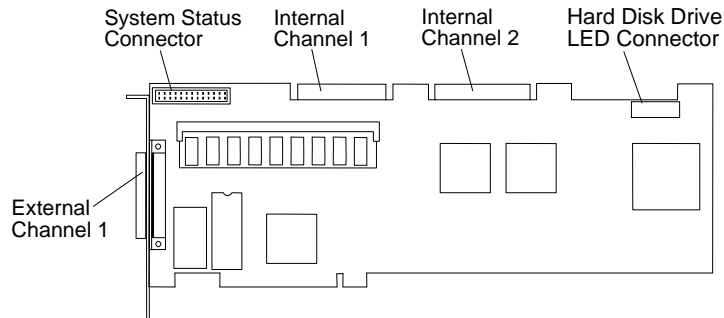
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external option? — Go to “Connecting External Options” on page 214.

Installing Hard Disk Drives in Hot-Swap Bays

Some models come with the Hot-Swap Bay Option installed. This option provides space for up to six 1-inch hot-swappable hard disk drives or three half-high (1.6-inch) hot-swappable hard disk drives. The Hot-Swap Bay option can be added as an upgrade. Contact your IBM reseller or IBM marketing representative for additional information.

If your server is a disk-array model, an IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter is installed in your server. You can connect the cable from the SCSI-2 connector on the hot-swap bay to either the Channel 1 or Channel 2 connector on the adapter.

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



Each hot-swappable drive that you plan to install in the hot-swap bay must have a hot-swappable drive tray attached to it. If your drive comes with a different tray, remove it and install a hot-swappable drive tray. Follow the instructions given in the kit that contains the hot-swappable drive tray.

You do not need to turn off the server to install additional hot-swappable drives in the hot-swap bays.

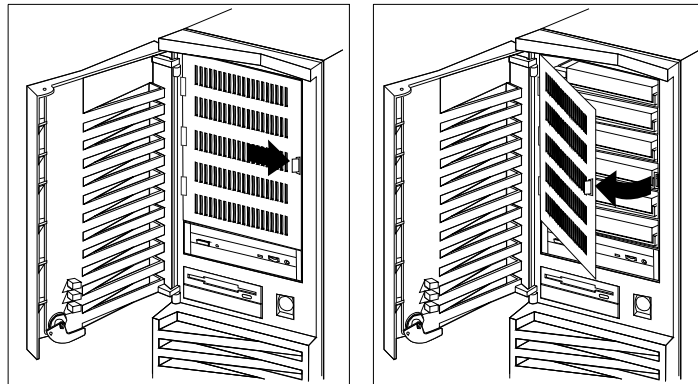
Before you begin, be sure you have:

- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Configured your server, if it is a disk-array server model. You must configure your server before installing any options.

Review Chapter 3, “Configuring the Disk Array” on page 35 for information about the RAID adapter; then, see “Using the System Diskettes” on page 91 for additional details about configuration.

Attention: Before you remove a defective hot-swap drive that is part of an array, make sure it is defective. If you partially or completely remove a good drive instead of a defective one, all of the data in your array might be lost.

1. Unlock and open the door.
2. Open the interior door.
 - a. Press the tab to the right.
 - b. Pull the tab outward.

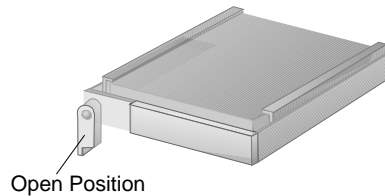


3. Each drive that you plan to install in a hot-swap bay must have a hot-swappable-drive tray attached. If your drive has a different tray, remove it and install a hot-swappable-drive tray before installing the drive. Follow the instructions given in the kit that contains the hot-swappable-drive tray.

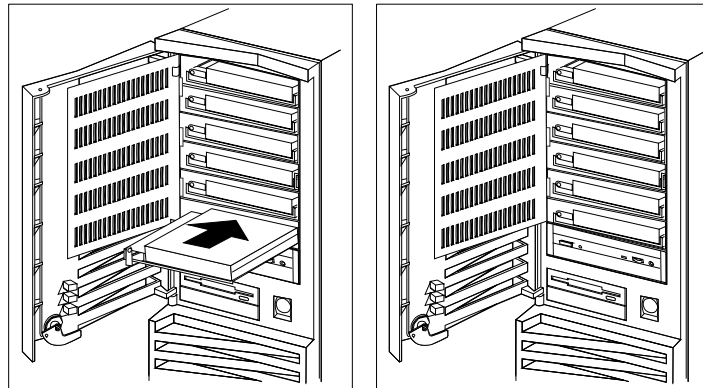
Installing Internal Drives

Note: Preinstalled hot-swap hard disk drives come with the hot-swappable-drive tray already attached.

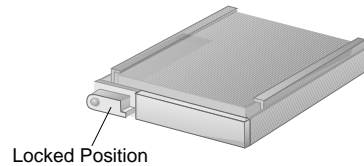
4. Install the hot-swappable disk drive:
 - a. Move the locking-lever to the open position.



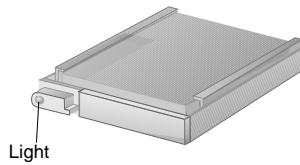
- b. Position the drive tray assembly horizontally, with the connector facing the rear of the server.
 - c. Align the side of the tray with the raised guides on the bottom of the bay.
 - d. Slide the drive tray to the rear of the bay until it connects to the backplane. When the drive is properly connected to the backplane, the handle is flush with the metal housing.



- e. Move the tray locking-lever to the locked position.



Note: If you did not turn off your server before installing the drive, the light on the locking-lever of the drive tray illuminates, indicating that the drive was installed correctly.

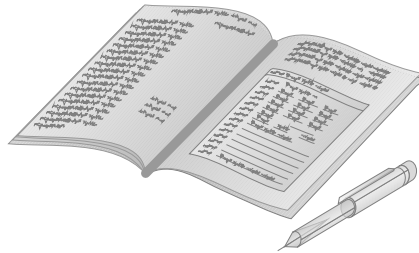


5. Select the appropriate action from the following list:
- If you are installing another hot-swappable drive, return to step 4 on page 170.
 - If you are removing a hot-swappable drive, go to step 3 on page 187.
 - If you are not installing or removing another hot-swappable drive, close the interior door, and then continue with the next step.

If you are not installing another hot-swappable drive, close the interior door, and then continue with the next step.

Installing Internal Drives

6. Go to Table 10 on page 295 to record the drive location; then, return here to determine your next step.



Note: If your server is a disk-array model, you must reconfigure your disk arrays after installing hard disk drives.

What to do next?

- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Replacing the battery? — Go to “Replacing the Battery” on page 191.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing a security feature? — Go to “Security Procedures” on page 204.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external option? — Go to “Connecting External Options” on page 214.

Removing Internal Drives

Before you begin, be sure you have:

- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Removed the server cover (see “Preparing to Install Options” on page 106).
- Determined the correct location of a failed hard disk, if your server is a disk-array model, and your system indicates that a drive is defective (bays 1–6 only).

To remove a drive from bays 1–2 (non-disk-array models) or bays 8–9 (disk-array models, go to “Removing Diskette Drives” on page 174.

To remove a hard disk drive from a non-disk-array model without a hot-swap drive bay, go to “Removing Hard Disk Drives” on page 178.

To remove a hot-swappable drive, go to step 3 on page 187.

Removing Internal Drives

Removing Diskette Drives

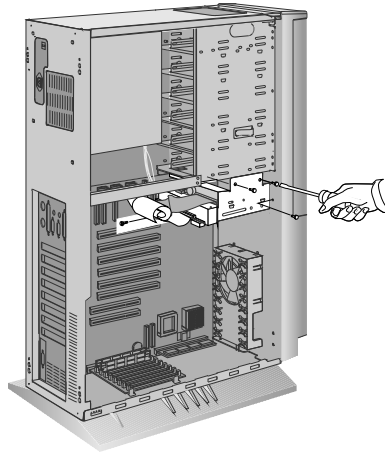
Note: The procedure for removing hard disk drives from the bottom bay of your server is the same as the procedure for removing diskette drives.

To remove a drive from bays 1-2 (non-disk-array models) or bays 8-9 (disk-array models):

1. Remove the four screws from the drive housing containing the bottom two bays.

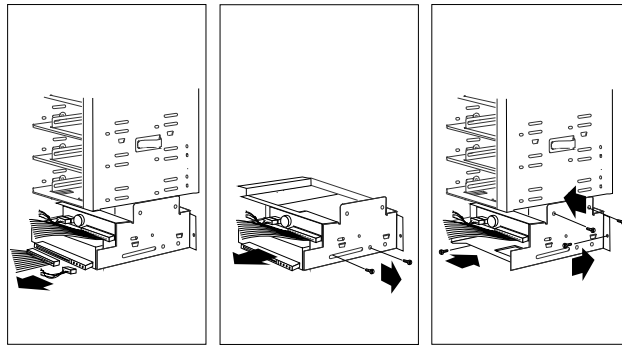
Note: Three screws are shown near the screwdriver in the following illustration. The fourth screw is located under the housing, on the left-hand side.

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



Removing Internal Drives

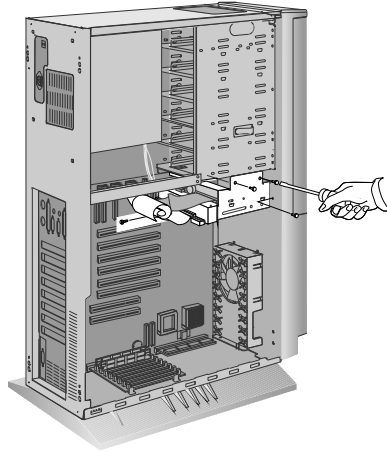
3. Remove the diskette drive:
 - a. Determine which drive you plan to remove.
 - b. Disconnect the cables (flat and power) from the rear of the drive.
 - c. Remove the screws that hold the drive in the housing.
 - d. Slide the drive out of the bay and store it in a safe place.



4. Reinstall the drive housing, making sure to align it properly over the two brackets located under the bay containing the CD-ROM drive.

Removing Internal Drives

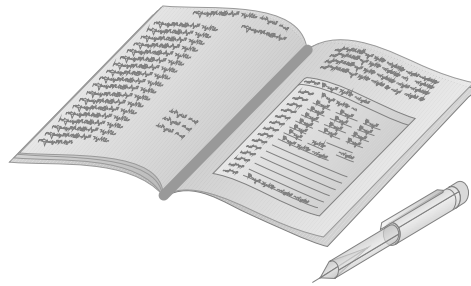
5. Reinstall and tighten the four screws that you removed in step 1 on page 174.



6. If you are installing another internal drive, go to step 1 on page 147.
If you are removing another internal drive, return to “Removing Internal Drives” on page 173.
If you are not installing or removing another internal drive, continue with the next step.
7. Replace the cover plate (bottom bay only).

Removing Internal Drives

8. Update your records in Table 10 on page 295; then, return here to determine your next step.



What to do next?

- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Replacing the battery? — Go to “Replacing the Battery” on page 191.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing a security feature? — Go to “Security Procedures” on page 204.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external option? — Go to “Connecting External Options” on page 214.

Removing Hard Disk Drives

If you are removing:

- Hot-swappable hard disk drives from a hot-swap bay, see “Removing Hard Disk Drives from Hot Swap Bays” on page 186.
- A hard disk drive from bay 1 (non-disk-array models) or bay 9 (disk-array models), see “Removing Diskette Drives” on page 174.

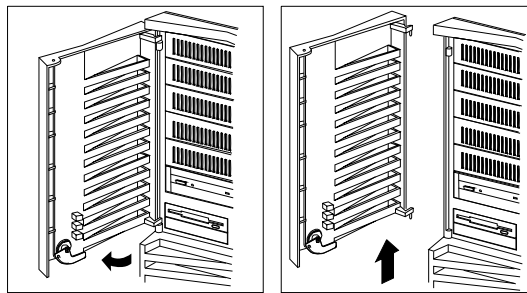
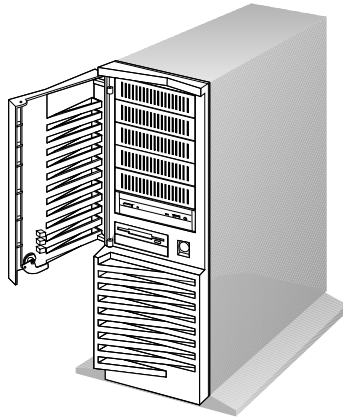
The procedure for removing hard disk drives from the bottom bay of your server is the same as the procedure for removing diskette drives.

- Rewritable optical disc drives from bays 4–8 (non-disk-array models without a hot-swap bay), follow this procedure.
- Tape drives from bays 4–8 (non-disk-array models without a hot-swap bay installed), follow this procedure.
- Hard disk drives from bays 4–8 (non-disk-array models without a hot-swap bay installed), follow this procedure.
- Hard disk drives in bays 4–8 (non-disk-array models without a hot-swap bay installed), follow this procedure.

Removing Internal Drives

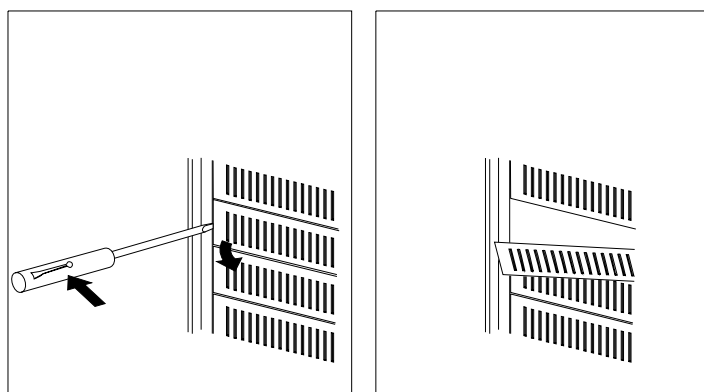
To remove a drive from bays 4–8:

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.



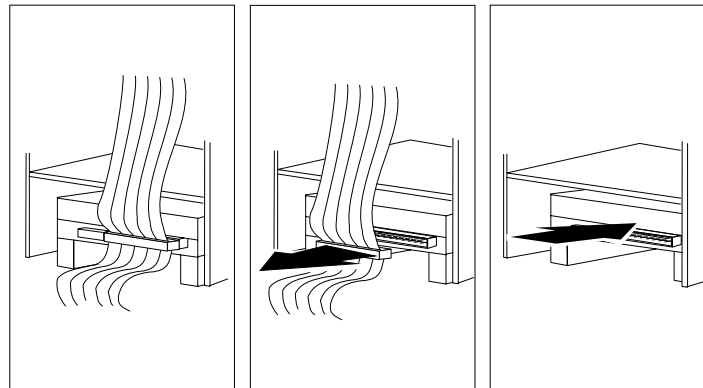
Removing Internal Drives

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.)



