

Setting Up Your Workgroup Server 9650

*Includes information about setting up and expanding
your server system; also includes technical specifications*

 Apple Computer, Inc.

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Communications regulation information

FCC Declaration of conformity

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. See instructions if interference to radio or television reception is suspected.

Radio and television interference

The equipment described in this manual generates, uses, and can radiate radio-frequency energy. If it is not installed and used properly—that is, in strict accordance with Apple’s instructions—it may cause interference with radio and television reception.

This equipment has been tested and found to comply with the limits for a Class B digital device in accordance with the specifications in Part 15 of FCC rules. These specifications are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation.

Note: When the 10BASE-T Ethernet cable is connected, the system complies with the FCC Part 15 Class A limits and the CISPR 22 Class A limits. In a residential environment, this equipment so configured may cause unacceptable levels of radio interference, which the user may be required to correct.

You can determine whether your computer system is causing interference by turning it off. If the interference stops, it was probably caused by the computer or one of the peripheral devices.

If your computer system does cause interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the computer to one side or the other of the television or radio.
- Move the computer farther away from the television or radio.
- Plug the computer into an outlet that is on a different circuit from the television or radio. (That is, make certain the computer and the television or radio are on circuits controlled by different circuit breakers or fuses.)

If necessary, consult an Apple-authorized service provider or Apple. See the service and support information that came with your Apple product. Or, consult an experienced radio/television technician for additional suggestions.

IMPORTANT Changes or modifications to this product not authorized by Apple Computer, Inc., could void the FCC Certification and negate your authority to operate the product.

This product was tested for FCC compliance under conditions that included the use of Apple peripheral devices and Apple shielded cables and connectors between system components. It is important that you use Apple peripheral devices and shielded cables and connectors between system components to reduce the possibility of causing interference to radios, television sets, and other electronic devices. You can obtain Apple peripheral devices and the proper shielded cables and connectors through an Apple-authorized dealer. For non-Apple peripheral devices, contact the manufacturer or dealer for assistance.

Responsible party: Robert Steinfeld, Apple Computer, Inc., 1 Infinite Loop, Cupertino, CA 95014-2084, 408-974-2618.

Industry Canada statement

This Class B device meets all requirements of the Canadian interference-causing equipment regulations.

Cet appareil numérique de la Class B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

VCCI Class 2 statement

情報処理装置等電波障害自主規制について

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づく第二種情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。

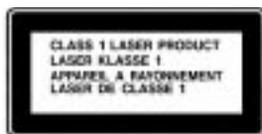
取扱説明書に従って正しい取り扱いをしてください。

Laser information

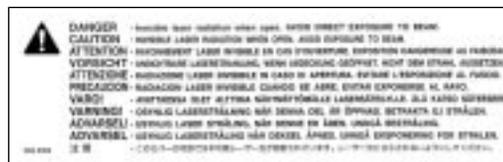
WARNING Making adjustments or performing procedures other than those specified in your equipment's manual may result in hazardous radiation exposure.

WARNING Do not attempt to disassemble the cabinet containing the laser. The laser beam used in this product is harmful to the eyes. The use of optical instruments, such as magnifying lenses, with this product increases the potential hazard to your eyes. For your safety, have this equipment serviced only by an Apple-authorized service provider.

If you have an internal Apple CD-ROM drive in your computer, your computer is a Class 1 laser product. The Class 1 label, located in a user-accessible area, indicates that the drive meets minimum safety requirements. A service warning label is located in a service-accessible area. The labels on your product may differ slightly from the ones shown here.



Class 1 label



Service warning label

About This Manual

This manual tells you how to set up your Workgroup Server 9650 and connect it to a network. It also provides technical specifications for your server and information about adding internal and external devices to your server. This setup manual is a companion to the *Workgroup Server Administrator's Manual*, which tells you how to configure the system software for use with your Workgroup Server, use application software programs, use your server's built-in CD-ROM drive and tape backup unit, and troubleshoot hardware and software problems that you may encounter while using your server.

About your Workgroup Server 9650 and Mac OS software

Your Workgroup Server is powered by the PowerPC™ microprocessor (or “chip”). This microprocessor was designed by Apple Computer, Inc., Motorola, Inc., and IBM Corporation. The PowerPC microprocessor uses Reduced Instruction Set Computer (RISC) technology to deliver very high performance at the lowest possible cost. The PowerPC RISC microprocessor represents the state of the art in microprocessor design.

Your Workgroup Server will run almost all of your existing Mac OS software, but for best performance, look for software programs designed especially for PowerPC-based Mac OS servers.

Who should read this manual

This manual is intended for the person who sets up the server and connects it to an existing network. You need to know some details of your existing network in order to choose the appropriate procedures for connecting the server to your network.

What this manual contains

Here's a brief summary of what you'll find in this manual:

- Chapter 1, “Setting Up Your Server,” provides a graphic overview of the Workgroup Server 9650 and explains how to connect the monitor, keyboard, and mouse, and how to start up your server for the first time.
- Chapter 2, “Connecting to the Network,” describes how to connect the server to an Ethernet or LocalTalk network, and provides information about setting up a high-performance network.
- Chapter 3, “Installing PCI Expansion Cards, Additional Memory, and Internal Storage Devices,” describes how to install internal components in the server.
- Chapter 4, “Connecting Additional Equipment,” describes how to connect additional external devices to the server.
- Appendix A, “Safety, Maintenance, and Health Information,” suggests how you can create a healthful and safe server environment and keep your server equipment in good working order.
- Appendix B, “Technical Information,” contains technical specifications for your server.

How to use this manual

Familiarize yourself with your server's basic components. See the section “Your Server at a Glance” in Chapter 1.

Consider security issues and placement of your server. Read the section “Security Issues” in Chapter 1 for important information about protecting your server from unauthorized access.

If you want to add an expansion card or internal drive to the server: Install the card or internal device according to the instructions in Chapter 3, “Installing PCI Expansion Cards, Additional Memory, and Internal Storage Devices.” Then return to Chapter 1 to connect the monitor and keyboard.

If you want to connect external peripheral devices to your server: After you connect the monitor and keyboard to the server, as described in Chapter 1, turn to the appropriate instructions in Chapter 4. Then return to Chapter 1.

Connect to the network to complete the setup process. See Chapter 2, “Connecting to the Network,” for details.

Other reference material

In addition to this manual, you may need to consult the following sources of information.

- After setting up your server's hardware, see the *Workgroup Server Administrator's Manual* for details on configuring and using the features of the Mac OS and Mac OS application programs. The *Administrator's Manual* also contains information about using your server's DAT and CD-ROM drives, as well as important troubleshooting information for help with problems you may experience while using your server.
- For important late-breaking information about your server and system software, see the Workgroup Server Read Me file, located on the server's hard disk and on the *Workgroup Server Software* CD-ROM disc.
- For information about server application programs included with your Workgroup Server 9650, such as RAID software and backup software, refer to the documentation for those programs included in the server accessory kit. (RAID stands for Redundant Array of Independent Disks.)
- You may have purchased network software programs such as AppleShare for use on your Workgroup Server 9650. Refer to the documentation included with the network software for installation and operation information.
- If you need a better understanding of how to configure your network, the following books from Apple Computer, published by Addison-Wesley, are available at computer bookstores:

Understanding Computer Networks gives an overview of networking basics.

Planning and Managing AppleTalk Networks provides in-depth information on setting up, maintaining, and troubleshooting AppleTalk networks.

Where to find answers

When you have questions about using your server, there are several places you can look for answers.



In this book

Use this book to help you set up and expand your server system, and to connect it to a network. Also use this book to check your server's technical specifications.



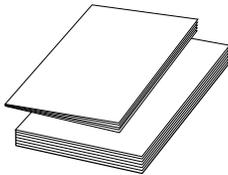
In the *Workgroup Server Administrator's Manual*

Use this book to configure the operating system for your server, to learn about the Mac OS, for troubleshooting information if you experience problems with your server, and to learn about your server's DAT and CD-ROM drives.



In the Guide menu

The Guide menu (marked with the  icon) is your main source of information about the Mac OS. To learn how to get different kinds of help from the Guide menu, see Appendix A in the *Workgroup Server Administrator's Manual*.



In other manuals

For answers to questions about other equipment or about application programs you have purchased, see the manuals that came with the equipment or programs.



On the Internet

Using a World Wide Web browser, visit these sites for more information:

<http://www.servers.apple.com>

<http://www.info.apple.com>



From Apple's customer support hotline

If you can't find an answer in any of the materials provided, call the customer support hotline. (The phone number for the hotline is in the service and support information that came with your server.)

1

Setting Up Your Server

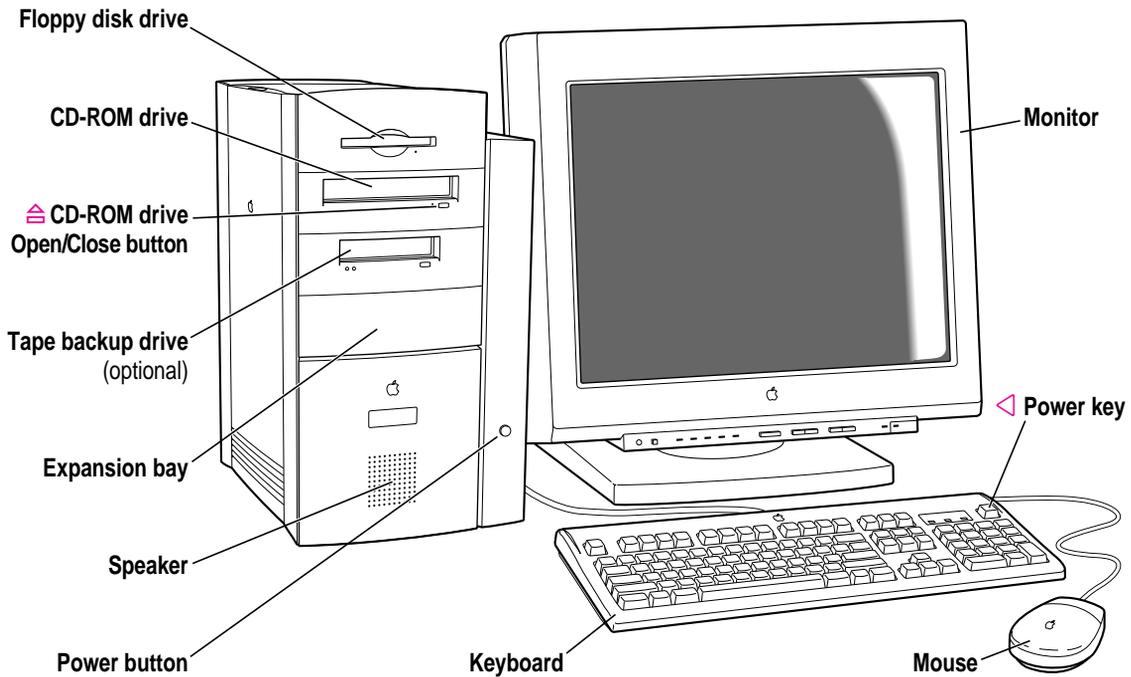
Setting up your server involves connecting a monitor, mouse, and keyboard, expanding your system to suit your needs, and connecting to the network.

First, acquaint yourself with your server's features, as shown in the next section, "Your Server at a Glance." Also read the section "Security Issues" for important information about protecting your server from unauthorized access. Then, if you want to install an expansion card or other internal devices, see the appropriate sections in Chapter 3 before returning to the setup procedures in this chapter. Once you've connected the monitor, mouse, and keyboard, you may need to refer to Chapter 3 again if you're connecting external devices.

You complete the setup process by connecting your server to the network, as described in Chapter 2. Once your server is connected to the network, see the *Workgroup Server Administrator's Manual* for instructions on configuring your server's system software.

Your server at a glance

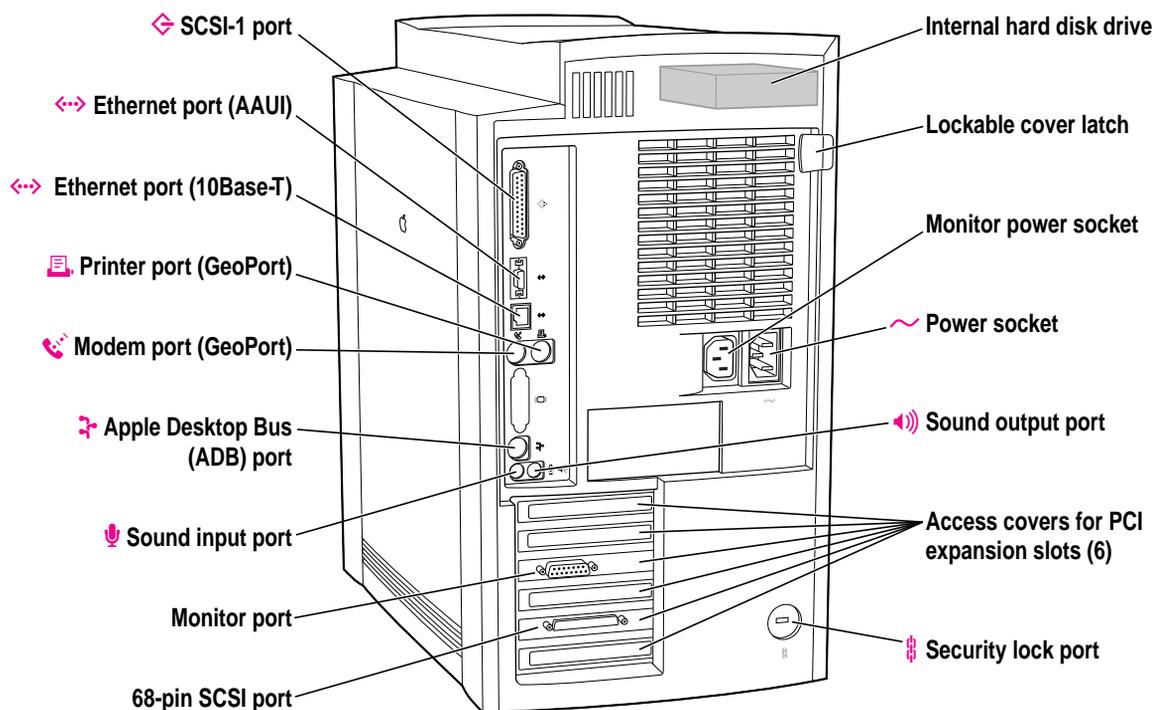
The following figure shows the basic components of your Workgroup Server 9650 assembled and connected to a network.



The ports on the back of the Workgroup Server 9650 and the icons that identify them are shown in the following figure. During setup, you'll connect hardware to some of these ports.

Your server's ports and connectors

SCSI-1 port (DB-25)	⚡	Connects your server to SCSI equipment such as external hard disk drives.
Ethernet port (AAUI)	↔	Connects your server to an Ethernet network using an AAUI adapter.
Ethernet port (10Base-T)	↔	Connects your server to an Ethernet network using a 10Base-T connector (RJ-45).
Printer port (GeoPort)	🖨️	Connects your server to a printer, LocalTalk network, GeoPort adapter, or serial device.
Modem port (GeoPort)	📠	Connects your server to an external modem, LocalTalk network, GeoPort adapter, or serial device.



Your server's ports and connectors

Apple Desktop Bus (ADB) port	↔	Connects your server to an input device, such as a keyboard or a trackball.
Sound input port	🎤	Connects your server to an Apple PlainTalk microphone or other audio input equipment.
Monitor port		Connects your server to a monitor. This port is on a video card installed in one of the PCI slots.
68-pin SCSI port		Connects your server to Ultra Wide SCSI-3 equipment such as external hard disk drives. This port is on a SCSI card installed in one of the PCI slots. Normally you should not use this port; for more information, see Chapter 4.
Sound output port	🔊	Connects your server to headphones, externally powered (amplified) speakers, or other audio output equipment.
Access covers for PCI expansion slots (6)		Your server supports up to six Peripheral Component Interconnect (PCI) expansion cards. (The monitor card and SCSI card are installed in two of the slots.)
Security lock port and lockable cover latch	🔒	You can attach a security lock to your server and to its cover to secure internal components. See your computer products retailer for security lock devices that work with your server.

Security issues

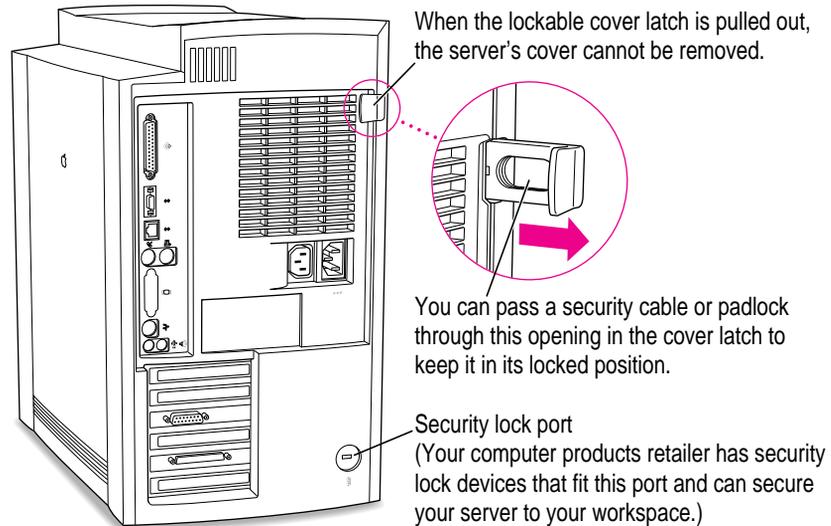
The Workgroup Server 9650 lets you concentrate valuable or sensitive information on one system that can be physically isolated and more carefully monitored than would be possible if that information were stored on personal computers. Before you set up the server, you may want to consider two measures that you can take to secure the hardware components: physically isolating the system and using a locking cable to secure the system.

Physically isolating the system

Even if software security features (such as password protection or locking screen savers) are in use on the server, it is still possible to disconnect peripheral devices from your server. There is no better way to protect hardware components than by physically isolating the server system—locking it either in a well-ventilated cabinet or in a room with controlled access. Depending on your security needs, the nature of the data stored on the server and its external drives may warrant the effort.

Using a locking cable

As an alternative to isolating the system completely in an area of controlled access, you can purchase a locking cable and attach it to your server. The back panel has a built-in port for a locking cable, and the cover has a lockable latch that prevents the server from being opened.



Follow the instructions supplied with the locking cable to secure it to your server. When you install the locking cable, be sure to thread the cable through the lockable latch on the cover; this locks the server cover and prevents memory, disk drives, and expansion cards from being removed.

By itself, a locking cable cannot prevent unauthorized use of the server, but it can prevent the server (and its peripheral devices, if they are also secured by locking cables) from being removed.

Installing internal devices

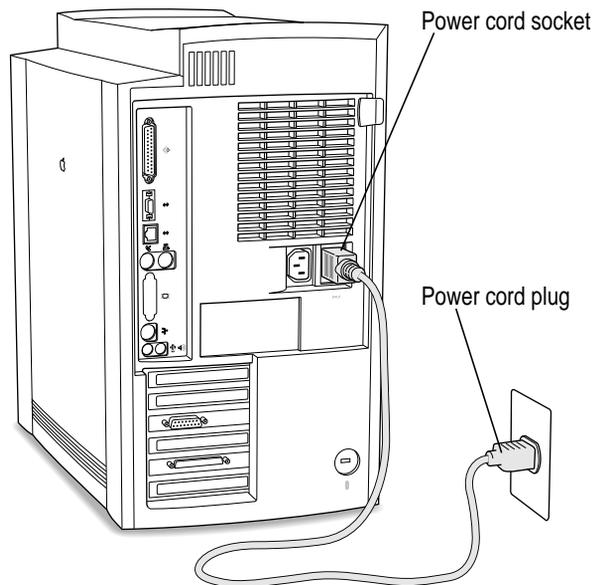
If you purchased additional internal drives or expansion cards for your server, install them now (see Chapter 3 for instructions). If you don't have internal devices to install, go on to the next section, "Plugging in the Server."

Plugging in the server

Before you plug your Macintosh into a wall socket, carefully read all the setup instructions in this chapter. Then, before you connect any other equipment to your Macintosh, follow the instructions in this section to plug it in. The plug grounds the server and protects it from electrical damage while you set up. When you are ready to begin, follow these steps:

- 1 Place your server on a sturdy, flat surface near a grounded wall outlet.
- 2 Plug the socket end of the server's power cord into the recessed power socket (marked with the symbol ~) on the back of the server.
- 3 Plug the other end of the power cord into a three-hole grounded outlet or power strip.

WARNING This equipment is intended to be electrically grounded. Your Macintosh is equipped with a three-wire grounding plug—a plug that has a third (grounding) pin. This plug will fit only a grounded AC outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact a licensed electrician to replace the outlet with a properly grounded outlet. Do not defeat the purpose of the grounding plug!



IMPORTANT The only way to disconnect power completely is to unplug the power cord. Make sure that at least one end of the power cord is within easy reach so that you can unplug the server when you need to.

Connecting a monitor

You can connect many types of monitors (often called displays) to your server, including most standard monitors. See Appendix B, “Technical Information,” for more information.

This section contains instructions for connecting most types of monitors. You should also refer to the instructions that came with the monitor for any special instructions.

IMPORTANT If you are connecting an Apple monitor that has built-in speakers or a microphone, you may need to install monitor software after you have set up and turned on your server. Otherwise, you may not be able to use all the monitor’s features. See the instructions that came with the monitor for more information.

Connecting the monitor power cord

At a minimum, monitors have two cords to connect: a power cord and a monitor cable. To connect the monitor power cord, follow these steps:

- 1 Place the monitor near the server.**

Keep these considerations in mind:

- Allow at least three inches for air circulation around the server and monitor.
- Make sure that the top of the screen is slightly below eye level when you’re sitting at the keyboard.
- Position the monitor to minimize glare and reflections on the screen from overhead lights and windows.

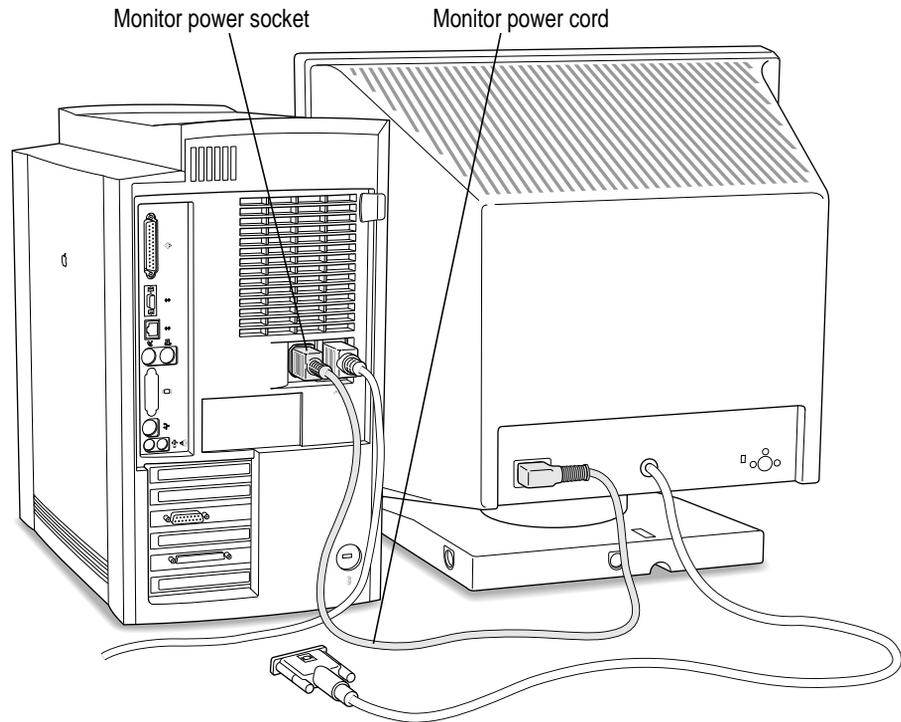
2 Connect the monitor power cord to the monitor.

On some monitors, the cord is already attached.

3 Plug in the monitor power cord.

Some monitor power cords are designed to plug into the back of your server.

Other monitor power cords must be connected to a grounded electrical outlet, not to the server. Check the information that came with the monitor.



Connecting the monitor cable and ADB cable

After you plug in the monitor power cord, you connect the monitor cable to the server's monitor port. Some monitors also include a cable called an Apple Desktop Bus (ADB) cable, which you connect between the ADB ports (marked with the ) on the monitor and the server.

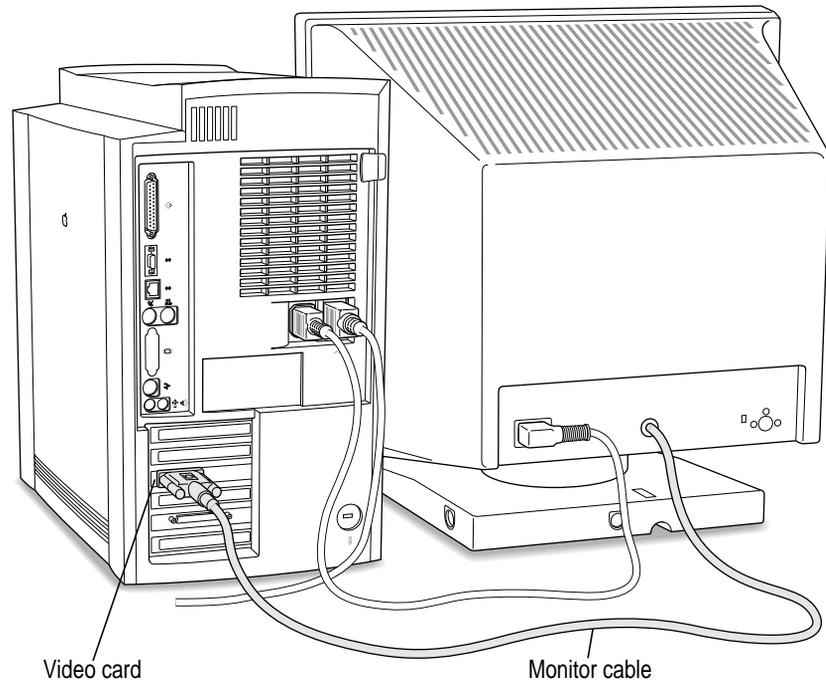
To connect the monitor cable and the ADB cable, follow these steps:

- 1 Attach the monitor cable to the monitor.**

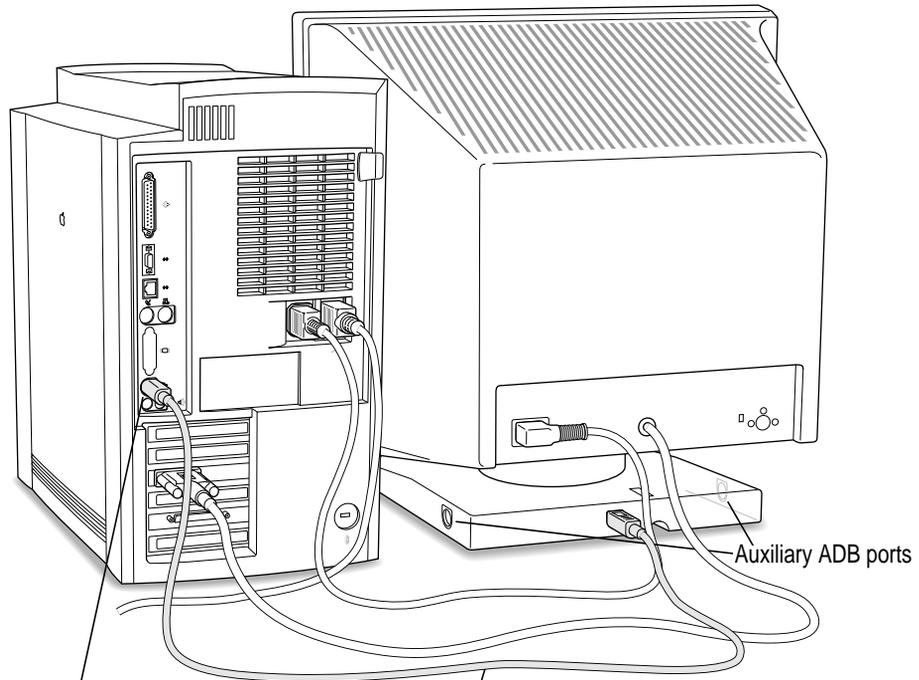
On some monitors, the cable is already attached.

- 2 Attach the monitor cable to the monitor port on the back panel of the server.**

The monitor port is on a video card installed in one of the PCI slots.



- 3 If your monitor came with an ADB cable, connect it between the ports marked with the  icon on the back of the server and on the back of the monitor.



 Apple Desktop Bus (ADB) port

Some monitors (such as this Apple Multiple Scan 20 Display) come with an ADB () cable that you can plug into the back of the monitor. The other end of this cable can be connected to your server. This allows you to connect a keyboard, mouse, or other ADB device directly to your monitor's auxiliary ADB ports.

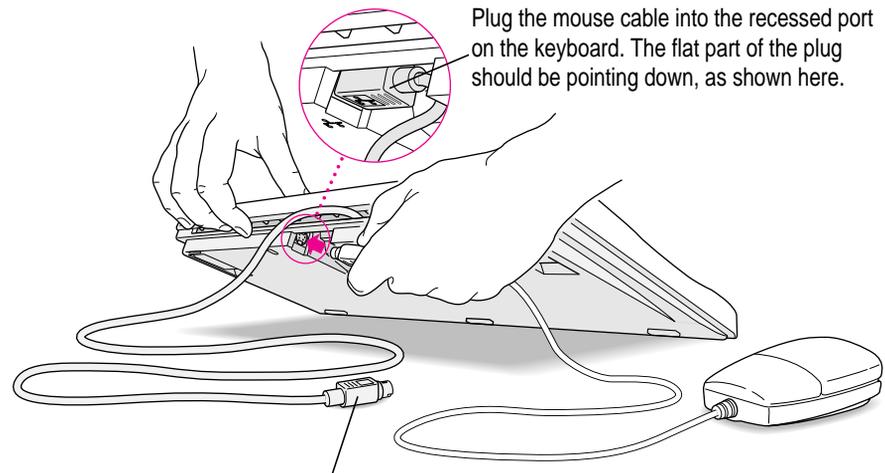
Connecting the mouse and keyboard

The way you connect the mouse and keyboard depends on whether the keyboard has a built-in cable or a separate cable.

Connecting a keyboard with a built-in cable

- 1 **Plug the mouse cable into the recessed port on the back of the keyboard.**

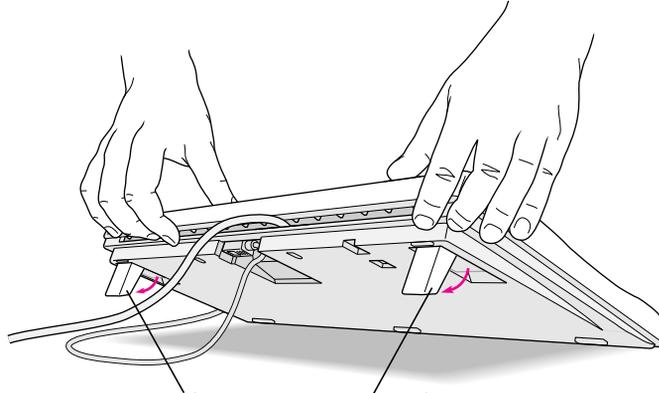
The plug and the port are marked with the ⌘ icon (symbol). The positions of the port and icon on your keyboard may be different from those pictured.



This cable plugs into the Apple Desktop Bus (ADB) port, marked with the ⌘ icon, on the back of the server.

- 2 **If the front or side of your monitor has a port marked with the ⌘ icon, plug the keyboard cable into this port. Otherwise, plug the keyboard cable into the port marked with the ⌘ icon on the back of the server.**

- 3 If you want to raise the angle of the keyboard, lower the feet.



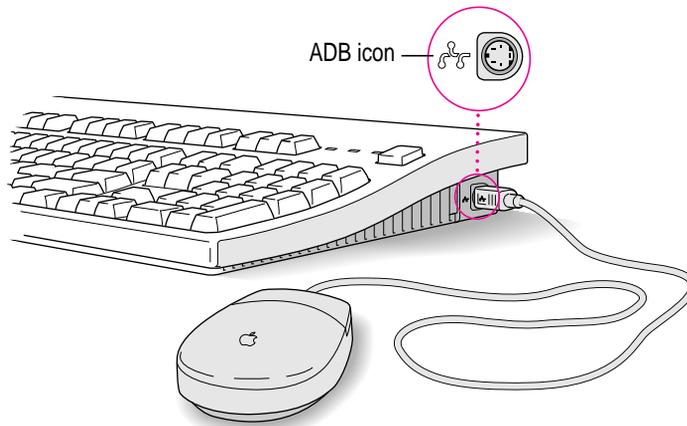
To adjust the angle of the keyboard, lower the feet until they snap into position.

Connecting a keyboard with a separate cable

- 1 Plug the mouse cable into the port on either side of the keyboard.

Most right-handed people prefer to use the mouse with their right hand; most left-handed people prefer to use their left hand. Plug the mouse into the port on the side you prefer.

The plug and the port are marked with the  icon (symbol). Align the symbols before you insert the plug. (The positions of the port and icon on your keyboard may be different from those pictured here.)

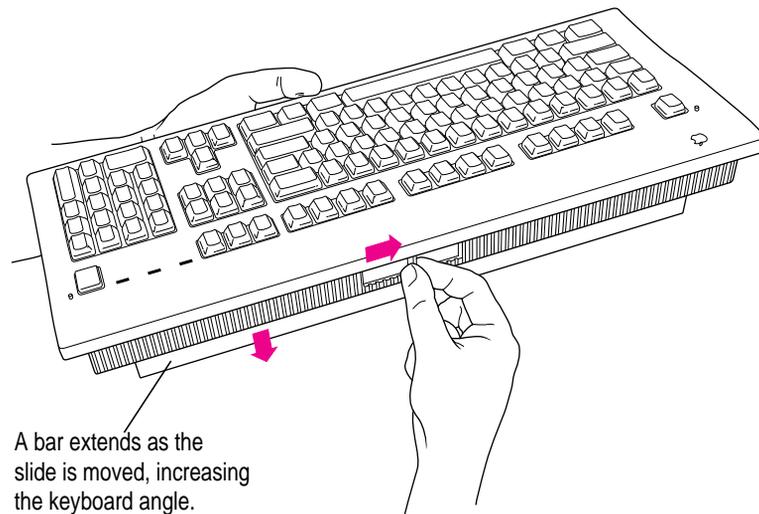


- 2 Plug the keyboard cable (both ends are the same) into the other ADB port on the keyboard.

If you plugged the mouse cable in on the right, for example, plug the keyboard cable in on the left.

- 3 If the front or side of your monitor has a port marked with the ⌘ icon, plug the keyboard cable into this port. Otherwise, plug the keyboard cable into the port marked with the ⌘ icon on the back of the server.

- 4 If you want to adjust the angle of the keyboard, slide the tab in the back of the keyboard.



Connecting other external devices

If you want to connect other devices to your server, such as an external hard disk or a printer, follow the instructions in Chapter 4.

Turning the server on

To turn on the server for the first time, follow these steps:

1 Turn on your monitor.

See the information that came with your monitor for the location of the power switch. On newer Apple monitors, the power switch is located on the front of the unit.

Note: You may not see the monitor power come on until you turn on the server in the third step.

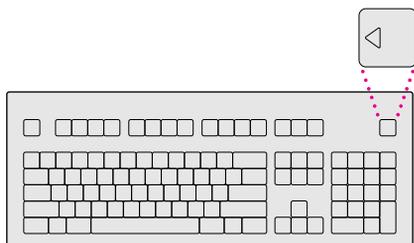
By the way: Depending on the type of monitor you have, you may only need to turn it on once. Some monitors turn off automatically when you shut down the server and turn on automatically when you start up the server. With other monitor types, you may have to turn the monitor on and off separately.

2 Turn on all external devices.

External devices may include hard disk drives or removable media devices. The server checks only once—at startup—for the presence of external devices, so you need to turn on the devices before you turn on the server.

3 Turn on your server by pressing the Power key on the keyboard or the power button on the front panel of the server.

The Power key is marked with a triangle on your keyboard.



You should hear a tone from the server as it starts up. If you don't, press the Power key again and hold down the key a little longer.

4 Check to see what's on your screen.

- If you see a message on the desktop, as shown in the following figure, your Mac OS is already set up correctly. Click the OK button to dismiss the dialog box.



Why the message about your network connection? The Workgroup Server is preset for a connection to an Ethernet network. When you start up your server for the first time (before connecting a network cable), the dialog box shown above alerts you that the system temporarily switched the network connection from built-in EtherTalk (software for Ethernet) to LocalTalk. However, if you shut down the server and connect to an Ethernet network later (as described in Chapter 2), the next time you start up, the system will automatically make the correct network connection for you.

See the *Workgroup Server Administrator's Manual* for information on configuring your server's software.

- If you see a blinking question mark, the server is having difficulty locating the system software it needs to start up.



If you have replaced the internal hard disk that contained system software, you need to reinstall system software. To install the Mac OS system software, see “Installing System Software” in Chapter 4, “Managing Hard Disks,” of the *Workgroup Server Administrator’s Manual*.

If you see a blinking question mark and you think the server should be starting up properly, see “Problems Turning On or Starting Up Your Server” in Chapter 7, “Solutions to Common Problems,” of the *Workgroup Server Administrator’s Manual*.

- If you see anything else on your screen, or if you see nothing at all, see the next section, “Problems Turning On Your Server?”

Problems turning on your server?

If you don’t see anything on your screen or you think your server did not start up properly, check these items to see if you can identify the problem:

- Is the server plugged into a power source? If it is plugged into a power strip, is the power strip turned on?
- Is the server turned on? The power button on the front panel of the server should be illuminated. If it isn’t, press the power button.
- Are the keyboard and mouse cables connected correctly? (Don’t connect or disconnect the keyboard or mouse cable while the server is on. You could damage your equipment. To turn off your server, press the power button on its front panel.)
- If you connected an ADB cable between the monitor and the server, is it attached firmly to the ports marked with a  icon? (Don’t connect or disconnect this cable while the server is on. You could damage your equipment. To turn off your server, press the power button on its front panel.)
- Is the monitor power cord plugged in?

- Is the monitor cable—the one connected to the monitor port on your server—attached firmly to both the monitor and the server?
- Is the monitor turned on? (Check the power-on light on the front of the monitor.)
- Is the brightness control on the monitor adjusted correctly? (On most monitors, the brightness control is marked with the symbol ☼.)

Turning the server off

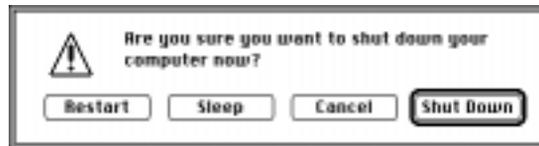
You need to turn off (shut down) the server before doing any of the following:

- moving the server
- connecting other equipment to the server
- unplugging the server

To turn off the server, follow these steps:

- 1 Press the Power key (<|>) on your keyboard.**

The following dialog box appears on the screen:



- 2 Press the Return key on the keyboard (or click the Shut Down button in the dialog box).**
- 3 Respond to the dialog boxes that may appear.**

Applications that are running may display dialog boxes that prompt you to save open files or that ask you to enter a message that is to be displayed to users who are logged in to your server.

To turn the server on again, just press the Power key on the keyboard.

Other ways to turn off the server

You can also turn off the server by pressing the power button (located at the front of the server) or by choosing Shut Down from the Special menu in the Finder. Both procedures safely turn off the server and ready the startup disk for a fast restart the next time you turn on the server.

2

Connecting to the Network

The Workgroup Server 9650 contains built-in hardware and software for connecting the server to two types of networks: LocalTalk and Ethernet. With the appropriate Peripheral Component Interconnect (PCI) card and software, you can also connect your server to additional networks, including other network types, such as Token Ring, Integrated Services Digital Network (ISDN), Fiber Distributed Data Interface (FDDI), Asynchronous Transfer Mode (ATM), and Fast Ethernet (100Base-T) networks.

You connect the server to a LocalTalk network through the printer port or modem port. The built-in Ethernet ports on the Workgroup Server 9650 let you connect the server to an Ethernet network through either the AAUI (Apple Attachment Unit Interface) Ethernet connector or the 10Base-T Ethernet interface connector.

IMPORTANT Although you can connect cables to both of these Ethernet ports at the same time, you can use only one of these built-in Ethernet connections at a time.

The Workgroup Server 9650 is preconfigured to use the built-in Ethernet connection. If both 10Base-T and AAUI networks are connected to the built-in Ethernet ports, your server automatically uses the 10Base-T connection. See Chapter 2, “Configuring Your Network Connection,” in the *Workgroup Server Administrator’s Manual* for instructions on changing the default network connection for your server.

Although your server is preconfigured to access one network segment at a time, with network server software (such as AppleShare) that supports the multihoming capabilities of Open Transport communications software, you can set up your server to access multiple network segments at the same time. See the section “Building a High-Performance Network” later in this chapter for more information on multihoming.

Connecting to an Ethernet network

The built-in Ethernet capabilities of your Workgroup Server 9650 allow you to connect to any standard Ethernet network using thin coaxial (or “coax”), 10Base-T twisted-pair, or thick coaxial cables; fiber-optic media; or other standard Ethernet cables.

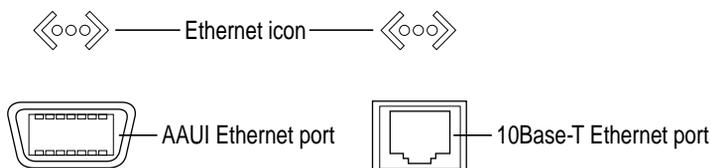
You can connect your server directly to an Ethernet network using a 10Base-T twisted-pair cable. To connect the server to an Ethernet network using coaxial cables, you need one of the following Ethernet media adapters:

- Apple Ethernet Thin Coax Transceiver
- Apple Ethernet AUI Adapter

See your Apple-authorized dealer for more information on Apple Ethernet media adapters for your Workgroup Server 9650.

WARNING Do not connect cables to the back of the server when the power is on or you may damage your system.

You can connect an adapter and cable for an Ethernet network directly to the server without installing an expansion card. You can find the Ethernet ports on the back of your server by looking for the Ethernet icon:



Although you can connect cables to both of these Ethernet ports at the same time, you can use only one of these built-in Ethernet connections at a time.

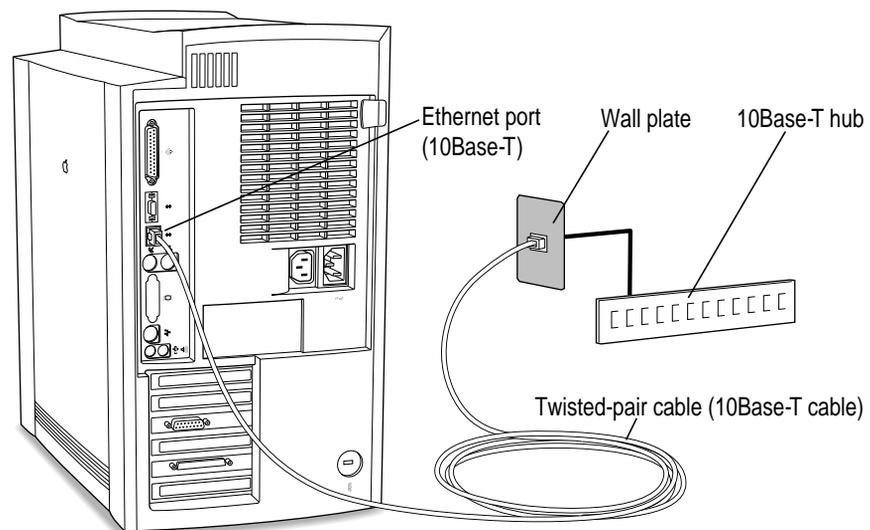
The following sections provide basic instructions for connecting your server to an Ethernet network.

Connecting to twisted-pair Ethernet

Follow this procedure to connect the server to a network that implements Ethernet over twisted-pair cable. The hardware connection requires a twisted-pair cable with an RJ-45 telephone-style connector jack. You plug the cable into a standard wall plate that is connected to a centralized 10Base-T hub.

To connect the server to a twisted-pair network:

- 1 Make sure that the server is turned off.**
- 2 Plug one end of the twisted-pair cable into an RJ-45 wall outlet that supports 10Base-T Ethernet.**



- 3 Plug the other end of the twisted-pair cable into the 10Base-T Ethernet port on the server.**

The server is preset to use the network software connection for Ethernet. You can use network services as soon as you start up the server.