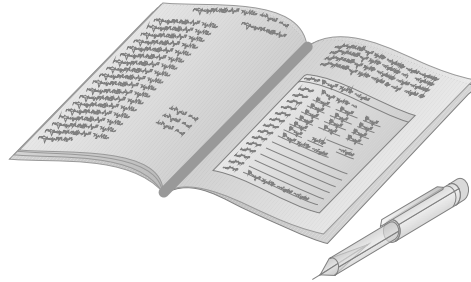
Removing Internal Drives

4. Remove the drive:
 - a. Determine which drive you intend 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 it 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 you installed when you installed the drive.



Removing Internal Drives

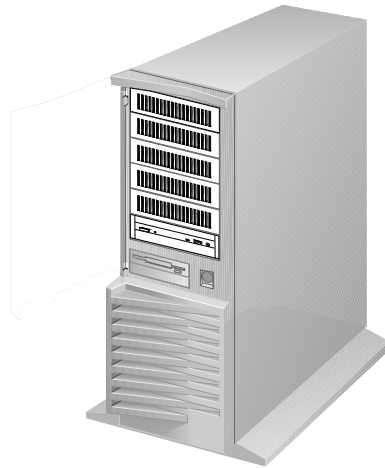
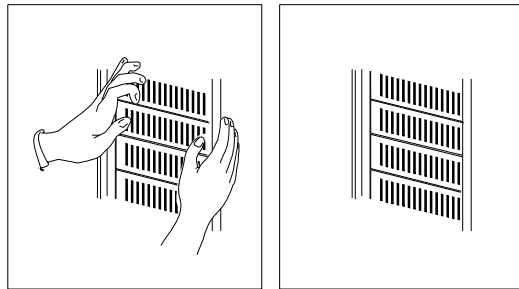
5. Update your records in Table 10 on page 295; then, return here to determine your next step.



6. If you are installing an internal drive, go to step 1 on page 147.
If you are removing another hard disk drive return to step 3 on page 180.
If you are not installing or removing another internal drive, continue with the next step.

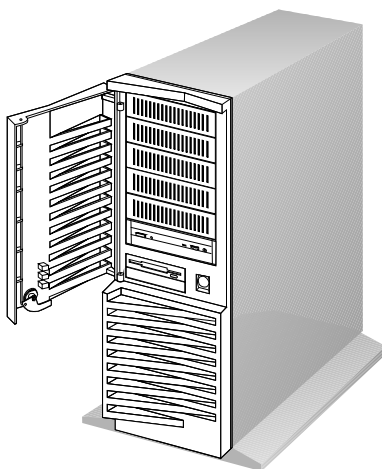
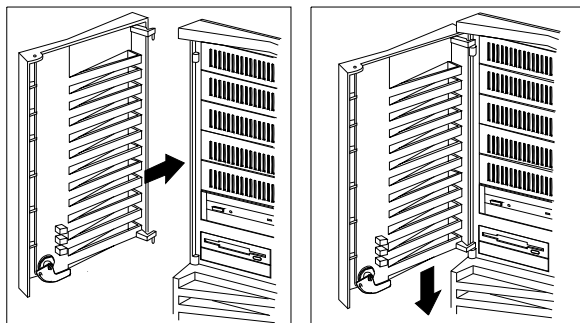
Removing Internal Drives

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



Removing Internal Drives

8. Reinstall the door at the front of the server by aligning the pins over the hinges, and sliding the door down.



9. Close and lock the door.

What to do next?

- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 134.
- Replacing the battery? — Go to “Replacing the Battery” on page 191.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing a security feature? — Go to “Security Procedures” on page 204.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external option? — Go to “Connecting External Options” on page 214.

Removing Internal Drives

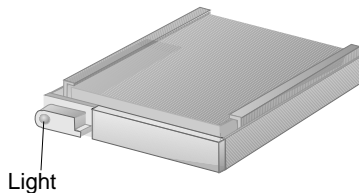
Removing Hard Disk Drives from Hot Swap Bays

Attention: Before you remove a hard disk drive that is not defective from a hot-swap bay, back up all important data.

If you remove a hard disk drive that is not defective from an array that already has a defective hard disk drive, all data in the array will be lost. This situation is especially relevant if you assigned RAID level 1 or 5 to the logical drives in your disk array. However, the RAID controller can rebuild the data you need, provided that certain conditions are met. See “Replacing a Faulty Drive” on page 63 for further details.

Before you attempt to remove a defective drive, thoroughly review the information displayed on your server screen to determine the location of the failed drive. “Logical and Hard Disk Drive Status Indications” on page 63 explains the codes that disk-array models use to indicate a defective drive. If you are removing a failed hard disk drive that is part of a disk array, do not accidentally remove a good drive, or all data in the array could be lost.

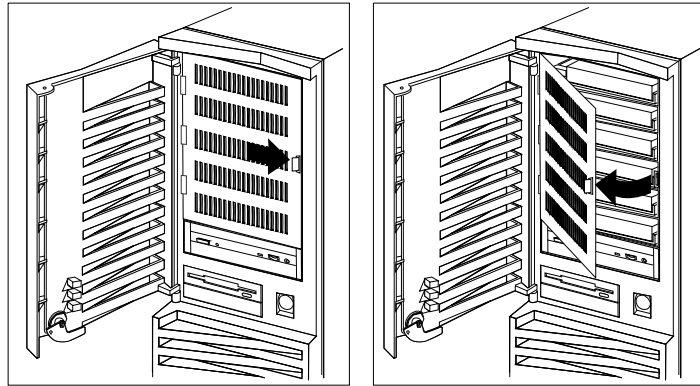
A defective hard disk drive is indicated by a blinking green indicator light on the locking-lever of the drive tray. A good hard disk drive is indicated by a solid green indicator light on the locking-lever of the drive tray. No power to the drive or a drive not securely inserted into the connector on the backplane of the hot-swap bay is indicated when the green indicator light is off.



Removing Internal Drives

To remove a hard disk drive from a hot-swap bay:

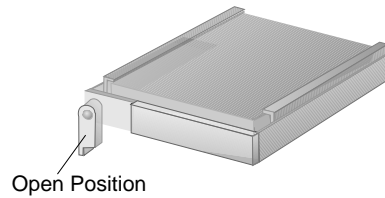
1. Unlock and open the door.
2. Open the interior door:
 - a. Press the tab to the right.
 - b. Pull the tab outward.



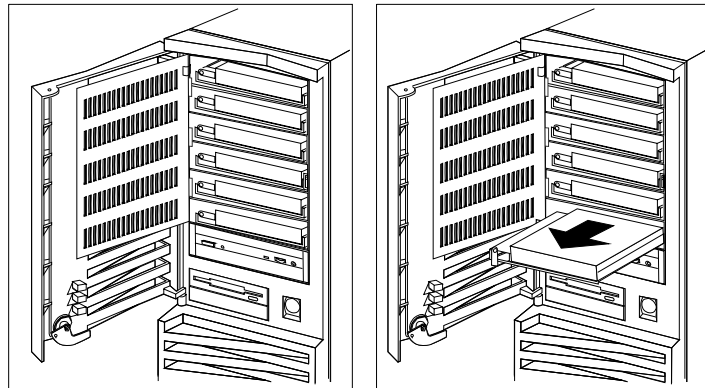
3. Identify the drive that you want to remove.
4. If your server is a disk-array model and a hard disk drive has failed, ensure that you have selected the correct drive for removal by verifying that the green indicator light on the locking-lever on the tray is blinking.

Removing Internal Drives

5. Unlock the drive by turning the locking-lever on the left down 90 degrees to the open position.



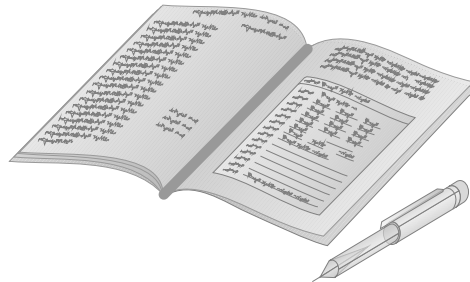
6. Disconnect the drive from the connector on the backplane by grasping the handle on the tray and pulling the drive out of the server. Store the drive in a safe place.



Note: If your server is a disk-array model, you may need to reconfigure the disk array associated with the hard disk drive that you removed. See “Starting the RAID Configuration Program” on page 42 for details.

Removing Internal Drives

7. Select the appropriate action from the following list:
 - If you are removing another hot-swappable drive, return to step 3 on page 187.
 - If you are installing another hot-swappable drive, go to “Installing Hard Disk Drives in Hot-Swap Bays” on page 168.
 - If you are not installing or removing another hot-swappable drive, close the interior door, and then continue with the next step.
8. Update your records in Table 10 on page 295; then, return here to determine your next step.



Removing Internal Drives

What to do next?

- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Changing a jumper setting? — Go to “Changing Jumper Settings” on page 195.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing a security feature? — Go to “Security Procedures” on page 204.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external option? — Go to “Connecting External Options” on page 214.

Replacing the Battery

IBM has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you replace the battery, be sure to adhere to the following instructions.

CAUTION:

This product contains a lithium battery. The lithium battery presents a fire, explosion, or severe burn risk if handled incorrectly.

When replacing the battery, use only IBM Part Number 33F8354 or an equivalent type lithium battery recommended by the manufacturer of the battery currently installed in your server. Dispose of the battery as required by local ordinances or regulations and the manufacturer's instructions.

If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

To order replacement batteries, call 1-800-772-2227 within the United States, and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your IBM reseller or IBM marketing representative.

Replacing the Battery

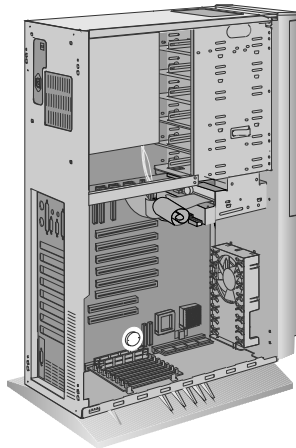
Before you begin, be sure you have:

- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Followed any special handling and installation instructions supplied with the replacement battery.
- Removed the server cover (see “Preparing to Install Options” on page 106).

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

To replace the battery:

1. Remove the memory-module kit:
 - a. Gently pull the clasps away from the memory-module kit.
 - b. Lift the memory-module kit at an angle until it is free from the pegs.
 - c. Pull the memory-module kit out at that angle, and place it on a flat, nonconductive surface.
2. Locate the battery on the system board.



3. Remove the battery:
 - a. Use one finger to lift the battery clip over the battery.
 - b. Use one finger to slightly slide the battery toward the front of the server. (The spring mechanism behind the battery will push it out toward you as you slide it forward.)
 - c. Use your thumb and index finger to pull the battery from under the battery clip.
4. Insert the new battery:
 - a. Tilt the battery so that you can insert it into the front of the socket, under the battery clip.
 - b. As you slide it under the battery clip, press the battery down into the socket.
5. Replace the memory-module kit:
 - a. Hold the memory-module kit at an angle just over the pegs on the memory-module kit, then, slide the memory-module kit into the connector.
 - b. Gently pull the memory-module kit over the pegs.
 - c. Press the clasps over the edge of the memory-module kit.
6. Reinstall the server cover and complete the installation (see “Completing the Installation” on page 211).
7. Start the Configuration/Setup utility program and reset configuration parameters as needed.
 - To reset the system date and time, go to “Date and Time” on page 83.
 - To reset the power-on password, go to “Setting a Power-on Password” on page 88.
 - To reconfigure your system, follow the instructions given in Chapter 3, “Configuring the Disk Array” on page 35 (disk-array system only) and “Using the System Diskettes” on page 91 (all models).

Replacing the Battery

What to do next?

- Setting the administrator password jumper? — Go to “Setting the Administrator Password Jumper” on page 207.
- Installing a U-bolt? — Go to “Installing a U-Bolt” on page 209.
- Installing a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external drive? — Go to “Connecting External Options” on page 214.

Changing Jumper Settings

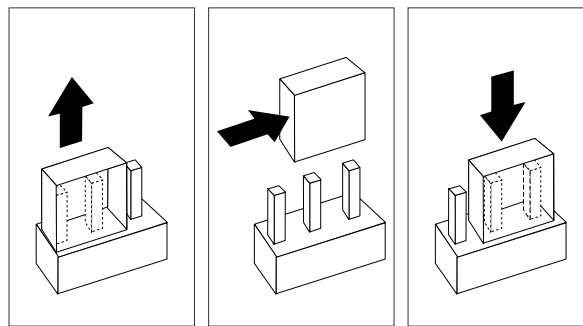
The system board and the system-board jumper settings for your model appear on a label inside your server. These values are preset. If you need to change them, follow the instructions given below. You will see the label when you remove the cover. (To remove the cover, go to “Preparing to Install Options” on page 106.)

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

How to Set Jumpers

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

Jumper positions are indicated on the system board with the jumper location identifier, for example J15, and the 0 or 1 symbol. The following illustration shows the jumper on a pin block being moved from position 0 to position 1. The orientation and labels for the jumpers on your system board might be different from those shown here.



To change a jumper setting:

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

Changing Jumper Settings

What to do next?

- Installing an L2 cache kit? — Go to “Installing an L2 Cache Kit” on page 111.
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 134.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Adding a microprocessor? — Go to “Installing a Microprocessor” on page 197.
- Installing a security feature? — Go to “Security Procedures” on page 204.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external option? — Go to “Connecting External Options” on page 214.

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 installing the second microprocessor, your PC Server 320 can operate as an SMP server. With symmetric multiprocessing, certain operating systems and application programs can distribute the processing load between the two microprocessors. This enhances performance for applications such as database transactions, graphics or CAD (computer-aided design) programs, and modeling or simulation programs.

Before you begin, be sure you have:

- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Removed the server cover (see “Preparing to Install Options” on page 106).
- Obtained one of the following operating systems (optional) at the specified release level:
 - IBM OS/2 for Symmetrical Multiprocessing Version 2.11 (OS/2 2.11 for SMP) or later
 - Microsoft Windows NT 3.5 or later
 - Novell NetWare 4.1 for SMP
- Located the documentation supplied with your server and operating system

Installing a Microprocessor

Notes:

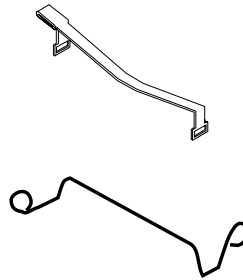
- Install the microprocessor before you install OS/2 2.11 for SMP. If you have already installed OS/2 2.11 for SMP, you must add the statement `PSD=OS2APIC.PSD` to the `CONFIG.SYS` file or reinstall OS/2 2.11 for SMP.
 - To optimize the performance of the second microprocessor, it is suggested that you increase the size of Level-2 cache memory in your server, if you have not previously done so.
 - The illustrations in this procedure might be slightly different from your hardware.
1. Refer to the printed system-board label inside your server to locate the secondary microprocessor socket. Your server comes with a microprocessor preinstalled in the primary socket. Therefore, you will install the new microprocessor in the secondary socket (also known as an upgrade socket).
 2. Remove the microprocessor from the static-protective bag. Locate the notch (beveled corner) on the microprocessor.
 3. Lift the latch on the socket.
 4. Carefully align the notch (beveled corner) of the microprocessor with the notch (beveled corner) on the socket.
 5. Center the microprocessor over the socket.