Connecting to thin coaxial Ethernet

Follow this procedure to connect the server to an Ethernet network that uses thin coaxial cable. The hardware connection requires an Apple (or Apple-compatible) thin coaxial transceiver and a thin coaxial cable.

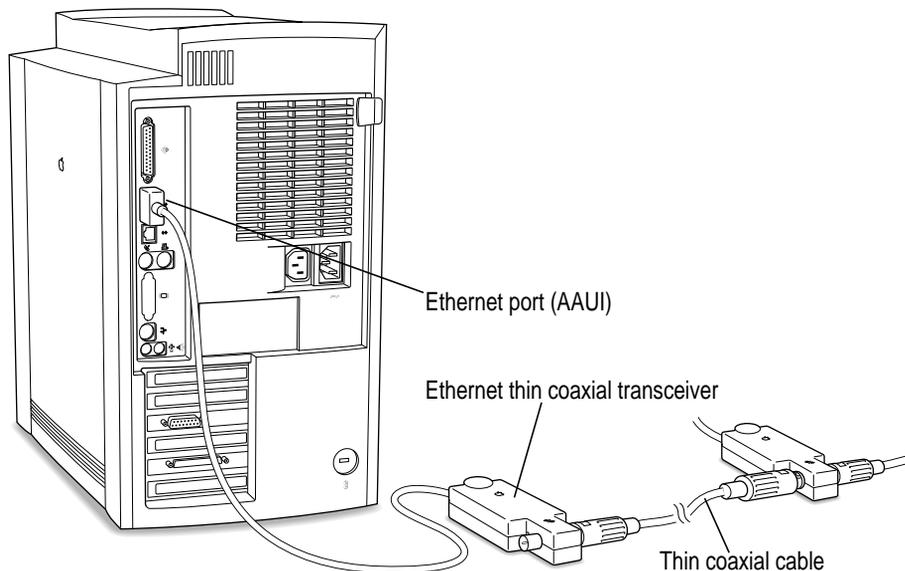
To connect the server to a thin coaxial network:

- 1 Make sure that the server is turned off.**
- 2 Attach one end of a thin coaxial cable to one of the posts on the thin coaxial transceiver.**
- 3 Attach the other end of the cable to the last thin coaxial transceiver on the network.**

A thin coaxial network must be terminated at the endpoints to function. An Apple transceiver is self-terminating. A non-Apple transceiver may require a terminator; check the documentation that came with the transceiver.

Note: You can connect the server anywhere along a network; however, to do so requires that you temporarily disconnect the network, which could disrupt existing network services.

- 4 Plug the connector on the transceiver into the AAUI Ethernet port on the server.**



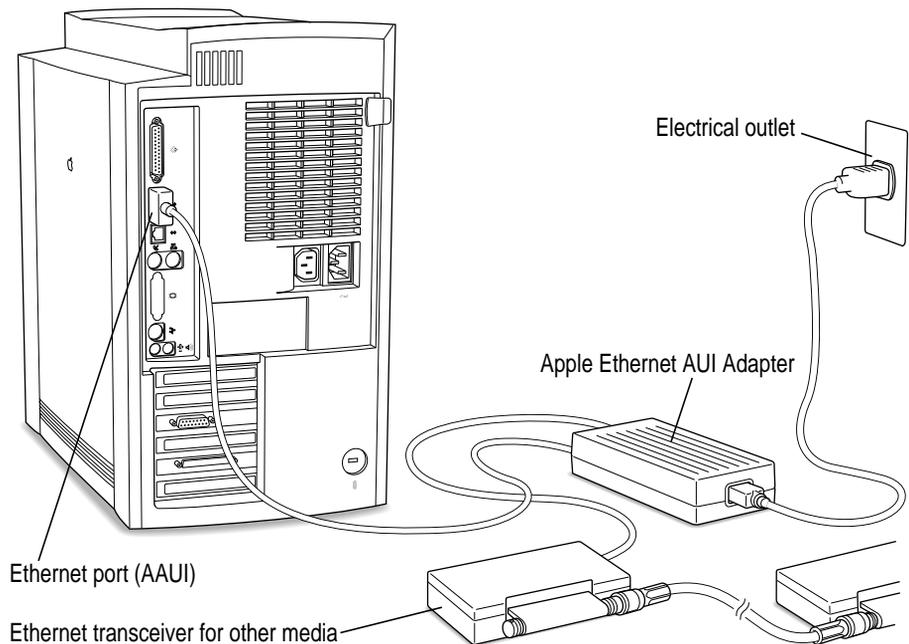
The server is preset to use the network software connection for Ethernet. You can use network services as soon as you start up the server.

Connecting to other types of Ethernet

The Apple Ethernet AUI Adapter is a universal adapter that lets you connect the server to less common types of industry-standard Ethernet media, such as thick coaxial or fiber-optic cable. If you are using the Apple Ethernet AUI Adapter, you also need an Ethernet transceiver for your specific media type, and the transceiver must have a standard AUI port on it.

To connect the server to an Ethernet transceiver for other types of Ethernet media:

- 1** Make sure that the server is turned off.
- 2** Connect the Ethernet transceiver to the network following the instructions in the documentation that came with the transceiver.
- 3** Plug the transceiver cable from the Ethernet transceiver into the standard AUI port on the Apple Ethernet AUI Adapter.



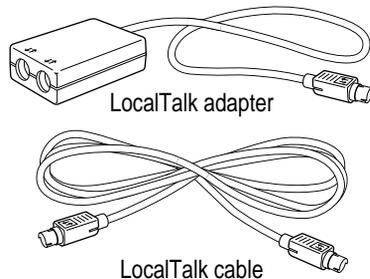
- 4 Plug the adapter's power cord into a power outlet.
- 5 Plug the connector on the Apple Ethernet AUI Adapter into the AAUI Ethernet port on the server.

The server is preset to use the network software connection for Ethernet. You can use network services as soon as you start up the server.

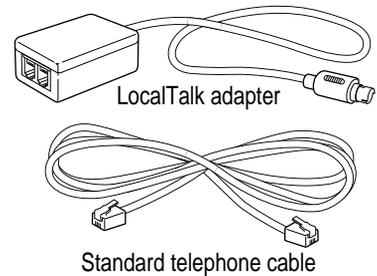
Connecting to a LocalTalk network

To connect your server to a LocalTalk network, you need LocalTalk cables and a LocalTalk adapter. In most cases, the Apple LocalTalk Locking Connector Kit DIN-8, available from your Apple-authorized dealer, contains the components you need to connect your server to an existing LocalTalk network. If your network uses standard telephone cables for your network wiring, obtain an Apple LocalTalk RJ-11 Connector instead.

Apple LocalTalk Locking Connector Kit DIN-8



Apple LocalTalk RJ-11 Connector

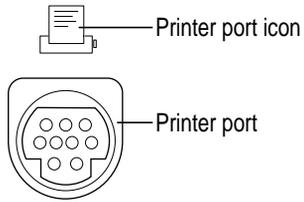


Note: An Ethernet network provides better performance than a LocalTalk network.

To connect your server to a LocalTalk network, do the following:

- 1 Make sure that the server is turned off.

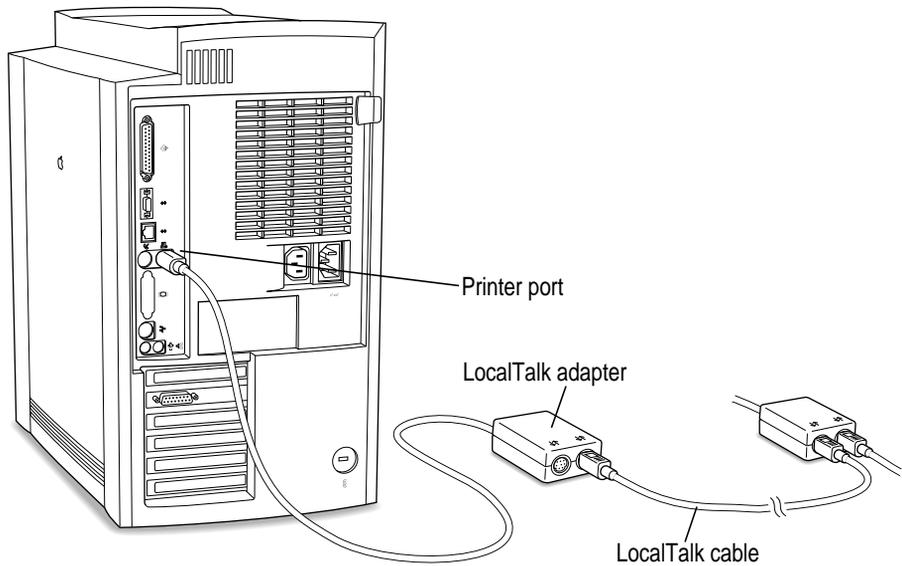
2 Attach the LocalTalk adapter to the printer port.



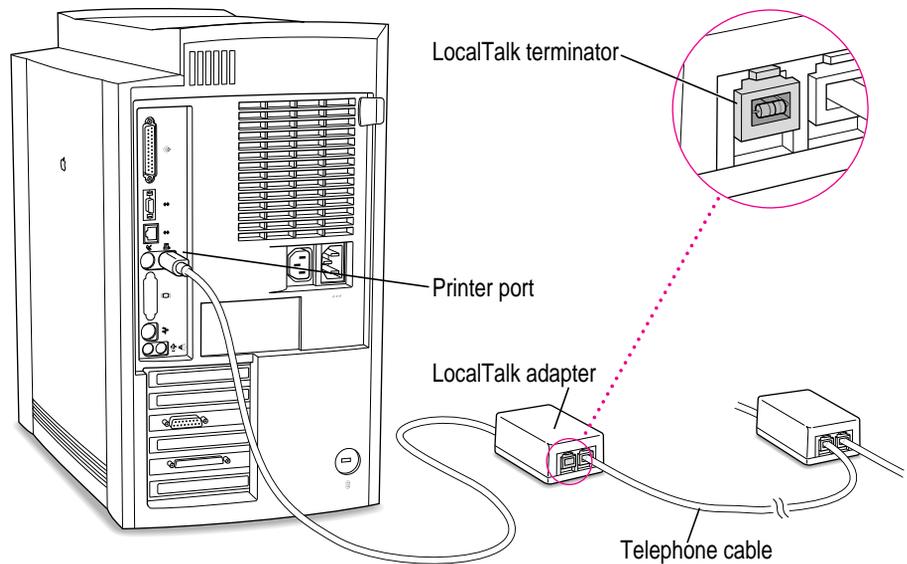
Note: If another device is already connected to the printer port, you can connect the LocalTalk adapter to the modem port.

3 Plug one end of a LocalTalk cable into the LocalTalk adapter.

4 Plug the other end of the cable into the last LocalTalk adapter on the network.



- 5 If you are using a LocalTalk adapter with RJ-11 (telephone) connectors, connect a terminator to the unused RJ-11 connector on the LocalTalk adapter.



For more information about LocalTalk network terminators, see the instructions that come with the Apple LocalTalk RJ-11 Connector.

Note: A LocalTalk adapter with the round DIN-8 connectors does not require an external terminator.

Now that you have made the server's physical connection to LocalTalk, you can start up the server.

IMPORTANT After connecting to a LocalTalk network (if you have not also connected to Ethernet), each time you start up the server you'll see a dialog box that indicates an error condition. This dialog box informs you that the system has made a temporary switch from EtherTalk (its preset network software connection) to LocalTalk. You will see this message until you change the default setting in the AppleTalk control panel. Turn to Chapter 2, "Configuring Your Network Connection," in the *Workgroup Server Administrator's Manual* to learn how to switch the setting in the AppleTalk control panel.

Building a high-performance network

Your Workgroup Server 9650 is designed to support a multisegment, high-performance network. Connection devices such as repeaters, bridges, routers, and gateways extend network segments and provide efficient links between a variety of network segments. For information about extending and connecting AppleTalk networks, see *Planning and Managing AppleTalk Networks* (an Apple book published by Addison-Wesley that is available at computer bookstores).

In addition to its built-in LocalTalk and Ethernet ports, your server has four available expansion slots where you can install PCI cards for connecting additional network segments, including different network types such as Token Ring, Integrated Services Digital Network (ISDN), Fiber Distributed Data Interface (FDDI), and Fast Ethernet (100Base-T) networks. The multihoming capabilities of Open Transport networking and communications software that is part of the Mac OS make it possible for your server to access multiple network segments at the same time.

Creating a high-performance Ethernet segment

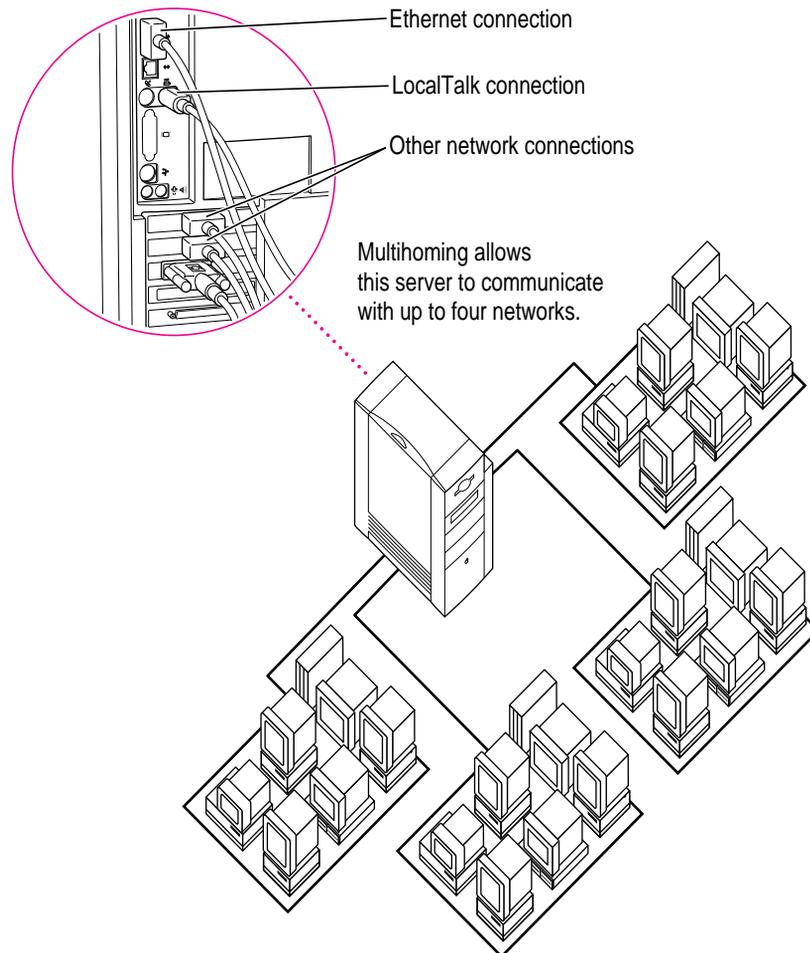
You can increase performance in Ethernet networks by creating subnetworks of devices connected by 10Base-T Ethernet hubs (repeaters that regenerate signals from one device to another). The Apple Ethernet 10T/5 Workgroup Hub provides a modular, plug-and-play approach to creating and expanding high-performance Ethernet networks. This hub gives you a simple, cost-effective means of connecting together a wide variety of Macintosh and other personal computers, Workgroup Servers, and Ethernet-capable printers.

One of the easiest and most cost-effective ways to increase bandwidth is to connect network devices with *switched Ethernet hubs*. A switched hub connects devices on a 10Base-T network, but it switches packets between ports, instead of passing them across a shared backbone, allowing each device that is connected to the switched hub to use the entire capacity of the link. In a 10Base-T network, you may want to dedicate switched hubs to devices that require extra bandwidth, such as file servers. You can create a high-speed (100Base-T) Ethernet segment by installing a 100 MB Ethernet PCI expansion card in your server (see Chapter 3 for card installation instructions) and using high-performance switched hubs to connect the network devices.

Contact your Apple-authorized dealer for help selecting PCI expansion cards and hubs to optimize performance on your Ethernet networks.

Using multiple network segments

In addition to the built-in Ethernet and LocalTalk connections, you can connect your server to other networks by installing additional PCI network cards (and associated software). To use more than one network segment at the same time, you also need network server software that supports multihoming on PCI-based systems (such as AppleShare). The following illustration is an example of a server that has multihoming enabled on the built-in Ethernet and LocalTalk connections, as well as on two additional network connections provided by PCI network cards.



Setting up multihoming

Follow these steps to set up multihoming capabilities on your server:

- 1 Install PCI network cards (and associated software) for additional network segments that you want to connect to your server.**

Follow the instructions in Chapter 3 of this manual.

Note: This step is optional; you can take advantage of multihoming capabilities even when network segments are connected only to the built-in LocalTalk and Ethernet ports on your server.

IMPORTANT Although you can simultaneously connect cables to the built-in AAUI and 10Base-T Ethernet ports, you can use only one of these Ethernet connections at a time.

- 2 Configure the Open Transport options for your server.**

Follow the instructions for configuring your AppleTalk network connection in Chapter 2, “Configuring Your Network Connection,” of the *Workgroup Server Administrator’s Manual*.

IMPORTANT Each port must be assigned to a different zone.

- 3 Configure your network server software to enable multihoming on your server.**

See the documentation that accompanied your network server software.

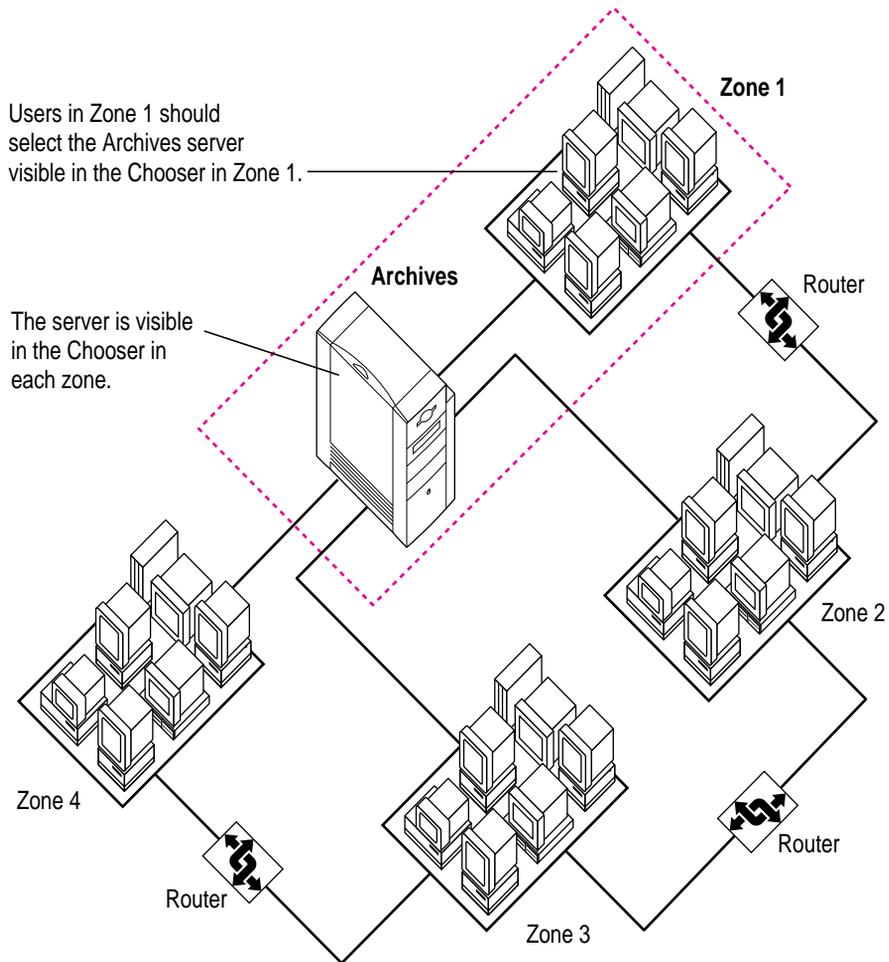
Use routers to connect network segments

Although users on different multihomed network segments can share and exchange files by using the server as a common storage area, each multihomed network segment is not visible to the other segments unless it is connected to them with a router. For example, suppose you have four multihomed network segments connected to your server (A, B, C, and D). Computers and other network devices such as LaserWriter printers on segment A are not visible to segments B, C, or D unless there’s a router between A and the other three segments.

Have users select the server in their own zone

If network segments connected to your server are connected to each other through routers, users will see the server in all the connected zones (in the Chooser). For best performance when selecting a server in the Chooser, make sure that users select the server that resides in the same zone as their own computer.

For instance, in the following illustration, users will be able to see the Archives server in Zones 1, 2, 3, and 4. Users in Zone 1 should log on to the Archives server in Zone 1.



3

Installing PCI Expansion Cards, Additional Memory, and Internal Storage Devices

This chapter provides information about peripheral component interconnect (PCI) expansion cards, memory, and internal devices, and explains how to install them. Installing one or more of these items involves three procedures (detailed steps for each are provided later in this chapter):

- opening the server
- inserting the card, memory module, or storage device into a specific slot or expansion bay
- closing the server

Note: Your server's PowerPC processor may also be upgraded with the installation of a processor card upgrade. Contact your Apple dealer for information about processor card upgrades. To install a processor card upgrade, refer to the documentation that comes with the card.

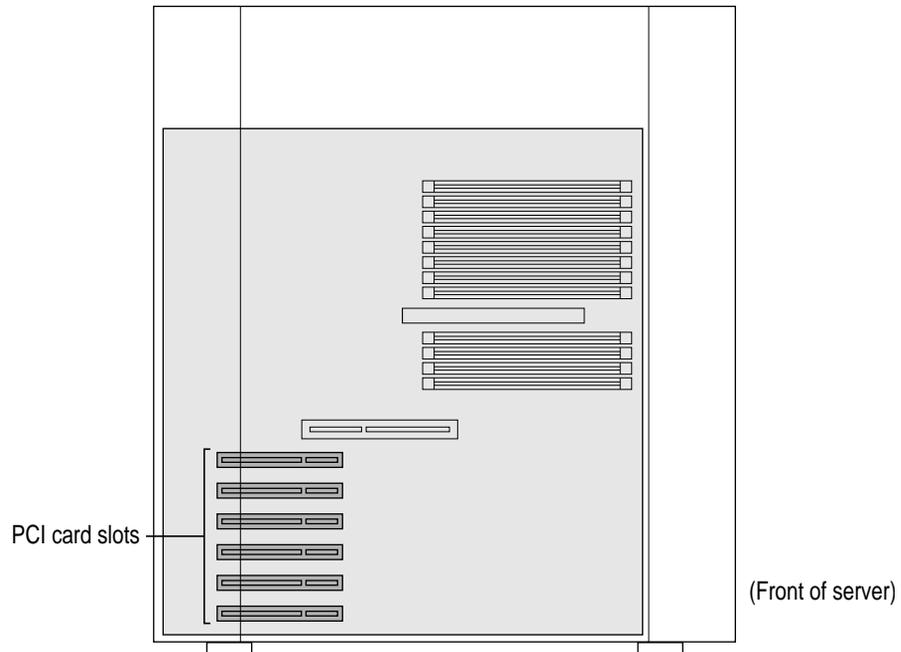
WARNING Although instructions for installing memory and expansion cards are provided in this manual, Apple Computer recommends that you have an Apple-certified technician install them. Consult the service and support information that came with your server for instructions on how to contact an Apple-authorized service provider or Apple for service. If you install these items yourself, you risk damaging your equipment, and this damage is not covered by the limited warranty on your server. See an Apple-authorized dealer or service provider for additional information about this or any other warranty question.