Installing a Microprocessor

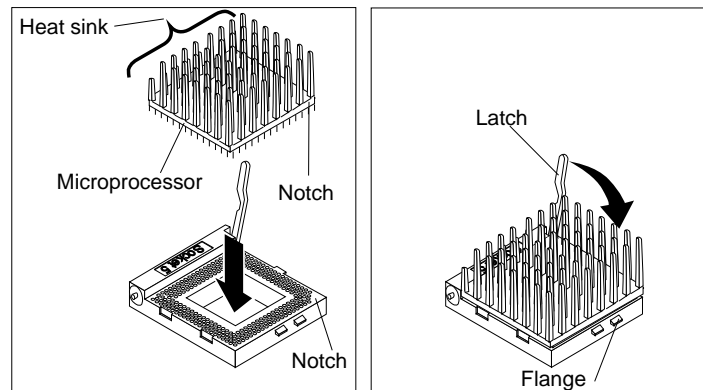
- Carefully put the microprocessor into place. Ensure the pins on the microprocessor align with the holes in the socket.

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

- Note the heat-sink clip that comes with the microprocessor and match it to one of the following figures.
 - If it is the top clip, go to step 8.
 - If it is the bottom clip, go to step 12 on page 201.



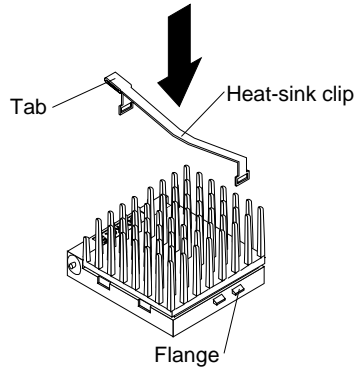
- Move the latch downward until the microprocessor is completely locked into the socket. Make sure the latch is in the fully closed position.



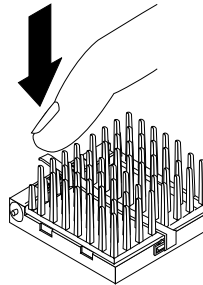
Installing a Microprocessor

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.



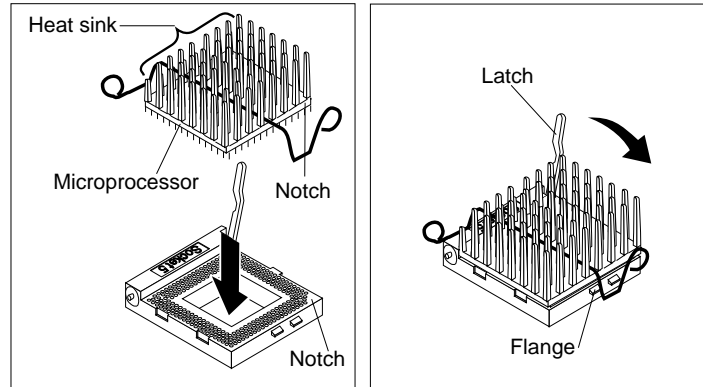
10. Clip one end of the heat-sink clip over the flange. Then, place the clip over the top of the heat sink and press down until it is secure on both sides of the socket.



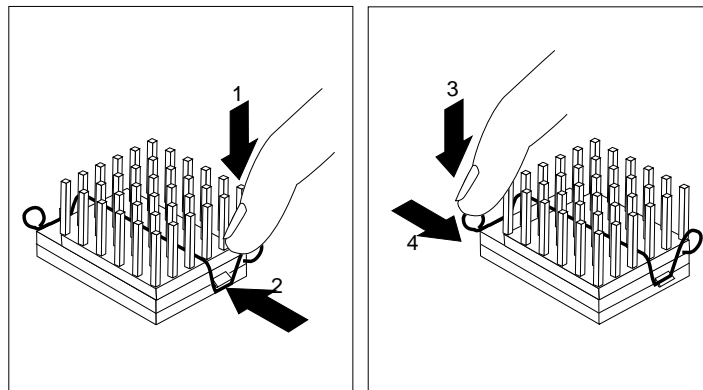
11. Go to step 14 on page 202.

Installing a Microprocessor

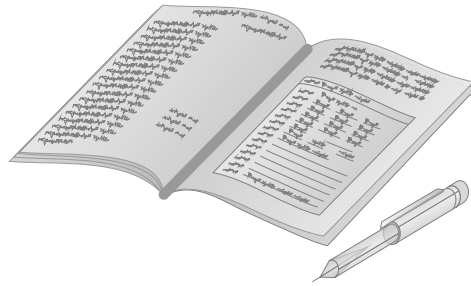
12. Move the latch downward until the microprocessor is completely locked into the socket. Make sure the latch is in the fully closed position.



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. Go to Table 7 on page 291 to record your microprocessor information; then, return here to determine your next step.

Note: Because you installed a new microprocessor in your server, you might want to upgrade your operating system. Install one of the operating systems that is listed at the beginning of this section. Follow the instructions in your operating system-documentation and note the software and operating system-considerations in Chapter 2, “Installing Software” on page 19.

What to do next?

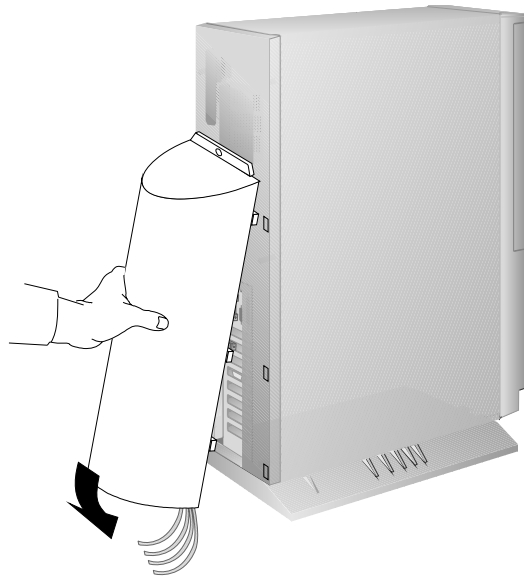
- Installing memory-module kits? — Go to “Installing Memory-Module Kits” on page 114.
- Removing memory-module kits? — Go to “Removing Memory-Module Kits” on page 120.
- Installing an adapter? — Go to “Installing Adapters” on page 123.
- Removing an adapter? — Go to “Removing Adapters” on page 130.
- Installing an internal drive? — Go to “Installing Internal Drives” on page 134.
- Removing an internal drive? — Go to “Removing Internal Drives” on page 173.
- Replacing the battery? — Go to “Replacing the Battery” on page 191.
- Setting a jumper? — Go to “Changing Jumper Settings” on page 195.
- Installing or removing a security feature? — Go to “Security Procedures” on page 204.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external drive? — Go to “Connecting External Options” on page 214.

Security Procedures

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

Security-Cover Option

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



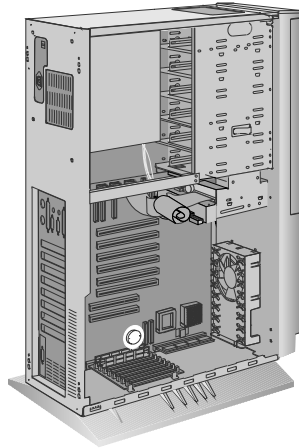
Removing an Unknown Power-On Password

Before you begin, be sure you have:

- Read the information about the power-on password in “Using the System Diskettes” on page 91.
- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Removed the server cover (see “Preparing to Install Options” on page 106).

Attention: If you use these instructions to remove an unknown power-on password, remember to set a new password after you reinstall the server cover. (See “Setting a Power-on Password” on page 88 for instructions.)

1. Remove the battery from the server as described in “Replacing the Battery” on page 191.



2. Wait approximately 15 minutes; then, reinstall the battery.

Note: After you remove and reinstall the battery, you must reconfigure your system and reset the system date and time (see Chapter 4, “Configuring Your Server” on page 75).

Security Procedures

What to do next?

- Setting a new power-on password? — Go to “Setting a Power-on Password” on page 88.
- Setting the administrator password jumper? — Go to “Setting the Administrator Password Jumper” on page 207.
- Installing a U-bolt? — Go to “Installing a U-Bolt” on page 209.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external drive? — Go to “Connecting External Options” on page 214.

Setting the Administrator Password Jumper

The system board and the system-board jumper settings for your model appear on a label inside your server. You will see the label when you remove the cover.

The administrator password jumper has two positions:

- In position 1 (called the *locked state*), an administrator password *cannot* be set, changed, or removed.
- In position 0 (called the *change state*), an administrator password *can* be set, changed, or removed.

Jumper positions are indicated by the 0 or 1 symbol printed on the system board next to the jumper with the jumper location identifier J15.

The default setting for this jumper is position 1.

Before you begin, be sure you have:

- Read the information about the administrator password (also known as the privileged-access or supervisor password) in “Using the System Diskettes” on page 91.
- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Removed the server cover (see “Preparing to Install Options” on page 106).

Attention: You cannot erase or override a forgotten administrator password. If you forget the administrator password, you must place a service call to regain access to your server.

1. Locate the 3-pin administrator password jumper. The jumper connector is labeled J15. (The jumper covers two of three pins on a pin block and might be positioned to the left or to the right.)

Security Procedures

2. To change the jumper setting:
 - a. Lift the jumper straight up off the pin block.
 - b. Align the holes in the bottom of the jumper with the center pin and the pin that was not covered previously.
 - c. Slide the jumper down over these pins.
3. Set the jumper to the desired position:
 - To set the administrator password to the *change* state, move the jumper to position 0.
 - To set the administrator password to the *locked* state, move the jumper to position 1.

What to do next?

- Setting a new administrator password? — Reinstall the cover as described under “Completing the Installation” on page 211; then, continue with the instructions in “Defining System Security” on page 84.
- Adding or changing a power-on password? — Go to “Setting a Power-on Password” on page 88.
- Installing a U-bolt? — Go to “Installing a U-Bolt” on page 209.
- No internal devices to install or remove? — Go to “Completing the Installation” on page 211.
- Installing an external drive? — Go to “Connecting External Options” on page 214.

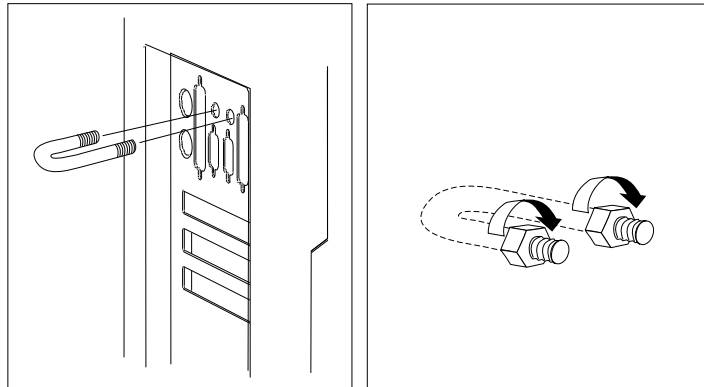
Installing a U-Bolt

Before you begin, be sure you have:

- A 19 mm (3/4 in.) U-bolt or wire rope (similar to National Manufacturing No. 3230, STK No. 176-735).
- A security cable.
- A lock, such as a combination lock or padlock.
- Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.
- Removed the server cover (see “Preparing to Install Options” on page 106).

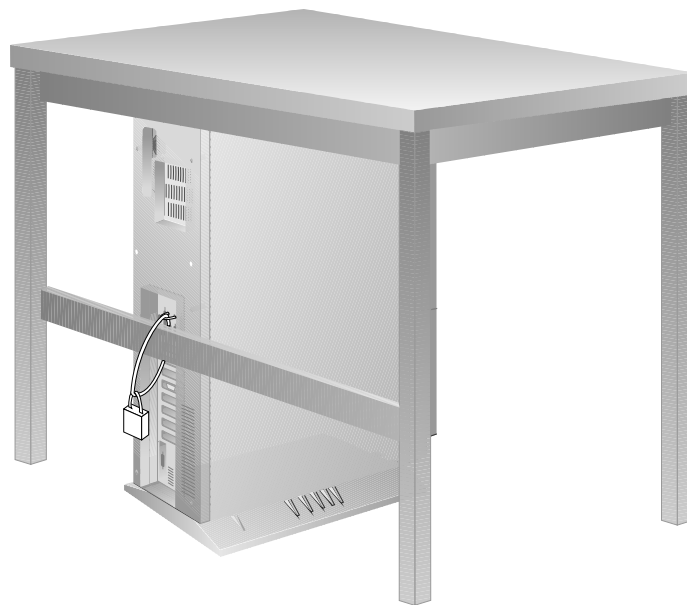
1. Install the U-bolt:

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



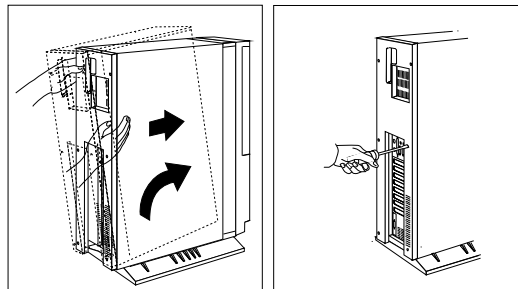
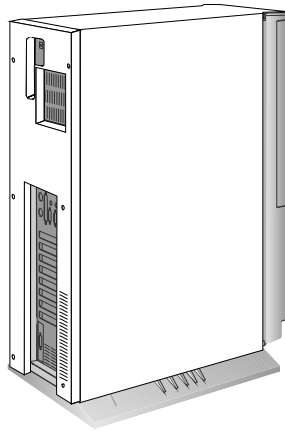
Installing a U-Bolt

2. Reinstall the server covers, and attach the cables (see “Completing the Installation” on page 211).
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.



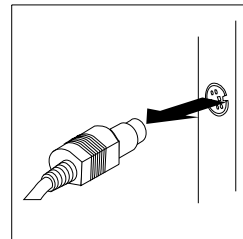
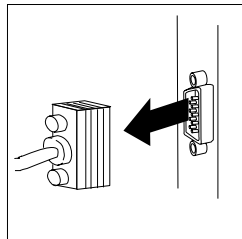
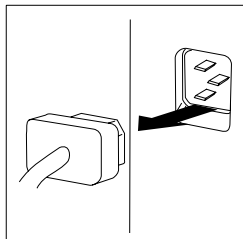
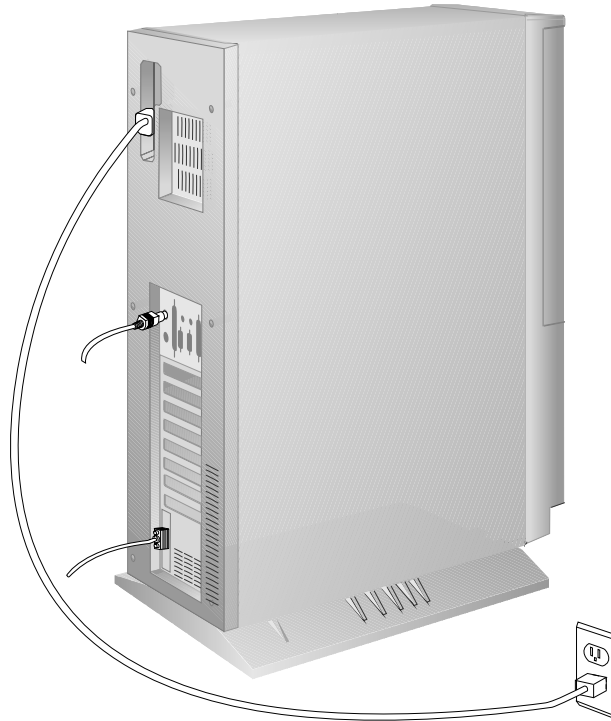
2. Close and lock the door.

Attention: Be sure to maintain a clearance of at least 51 mm (2 inches) on all sides of the server to allow for air circulation.

Completing the Installation

3. 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?

- Connecting external options? — Go to “Connecting External Options” on page 214.
- No external options to connect? — Go to “Updating System Programs” on page 220.

Connecting External Options

— Before you begin, be sure you have: —

Read “Electrical Safety” on page 104 and “Handling Static-Sensitive Devices” on page 105.

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, modems, and other serial and parallel devices, and an uninterruptible power supply (UPS).

The information in this section supplements the instructions that come with the external option. Use the instructions that come with the option to prepare it for installation.

Adding a Hot-Swap Storage Expansion Enclosure

The IBM 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.



Adding External SCSI Devices

Notes:

1. If you plan to install both internal and external SCSI devices, you must follow the instructions given in “SCSI Drives” on page 141 in addition to the instructions in this section. Read “SCSI Drives,” and then return here.
2. You cannot use both 16-bit SCSI-2 connectors on the system board to support internal SCSI devices, at the same time and also use the external connector.

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

Before you install external SCSI devices, you must have the correct external SCSI cables. The cables must have the proper connectors to attach to the the external SCSI-2 connector on one end, and 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.

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 6. Maximum External SCSI Cable Lengths

Connecting External Options

The SCSI-2 connector can support a total of 15 devices, provided that you do not exceed the maximum cable lengths listed in Table 6.

You must set a unique SCSI ID for each external SCSI device connected to the SCSI-2 controller. The default ID for the SCSI-2 controller is 7. In a non-disk-array model, the ID for the preinstalled CD-ROM drive in bay 3 is 3. If your server comes with a preinstalled hard disk drive in bay 1, the ID is 0. Therefore, do not set the SCSI IDs for external devices to these values or to the values that you use for other internal devices. (See “SCSI Drives” on page 141 for additional SCSI IDs.) Refer to the instructions that come with the SCSI devices for more information about setting a SCSI ID.

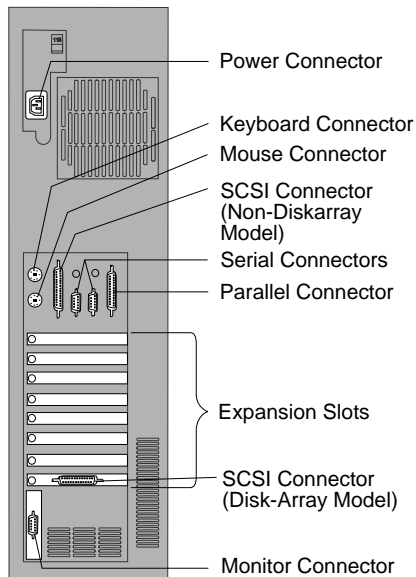
Note: If you install a SCSI-2 adapter in an expansion slot, you can use the same SCSI IDs that you use for the SCSI-2 controller on the system board.

Connecting External Options

Adding External Options

To add an external option:

1. Turn off the server and all attached devices.
2. Follow the instructions that come with the option to connect it to the server; then, go to “What to do next?” on page 219 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 the UPS, you must load the support software 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.

What to do next?

- Device drivers to install? See the instructions that come with the option to determine if device drivers are required, and, if so, how to install them.
- Go to “Updating System Programs” on page 220 to see if you need to update the system programs.
- If you don't need to install any device drivers or update the system programs, your server is ready to use.

Updating System Programs

Before you begin, be sure you have:

- Installed the server cover, cables, and power cords (see “Completing the Installation” on page 211).
- Connected all of your external options (see “Connecting External Options” on page 214).

When you install or remove an internal option or external SCSI device, you might need to update some system programs. See “Using the System Diskettes” on page 91 for detailed information about the system programs. Some updating requirements might include:

- Running the automatic configuration program
- Copying an Option Diskette (required only if an Option Diskette comes with the option)
- Backing up the changed programs
- Installing device drivers (required only if the option has device drivers)
- Following the instructions that come with an adapter developer diskette (ADD) and the adapter

Notes:

- All system programs are located on a Reference Diskette that comes with your server. Be sure to make a backup copy of the Reference Diskette onto another diskette.

Store the original Reference Diskette in a safe place, and use the backup copy of the system diskettes when configuring and troubleshooting your server.

- If you used the Configuration/Setup or SCSISelect utility programs to make changes to your server configuration, be sure you have a record of any customized settings *before* you do the following steps. *If you run the Configuration/Setup utility program, you must restore the settings.*

- Follow the instructions given under “Updating the System Diskettes.”

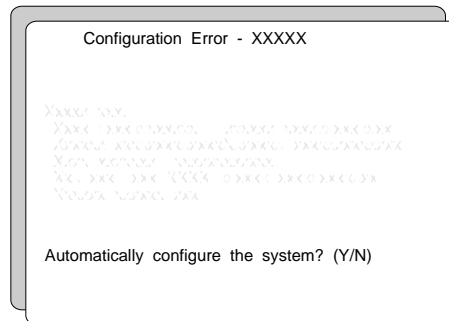
Updating the System Diskettes

To update the system programs on the System Diskettes:

1. Remove all media from the drives; then, turn on all external devices. Turn on the server.

After a few moments, a configuration message appears on the screen. This is normal because you changed the server configuration when you added or removed options. (If you do not get the message, check for loose connections on the options you just installed.)

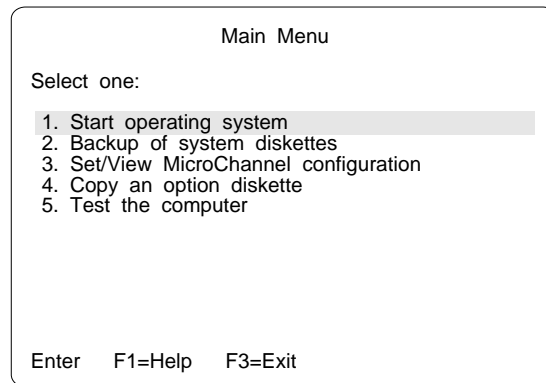
2. Insert the backup copy of the Reference Diskette. Turn the server off, and turn it on again, or restart the system (press **Ctrl+Alt+Del**) if the server is already on.



3. If you do not have any Option Diskettes to copy, press Y (for Yes) to start the Automatic Configuration program. When the program is completed, go to step 8 on page 223.
4. If you have Option Diskettes to copy, press N (for No) to skip the Automatic Configuration program; then, continue with the next step.

Updating System Programs

5. When the Main Menu appears, and displays the following choices.



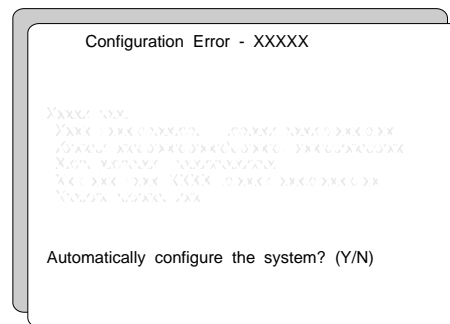
- a. Select **Copy an option diskette** and follow the instructions on the screen.
- b. Remove the Option Diskette from the diskette drive.
- c. Repeat this step until you have copied all of your Option Diskettes.

6. Update your configuration information:

Press **Ctrl+Alt+Del**; then, release the keys.

After a few moments, a configuration message appears on the screen. This is normal because you changed the server configuration when you added or removed options.

7. Press **Y** (for Yes) to automatically update the configuration information. In a few moments, a message appears on the screen indicating that the process is complete.



8. Back up the configuration information:

- a. When the Automatic Configuration is complete, the Reference Diskette restarts the system. The IBM Logo screen appears.
- b. Press **Enter** to go to the Main Menu.
- c. From the Main Menu, select **Backup of system diskettes** and follow the instructions on the screen.

The updated configuration information will be copied to the backup copy of the Reference Diskette.

Updating System Programs

9. Remove the backup copy of the Reference Diskette from the drive.

Press **Enter** to restart the system. Complete any other instructions specific to your options.

Notes:

- After copying all the Option Diskettes and backing up the configuration information, remember to write protect the backup copy of the Reference Diskette. Locate the switch on the left side of the backup copy of the Reference Diskette, and then push the switch down to prevent overwriting the information stored on the diskette.
- If you are configuring your system for the first time, you will be prompted to install an operating system upon completion of step 9. See Chapter 2, “Installing Software” on page 19 or refer to your operating-system documentation for instructions for installing your operating system.
- For information regarding system configuration requirements and backup procedures:
 - If your server is a disk-array system, see Chapter 3, “Configuring the Disk Array” on page 35 and “Using the System Diskettes” on page 91. If you installed hard disk drives, you must configure each newly installed hard disk drive as a hot-spare drive or as part of a disk array. See “Defining a Hot-Spare Drive” on page 53 or “Creating a Disk Array” on page 46 for instructions.
 - If your server is a non-disk-array model, see “Using the System Diskettes” on page 91.
 - If you installed options during setup and have updated your configuration, return to Chapter 2, “Installing Software” on page 19 and complete the setup and installation procedures.

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 279.

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Introduction

System problems can be caused by the hardware, the software, or a user error. (An example of a user error is pressing the wrong key.) You might be able to solve the problem yourself or provide helpful information to a service technician.

You can check the hardware by using the test programs and the information in this chapter. If the hardware is OK, and you have not made an error, you might have a software problem. If you suspect that you have a software problem, refer to the information that came with that software package.

CAUTION:

You could injure yourself if you attempt to lift or move an object that is too heavy for you. Always get another person to help you. Be careful when moving or changing the position of the system and its attached devices.

Getting Started

If you are not familiar with the diagnostic tools and system programs, continue reading the following sections. If you are familiar with these topics, select the appropriate instructions from the list below:

- To interpret an error message (for example, you have a **210** on the screen), go to “Error Messages” on page 246.
- For more information about a hardware failure (for example, keys on the keyboard not working) or a screen prompt, go to “Troubleshooting” on page 261.

Diagnostic Tools Overview

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

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

Power-On Self-Test (POST)

Each time you turn on the system, it performs a series of tests that check the operation of the system and some options. This series of tests is called the *power-on self-test*, or *POST*. POST does the following:

- Checks some basic system-board operations
- Checks the memory operation
- Compares the current system configuration with the stored system configuration information
- Starts the video operation
- Verifies that the diskette drive is working
- Verifies that the hard disk drive is working

While the memory is being tested, the amount of available memory and the KB OK message appear on the screen. These numbers advance as the system progresses through POST. If POST finishes without detecting any problems, a single beep sounds and the first screen of your operating system or application program appears.

If POST detects a problem, an error message appears on your screen. A single problem might cause several error messages to appear. When you correct the cause of the first error message, the other error messages probably will not appear on the screen the next time you turn on the system.

POST Beep Codes

POST generates a beeping sound to indicate successful completion of POST or to indicate that the tests detect an error.

One beep and the appearance of text on the monitor indicates successful completion of the POST. More than one beep indicates that POST detects an error.

For more information on beep codes, see “Beep Codes” on page 268.

Test Programs

The System Board Diagnostic Diskette contains the QAPLus/PRO test programs, developed by DiagSoft, Inc. for IBM. These programs are the primary method of testing the system board, memory, disk drives, and many other options that you install in the IBM PC Server 320. The test programs on the Micro Channel Diagnostic Diskette test any Micro Channel adapters that you install.

These programs require minimal interaction from you. You can use them to test the IBM components of the system and some external devices. The amount of time required to test all components depends on the number of components. The more optional adapters and devices you have attached to your system, the longer the testing takes.

If you cannot determine whether a problem is caused by the hardware or by the software, you can run the test programs to confirm that the hardware is working correctly.

The programs on the System Board Diagnostic Diskette include the following:

- Diagnostic Tests

The diagnostic tests identify most problems associated with the major components of your system. These programs test the system board, hard disk drives, diskette drives, CD-ROM drives, RAM, serial and parallel ports, video adapter, printer, keyboard, and mouse.

Diagnostic Tools Overview

Test options let you run groups of tests in a batch, specify parameters to use for each test (for example, video modes, port addresses, and so on), specify the number of passes you want to run (one to continuous), log the test results to a text format file, and save all test settings for future use.

These test programs also allow you to view the server's configuration information. For example, you can view the IRQ and DMA assignments, memory usage, device drivers, and so on.

- Utility Programs

The System Board Diagnostic Diskette also contains utility programs, such as an ASCII text editor, a 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 247.

POST Beep Codes

POST beep codes are sounds emitted from the speaker if POST finds a problem. One beep indicates 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 268.

Diagnostic Error Messages

Diagnostic error messages appear when a test program finds a problem with a hardware option. Normally, these messages are text, but they can be numeric. The test programs will generate one of the following return codes:

- 0** A return code of “0” indicates that the device passed its test.
- 1** A return code of “1” indicates that the device failed its test.
- 2 or higher** A return code of “2” or higher indicates that the test stopped.

Software-Generated Error Messages

These messages appear if a problem or conflict is found by an application program, the operating system, or both. For an explanation of these messages, refer to the information that came with your software package.

RAID Adapter Messages

These messages apply to disk-array models that have the IBM SCSI-2 Fast/Wide PCI-Bus RAID Adapter. The messages are listed in alphabetic order in “RAID Adapter Message Table” on page 258.

Troubleshooting Charts

The troubleshooting charts given in “Troubleshooting Charts” on page 261 list symptoms of problems (for example, perhaps the symptom is “the mouse is not working”), as well as steps to correct the problems.

Testing the System

Option Diskettes

An optional device or adapter might come with a diskette. Option Diskettes usually contain diagnostic files or configuration files that the system needs to recognize and activate the option.

If your optional device or adapter came with an Option Diskette, you might need to install some configuration files or diagnostic files. See Chapter 4, “Configuring Your Server” on page 75 for instructions on installing the configuration files, or see “Installing Additional Test Programs” on page 271 for installing diagnostic files.

Testing the System

The Test the Computer program provides access to two test programs for your system: the Advanced Diagnostics programs and the Micro Channel Diagnostics. These test programs are designed to test IBM products only. Non-IBM products tested with these programs might present misleading error messages or unexpected system responses. If you want to test a non-IBM product, refer to the information that came with that product.

Note: You might have to install a wrap connector on your active parallel port to obtain accurate parallel-port test results. If you do not have a wrap connector, contact your IBM reseller or IBM marketing representative.