About PCI expansion cards

You can install printed circuit boards (called “cards”) for video and graphics applications, networking and communications, additional processing power, or other purposes. The cards fit into connectors, called “expansion slots,” inside the server.

Your Macintosh has six expansion slots, each designed to accept a 7-inch or 12-inch long PCI card. Install only expansion cards that come with Macintosh drivers and are compliant with the PCI 2.0 standard. NuBus™ cards cannot be used in these expansion slots.

The following illustration shows the locations of PCI expansion slots on the logic board.



Expansion card power requirements

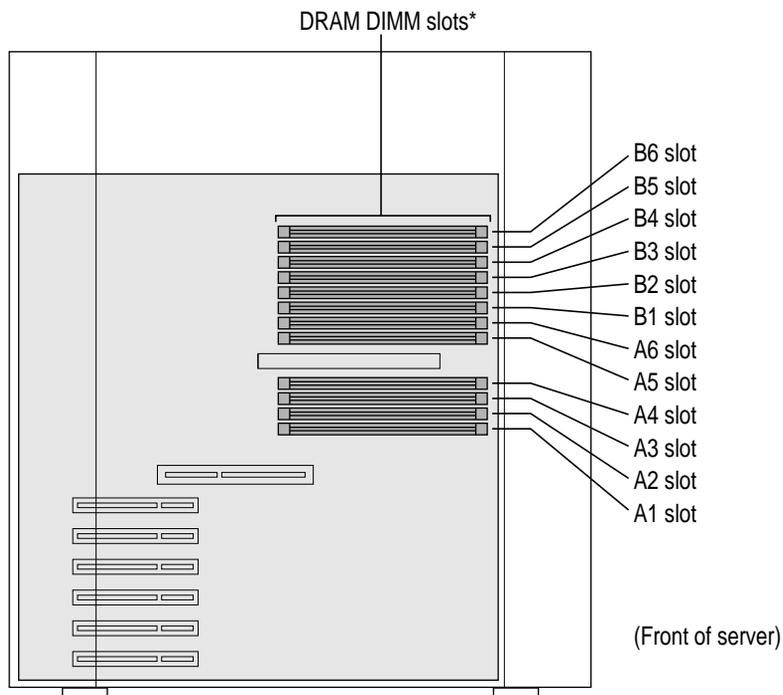
The combined power consumption of expansion cards must not exceed the limits specified for your Macintosh model. If you have more than one expansion card installed, check the information that came with your cards to make sure that their power consumption is within the limits specified in Appendix B, “Technical Information.”

WARNING To avoid damaging your server and expansion card, do not attempt to install any expansion card without first checking the documentation for that card. If the documentation specifies that an Apple-certified technician must install the card (usually because the installation requires special training or tools), consult the service and support information that came with your server for instructions on how to contact an Apple-authorized service provider for assistance. If you attempt to install the card yourself, any damage you may cause to the server or card will not be covered by the limited warranty on your server. If the card is not an Apple-labeled product, check with an Apple-authorized dealer or service provider to see if you can install it yourself.

About memory

You can add dynamic random-access memory (DRAM) by installing Dual Inline Memory Modules (DIMMs) in your server.

The following illustration shows the locations of memory slots on the logic board.



*When installing DRAM, for best performance, fill paired slots—A1 and B1, A2 and B2, and so on. It doesn't matter which pairs you use or the order in which you use them.

DRAM configurations

You can increase your server's DRAM up to 768 MB. The main logic board has 12 DIMM slots that accept DIMMs that meet these specifications:

- 8, 16, 32, or 64 MB (128 MB DIMMs are available, but they have not been tested for use with this Workgroup Server model.)
- 64-bit wide, 168-pin
- 70-nanosecond (ns) RAM access time or faster. (If you install DIMMs with different speeds, they will all operate at the speed of the slowest DIMM installed.)
- 1K, 2K, or 4K refresh rate
- 5 volts
- extended data output (EDO) or fast-paged mode

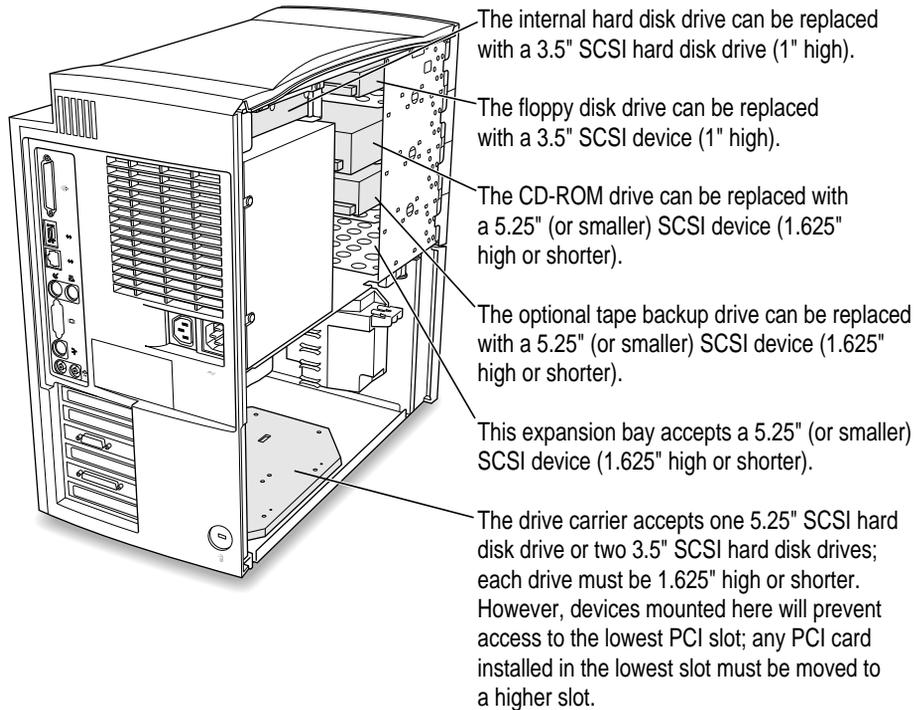
IMPORTANT The Single Inline Memory Modules (SIMMs) from older Macintosh computers are not compatible with your server and cannot be used.

DIMMs can be installed one at a time in any order in any of the memory slots. However, if you wish to take advantage of your server's memory interleaving capability, which provides maximum performance, you must install the DIMMs in pairs, and in paired slots. (Slots are paired A1 and B1, A2 and B2, and so on. It doesn't matter which pairs you use or the order in which you use them, as long as the DIMMs are installed in paired slots.) Memory interleaving allows the server to read or write to its memory at the same time that other memory reads or writes are occurring, thus providing approximately 5 percent to 15 percent faster performance.

To increase DRAM to the maximum of 768 MB, fill all 12 slots with 64 MB DIMMs.

About internal storage options

The Workgroup Server 9650 has room to install and connect up to seven internal SCSI devices. The illustration below shows all of the internal expansion options.



The table on the next page describes the four internal SCSI buses that are available for connecting internal SCSI devices. In most cases, you should only need to use the first two.

Internal SCSI buses on the Workgroup Server 9650

SCSI connector	SCSI type (familiar name)	Notes	Max # of drives supported	Bits in data path	Clock speed	Max data transfer rate
68-pin	SCSI-3 wide (Ultra Wide)	The internal hard disks* that came with your server are connected to this bus, which is on the SCSI PCI card.	4 [†]	16	4x	40 MB per second
50-pin	SCSI-2 narrow (Fast)	The CD-ROM drive and optional DAT drive are connected to this bus.	5 [†]	8	2x	10 MB per second
50-pin	SCSI-2 narrow (Fast)	This SCSI bus is on the SCSI PCI card. In most cases, you should use the SCSI-2 narrow bus described above because you cannot use all three SCSI connectors on the SCSI PCI card at the same time.	0**	8	2x	10 MB per second
50-pin	SCSI-1 narrow (Old or Slow)	This connector on the logic board allows you to connect internal devices to the external SCSI-1 narrow bus. However, in most cases you should use the SCSI-2 narrow bus because it offers better performance.	0**	8	1x	5 MB per second

* Depending on your configuration, either one or two internal hard drives were installed in your server at the factory.

[†] Although SCSI cables are provided to support four SCSI-3 devices and five SCSI-2 devices, the maximum number of SCSI devices that may be installed inside the server is seven.

** SCSI cables are not provided for these SCSI connectors. Use the SCSI buses for which cables are provided.

For more information about the Ultra Wide SCSI-3 bus, see “About the Ultra Wide SCSI-3 Bus,” next.

For more information about the Fast SCSI-2 bus, see “About the Fast SCSI-2 Bus” later in this chapter.

Note: In addition to the internal SCSI buses, there are two external SCSI buses available for connecting external devices. For more information, see “Connecting External SCSI Devices” in Chapter 4, “Connecting Additional Equipment.”

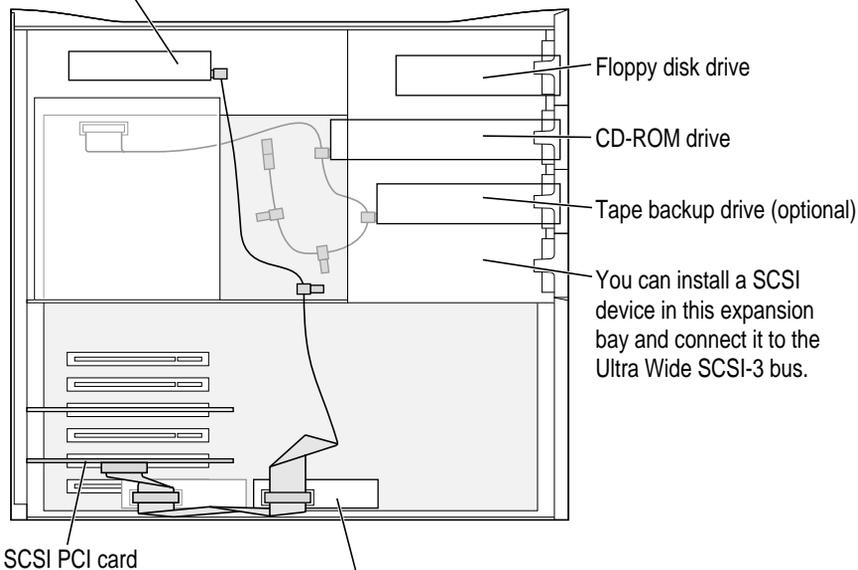
About the Ultra Wide SCSI-3 bus

The Workgroup Server 9650 comes with a SCSI card installed in one of the PCI slots. You can connect up to four internal devices to the Ultra Wide SCSI-3 bus on this card.

IMPORTANT In addition to the information in this section, refer to the SCSI card manual that came with your server before you connect an internal device to the Ultra Wide SCSI-3 bus. It contains additional information and installation instructions.

The illustration below shows where to install SCSI devices for use with the Ultra Wide SCSI-3 bus.

The internal hard disk drive (SCSI ID 0) is connected to the Ultra Wide SCSI-3 bus.



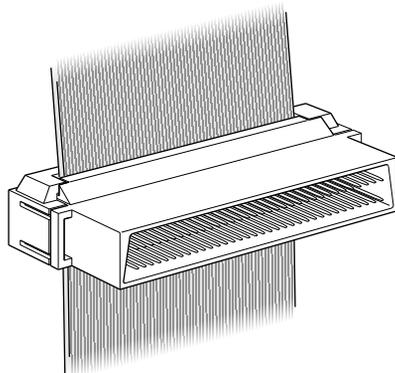
One 5.25" hard disk drive or two 3.5" hard disk drives can be installed on the floor of the server and connected to the Ultra Wide SCSI-3 bus. (Some Workgroup Server models come with a second hard disk drive [SCSI ID 1] installed here.)

Some of the drives that were installed in your server at the factory, as well as the SCSI card itself, have already reserved certain SCSI ID numbers on the Ultra Wide SCSI-3 bus. Other ID numbers are available for assignment to SCSI devices that are added later, as described in the following table.

Ultra Wide SCSI ID number	Device
0	Factory-installed hard disk drive (terminated)
1	Second factory-installed hard disk drive (optional)
2 through 6	Available
7	SCSI PCI card (terminated)
8 through 15	Available

IMPORTANT The factory-installed internal hard disk and the SCSI card are both terminated. Other SCSI devices that you install and connect to the Ultra Wide SCSI-3 bus must not be terminated. If you attach a terminated device to the internal SCSI interface, the server will malfunction.

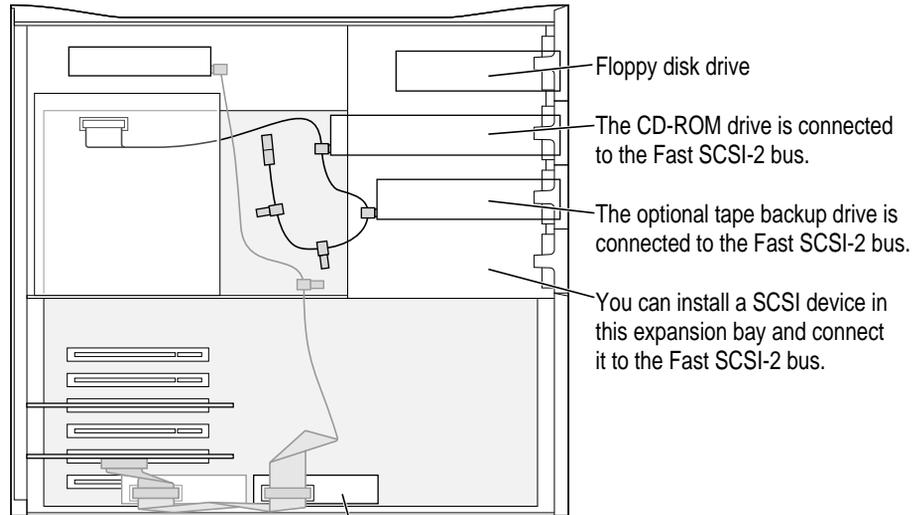
You use the internal ribbon cable with the 68-pin connectors to connect an internal SCSI device to the Ultra Wide SCSI bus.



68-pin connector

About the Fast SCSI-2 bus

The internal Fast SCSI-2 bus supports the internal CD-ROM drive and optional tape backup drive. The illustration below shows where to install SCSI devices for use with the Fast SCSI-2 bus.



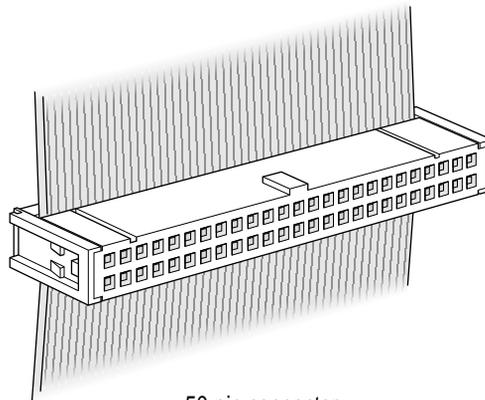
Though you can install two SCSI hard disk drives on the floor of the server, you can connect only one of them to the Fast SCSI-2 bus; connect the other to the Ultra Wide SCSI-3 bus. (Some Workgroup Server models come with a second hard disk drive installed here and connected to the Ultra Wide SCSI-3 bus.)

All devices on the same SCSI bus must have unique ID numbers, but devices on different SCSI buses may use the same SCSI ID number. (For example, you could have a CD-ROM drive with ID number 3 connected to the Fast SCSI-2 bus and a hard disk with ID number 3 connected to the Ultra Wide SCSI-3 bus.)

Some of the drives that were installed in your server at the factory, as well as the server itself, have already reserved certain SCSI ID numbers on the Fast SCSI-2 bus. Other ID numbers are available for assignment to SCSI devices that are added later, as described in the following table.

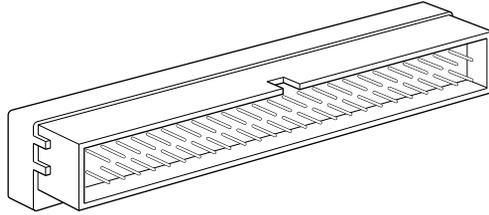
SCSI ID number	Device
0	Available
1	Available
2	Factory-installed tape backup drive (optional)
3	Factory-installed CD-ROM drive
4	Available
5	Available
6	Available
7	Workgroup Server

You use the internal ribbon cable with the 50-pin connectors to connect an internal SCSI device to the Fast SCSI bus.



50-pin connector

Only one internal terminator is allowed on the Fast SCSI bus. Neither the CD-ROM drive nor the optional DAT drive is terminated; instead, termination is supplied to the Fast SCSI bus via a termination block attached to the end of the internal ribbon cable.



50-pin termination block

If you are connecting an unterminated device to the Fast SCSI bus, leave the termination block attached to the ribbon cable, and connect one of the available 50-pin connectors to the device.

If the device you want to connect to the Fast SCSI bus is terminated, make sure there is only one terminator on the bus by doing one of the following:

- Remove the termination block at the end of the SCSI ribbon cable and connect the last 50-pin connector on the ribbon cable to the terminated device. This allows the device you are installing to terminate the Fast SCSI bus.
- Have an Apple-authorized service provider remove any built-in terminator from the device that you want to install. This allows you to connect the device as an unterminated device to any available 50-pin connector on the ribbon cable, as described previously.

IMPORTANT If you attach more than one terminator to the internal SCSI interface, damage to the server's main logic board can occur.

IMPORTANT Some older SCSI devices may require updated drivers. (A “driver” is special software that is installed in your System Folder.) For more information, see “Installing a Device Driver” in Chapter 4.

Installing a PCI expansion card, memory, or an internal storage device

Follow these instructions to install a PCI expansion card, memory, or an internal storage device.

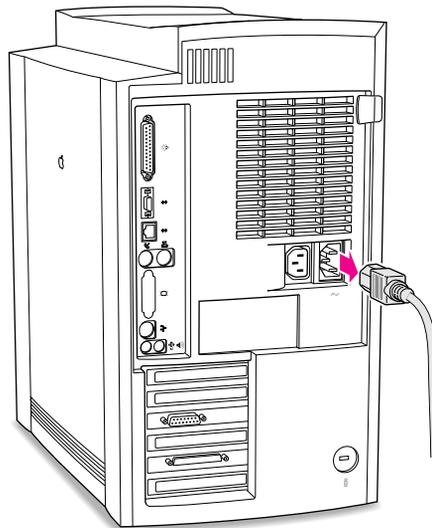
IMPORTANT Before installing any of these items, carefully read “About PCI Expansion Cards,” “About Memory,” and “About Internal Storage Options” earlier in this chapter.

Opening the server

- 1 If your server is turned on, turn it off by choosing Shut Down from the Special menu. Then wait 20 minutes.

Before proceeding with these instructions, you need to allow the server’s internal components to cool.

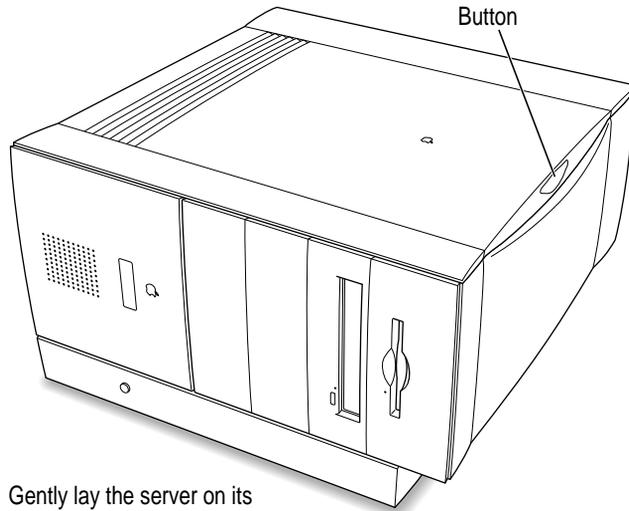
- 2 Unplug all the cables from the server, including the power cord.



- 3 If the cover is locked shut, unlock it by removing the security cable or padlock from the cover latch.

Do not remove the cover yet.

- 4 Carefully lay the server on its side with the cover and button facing up.

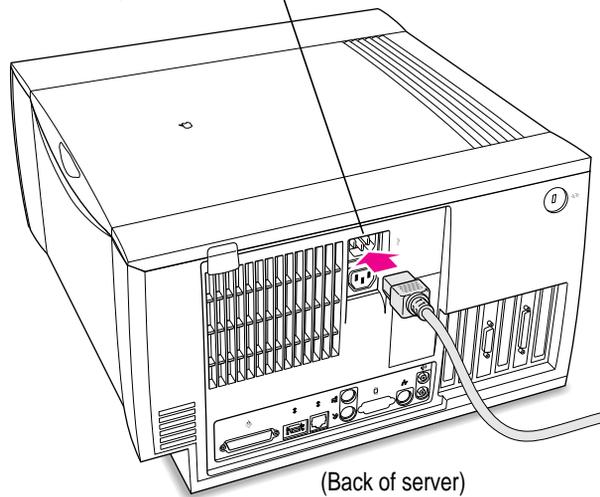


Gently lay the server on its side on a clean, flat, stable surface.

- 5 Reconnect the power cord to the server.

Connect the power cord to your server and to an AC outlet.

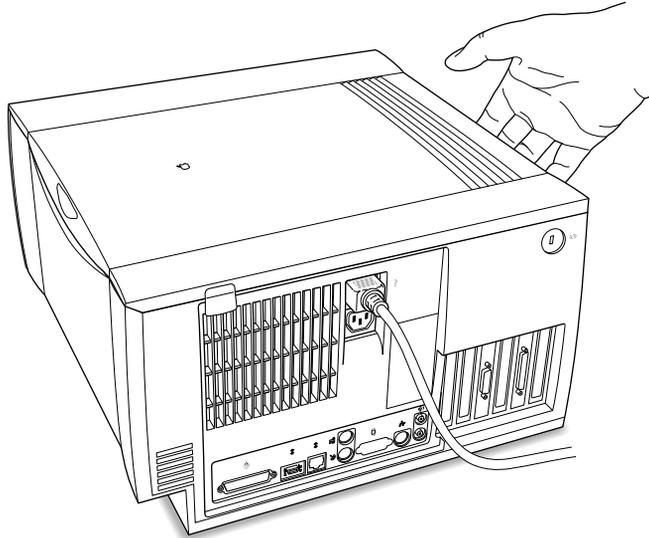
Plug the power cord into the power socket.



6 Touch the metal part of the chassis on the bottom of the server.

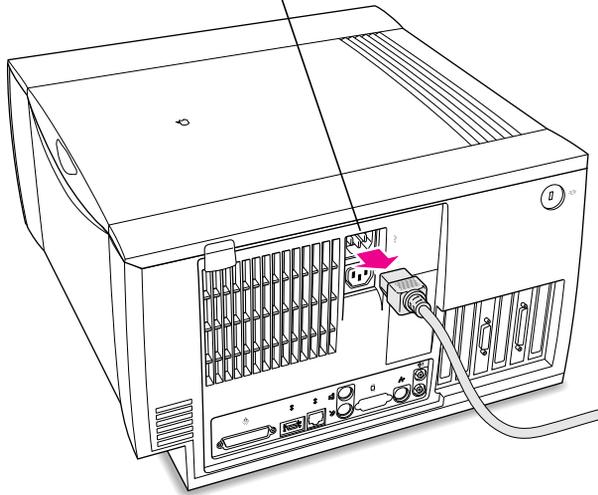
This helps protect the server from damage caused by electrostatic discharge.

IMPORTANT Always do this before you touch any parts, or install any components, inside the server. To avoid generating static electricity, do not walk around the room until you have completed the installation of the expansion card or memory and closed the server.



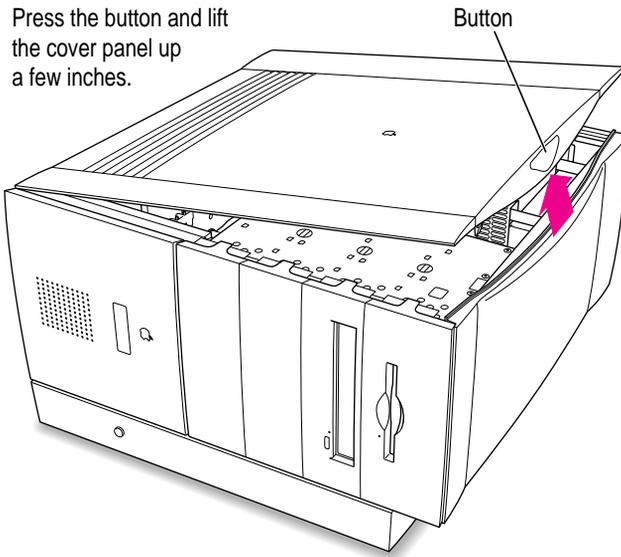
7 Disconnect the power cord from the back of the server.

Remove the power cord from the back of the server.

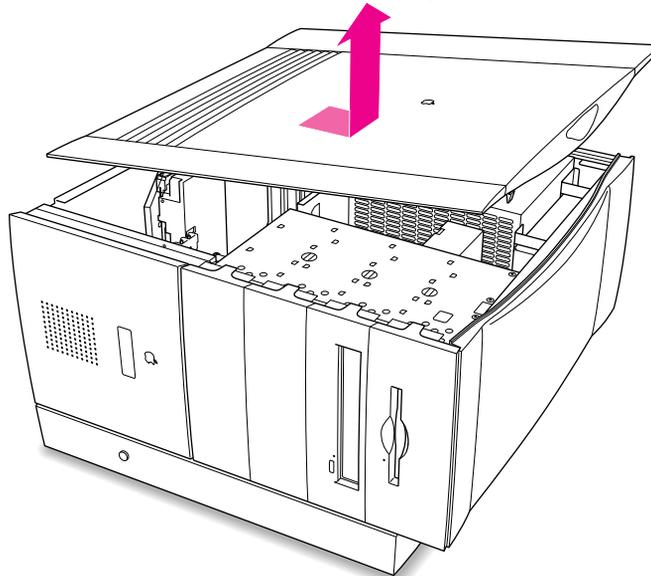


8 Remove the cover.

Press the release button on the side of the cover. Then lift up the cover panel near the button and slide it off.



Slide the cover panel to the right and lift it off.



9 Set the cover panel aside.

To protect the metal shielding on the inside of the panel, lay down the panel so that the metal shielding faces up.

What you do next depends on whether you are installing a PCI expansion card, memory, or an internal storage device.

10 Go to the section that provides the instructions for the item that you want to install.

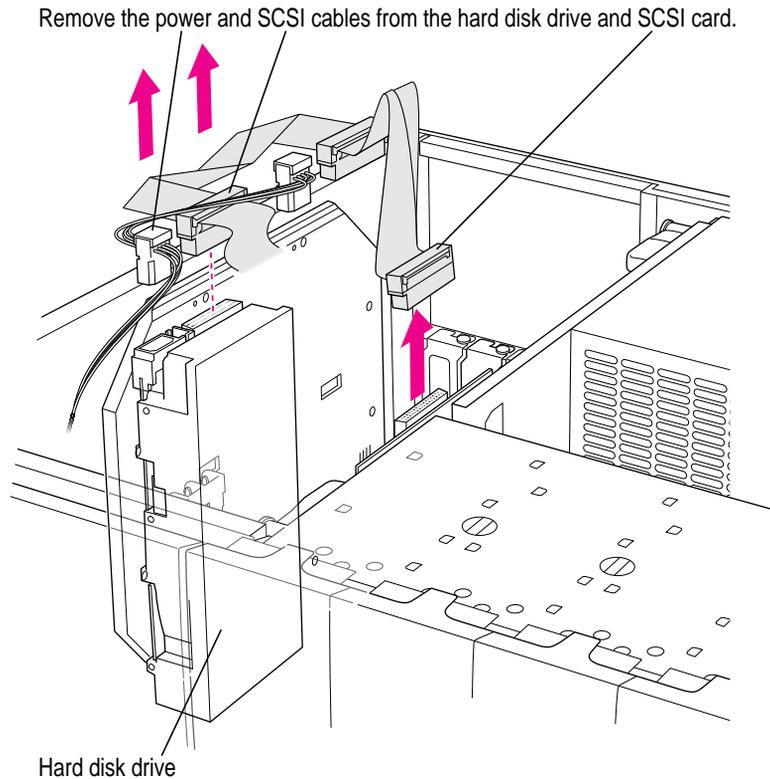
To install	Follow the instructions in
PCI expansion card	"Installing a PCI Expansion Card," next
Memory	"Installing Memory" later in this chapter
Internal storage device	"Installing Hard Disks and Other SCSI Devices" later in this chapter

Installing a PCI expansion card

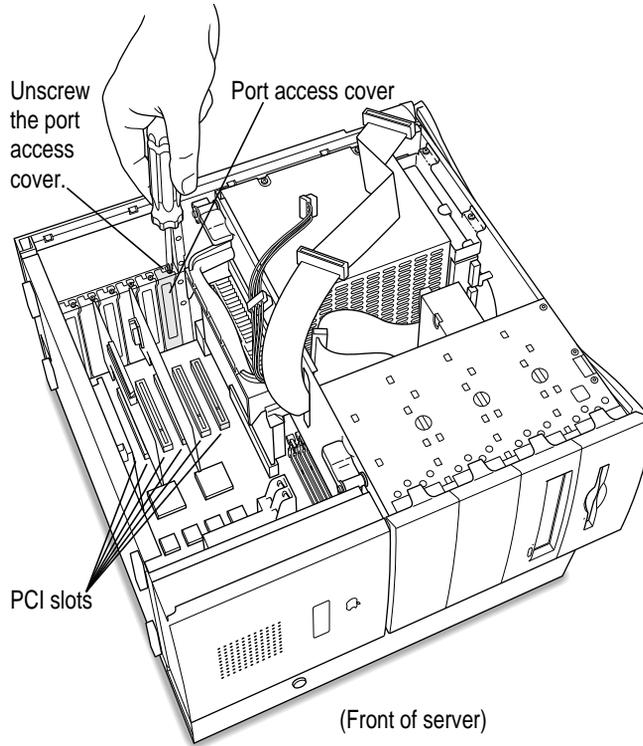
IMPORTANT Before installing a PCI expansion card, read “About PCI Expansion Cards” at the beginning of this chapter. Also, follow the steps in “Opening the Server” to safely open the server.

- 1 **Disconnect the SCSI cable from the SCSI PCI card. Also disconnect the SCSI cable and the power cable from each hard disk drive mounted on the floor of the server (if any).**

Depending on your configuration, you may have to disconnect cables from zero, one, or two hard disk drives.

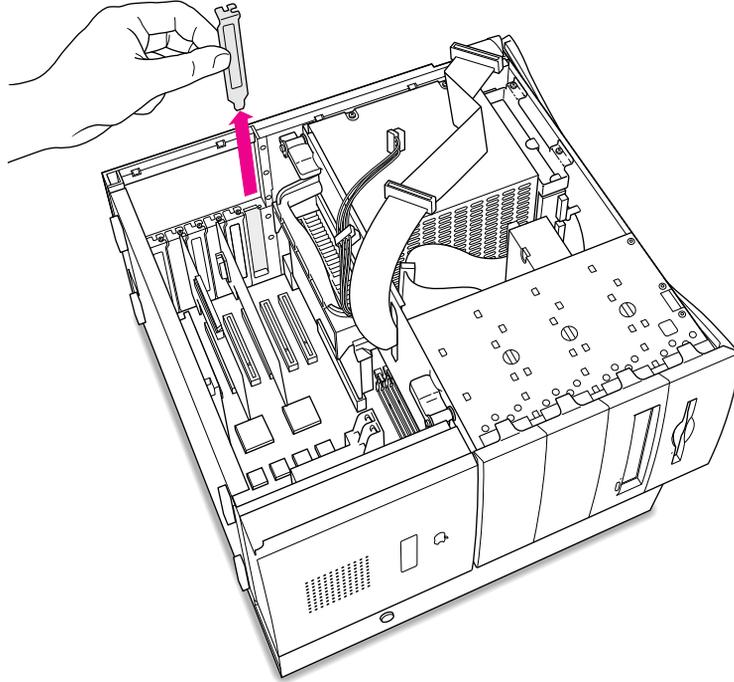


- 2 Remove the screw from one of the six expansion port covers.



Save the screw; you will need it later in these instructions.

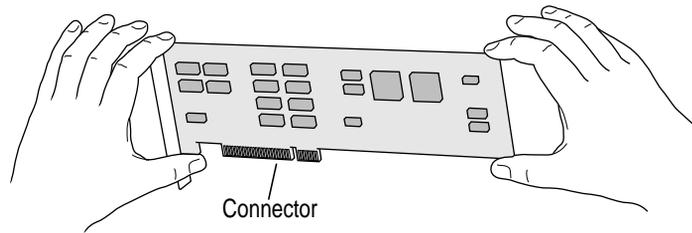
- 3 Pull out the port access cover and set it aside.**



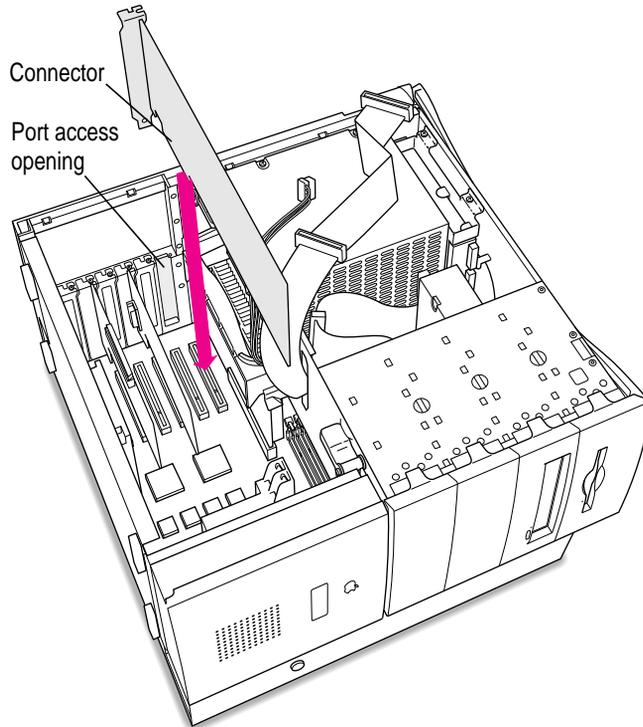
You won't need the port cover for the rest of these instructions, but save it in case you ever remove the PCI card and need to cover the port again.

4 Remove the card from its static-proof bag.

Hold the card by its edges to avoid touching the connector or any of the components on the card.

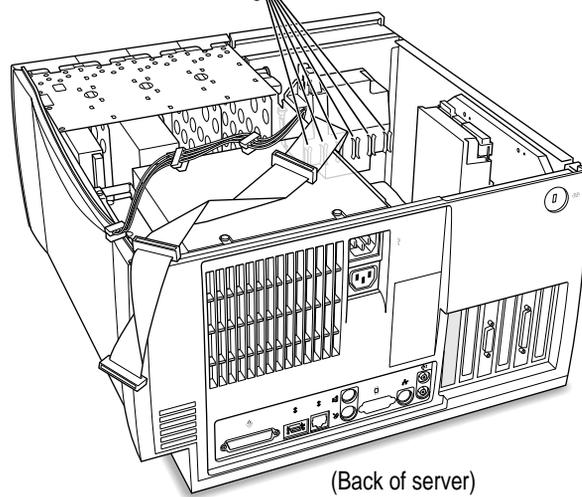


5 Align the connector end of the card with the expansion slot.



If you are installing a 12-inch card, make sure the other end of the card fits into the proper card guide.

If the PCI card you are installing is full-length (12 inches), be sure that it fits in one of the six card guides toward the front of the server.

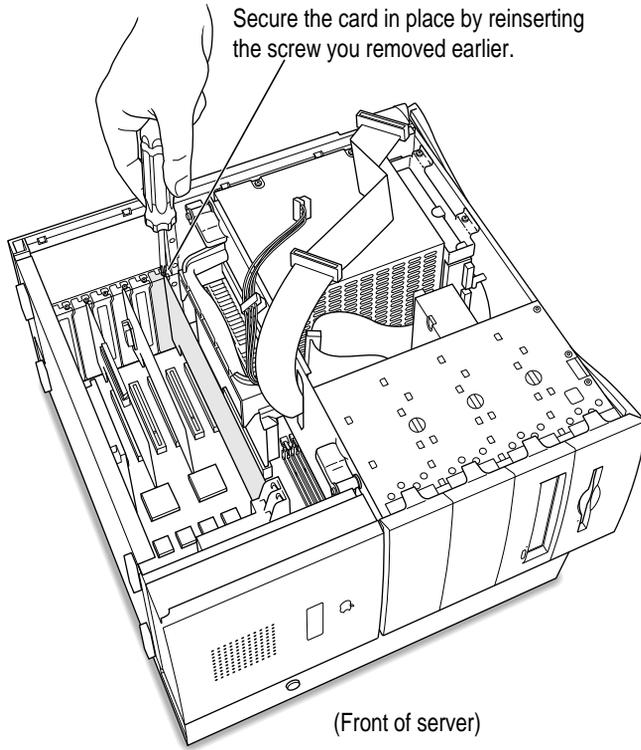


6 Press the card gently but firmly until the connector is fully inserted.

- Don't rock the card side to side; instead, press the card straight into the slot. (Rocking the card can damage the PCI slot.)
- Don't force the card. If you meet a lot of resistance, pull the card out and try again.
- To see if the card is properly connected, pull it gently. If it resists and stays in place, it's connected. (Make sure you don't pull the card so much that you accidentally disconnect it.)

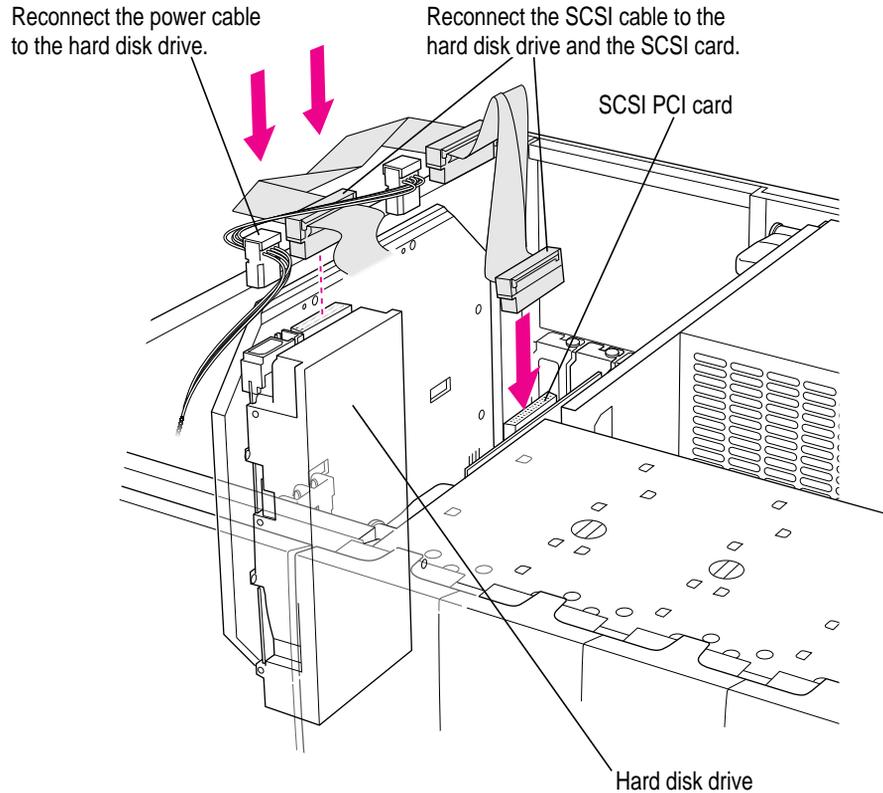
Note: In rare cases, some 12-inch PCI cards may be difficult to insert in the slot; the ports on the PCI card fence may stick out so far that it is not possible to install the card. If you have tried several times to insert a card and are still unsuccessful, skip now to “Installing an Unusually Long PCI Card,” next.

7 Reinsert the screw that you removed earlier and tighten it.



If you have other cards to install, put them in now by repeating steps 2 through 7.

- 8** Reconnect the SCSI cable and the power cable to the SCSI card and to any drives mounted on the floor of the server.



- 9** If you are finished installing items in your server, proceed to “Closing the Server” later in this chapter. To install additional items inside your server, go to the section that provides the instructions you need.

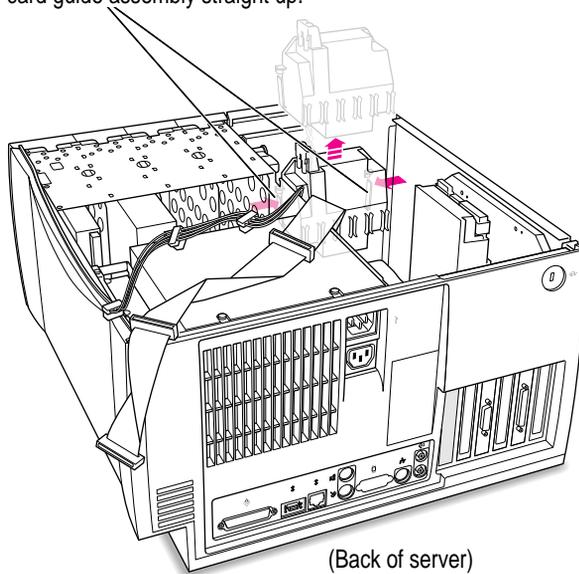
To install	Follow the instructions in
Memory	“Installing Memory” later in this chapter
Internal storage device	“Installing Hard Disks and Other SCSI Devices” later in this chapter

Installing an unusually long PCI card

If you are having difficulty inserting a 12-inch PCI card into the slot, it may be necessary to temporarily remove the speaker housing/card guide assembly to install the card. Follow these steps to remove the speaker housing/card guide assembly and install a PCI card.

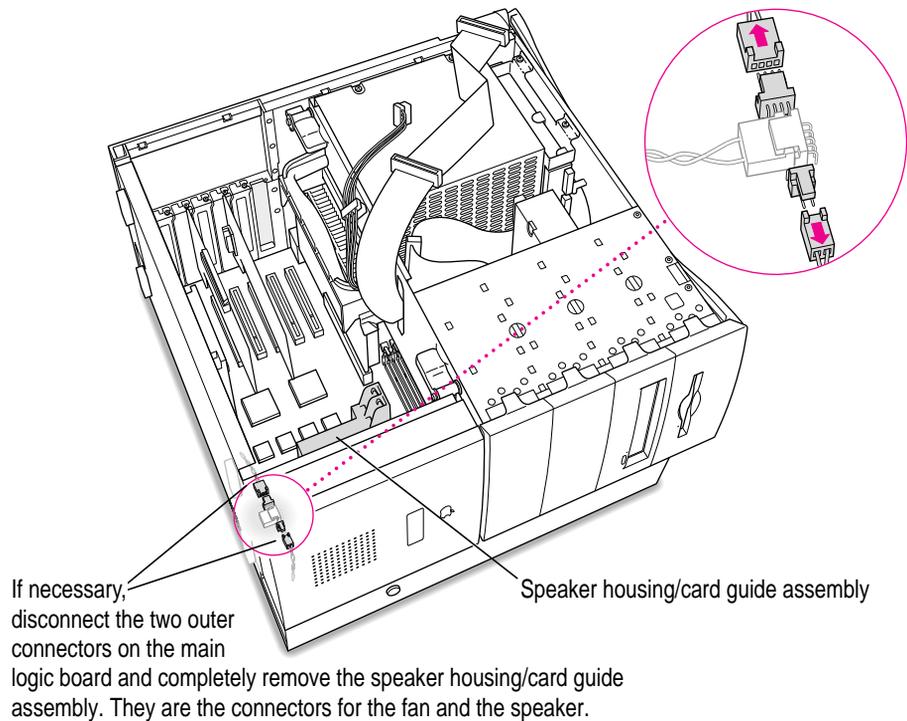
- 1 Remove the speaker housing/card guide assembly as shown below.**

Squeeze these two tabs and slide the speaker housing/
card guide assembly straight up.