This section includes procedures for starting the Test the Computer program and starting the diagnostic programs. In addition, this section includes useful information about navigating through the test programs, as well as procedures for starting and stopping them. These programs are designed to test the IBM PC Server 320.

Starting the Test the Computer Program

Note: Always use the backup copy of the system diskettes when configuring and troubleshooting your server.

To start the Test the Computer program:

1. Insert the backup copy of the Reference Diskette into the primary diskette drive.
2. Turn on the system. Or, if the system is turned on already, insert the Reference Diskette and press **Ctrl+Alt+Del**.

The system begins the power-on self test. If a power-on or administrator password is set, the system prompts you to enter it.

Note: If an administrator password is set, you *must* enter it to access the Reference and Diagnostic Diskettes.

After a few moments, the system programs Main Menu appears.

3. Select **Test the computer** from the Main Menu; then, press **Enter**.
4. To test the system board, disk drives, video, and other system components, select **System board diagnostics**; then, press **Enter**. When prompted, remove the Reference Diskette and insert the System Board Diagnostic Diskette. Then go to “The Main Menu of the System Board Diagnostic Diskette” on page 234.
5. To test Micro Channel adapters, select **Option diagnostics**; then, press **Enter**. When prompted, remove the Reference Diskette and insert the Micro Channel Diagnostic Diskette. Follow the instructions on the screen.

If the system stops during testing and you cannot continue, have the system and keyboard serviced.

If the test program does not find a problem, refer to “Troubleshooting” on page 261, and look for the problem symptom.

The Main Menu of the System Board Diagnostic Diskette

The Main Menu is the starting point for all of the diagnostic tests.

It contains the following choices:

- **Diagnostics:** When you select this choice from the Main Menu, the Diagnostics Menu appears. The Diagnostics Menu contains the following selections:
 - **Quick Check** automatically checks the hardware configuration and builds a group of tests based on the configuration check. The diagnostic program then runs the tests for each of the devices or modules found during the configuration check. Upon completion of the Quick Check, you are prompted to: Press any key to continue. Pressing any key at that point brings you back to the Diagnostics Menu.
 - **Module Tests** allow you to more rigorously test an individual module (or device such as a diskette drive) or specify a group of tests for several modules. In addition, you can specify how many times to run an individual test and how the test program should note and log any errors it finds. See “Using the Module Tests” on page 241 for more information about running the module tests.
 - **Options** allow you to set or change defaults that affect the reporting, error logging, and presentation of the error information. For more information about the options available, see “Test Options” on page 243.
- **System Info:** When you select this choice from the Main Menu, the System Info Menu appears. The System Info Menu allows you to view the server's hardware and software configuration information. For example, you can view the IRQ and DMA assignments memory usage, address and attribute information for device drivers, and so on.
- **Reports:** When you select this choice from the Main Menu, the Reports Menu appears. The Reports Menu allows you to print the system information.

- **Utilities:** When you select this choice from the Main Menu, the Utilities Menu appears. The Utilities Menu provides access to additional programs on the System Board Diagnostic Diskette. These utility programs include: RAM Chip Locator, File Editor, Format Diskette, and Hard Disk Utilities. For more information about the File Editor, see “Using the File Editor” on page 273.
- **Exit:** Select this choice to exit from the System Board Diagnostic Diskette.

Program Navigation

You can maneuver within the test programs by typing the first letter of a menu choice, using the function keys, or using command-line options.

Using the Function Keys

You can use the following keys to maneuver within the test programs:

Enter	Selects an item, runs the test module, or runs the test.
Down Arrow (↓)	Moves the cursor down.
Up Arrow (↑)	Moves the cursor up.
F1	Displays the appropriate Help information. Use the Up Arrow (↑) or Down Arrow (↓) key to scroll through the information. Pressing F1 from within a Help screen provides a help index from which you can select different categories. Pressing Esc exits Help and returns to where you left off.
Esc	Returns to the previous menu.
Tab	Moves the highlight bar (or cursor) to the test group (or moves to parameters).

Testing the System

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 without having to back up through menus.• Single Test moves from the Module Test Menu to the relevant Test Group window for test selection.• Next and Previous LUN changes from one Logical Unit Number (LUN) or device to another (for example, HD1 to HD2, or Base Memory to Extended Memory).
+	Displays next logical unit number (only used in the Test Module menu and Test Group screens).
-	Displays previous logical unit number (only used in the Test Module menu and Test Group screens).

Using the Command Line Options

The following Command Line Options allow you to define specific conditions for running the diagnostic programs at startup time.

At the operating system prompt, type QAPRO /XXX (where /XXX represents one of the following from the list below); then, press

Enter:

- | | |
|-------------------------|---|
| /B&W | The /B&W option forces the program to load in black and white (monochrome) mode. |
| /LOG=file | The /LOG=file option directs the test programs to start using a specified Error Log file. |
| /INT10 | The /INT10 option forces the test programs to use the Basic Input/Output System (BIOS) for screen writes. |
| /OXXX | The /OXXX option, where XXX =test group (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, 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 diagnostic tests:

Note: Use your backup copy of the System Board Diagnostic Diskette or Micro Channel Diagnostic Diskette when you run the diagnostic programs.

1. Insert the Reference Diskette into the primary diskette drive (usually drive A).
2. Turn on the system. Or, if the system is turned on already, insert the Reference Diskette and press **Ctrl+Alt+Del**. After a few moments, the system programs Main Menu appears.
3. Select **Test the computer**; then, press **Enter**.
 - a. To test Micro Channel adapters, Select **Option diagnostics** from the Test the Computer menu; then, press **Enter**. A message prompts you to remove the Reference Diskette and insert the Micro Channel Diagnostic Diskette into the primary diskette drive. Follow the instructions on the screen.
 - b. To test the system board and system components, go to step 4.
4. Select **System board diagnostics** from the Test the Computer menu; then, press **Enter**.
5. Insert the System Board Diagnostic Diskette into the primary diskette drive.

The IBM PC Server logo appears on your screen followed by the system running POST. When POST completes, QAPlus/PRO for IBM appears on your screen.

6. Press any key to continue. The Welcome window appears.
7. Press any key to continue.

Note: IntruderAlert starts and runs automatically after you press any key. If IntruderAlert detects a problem with the System Board Diagnostic Diskette, it will automatically stop further testing. See “IntruderAlert” on page 237 for more information.

8. Press **Enter**.

Several analysis programs start and run automatically. When they complete, the Main Menu appears.

9. Use the **Up Arrow** (↑) or **Down Arrow** (↓) key to move the highlight bar to your desired Main Menu selection.

10. Press **Enter**.

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

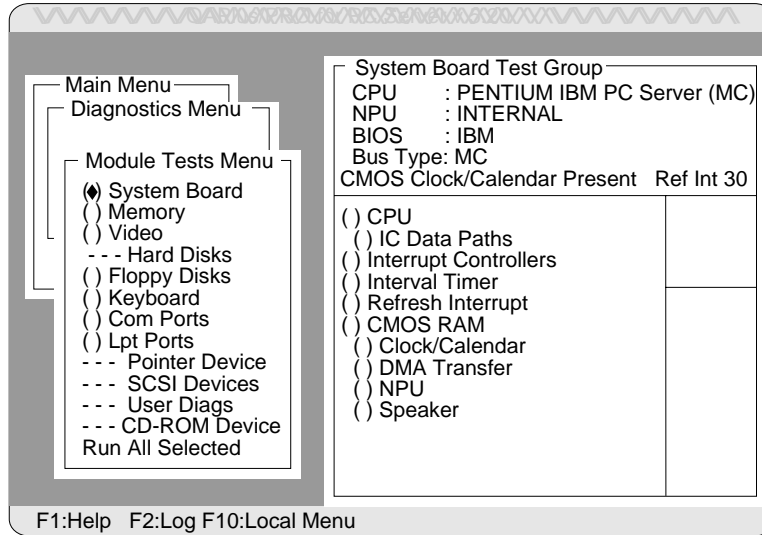
The Test Group Window

When you select Quick Tests or Module Tests from the Diagnostic Menu, a Test Group window appears. (For Module Tests, if you press Tab, the window expands to a full screen.) The Test Group window shows the attributes, parameters, and selected tests of the corresponding Test Group. The diamond “◆” mark indicates a module or device selected for testing.

Starting the Test Programs

Test Group Specifications: In the upper portion of the Test Group window are the specifications for the related test group.

The following illustration is an example of the Test Group Window when the System Board is selected from the Module Tests Menu.



Using the Module Tests

To start the Module Tests from the Main Menu of the System Board Diagnostic Diskette:

1. Start the diagnostic programs. If you do not know how to do this, see “Starting the Test Programs” on page 238.
2. Select **Diagnostic** from the Main Menu; then, press **Enter**.
3. Select **Module Tests**; then, press **Enter**. Use the **Up Arrow** (↑) or **Down Arrow** (↓) key to move the highlight bar from one selection to the next within the Module Tests menu.
4. To select or deselect a test, use the Spacebar (the Spacebar toggles your selection on or off). When you have selected a test, a ♦ appears next to the selection.

Attention: An (*) directly adjacent to an item indicates that running that test might damage your data. Make sure to back up all of your data *before* running the tests.

5. If you want to run all of the selected tests, you can do so by moving the highlight bar to the last choice, **Run All Selected Modules**, then pressing **Enter**. If you want to run each test, one at a time, press **Enter** at the highlight bar of the desired selection.
6. When you are done, press **Esc** to return to the Test Group window.

Note: As you move the highlight bar up or down the selection menu, the Test Group window to the right changes to correspond to the highlighted module.

Starting the Test Programs

Changing Selected Tests in Test Groups

To add or remove a test from a Test Group:

1. In the Module Tests Menu, use the **Up Arrow** (↑) or **Down Arrow** (↓) key to move the highlight bar to your selection.
2. Press **Tab** to move into the expanded Test Group window.
3. Move the highlight bar to the test you want to select or deselect.
4. Press the Spacebar at the highlighted test to toggle between select (indicated by a “◆”) and deselect.

Attention: An (*) directly adjacent to an item indicates that running that test might damage your data. Make sure to back up all of your data *before* running the tests.

5. Press **Enter**.

Creating Test Scripts

Scripting allows you to select specific groups of tests, testing parameters, and options. You can then save your selections for later use as a test *script*.

To set up a test script:

1. Select **Diagnostics** from the Main Menu; then, press **Enter**.
2. Select **Module Tests**; then, press **Enter**.
3. Select the test groups and specific tests.
4. Select **Save Script** (the last item on the Options Menu).
5. Type in a file name. The test program automatically adds the extension “QA.”
6. To load and run the test program with this test setting, type: QAPRO /SCRIPT-*Filename*,R and then, press **Enter**.

Note: Adding the “,R” runs the tests listed in the named Test Script. If this is omitted, the diagnostic program loads only the program with the test settings as previously saved in the chosen Script File.

Test Options

Each option that appears on the Options Menu is briefly described below.

- **Halt on Error:** The default is **No**. If you select **Yes**, you can resume testing after a halt by pressing any key. If you select **No**, any error detected is logged (only if you enabled the Test Log) and the program continues testing without halting.
- **Beep on Error:** The default is **No**. If you select **Yes**, a beep sounds whenever the test program detects an error.
- **Lap Count:** This option allows you to set the number of times to run each group of tests. The default setting is 1. You can enter a number from 0 to 10. The looping is controlled on a block basis, not on an individual test basis. Therefore, if you select tests A, B, and C and the Lap Count is set to 3, the test sequence is ABC/ABC/ABC.
- **Pause Control:** You can choose to have the test programs pause between test modules and wait for you to press any key to continue. Also, you can choose to have the test program wait for a user response to indicate if the video tests pass. The default setting is **Pause Between**. The available choices are **Pause Between** and **No Pause**. If you choose **No Pause**, the test programs continue testing without a pause from one video test to the next, and from one test module to the next.
- **Test Log:** Allows you to select whether or not to do logging. You can select one of the following five choices:
 - No Logging
 - COM1
 - LPT1
 - ASCII
 - .DBF

No Logging is the only selection that turns off Test Log. The other four selections enable Test Logging.

Starting the Test Programs

When Test Log starts, the test programs create a log with the following information:

- The date and time the log was opened
- The start and end times of each module tested and for each test selected for that module
- The results of testing
- The date and time the log was closed

Disabling the Test Log writes the date and time to the Test Log along with a message that the log was closed. Any Test Log is automatically closed upon exiting the program.

If you enable Test Log, the hardware configuration is automatically entered at the beginning of the log.

If you select **ASCII File**, the test programs prompt you to type in the name of the Test Log file. The test programs automatically assign the extension **.LOG** to the file if you do not specify a file-name extension. The file is stored in ASCII text format. You can then examine the file with most word processors and text editors at a later time.

If you select **.DBF File**, the test programs prompt you to fill in the information on an Open DBF File screen. This creates a new file or opens an existing data base compatible file to insert new information on the current test machine. The Machine Type, Serial Number, and Work Center lines identify the system that is being tested.

Note: If you plan to run hard disk tests and to do test logging, do the test logging on a drive other than the drive to be tested. If you log to a drive that is to be tested, the logging is disabled for the remainder of the test cycle.

- **Test Log Mode:** This choice determines the amount of data to be logged after you select COM1, LPT1, ASCII, or .DBF. The available options are LogAll or LogFail. LogAll logs all test information. LogFail logs only failures.
- **Log Message Queue:** Pressing F2 allows you to examine the test results to date via a Log Message Queue. This information is generated whether or not you select a Test Log. It does not, however, allow you to examine previous Test Logs.
- **Save Script:**
See “Creating Test Scripts” on page 242 for a more detailed description of scripting.

Option Diskettes

An optional device or adapter might come with a diskette. If it does, the system needs the files on the diskette so that it can recognize and activate that specific option. You can tell the purpose of the files by their file-name extensions:

File-Name Extension	File Purpose
ADF	Configuration files
DGS	Diagnostic Files
PEP	Message Files

Follow the instructions that came with the option. Different instructions apply depending on whether the Option Diskette is startable or not startable.

Some adapter manufacturers supply an adapter developer diskette. Procedures vary with these diskettes. Use the instructions provided with the adapter developer diskette.

Error Messages

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

Types of Messages

System problems can result in two types of error messages:

- POST error messages appear when, during startup, POST finds problems with the hardware or detects a change in the hardware configuration.
- Diagnostic error messages appear when the Test the Computer program or Diagnostic program finds a problem with hardware.

Messages generated by your software—the operating system or application programs—generally are text messages, but they also can be numeric. Information about these messages is not included in this handbook. For information about these error messages, refer to the documentation that comes with your software.

Multiple Messages

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

POST Error Message Table

The following table shows error messages that might appear on the screen during the power-on self-test (POST).

Notes:

1. The actions for some of the messages require you to start the system programs. (For instructions, see “Using the System Diskettes” on page 91.)
2. The actions for some of the messages require you to start the Configuration/Setup utility program. (For instructions, see “Starting the Configuration/Setup Utility Program” on page 79.)
3. If a password prompt appears with a POST message, type the administrator or power-on password; then, press **Enter**.

POST Message	Description
101 102 106	A failure occurred during testing of the system board and microprocessor. <i>Action:</i> Turn off the system, wait 30 seconds; then, turn it back on. If the error message reappears, have the system serviced.
111	An I/O channel check occurred during testing of the system board and memory. Defective memory, the system board, or the microprocessor could cause this error. <i>Action:</i> Start the system programs and run the Test the Computer program to determine the cause of the problem and the action to take.
114	An adapter ROM (read-only memory) error occurred. <i>Action:</i> Start the system programs and run the Test the Computer program to determine the cause of the problem and the action to take. If the error message reappears, have the system serviced.
151	The real time clock has failed. <i>Action:</i> Start the system programs and run the Test the Computer program to determine the cause of the problem and the action to take.

Error Messages

POST Message	Description
161	<p>The real-time clock battery has failed.</p> <p>CAUTION: The lithium battery (IBM part number 33F8354) presents a fire, explosion, or severe burn risk. Do not recharge it, disassemble it, heat it, incinerate it, or expose its cell contents to water. Dispose of the battery as required by local ordinances or regulations.</p> <p><i>Action:</i> Call for service, or replace the battery yourself (see “Replacing the Battery” on page 191 for assistance).</p>
162	<p>POST found a configuration data error.</p> <p><i>Action:</i> Turn off the system and make sure all attached devices are turned on; then, turn on the system.</p> <ul style="list-style-type: none">• If you have changed the configuration (for example, added or removed an option), enter Configuration/Setup to clear the configuration errors.• If you have not changed the configuration, start the system programs and run the Test the Computer program to determine the cause of the problem and the action to take.
163	<p>Time of day has not been set.</p> <p><i>Action:</i> Start the Configuration/Setup utility program; then, select Date and time to set the correct date and time. Until the system is serviced, it can be used, but any application programs that use the date and time will be affected.</p>
164	<p>A change in the memory configuration occurred. Installing memory, incorrectly installing memory, or removing memory can cause this problem. It also can occur if a defective memory module is disabled.</p> <p><i>Note:</i> The system can be used with decreased memory capacity.</p> <p><i>Action:</i></p> <ul style="list-style-type: none">• If you have just installed memory, see “Installing Memory-Module Kits” on page 114 to verify that the new memory is correct for your system. Then start the system programs and run the Test the Computer program to identify the location of the problem memory module.• If you have not just installed memory, have the system serviced.

POST Message	Description
165	<p>A change in the Micro Channel adapter configuration occurred. This error generally occurs under one or more of the following conditions:</p> <ul style="list-style-type: none"> • A new Micro Channel adapter was installed and the system was not reconfigured. • One or more Micro Channel adapters were removed. • One or more Micro Channel adapters were moved to a different slot. • A Micro Channel adapter is failing and is no longer recognized by the system as being installed. <p><i>Action:</i></p> <ul style="list-style-type: none"> • If you just added, removed, or changed the location of an adapter, start the computer and select Yes to run the Automatic Configuration program. Enter the Configuration/Setup utility program. If you installed a Micro Channel adapter, select Micro Channel Configuration, and follow the instructions on the screen. <p>If an adapter description file (ADF) is missing, the Configuration/Setup utility program identifies the slot number of the unidentified adapter. In that case, you will be prompted to insert the Option Diskette.</p> <p><i>Note:</i> Some adapters have an <i>additional</i> diskette containing the required ADF file.</p> <ul style="list-style-type: none"> • If you did not add, remove, or change the location of an adapter, an adapter probably failed. Have the system serviced.
175	<p>A hardware error occurred.</p> <p><i>Action:</i> Have the system serviced.</p>
176	<p>The system cover or the security cover (if you have one) has been removed without a key being used.</p> <p><i>Action:</i> If an administrator password is set, you must enter the password to clear the latch.</p>
177 178	<p>A hardware error occurred.</p> <p><i>Action:</i> Have the system serviced.</p>
184	<p>The power-on password information stored in your system was corrupted.</p> <p><i>Action:</i> Restore the power-on password.</p> <p>Start the Configuration/Setup utility program and select System Security; then, select Power-on Password to set a new power-on password.</p>

Error Messages

POST Message	Description
185	<p>The stored information about the drive-startup sequence has been corrupted.</p> <p><i>Action:</i> Restore the startup sequence.</p> <p>Start the Configuration/Setup utility program; then, select Start Options.</p>
186	<p>A system board or security hardware error occurred.</p> <p><i>Action:</i> Have the system serviced.</p>
189	<p>An attempt has been made to access the system with invalid passwords.</p> <p><i>Action:</i> Enter the administrator password, if one has been set. The error is cleared when you exit from the Configuration/Setup utility program.</p>
201	<p>A failure occurred during memory testing. This error can be caused by incorrectly installed memory, a failing memory module, or a system-board failure.</p> <p><i>Action:</i></p> <ul style="list-style-type: none">• If you have just installed memory, see “Installing Memory-Module Kits” on page 114 to verify that the new memory is correct for your system. Then start the system programs and select System board diagnostics from the Test the Computer utility program menu to identify the location of the problem memory module.• If you have not just installed memory, have the system serviced. <p><i>Note:</i> Refer to “Installing Memory-Module Kits” on page 114 to determine which modules are supported in your system.</p> <p><i>Action:</i> Replace the failing memory module. If the error reoccurs, replace the memory module pair. If the problem remains, have the system serviced.</p>

POST Message	Description
229	<p>A failure occurred during cache memory testing.</p> <p><i>Action:</i> If you have just installed or replaced cache memory, see “Installing an L2 Cache Kit” on page 111 to verify that the new memory is correct for your system. If it is, use the following procedure:</p> <ol style="list-style-type: none"> 1. Start the Configuration/Setup utility program. 2. Select Advanced Setup. 3. Select Cache Control. 4. Select Cache State. 5. Press the Left Arrow (←) or Right Arrow (→) key to change the cache state to Enabled. <p>If the error persists, remove the L2 cache kit and have the system serviced.</p>
301	<p>An error occurred during testing of the keyboard and its controller.</p> <p><i>Action:</i></p> <ul style="list-style-type: none"> • Make sure that nothing is resting on the keyboard and pressing a key. • Verify that the keyboard cable is connected correctly to the keyboard and to the correct port on the system. • If you have just connected a new mouse or other pointing device, turn the system off and disconnect that device. Wait at least 5 seconds; then, turn on the system. If the error message goes away, replace the device. <p>If the error message remains, have the system, keyboard, and cable serviced.</p>
303	<p>A failure occurred while testing the keyboard controller.</p> <p><i>Action:</i> Have the system serviced.</p>
604	<p>A diskette drive failed.</p> <p><i>Action:</i> Remove the failing diskette drive. If the problem remains, have the system serviced.</p>
662	<p>A change has occurred to the configuration of the diskette drive.</p> <p><i>Action:</i> Start the Configuration/Setup utility program; then, select Devices and I/O Ports. Verify the number and type of diskette drives. If the problem persists, have the system serviced.</p>
762	<p>A fault has occurred on the system board.</p> <p><i>Action:</i> Have the system serviced.</p>

Error Messages

POST Message	Description
962	<p>An error occurred during testing of the parallel port on the system-board.</p> <p><i>Action:</i> If you have a parallel printer or other parallel device attached to your system, verify that the parallel cable is connected correctly. If it is, use the following procedure:</p> <ol style="list-style-type: none">1. Turn off the system.2. Disconnect the parallel cable from the parallel port.3. Turn on the system. <p>If the POST error message does not reappear, either the parallel cable or the device is probably failing.</p> <p>See the information that came with the parallel device for additional testing information.</p> <p>If the POST error message reappears, have the system serviced.</p>
1162	<p>An error occurred during testing of serial port 1 or serial port 2 on the system board.</p> <p><i>Action:</i> If you have a modem, serial printer, or other serial device attached to your system, verify that the serial cable is connected correctly. If it is, use the following procedure:</p> <ol style="list-style-type: none">1. Turn off the system.2. Disconnect the serial cable from the failing serial port.3. Turn on the system. <p>If the POST error message does not reappear, either the serial cable or the device is probably failing.</p> <p>See the information that came with the serial device for additional testing information.</p> <p>If the POST error message reappears, have the system serviced.</p>
1801	<p>No more room for PCI option ROM.</p> <p><i>Action:</i> Remove the failing PCI or Micro Channel adapter or Remove or manually reconfigure the Micro Channel adapters until the problem disappears. If the problem persists, have the system serviced.</p>
1802	<p>No more I/O space available for PCI adapters.</p> <p><i>Action:</i> Remove the failing PCI or Micro Channel adapter, or remove or manually reconfigure the Micro Channel adapters until the problem disappears. If the problem persists, have the system serviced.</p>

POST Message	Description
1803	<p>No more memory (above 1 MB) is available for PCI adapters.</p> <p><i>Action:</i> Remove the failing PCI or Micro Channel adapter, or remove or manually reconfigure the Micro Channel adapters until the problem disappears. If the problem persists, have the system serviced.</p>
1804	<p>No more memory (below 1 MB) is available for PCI adapters.</p> <p><i>Action:</i> Remove the failing PCI or Micro Channel adapter, or remove or manually reconfigure the Micro Channel adapters until the problem disappears. If the problem persists, have the system serviced.</p>
1805	<p>PCI option ROM checksum error.</p> <p><i>Action:</i> Remove the failing PCI adapter. If the problem persists, have the system serviced.</p>
1962	<p>No valid boot devices found. The system cannot find the startup drive or operating system.</p> <p><i>Action:</i> Be sure that the drive you want to start from is in the startup sequence.</p> <ol style="list-style-type: none"> 1. Select Start Options from the Configuration/Setup Menu. If you are unable to set the startup sequence, have the system serviced. 2. Check the list of startup devices in the Startup device data fields. Is the drive you want to start from in the startup sequence? <ul style="list-style-type: none"> Yes Exit from this screen; then, select Exit Setup to exit the Configuration/Setup menu. Go to step 3. No Follow the instructions on the screen to add the drive; then, save the changes and exit the Configuration/Setup menu. Restart the system. 3. Is an operating system installed? <ul style="list-style-type: none"> Yes Turn off the system. Go to step 4. No Install the operating system in your system; then, turn off the system. 4. Wait at least 5 seconds; then, turn on the system. During system startup, watch for messages indicating a hardware problem. <p>If the same error message appears, have the system serviced.</p>

Error Messages

POST Message	Description
2462	<p>An error occurred during testing of the video controller. This error can be caused by a failing monitor, system board, or video adapter.</p> <p><i>Action:</i> Verify that the monitor is connected correctly to the video adapter or video port. If it is, have the monitor and system serviced.</p> <p><i>Note:</i> Some systems come with an additional diagnostic diskette for the specific video adapter installed in the system. If your system came with an additional diagnostic package, refer to the information in that package.</p>
8601 8603	<p>An error occurred during testing of the pointing device (for example, a mouse or track ball) and pointing device controller. This error can be caused by the pointing device or by a failing system board.</p> <p><i>Note:</i> This error also can occur if electrical power was lost for a very brief period and then restored. In this case, turn off the system for at least 5 seconds; then, turn it on.</p> <p><i>Action:</i> Ensure the keyboard and pointing device are attached to the correct ports. If they are attached correctly, use the following procedure:</p> <ol style="list-style-type: none">1. Turn off the system.2. Disconnect the pointing device from the system.3. Turn on the system. <p>If the error message does not reappear, the pointing device is probably failing. See the documentation that came with the pointing device for additional testing information. If the problem remains, have the pointing device serviced.</p> <p>If the error message reappears, start the system programs and run the Test the Computer program to determine the cause of the problem and the action to take. If the problem remains, have the system serviced.</p>
19990301	<p>An error occurred while reading the fixed boot sector.</p>
Other Numbers	<p>The power-on self-test (POST) routine found an error.</p> <p><i>Action:</i> Follow the instructions on the screen.</p>

Diagnostic Error Message Table

The following table shows the hardware option related to the error messages that might appear on the screen when you run the Advanced Diagnostic program with the related option.

If one of these messages appears and your software does not require the use of the failing option, you can continue to use your system. However, you must have your system and related option serviced.

Note: The following table should be used for reference, because some error messages are not included and some options are not listed. The options that might not be listed are non-IBM hardware options and IBM hardware options that were released after this handbook was written.

Where “X” is used, it can be any alphanumeric character.

Message	Related Option
0012XXXX	Dual Async Adapter/A
0046XXXX	Multiport/2 Adapter
0075XXXX	Monitor adapter or system board
0096XXXX	SCSI adapter (with cache)
0100XXXX	Multiprotocol Adapter/A
0101XXXX	Modem Adapter/A
0106XXXX	Ethernet Network Adapter
0109XXXX	ActionMedia Adapter/A
0112XXXX	SCSI adapter (without cache)
0141XXXX	Real-Time Interface Coprocessor Portmaster Adapter/A
0152XXXX	XGA Display Adapter/A
0164XXXX	120 MB Internal Tape Drive
0165XXXX	6157 Tape-Attachment Adapter/Drive
0166XXXX	Token-Ring Network Adapter/A
0167XXXX	Token-Ring Network Adapter/A
200XXXX	Image Adapter/A
0206XXXX	SCSI-2 Fast/Wide Adapter/A
0208XXXX	Undetermined device type
0209XXXX	SCSI Direct Access Removable Media or other than 512-Byte Blocks
0210XXXX	SCSI hard disk
0211XXXX	2.3 GB SCSI tape drive
0212XXXX	SCSI printer

Error Messages

Message	Related Option
0213XXXX	SCSI processor
0215XXXX	SCSI CD-ROM drive
0216XXXX	SCSI scanner
0217XXXX	Rewritable optical drive
0218XXXX	SCSI Changer
0219XXXX	SCSI Communications
0243XXXX	XGA-2 Adapter Video
0258XXXX	XGA-2 System Board Video
0259XXXX	SVGA adapter
0270XXXX	IBM RAID Controller
0271XXXX	RAID Hard Disk Drive

SCSI Messages

If your server has at least one hard disk drive, review the following information before having the system serviced.

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

SCSI Messages	Description
All	<p>One or more of the following might be causing the problem.</p> <ul style="list-style-type: none"> • A failing SCSI device (adapter, drive, controller) • An improper SCSI configuration • Duplicate SCSI IDs in the same SCSI chain • An improperly installed SCSI terminator • A defective SCSI terminator • An improperly installed cable • A defective cable <p><i>Action:</i> Verify that:</p> <ul style="list-style-type: none"> • The external SCSI devices are turned on. External SCSI devices must be turned on before the system. • The cables for all external SCSI devices are connected correctly. • The last device in each SCSI chain is terminated correctly. (See “SCSI Drives” on page 141 for more SCSI chain information.) • The SCSI devices are configured correctly. <p>If the above are correct, run the diagnostics for additional information about the failing device. If the error recurs, have the system serviced.</p>

RAID Adapter Message Table

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

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>

SCSI Messages

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.

Troubleshooting

You can use the troubleshooting charts in this section to find solutions to problems that have definite symptoms.

Troubleshooting Charts

Look for the symptom in the left column of the chart. Instructions and probable solutions to the problem are in the right column.