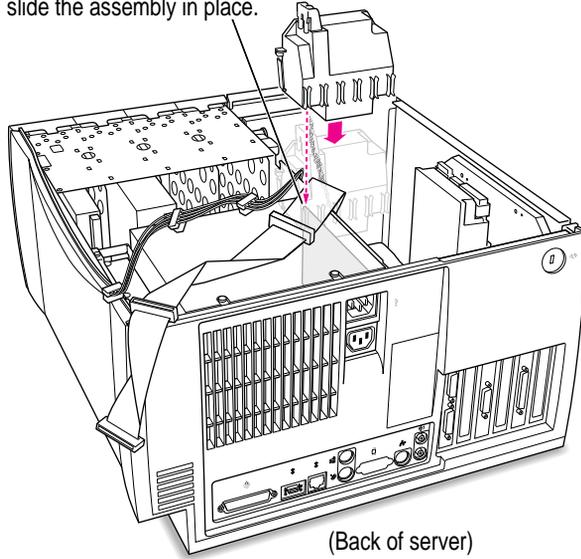
- 2 Move the speaker housing/card guide assembly to one side so that it does not block the slot you want to use.**

- 3 Insert the PCI card into the slot. Press the card gently but firmly until the connector is fully inserted.**
- Don't rock the card side to side; instead, press the card straight into the slot. (Rocking the card can damage the PCI slot.)
 - Don't force the card. If you meet a lot of resistance, pull the card out and try again.
 - To see if the card is properly connected, pull it gently. If it resists and stays in place, it's connected. (Make sure you don't pull the card so much that you accidentally disconnect it.)
 - If the speaker housing/card guide assembly is still blocking the slot you want to use, disconnect the two connectors to completely remove the speaker housing/card guide assembly. Then insert the PCI card into the slot.

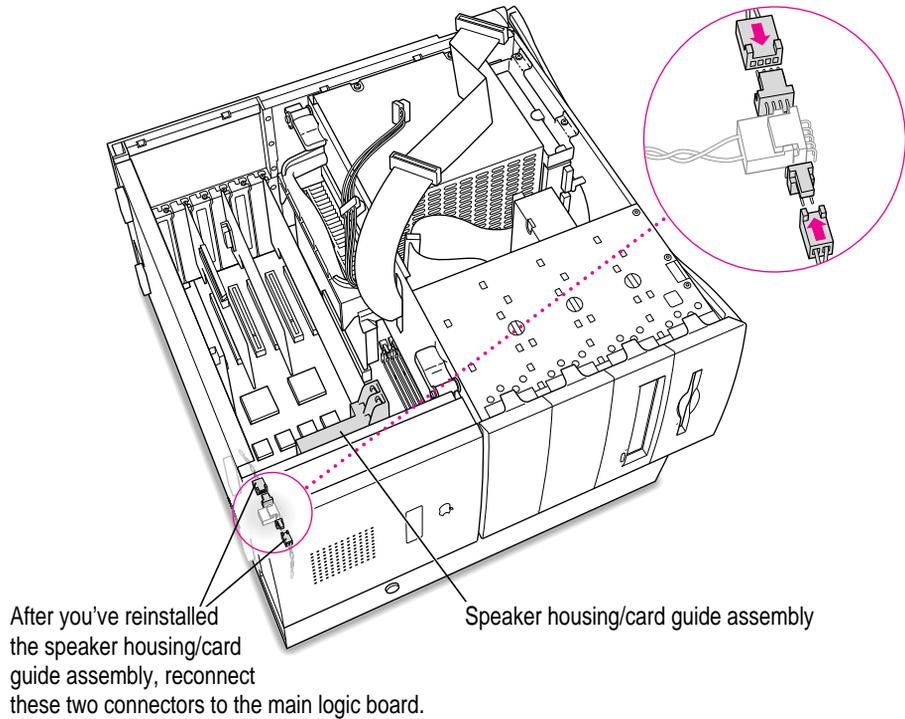


4 Slide the speaker housing/card guide assembly back into place.

Slide the speaker housing/card guide assembly straight down and snap it back into place inside the server. Be sure that the proper card guide engages the end of the card as you slide the assembly in place.

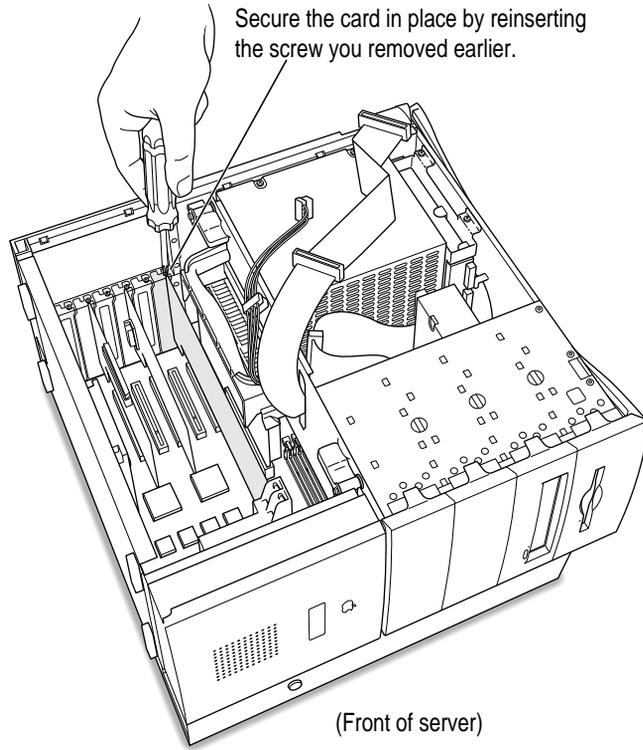


- 5 If you disconnected the two connectors in step 3, reconnect them now.

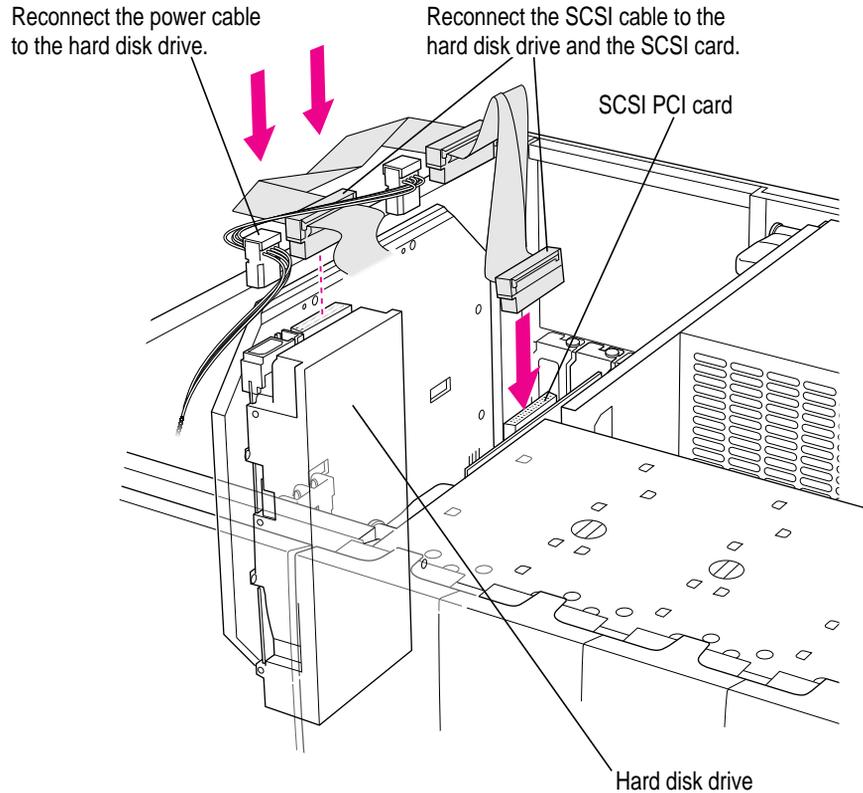


IMPORTANT Make sure the two connectors are connected properly. Otherwise, the fan may not receive power and the components in your server could be damaged due to excessive heat.

6 Reinsert the screw that you removed earlier and tighten it.



- 7** Reconnect the SCSI cable and the power cable to the SCSI card and to any drives mounted on the floor of the server.



- 8** If you are finished installing items in your server, proceed to “Closing the Server” later in this chapter. To install additional items inside your server, go to the section that provides the instructions you need.

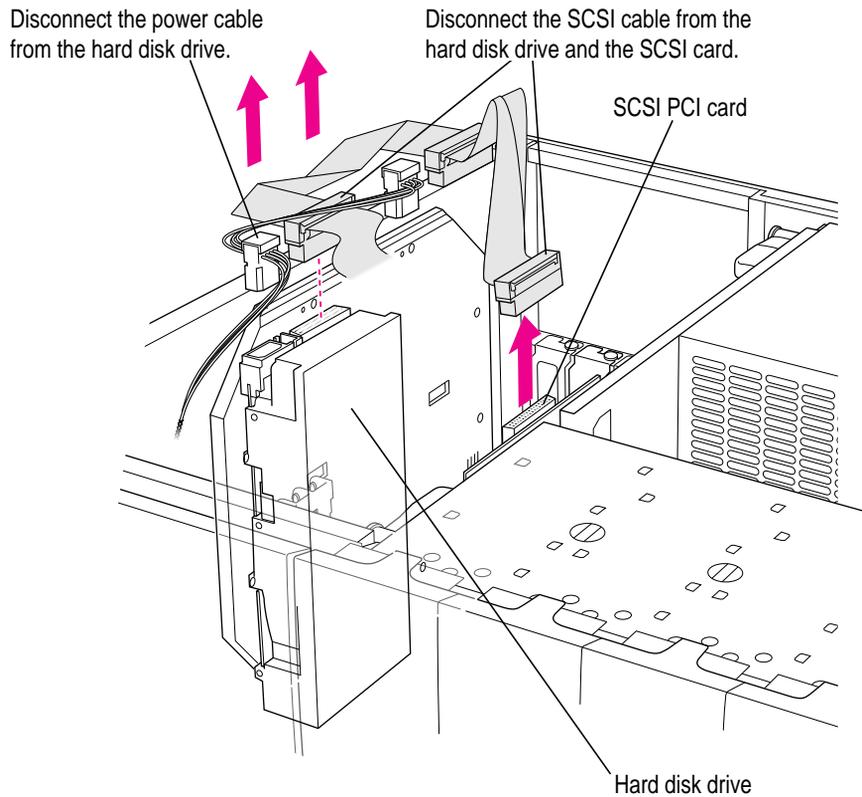
To install	Follow the instructions in
Memory	“Installing Memory,” next
Internal storage device	“Installing Hard Disks and Other SCSI Devices” later in this chapter

Installing memory

IMPORTANT Before installing memory, read “About Memory” at the beginning of this chapter. Also, follow the steps in “Opening the Server” to safely open the server.

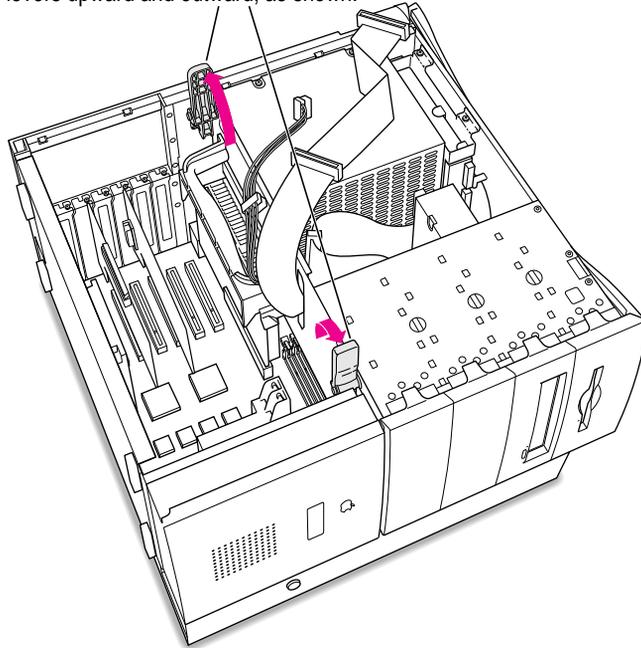
- 1 **Disconnect the SCSI cable from the SCSI PCI card. Also, disconnect the SCSI cable and the power cable from each hard disk drive mounted on the floor of the server (if any).**

Depending on your configuration, you may have to disconnect cables from zero, one, or two hard disk drives.



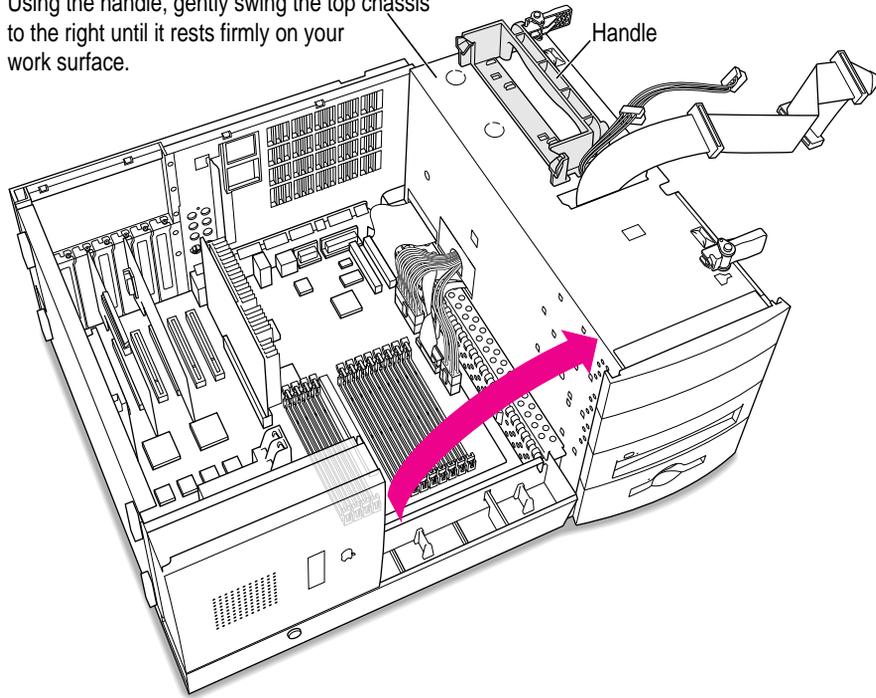
2 Unlock the top chassis by rotating the two locking levers on the chassis.

Unlock the top chassis by moving the two locking levers upward and outward, as shown.



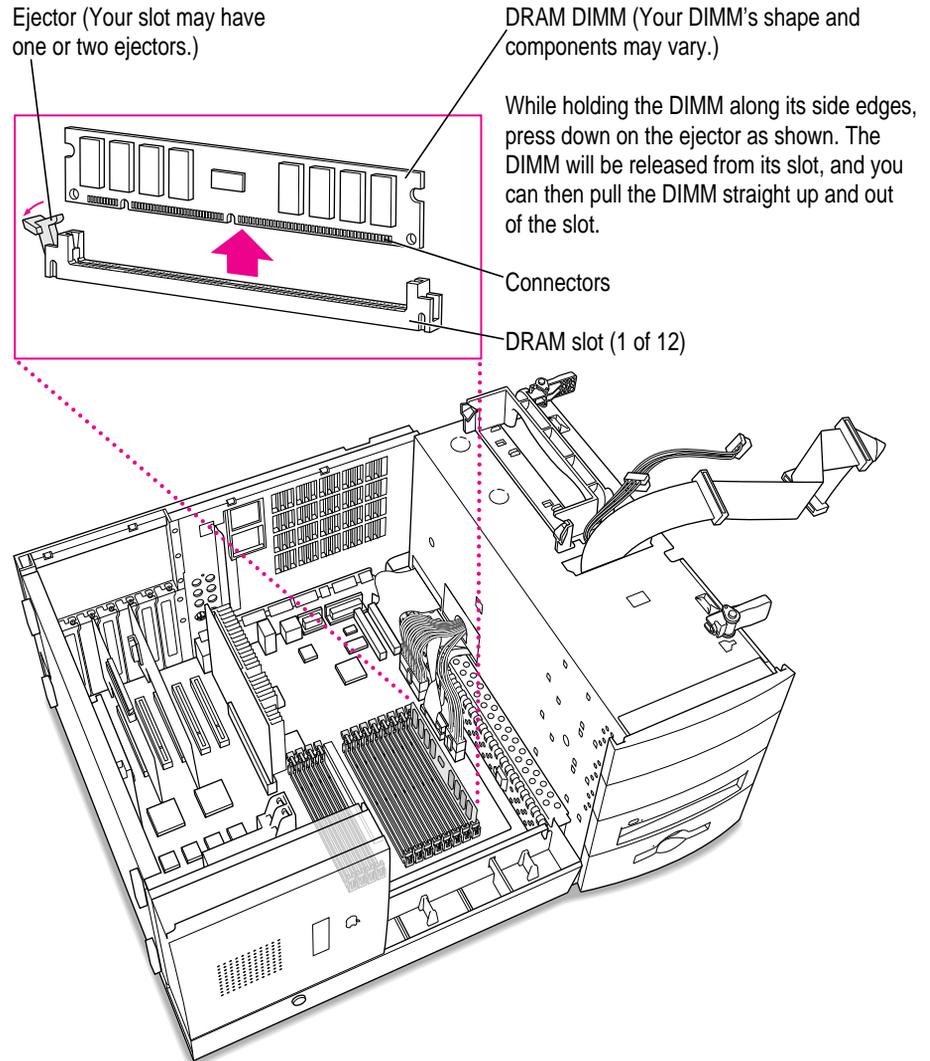
- 3 Using the plastic handle, lift the top chassis up and to the side until it rests on your working surface, revealing the DRAM slots underneath.

Using the handle, gently swing the top chassis to the right until it rests firmly on your work surface.



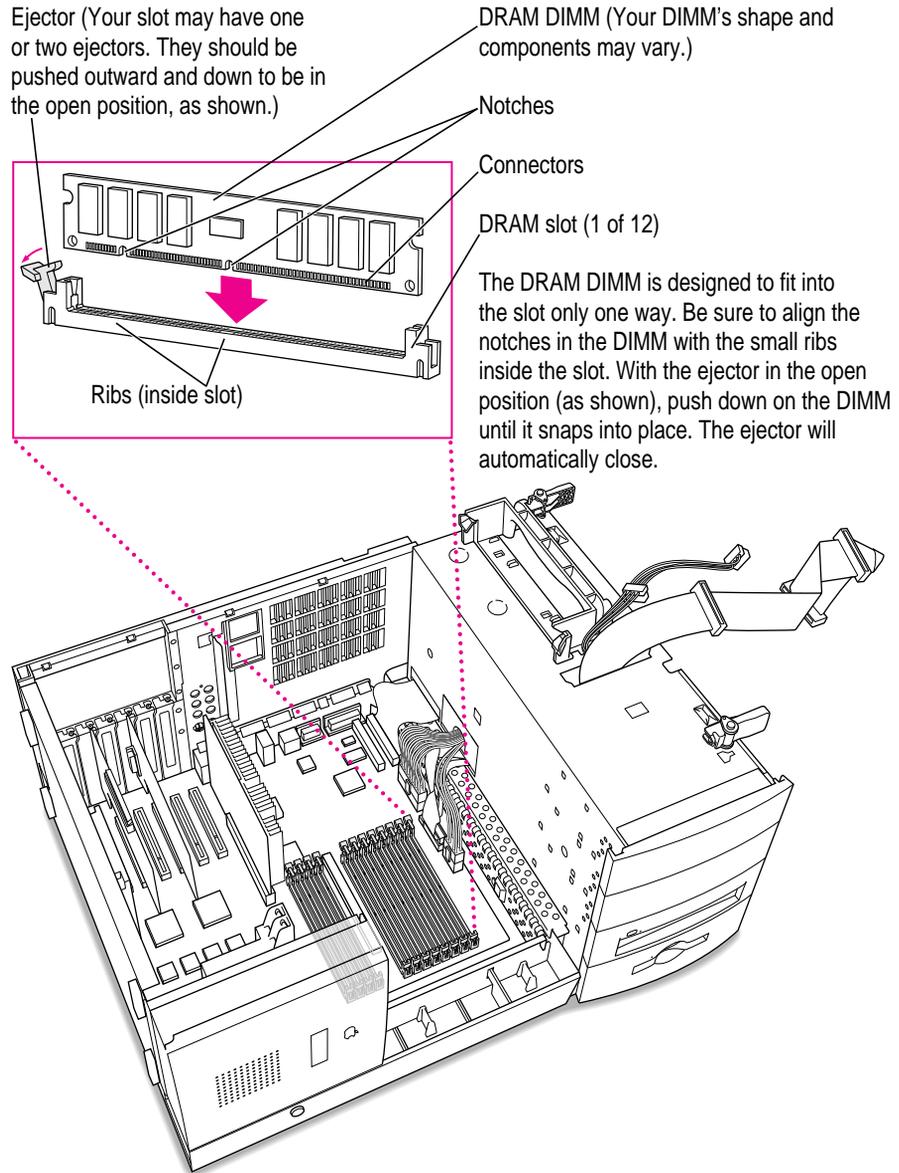
- 4 If you need to remove one or more existing DRAM DIMMs to make room for new ones, remove them now by following the illustration below.

IMPORTANT Do not touch the DIMM's connectors. Handle the DIMM only by the edges.