Note: If you are instructed to use the System Diskettes, insert the Reference Diskette first. (Refer to “Using the System Diskettes” on page 91 for information on System Diskettes.)

In these charts, an *X* can be any alphanumeric character.

CD-ROM Drive Problems	Action
The CD is not working properly.	Clean the CD by wiping it with a soft, lint-free cloth, from the center of the CD to the outer edge. Do not clean in a circular pattern. This can cause loss of data. If this does not correct the problem, clean the optical-head lens. Discs for cleaning the lens are available from your place of purchase. If a problem still exists, have the system serviced.
CD-ROM Drive Tray Not Working	The server must be turned on. If the server is on and the tray does not extend out, insert the end of a paper clip into the manual tray-release opening. If the drive tray still does not extend properly, have the server serviced.
CD-ROM Drive Not Recognized	Use SCSISelect to verify the SCSI ID of the CD-ROM drive (see “SCSISelect Utility Program Options” on page 98 for information on the SCSISelect utility program). In a disk-array system, the SCSI ID for the CD-ROM drive is set to 6. The default SCSI ID for bay 4 in the Hot-Swap Bay Option is 3. If SCSI ID for the CD-ROM drive is set to 3, and bay 4 contains a hot-swap drive, the SCSI controller does not recognize either device. If SCSISelect does not indicate a conflict with the SCSI IDs, call for service.

Troubleshooting

Diskette Drive Problems	Action
Diskette drive In-Use light stays on, or the system bypasses the diskette drive.	<p>If a diskette is in the drive, verify that:</p> <ol style="list-style-type: none">1. The diskette is good and not damaged. (Try another diskette if you have one.)2. The diskette is inserted correctly (label up and metal-shutter end first) in the drive.3. The diskette contains the necessary files to start the system.4. Your software program is OK. <p>If the diskette drive In-Use light stays on, or the system continues to bypass the diskette drive, have the system serviced.</p>

Monitor Self-Tests	Action
	<p>Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, refer to the information that comes with the monitor for adjusting and testing instructions.</p> <p>If you still cannot find the problem, have the monitor and system serviced.</p>

Monitor Problems	Action
<p>Wavy, unreadable, rolling, or 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 the monitor on.</p> <p><i>Notes:</i></p> <ol style="list-style-type: none"> 1. The distance between monitors and diskette drives should be at least 76 mm (3 in.) to prevent diskette drive read/write errors. 2. The use of non-IBM monitor cables might cause unpredictable problems. 3. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. See your IBM authorized reseller or IBM marketing representative. <p>If the problem remains, have the monitor and system serviced.</p>
<p>The monitor works when you turn on the system, but goes blank when you start some application programs.</p>	<p>Verify that:</p> <ol style="list-style-type: none"> 1. The monitor power cable is connected to the monitor and to a working electrical outlet. 2. The monitor is turned on and the Brightness and Contrast controls are adjusted correctly. 3. The monitor signal cable is connected correctly to the video connector on the system or to the video adapter.
<p>Blank screen and no beep.</p> <p>Note: If you are not sure about the beeps, turn the system off; then on again, and listen for the beep.</p>	<p>Verify that:</p> <ol style="list-style-type: none"> 1. The system power cord is plugged into the system and a working electrical outlet. 2. The cables connected to the system are secure. (For information about where cables connect, see "Completing the Installation" on page 211.) 3. The system and monitor power switches are on. <p>If the items above are correct and the screen remains blank, have the system serviced.</p>

Troubleshooting

Monitor Problems	Action
Blank screen and one beep.	Verify that: <ol style="list-style-type: none">1. The monitor power cable is connected to the monitor and to a working electrical outlet.2. The monitor is turned on and the Brightness and Contrast controls are adjusted correctly.3. The monitor signal cable is connected correctly to the video connector on the system board or to the video adapter. If the screen remains blank, run the monitor self-tests. If those tests show the monitor is OK, have the system serviced.
Blank screen, continuous beep, or more than one beep.	Have the system serviced.
Only the cursor (_) appears.	Have the system serviced.
Wrong characters appear on the screen.	Have the system serviced.
General Problems	Action
Problems such as broken cover locks or indicator lights not working.	Have the system serviced.
Intermittent Problems	Action
A problem occurs only occasionally and is difficult to detect.	Verify that: <ol style="list-style-type: none">1. All cables and cords are securely connected to the rear of the system and attached options.2. When the system is turned on, air is flowing from the rear of the system at the fan grill. If there is no air flow, the fan is not working. This causes the system to overheat and shut down.3. The last external device in each SCSI chain is terminated correctly. (See "SCSI Drives" on page 141 for more information about SCSI terminators.) If these items are correct, the next time it occurs, make a note of what the system is doing when the problem occurs again. Then have the system serviced.

Keyboard, Mouse, or Pointing- Device Problems	Action
All or some keys on the keyboard do not work.	<p>You might have a password set, or have disketteless operation enabled. To use the system, type the correct password and press Enter.</p> <p>If you forget your power-on password, and an administrator password has been set, use the administrator password at the power-on prompt; then, start the Configuration/Setup utility program and change the power-on password. If no administrator password has been set, you can erase the power-on password by removing the battery from the system board for approximately 15 minutes. See “Removing an Unknown Power-On Password” on page 205 for instructions.</p> <p>If you forget your administrator password, you cannot erase it. Have the system serviced.</p> <p>If no passwords are set, or if the password is not working correctly, have the system, keyboard, and keyboard cable serviced.</p>
The mouse or pointing device does not work.	<p>Verify that:</p> <ol style="list-style-type: none"> 1. The mouse or pointing-device cable is securely connected and the device drivers are installed correctly. 2. Disketteless operation is not set. Disketteless operation disables the pointing-device port when the system is turned on, and the device driver will not be loaded. <p><i>Note:</i> The pointing-device port is also known as the auxiliary-device port or mouse port.</p> <p>If the problem remains, have the system and the device serviced.</p>

Troubleshooting

Option Problems	Action
An IBM option that was just installed does not work.	<p>Verify that:</p> <ol style="list-style-type: none"><li data-bbox="648 420 1044 444">1. The option is designed for the system.<li data-bbox="648 447 1145 551">2. The Reference Diskette was updated with the information on the Option Diskette, if one was provided. (See "Using the System Diskettes" on page 91.)<li data-bbox="648 555 1175 602">3. You followed the installation instructions that came with the option.<li data-bbox="648 606 987 629">4. The option is installed correctly.<li data-bbox="648 633 1164 680">5. You have not loosened any other installed options or cables.<li data-bbox="648 684 1151 766">6. The configuration information has been updated. To update the configuration information, run the Automatic Configuration program. <p>If you are using an expanded- or enhanced-memory manager, such as the DOS Expanded Memory Specification (EMS) driver, go to "Configuration Conflicts" on page 275.</p> <p>If all of the above items are correct, start the system programs and run the Test the Computer program. If the test programs find no problem, have the system and the option serviced.</p>
An IBM option that used to work does not work now.	<p>Verify that all of the option hardware and cable connections are secure.</p> <p>If the option came with its own test instructions, use those instructions to test the option.</p> <p>If the failing option is a SCSI option, verify that:</p> <ol style="list-style-type: none"><li data-bbox="648 1188 1090 1235">1. The cables for all external SCSI options are connected correctly.<li data-bbox="648 1239 1167 1343">2. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. (See "SCSI Drives" on page 141 for more information on SCSI terminators.)<li data-bbox="648 1346 1164 1428">3. All external SCSI options are turned on. External SCSI options must be turned on before the system is turned on. <p>If the items above are correct and the test programs find no problem, have the system and option serviced.</p>

Printer Problems	Action
The printer does not work.	<p>Verify that:</p> <ol style="list-style-type: none">1. The printer is turned on and is online.2. The printer signal cable is connected to the correct serial or parallel port on the system. (For the location of the serial or parallel port, see "Input/Output Connectors" on page 6.) <p><i>Note:</i> Non-IBM printer cables might cause unpredictable problems.</p> <ol style="list-style-type: none">3. You have assigned the printer port correctly in your operating system or application program. <p>If the items above are correct and the printer still does not work, run the tests described in the printer manual. If the tests show the printer is OK, have the system serviced.</p>

Software Problem	Action
Is your software program OK?	<p>To determine if problems are caused by the software, verify that:</p> <ol style="list-style-type: none">1. Your system has the minimum memory requirements needed to use the software. Refer to the information that came with the software to verify memory requirements. <p><i>Note:</i> If you have just installed an adapter or memory, you might have a memory address conflict (see "Configuration Conflicts" on page 275).</p> <ol style="list-style-type: none">2. The software is designed to operate on your system.3. Other software works on your system.4. The software you are using works on another system. <p>If you received any error messages when using the software program, refer to the information that came with the software for a description of the messages and solutions to the problem.</p> <p>If the items above are correct and the problem remains, contact your place of purchase or service technician for help.</p>

Beep Codes

System Diskette Backup Copy Problems	Action
Did you update the backup copy of your System Diskettes?	<p>Always keep a current backup copy of your system programs. The copy should contain the current configuration information and test programs for your system. If the system programs are not current, the test programs might not find the problem.</p> <p>Some options come with an Option Diskette. Be sure to copy this diskette to the System Diskettes when you install the option. This Option Diskette contains the option test program and configuration information. If you installed an option, check its instructions to see if it came with an Option Diskette.</p>

Note: If you cannot find the problem in the troubleshooting charts, go to “Testing the System” on page 232 to test the system. If you already have run the test program, or if running the test does not reveal the problem, have the system serviced.

Beep Codes

One beep and the appearance of text on the monitor indicates successful completion of POST. More than one beep indicates that POST detects an error.

Beep codes are sounded in a series of two or three sets of beeps. The duration of each beep is constant, but the length of the pause between the beeps varies. For example, a 1-2-4 beep code sounds like one beep, a pause, two consecutive beeps, another pause, and four more consecutive beeps.

It is possible to misinterpret a beep code if you do not understand exactly how they work. Keeping in mind that POST error codes vary in the length of the pause, and not the duration of the beep tones will help you to distinguish the beeps.

Beep Code Chart

Beep Code	Description
1-1-3	CMOS write/read failure
1-1-4	BIOS ROM checksum failure
1-2-1	Programmable Interval Timer test failure
1-2-2	DMA initialization failure
1-2-3	DMA page register write/read test failure
2-1-1	Secondary DMA register test in-progress or failure
2-1-2	Primary DMA register test in-progress or failure
2-1-3	Primary interrupt mask register test failure
2-1-4	Secondary interrupt mask register test failure
2-2-2	Keyboard controller test failure
1-3	Video controller failure
<i>Action:</i> Have the system serviced.	
1-2-4	RAM refresh verification failure
1-3-1	First 64K RAM test failure
1-3-2	First 64K RAM parity test failure
<i>Action:</i> Reseat the memory module and the memory riser card. If the problem recurs, have the system serviced.	

Checking the System for Damage

This section provides instructions on what to do if your system might be damaged.

After Dropping It

Look for loose cables and obvious damage. If any cables are loose, reconnect them securely. If there is obvious damage to the system, have it serviced.

If you see no damage, turn on the system. If it works correctly, the system probably did not suffer any damage.

CAUTION:

Observe all safety and electrostatic precautions listed in this book to avoid personal injury or damage to your system.

If the system does not work correctly, turn it off and check the adapters and memory modules to ensure that they are connected correctly. Go to “Electrical Safety” on page 104 and follow the

Checking the System for Damage

instructions for opening your system; then, reseal all adapters and memory modules.

If the system still does not work correctly, start the system programs and test the system. Refer to “Testing the System” on page 232 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

Using the Copy an Option Diskette utility program in the system programs, you can add other test programs to the Diagnostic Diskettes. These other programs are usually provided on the diskette that comes with a device. After you add the programs to the System Board Diagnostic Diskette, you can include information from the programs in the Test Log.

Before the test programs can find these programs to run as the User Diags test group, information about them must be included in a file called USERDIAG.CFG. This is an ASCII text file. It must include the following three items for each test to run:

- Program Name (.COM and .EXE files only)
- Test Description of the test to be run
- Command-line parameters to be passed to the program identified in the first item of this list

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 number for the above tests are as follows:

- 202 9600 Baud 5 Line Modem
- 203 Generic 1
- 204 Generic 2
- 205 CMD 1
- 206 CMD 2
- 207 CMD 3

Using the Utility Programs

The System Board Diagnostic Diskette contains utility programs for formatting diskettes and editing.

Formatting Diskettes

To format a diskette within the diagnostic programs, insert a diskette into diskette drive A or B; then, select one of the following options:

Format A: high density — 1.44 MB

Format A: low density — 720 KB

Format B: high density — 1.44 MB

Format B: low density — 720 KB

After selecting one of the above options to format a diskette, follow the instructions that appear on the screen.

Using the File Editor

The file editor allows you to modify text files. By modifying files, such as your AUTOEXEC.BAT or CONFIG.SYS files, you can improve the test system's performance and eliminate unnecessary lines of information in those files.

Note: Always make a backup copy on a self-starting diskette of the AUTOEXEC.BAT and CONFIG.SYS files *before* making any changes.

The File Editor is an ASCII text editor that uses the following function keys:

Key	Description
Arrows	Use the arrow keys to move the cursor to the place in the text where you want to make changes.
Home	To move the cursor to the start of the current line, press Home once. To move to the beginning of the current screen, press Home twice. To move to the beginning of the file, press Home three times.

Using the Utility Programs

- End** To move the cursor to the end of the current line, press End once. To move the cursor to the end of the current screen, press End twice. To move the end of the file, press End three times.
- F2** To be in search mode, press **F2**. You are prompted to enter the search word or words on a reverse highlighted line at the bottom of the File Edit Screen. After typing in the search word, press **Enter**.
- F3** To find the next occurrence of a search word, press **F3**.
- F4** To mark the start of a block of text (if you have not previously marked it), press **F4**. If you previously marked the block of text, pressing this key unmarks the text block.
- F5** To complete the block marking (started with F4), press **F5**. If you did not previously press **F4** to start marking a block of text, F5 is ignored.
- F6** To move an active (marked) block of text, first press F6 while the cursor is within the active block. Then, move the cursor to the new location where the active block is to be moved, and press **F6** again. If no block of text is active. F6 is ignored.
- F7** To copy an active (marked) block of text to the a new location, move the cursor to the new location and press **F7**. If no block of text is active. F7 is ignored.
- F8** To delete an active (marked) block of text, move the cursor within the active block and press **F8**. If no block of text is active. F8 is ignored.
- F10** To save all changes and exit the file, press **F10**.
- Insert** Insert is the default text-editing mode of the File Editor. To toggle between replace and insert modes, press Insert.

To access the File Editor:

1. Select **File Editor** from the Utilities Menu; then, press **Enter**.
2. Insert a diskette into drive A or drive B before selecting the file you want to edit; then, select the file from the Files Selection box.

3. Press **Enter**.
4. Make your changes.
5. When you are done, press **F10** to update the file with the changes you made, or press **Esc** to quit the editing process without saving the changes.

Note: Pressing F1 when inside the File Editor displays all of the keyboard functions available to you while editing.

Configuration Conflicts

The Automatic Configuration program configures only the system hardware. It does not consider the requirements of the operating system or the application programs. For these reasons, configuration conflicts might occur.

Resolving Memory-Address Conflicts

The Automatic Configuration program might change the memory-address space used by some hardware options. If it does, the new address might conflict with addresses that are defined for use through expanded memory specification (EMS). (EMS is used only with DOS.)

If a memory conflict exists, one or more of the following conditions might exist:

- The system cannot load the operating system.
- The system does not work.
- An application program does not operate, or it returns an error message.
- Screen messages indicate that a memory-address conflict exists.

You can resolve memory-address conflicts by changing either the software or hardware configuration setup.

Configuration Conflicts

Changing the Software Configuration Setup

The best way to resolve memory-address conflicts is to change the software configuration by changing the addresses that the EMS device driver defined. The SVGA video memory occupies 8 KB of space in the hex C0 to C7FFF EMS memory area. EMS device drivers must use addresses different from those assigned to video read-only memory (ROM). You can view or change the current setting for video ROM by using the **Devices and I/O Ports** menu in the Configuration/Setup utility program.

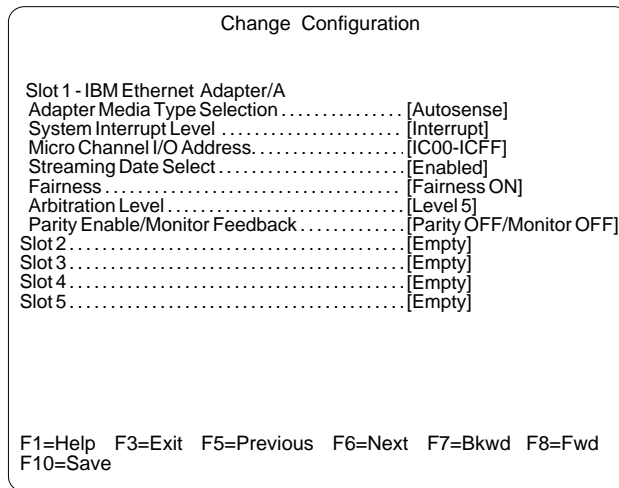
If the SVGA or EMM386 device driver is causing the memory-address conflict, refer to your DOS documentation. For information about resolving conflicts that are caused by application-program device drivers instead of DOS device drivers, refer to the device-driver documentation.

Changing the Hardware Configuration Setup

An alternative way to resolve memory-address conflicts is to change the address of the conflicting hardware option by using the Set/View Micro Channel Configuration program.

Note: PCI configuration is resolved during system startup. Any unresolved conflicts cause a POST error message to be displayed.

To change the configuration information, select **Set/View Micro Channel Configuration** from the system programs Main Menu. Identify the adapter using the addresses assigned to the EMS device driver; then, set the adapter to a nonconflicting address.



Note: If you run the Automatic Configuration program after changing an address, the address you changed will be set back to its default (and possibly conflicting) value.

Configuration Conflicts

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.

Solving Problems

Many computer problems can be solved without outside assistance, by using the online help or by looking in the online or printed documentation that comes with your computer or software. Also, be sure to read the information in any README files that come with your software.

Most computers, operating systems, and application programs come with documentation that contains troubleshooting procedures and explanations of error messages. (For troubleshooting and error information about your PC Server 320, see “Troubleshooting” on page 261, “Error Messages” on page 246, and “SCSI Messages” on page 257). The documentation that comes with your computer also contains information about the diagnostic tests that you can perform (see “Starting the Test Programs” on page 238).

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 the documentation and take the appropriate action.

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

Using the HelpWare Support Family

IBM HelpWare is the “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 computer 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 computer, monitor, and other components, or your proof of purchase
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information for your system

If possible, be at your computer when you call.

These services are available 24 hours a day, 7 days a week (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 travel with your computer or need to move it to another country, you can register for International Warranty Service. When you register with the International Warranty Service Office, you will receive an International Warranty Service Certificate that is honored virtually worldwide, wherever IBM or IBM resellers sell and service IBM PC products.

For more information or to register for International Warranty Service in the U.S. or Canada, call 1-800-497-7426.

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 285.

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 285.

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 285.

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 281 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

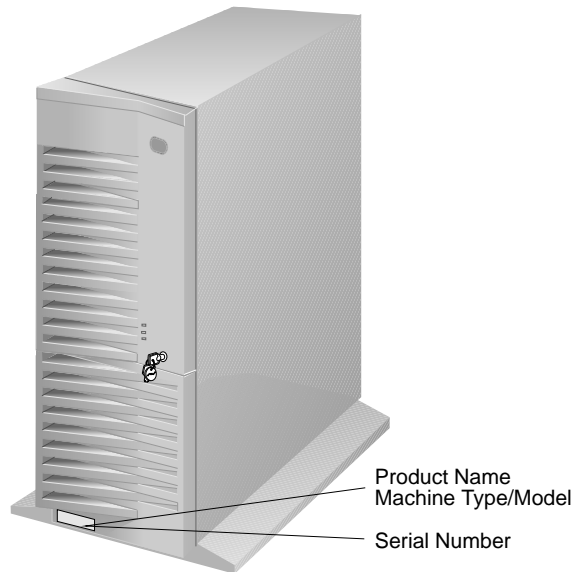
Additional publications are available for purchase from IBM. For a list of publications available in your country:

- 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

Record the Identification Numbers

The locations of the PC Server 320 identification numbers are shown below. They are located near the bottom, on the front of the server.



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

Device Records

Record and retain the following information.

Product Name	IBM PC Server 320
Machine Type	8640
Model	<input type="checkbox"/> with preinstalled hard disk drive <input type="checkbox"/> without preinstalled hard disk drive <input type="checkbox"/> with hot-swap bay <input type="checkbox"/> without hot-swap bay
Serial Number	_____
Key Serial Number	_____
ServerGuide License Diskette Serial Number	_____

Installed Device Records

Use the following tables to keep a record of the options installed in or attached to your system. You can also record your system's default configuration settings. This information can be helpful when you install additional options in your server or if you ever need to have your server serviced. It is recommended that you copy these tables before recording information in them, in case you need extra space to write new values later, when you update your system's configuration.

Option	Default Value	New Value	Additional Information
System Summary			
Microprocessor	Pentium	_____	_____
Microprocessor Speed		_____	_____
System Memory	640 KB	_____	_____
Extended Memory	15360 KB	_____	_____
Video Controller	SVGA	_____	_____
Cache Size	256 KB	_____	_____
Shadow RAM	384 KB	_____	_____
System ROM	F000h — FFFFh	_____	_____
Memory Type	[Parity]	_____	_____
Diskette Drive A:	[1.44 MB 3.5 in]	_____	_____
Diskette Drive B:	[not installed]	_____	_____
Mouse	[Installed]	_____	_____
Micro Channel Configuration			
Micro Channel Slot 1	Empty	_____	_____
Micro Channel Slot 2	Empty	_____	_____
Micro Channel Slot 3	Empty	_____	_____
Micro Channel Slot 4	Empty	_____	_____
Micro Channel Slot 5	Empty	_____	_____
Micro Channel Slot 6	Empty	_____	_____
<i>Note:</i> Some models ship with a preinstalled network adapter.			
Product Data			
Machine Type/Model	8640	_____	_____
Flash EEPROM Revision Level	_____	_____	_____
System Board Identifier	_____	_____	_____
System Serial Number	_____	_____	_____
BIOS Date	_____	_____	_____
Devices and I/O Ports			
Serial Port A Address	[3F8h - IRQ 4]	_____	_____
Serial Port B Address	[2F8h - IRQ 3]	_____	_____
Parallel Port	[3BCh - IRQ 7]	_____	_____
Parallel Port Mode	[Standard]	_____	_____
Parallel Port Extended Mode	[]	_____	_____
Mouse	[Installed]	_____	_____
Diskette Drive A:	[1.44 MB 3.5 in]	_____	_____
Diskette Drive B:	[not installed]	_____	_____
Video Setup			
Video Controller	SVGA	_____	_____
Video Memory	1024 KB	_____	_____
Video Display Type	[User Defined]	_____	_____
Monitor Horizontal Frequency	[Not Used]	_____	_____
Refresh Rate For (640x480)	[60 Hz]	_____	_____
Refresh Rate For (800x600)	[Undefined]	_____	_____
Refresh Rate For (1024x768)	[Undefined]	_____	_____

Device Records

Option	Default Value	New Value	Additional Information
Refresh Rate For (1280x1024)	[Undefined]	_____	_____
Refresh Rate For (1600x1200)	[Undefined]	_____	_____
System Security			
Power-On Password		_____	_____
System Owner's Name		_____	_____
Administrator Password		_____	_____
Secure Diskette Drives	[Disabled]	_____	_____
Start Options			
Keyboard Numlock State	[On]	_____	_____
Keyboard Speed	[Fast]	_____	_____
Disketteless Operation	[Disabled]	_____	_____
Monitorless Operation	[Disabled]	_____	_____
Keyboardless Operation Mode	[Disabled]	_____	_____
First Startup Drive	[Diskette Drive 0]	_____	_____
Second Startup Drive	[Hard Disk 0]	_____	_____
Third Startup Drive	[Disabled]	_____	_____
Fourth Startup Drive	[Disabled]	_____	_____
Power On Self Test	[Enhanced]	_____	_____
SureTest	[Disabled]	_____	_____
Virus Detection	[Enabled]	_____	_____
Advanced Setup			
Cache Control			
Cache State	[Enabled]	_____	_____
Cache Size	[256 KB]	_____	_____
ROM Shadowing			
F0000h - FFFFFh (System BIOS)	Enabled	_____	_____
E8000h - EFFFFh	Enabled	_____	_____
E0000h - E7FFFh	Enabled	_____	_____
DC000h - DFFFFh	[Disabled]	_____	_____
D8000h - DBFFFh	[Disabled]	_____	_____
D4000h - D7FFFh	[Disabled]	_____	_____
D0000h - D3FFFh	[Disabled]	_____	_____
CC000h - CFFFFh	[Disabled]	_____	_____
C8000h - CBFFFh	[Disabled]	_____	_____
C0000h - C7FFFh (Adapter Video BIOS)	[Enabled]	_____	_____

Table 7. Configuration/Setup Program Defaults and Changes

The following table shows the defaults for system memory and extended memory in your server. Record changes to existing memory and upgrades here.

Option	Default Value	New Value	Additional Information
System Memory	640 KB	_____	_____
Extended Memory	360 KB	_____	_____
Bank 0 socket	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	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	_____	_____	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 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	_____	_____	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	_____	_____	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	_____	_____	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	_____	_____	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	_____	_____	_____

Table 8. RAM Default Settings and Changes

Record expansion slot configuration information for your server in the following table.

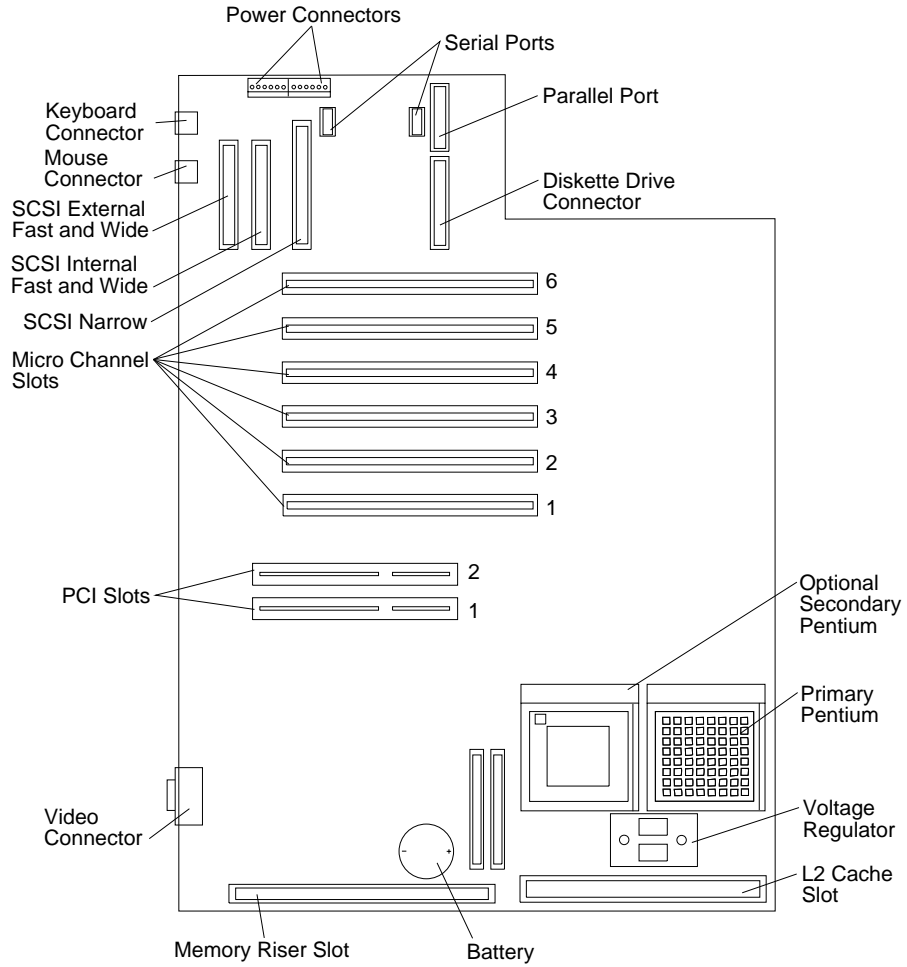
Slot	IRQ	DMA	I/O Port	ROM/RAM Address	Option Description and Additional Information
6	_____	_____	_____	_____	_____
5	_____	_____	_____	_____	_____
4	_____	_____	_____	_____	_____
3	_____	_____	_____	_____	_____
2	_____	_____	_____	_____	_____
1	_____	_____	_____	_____	_____

Note: Before setting values, review “Using the System Diskettes” on page 91 and follow the instructions for avoiding configuration conflicts.

Table 9. Expansion Slot Configuration Information

Device Records

A simplified layout of the system board is shown in the following diagram.



Record the types and SCSI IDs for drives or devices attached to your server in the following table.

Location	Drive or Device Description
Bay 1	_____
Bay 2	_____
Bay 3	_____
Bay 4	_____
Bay 5	_____
Bay 6	_____
Bay 7	_____
Bay 8	_____
Bay 9	_____
<i>Note:</i> Disk-array servers contain nine bays. Non-disk-array servers contain eight bays.	
External Devices	
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____

Table 10. Internal and External Drives and Devices

Device Records

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 9 on page 293 (in the same row as the expansion-slot number of the adapter).

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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Intel	Intel Corporation
Microsoft	Microsoft Corporation
NT	Microsoft Corporation
NetWare	Novell, Inc.
Novell	Novell, Inc.
OpenServer	The Santa Cruz Operation, Inc.
Pentium	Intel Corporation
PowerChute	American Power Conversion
PRODIGY	Prodigy Services Company
QAPLUS/PRO	DiagSoft, Inc.
SCSISelect	Adaptec, Inc.
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