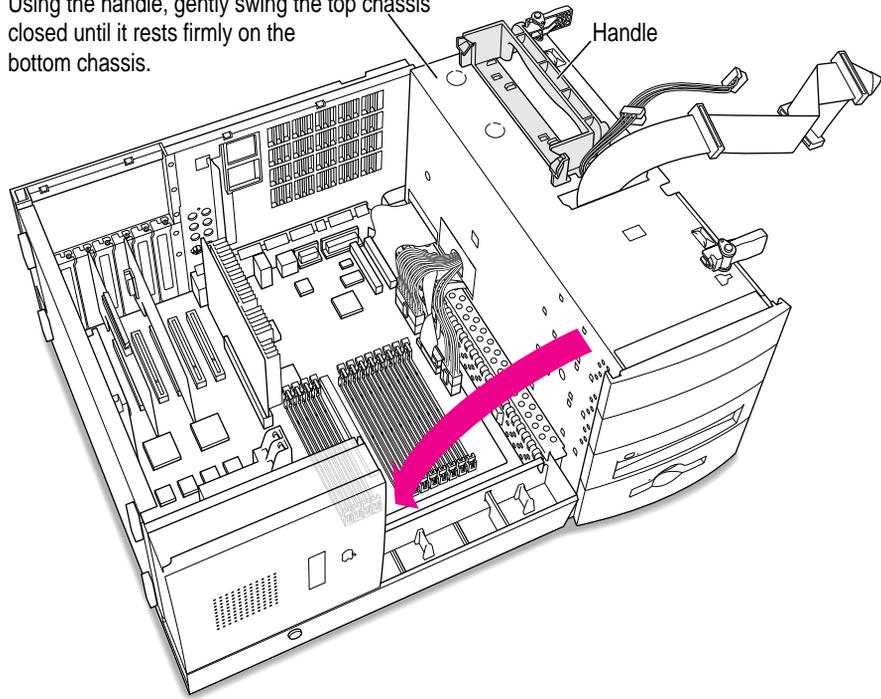
5 Align the DRAM DIMMs in the DRAM slots as pictured.

IMPORTANT Do not touch the DIMM's connectors. Handle the DIMM only by the edges.



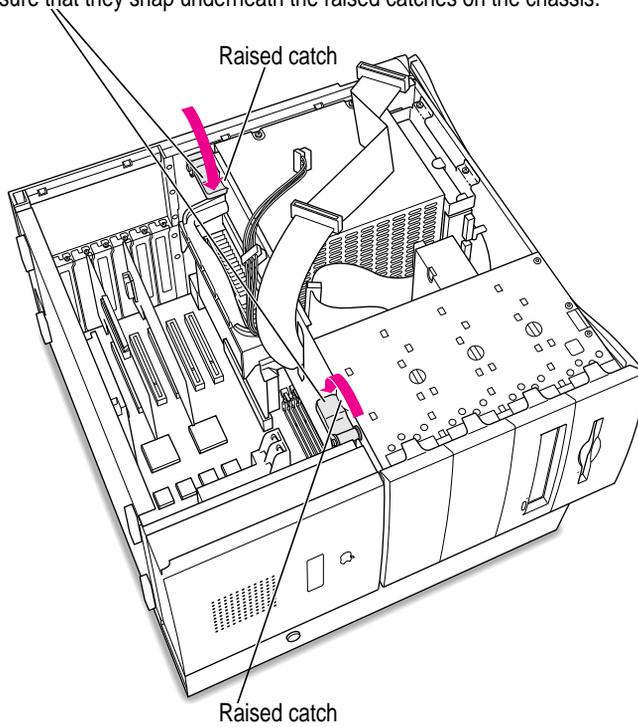
6 Replace the chassis by swinging it back into place.

Using the handle, gently swing the top chassis closed until it rests firmly on the bottom chassis.



7 Lock the chassis by rotating the locking levers.

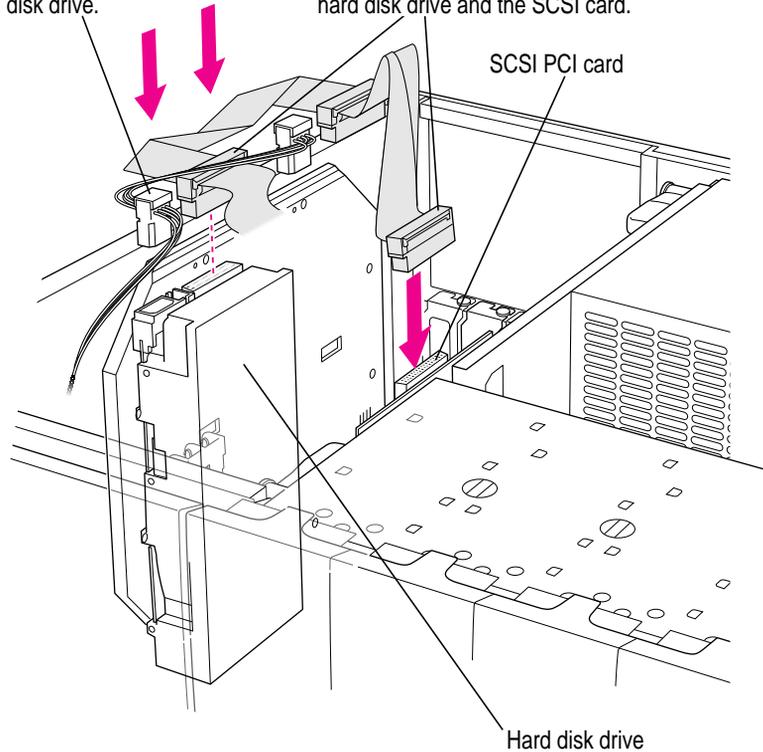
Lock the top chassis in place by moving the two locking levers inward and downward, as shown. Be sure that they snap underneath the raised catches on the chassis.



- 8 Reconnect the SCSI cable and the power cable to the SCSI card and to any drives mounted on the floor of the server.

Reconnect the power cable to the hard disk drive.

Reconnect the SCSI cable to the hard disk drive and the SCSI card.



- 9 If you are installing an internal storage device, go to the next section, “Installing Hard Disks and Other SCSI Devices.” If you are finished installing items in your server, proceed to “Closing the Server” later in this chapter.

Installing hard disks and other SCSI devices

IMPORTANT Before installing an internal SCSI device, read “About Internal Storage Options” at the beginning of this chapter. Also, follow the steps in “Opening the Server” to safely open the server.

The instructions you should follow to install a hard disk or other SCSI device depend on where you want to install the device inside the server.

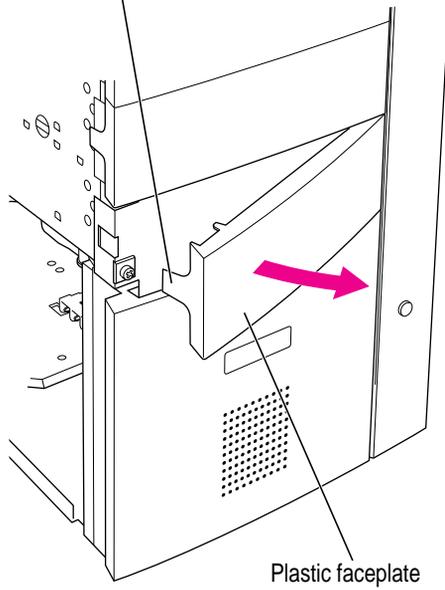
- To install a hard disk or other SCSI device in one of the upper expansion bays near the floppy drive and CD-ROM drive, see “Installing a Hard Disk or SCSI Device in an Expansion Bay,” next.
- To install a hard disk on the floor of the server near the PCI expansion slots, see “Installing a Hard Disk on the Floor of the Server” later in this section.

Installing a hard disk or SCSI device in an expansion bay

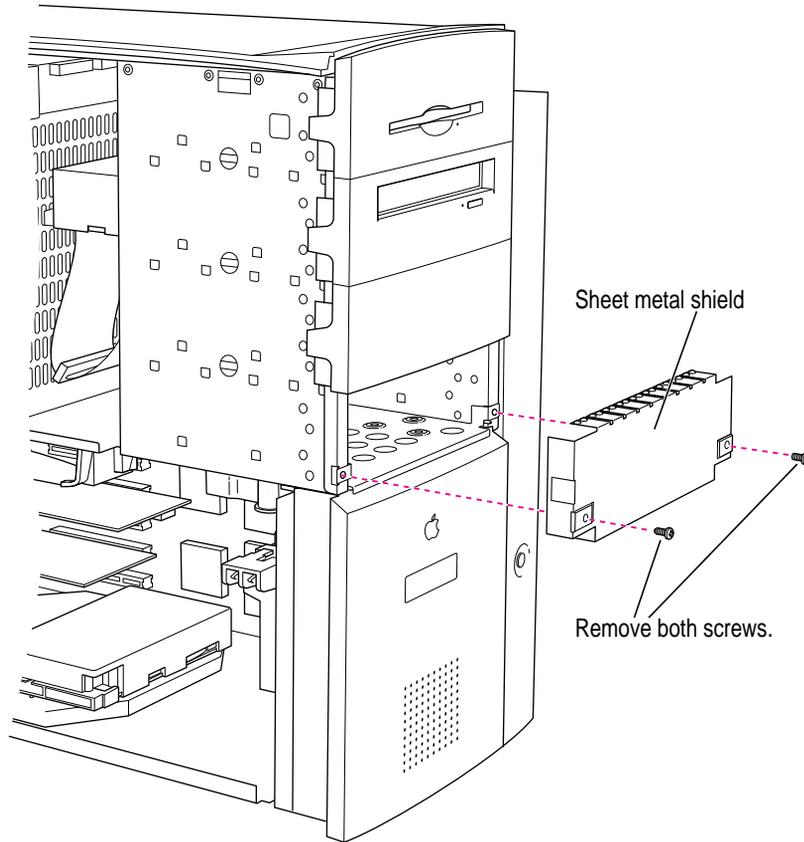
- 1 Carefully lift up the server so that it sits upright.**
- 2 If you are replacing an existing SCSI device with a new one, disconnect the SCSI ribbon cable and power cable from the device you want to remove.**

3 Remove the plastic faceplate.

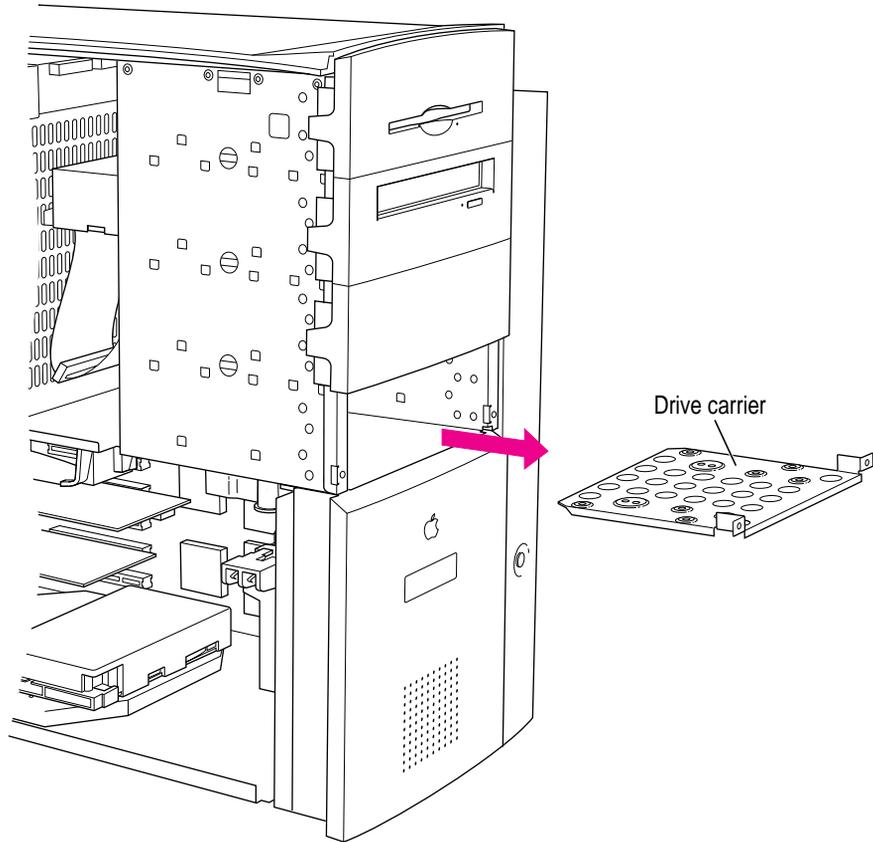
Gently lift this tab to release the plastic faceplate, and remove it completely.



- 4** Remove the two screws from the sheet metal shield. Then carefully remove the shield.



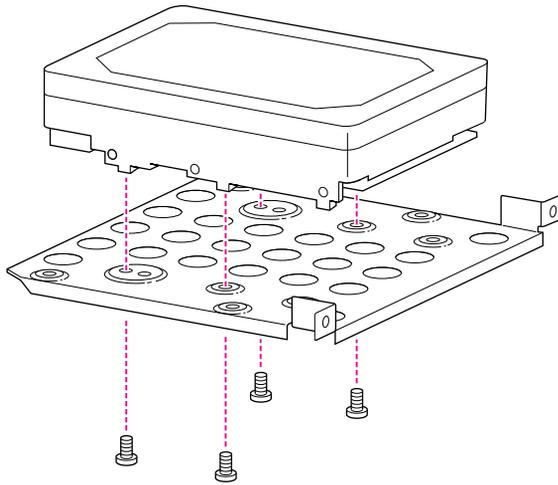
- 5** Slide the drive carrier out of the expansion bay.



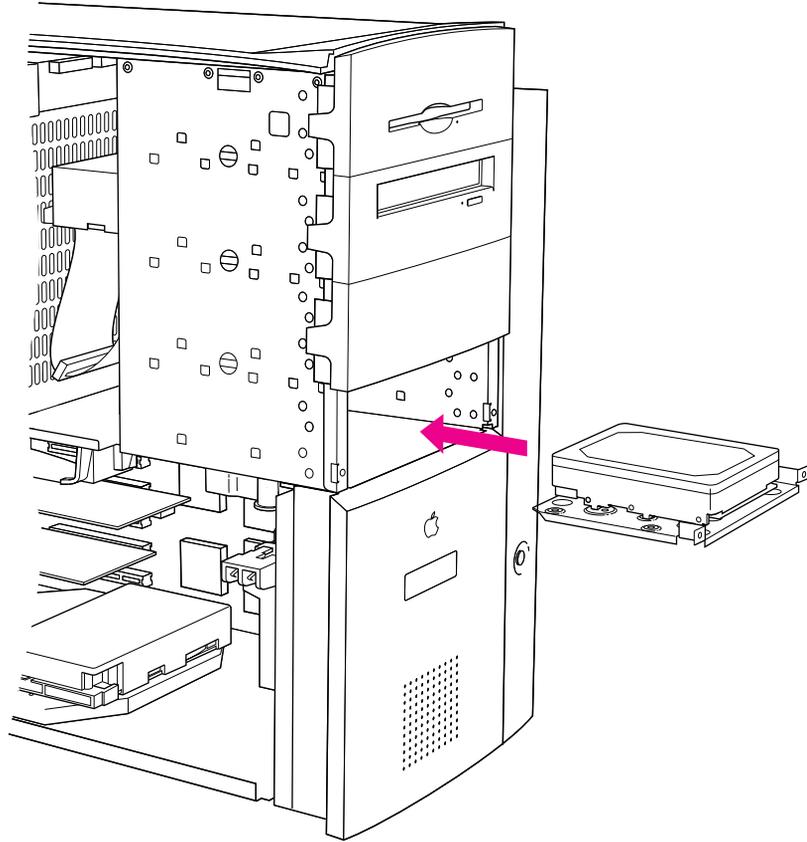
- 6** If you are replacing an existing SCSI device, remove the existing device from the drive carrier.

7 Using screws, attach the SCSI device to the drive carrier.

Make sure you attach the SCSI device to the correct side of the drive carrier, as shown in the illustration.

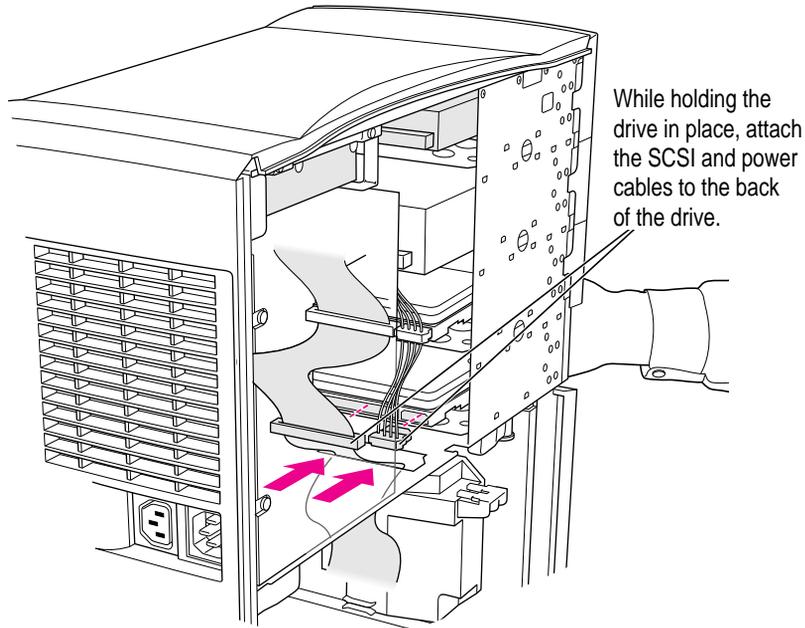


- 8** Slide the drive carrier back into the expansion bay.



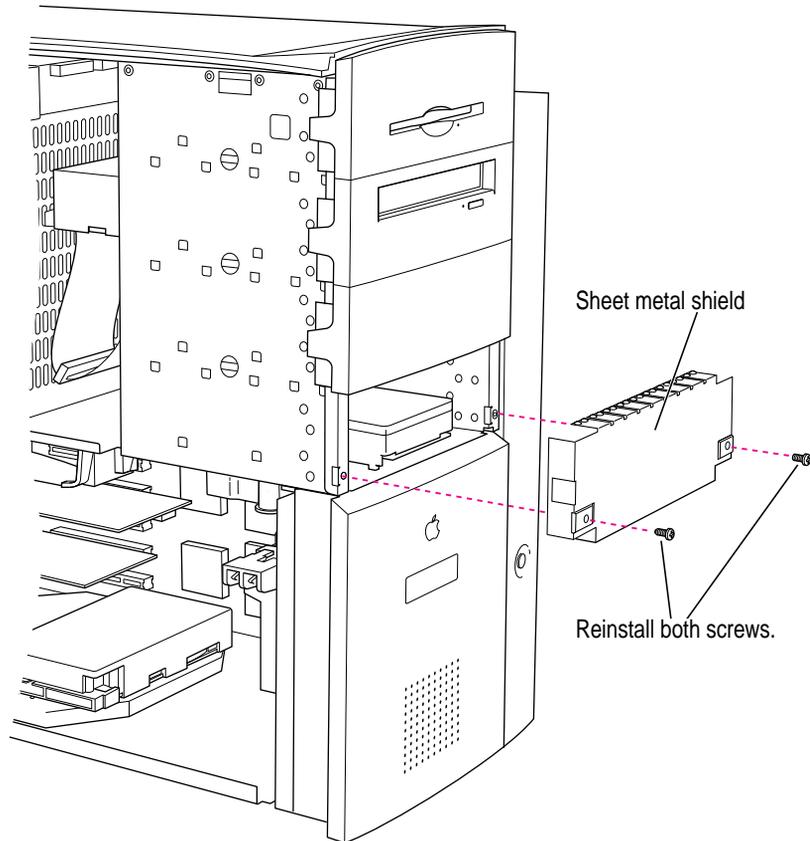
- 9 While holding the drive in place with one hand, connect a power cable and the appropriate SCSI cable to the back of the SCSI device.

You can temporarily slide the device slightly forward if you need more room to attach the cables to the back of the device. Depending on the type of connector on the SCSI device you are installing, connect either the 50-pin or 68-pin cable to the back of the device.



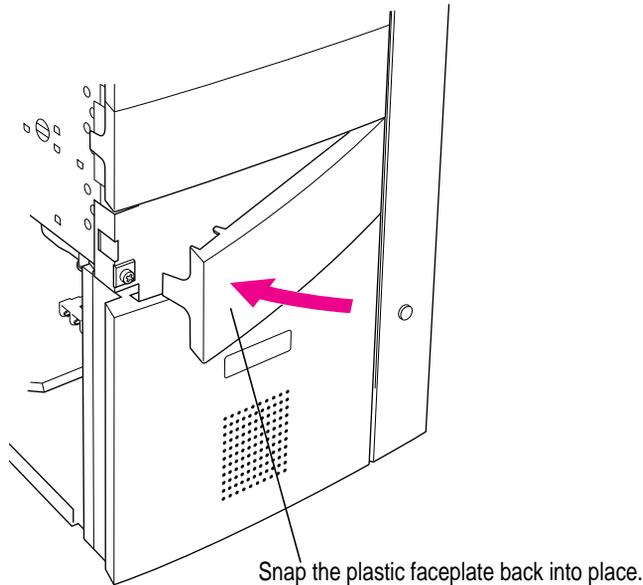
- 10** Replace the sheet metal shield you removed earlier. Then reinsert the screws and tighten them.

Note: Do not replace the sheet metal shield if you're installing a removable storage device such as a tape drive. If a specialized sheet metal shield came with the device, install it instead and replace the screws. Otherwise, insert the screws into the drive carrier and tighten them.



11 Replace the plastic faceplate.

Note: If the SCSI device is a removable storage device such as a tape or cartridge drive, do not install the faceplate you removed earlier. A new faceplate may be included with the removable storage device. If so, install the new faceplate instead.

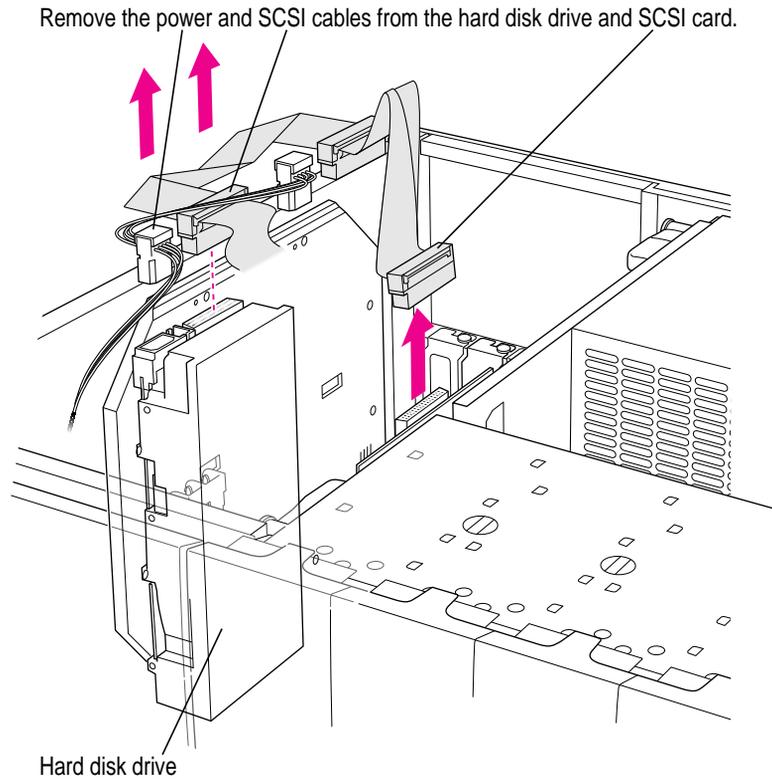


12 Carefully lay the server on its side.

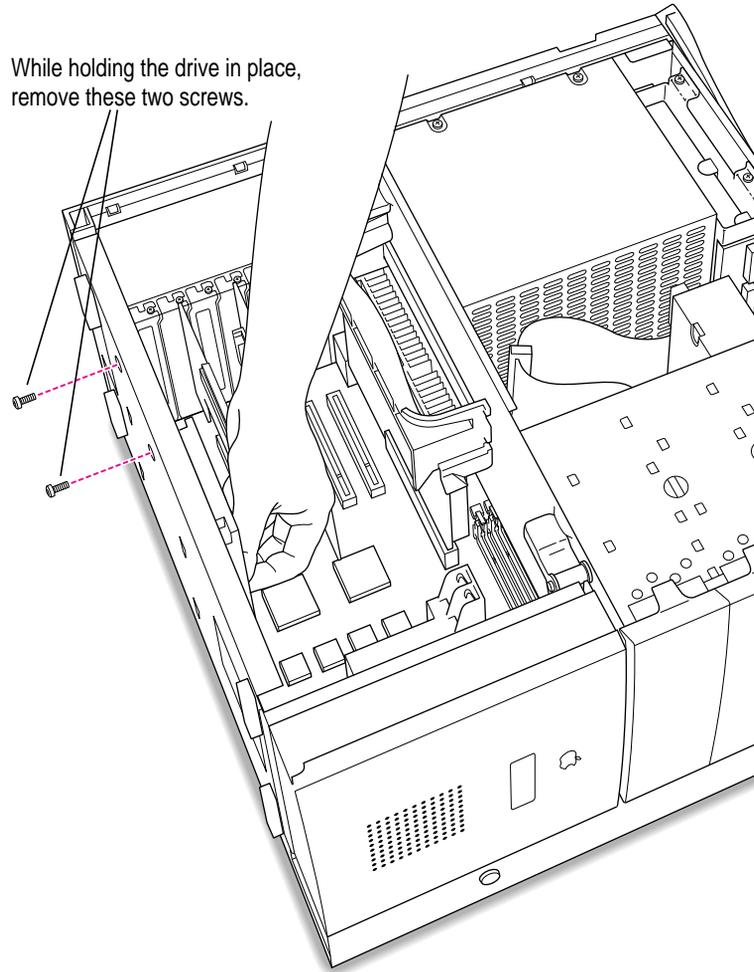
13 If you want to install a hard disk on the floor of the server near the PCI expansion slots, go to the next section, "Installing a Hard Disk on the Floor of the Server." If you are finished installing items in your server, proceed to "Closing the Server" later in this chapter.

Installing a hard disk on the floor of the server

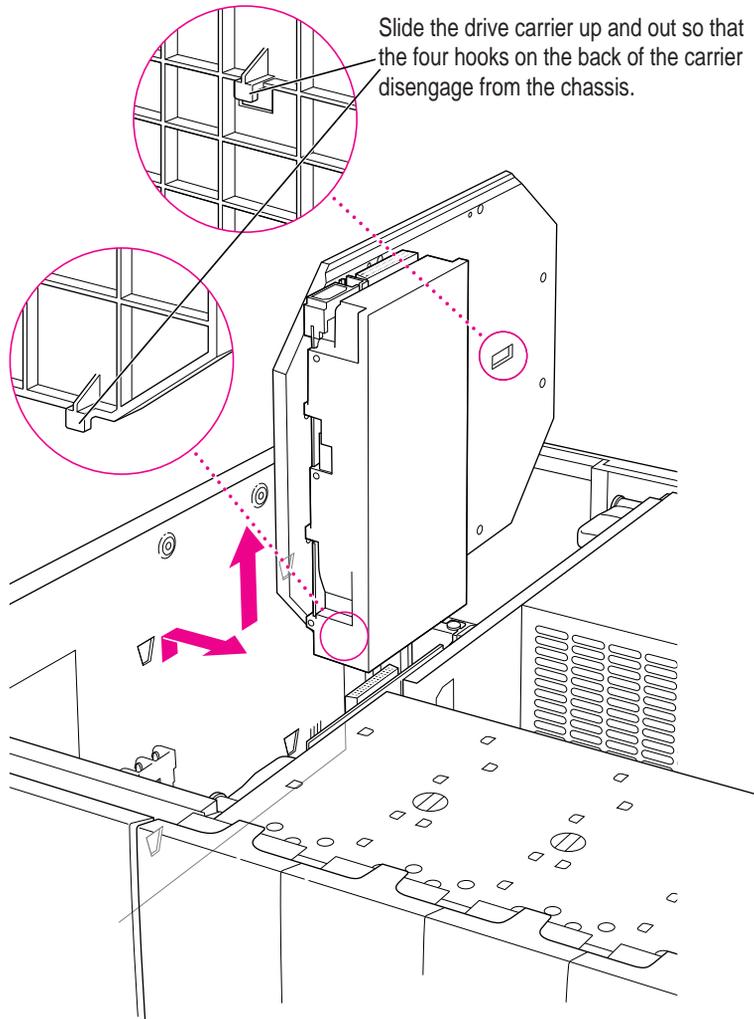
- 1 If one or more drives are currently installed on the drive carrier, disconnect the SCSI cables and power cables from the drives.



- 2 While holding the drive carrier in place with one hand, remove the two screws from the bottom of the server.



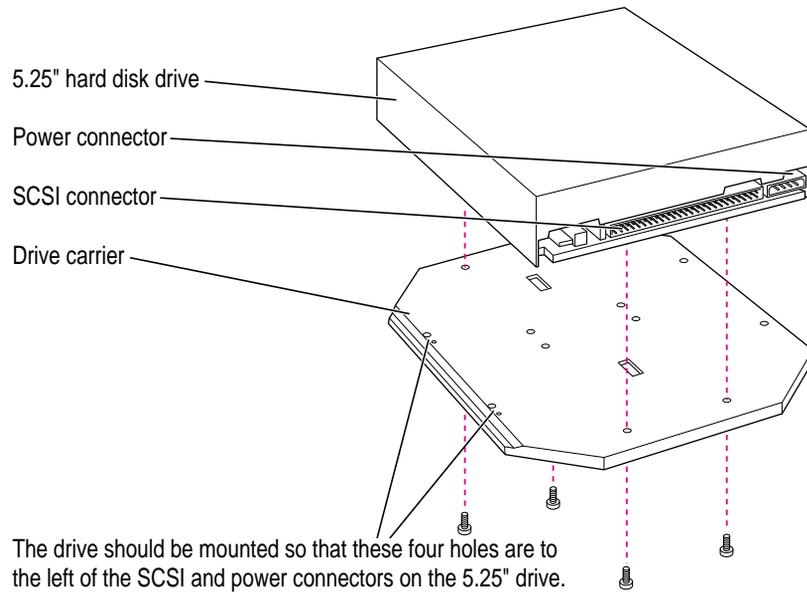
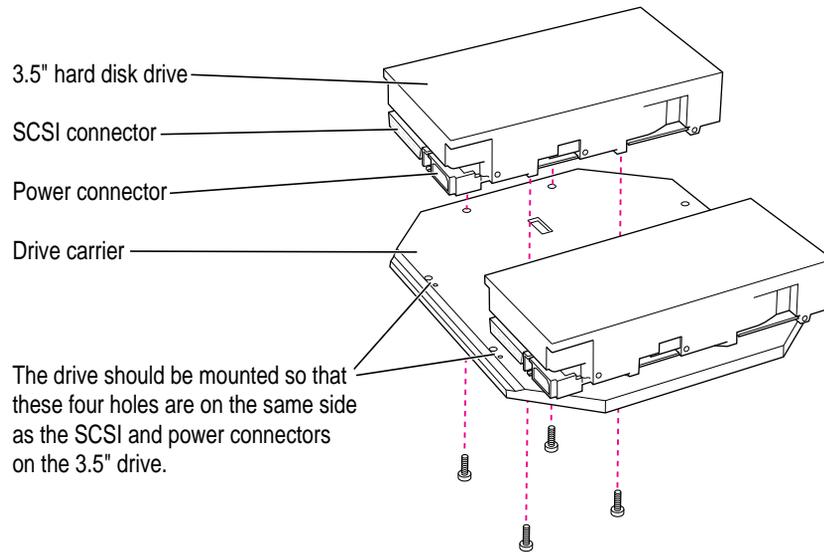
- 3** Remove the drive carrier from the floor of the chassis by carefully sliding the drive carrier up and lifting it out.



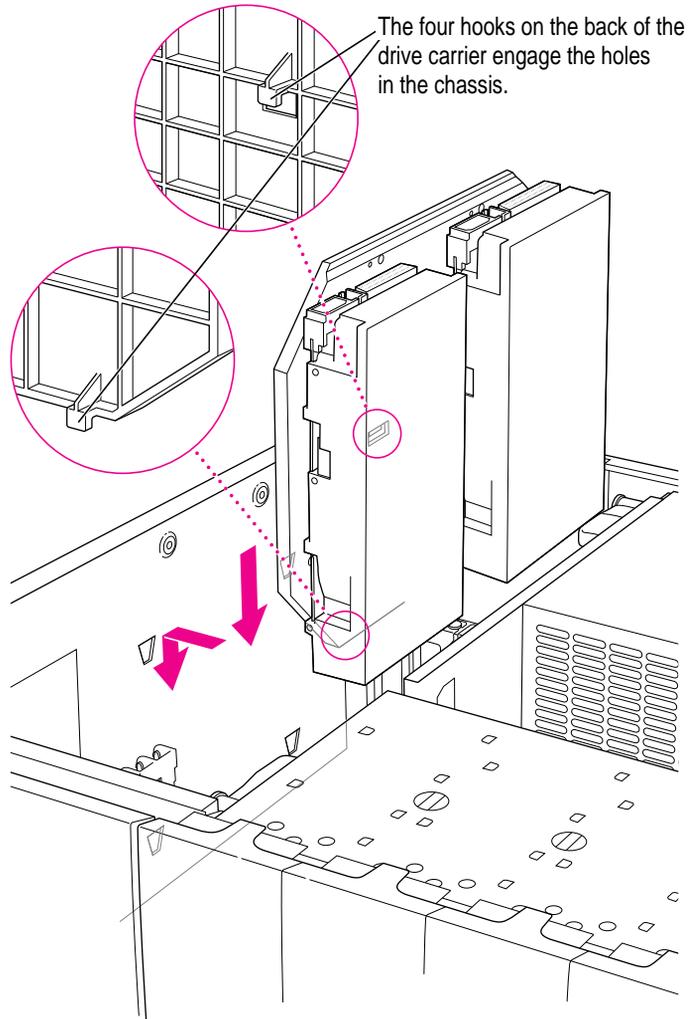
- 4** If you are replacing an existing hard disk, remove that disk from the drive carrier.

5 Using screws, attach the drive to the drive carrier.

You can attach two 3.5" drives or one 5.25" drive, as shown in the illustrations.

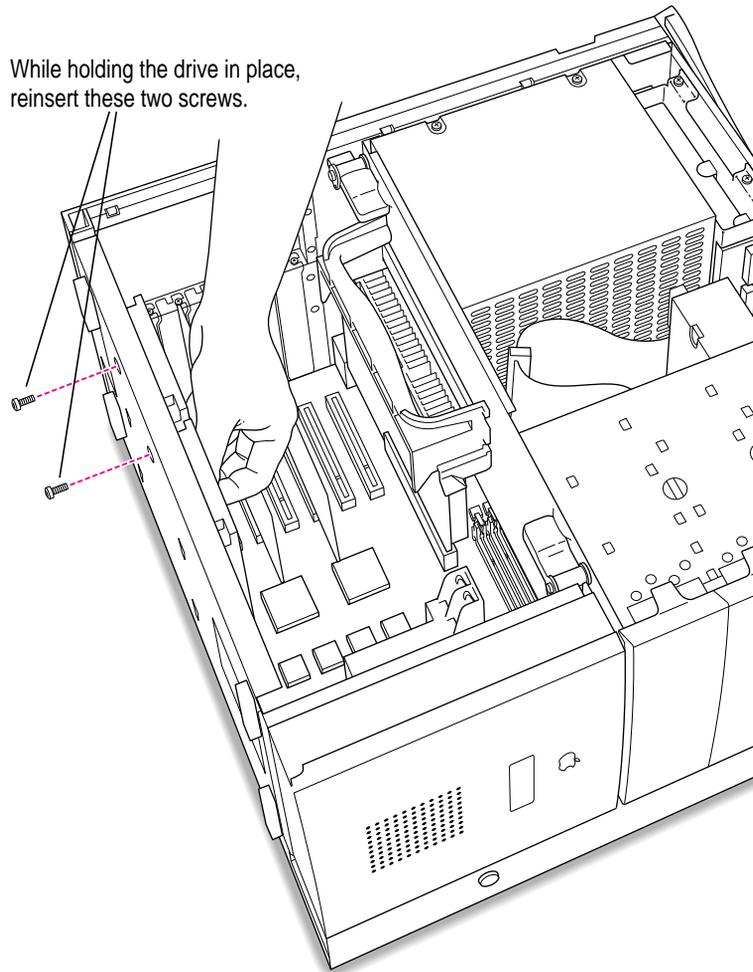


6 Reinstall the drive carrier onto the floor of the chassis.



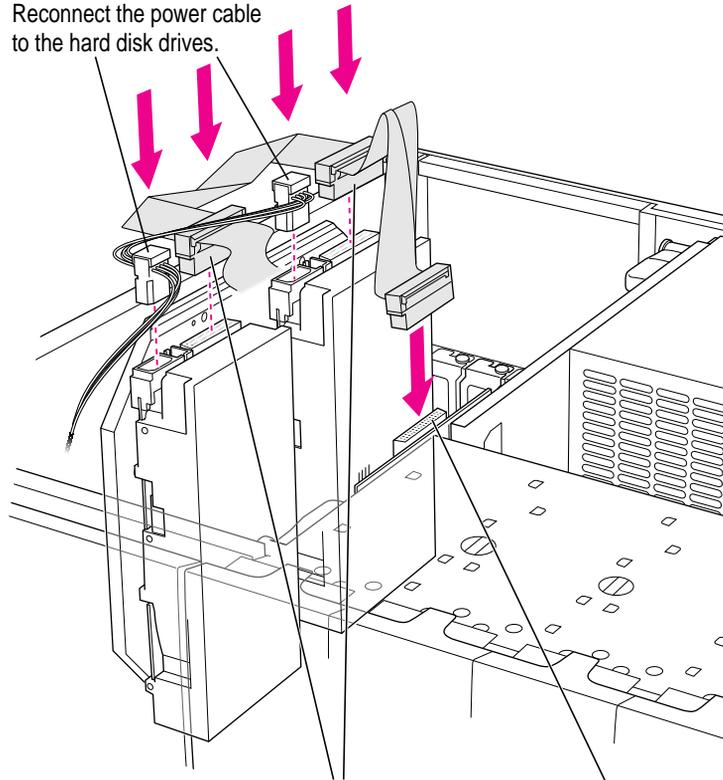
7 Reinsert the screws you removed earlier and tighten them.

IMPORTANT Do not operate the server without the drive carrier in place.



- 8 Depending on the type of connector on the hard disk you are installing, connect either the 50-pin or 68-pin SCSI cable to the disk.

Reconnect the power cable to the hard disk drives.



Reconnect the SCSI cable to the hard disk drives and the SCSI card.

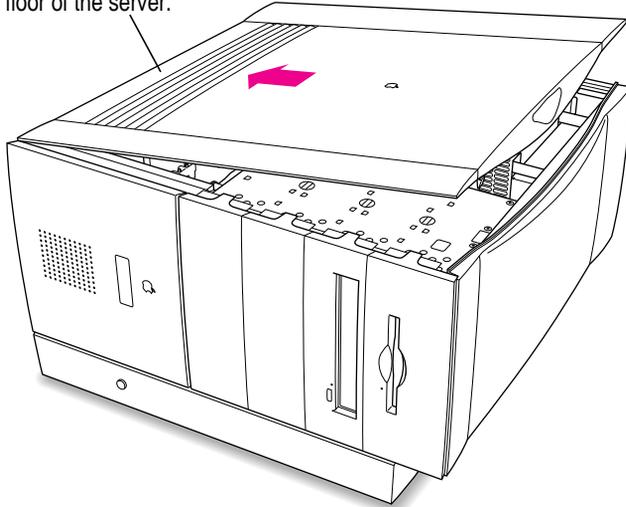
- 9 Proceed to “Closing the Server,” next.

Closing the server

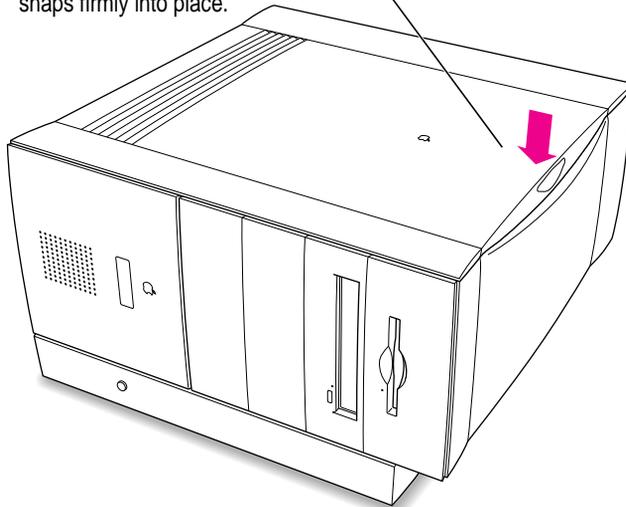
1 Replace the cover panel.

Align the bottom edge of the cover panel with the server chassis as shown below. Then press the cover panel onto the chassis until it snaps into place.

Fit the bottom edge of the cover panel into the floor of the server.



Press down on the top edge of the cover panel until it snaps firmly into place.



2 Lift up the server so that it sits upright.

You are now finished with the installation. You may reconnect the cables and power cord you disconnected from your server, turn on the server, and start using the equipment you installed.

If you need help reconnecting your cables, see Chapter 1, “Setting Up Your Server.”

WARNING Never turn on your server unless all of its internal and external parts are in place. Operating the server with the cover panel off or when it is missing parts can be dangerous and can damage your server.

4

Connecting Additional Equipment

You can expand your server by connecting other equipment to it. The illustrations at the beginning of Chapter 1, “Setting Up Your Server,” show where to connect equipment to your server.

This chapter describes how to connect the following types of devices:

- external SCSI devices, such as a hard disk and a cartridge drive
- a printer
- a second monitor
- additional ADB input devices, such as a trackball or a graphics tablet
- audio equipment, such as a microphone, headphones, or speakers

For instructions on installing internal equipment, see Chapter 3, “Installing PCI Expansion Cards, Additional Memory, and Internal Storage Devices.”

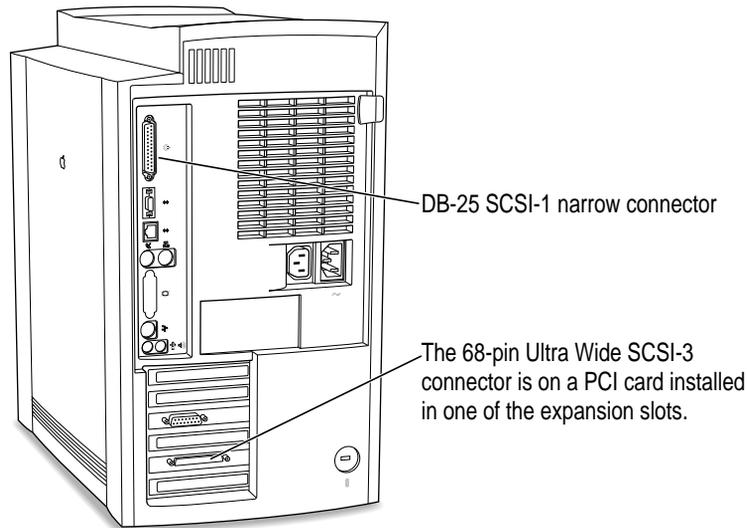
For instructions on connecting to a network, see Chapter 2, “Connecting to the Network.”

IMPORTANT Each device you add should be compatible with your server and must not exceed the maximum power allowance for that device. Turn off the server before connecting a SCSI or ADB device. For more information, consult an Apple-authorized dealer, the manufacturer of the equipment you add, and Appendix B, “Technical Information.”

Connecting external SCSI devices

The Workgroup Server 9650 has two external buses for connecting devices that use the Small Computer System Interface (SCSI, pronounced “skuh-zee”). The SCSI connections permit high-speed communication between the server and the devices. SCSI devices commonly attached to the Workgroup Server 9650 include hard disks, CD-ROM drives, scanners, and tape-backup drives.

The illustration below shows the location of the two external SCSI connectors.



The SCSI-1 narrow bus can transfer data at up to 5 MB per second. The SCSI-3 Ultra Wide bus can transfer data at up to 40 MB per second.

IMPORTANT Even though there is an external 68-pin SCSI-3 connector available, do not connect external devices to this connector. For more information, see “About the External Ultra Wide SCSI-3 Bus,” next.

About the external Ultra Wide SCSI-3 bus

WARNING Read the instructions in this section before connecting any SCSI devices to the external 68-pin SCSI-3 connector on the PCI card. Data transfer errors can occur if external SCSI devices are connected.

There is a 68-pin SCSI cable inside the server that is connected to the SCSI-3 PCI card. This cable supports up to four internal Ultra Wide SCSI-3 devices.

Connecting even one external SCSI device to the external 68-pin connector extends the overall cable length of the SCSI bus beyond the limit for which error-free operation can be guaranteed; the combined length of the internal cable and the external cable reduces the reliability of all the devices connected to the Ultra Wide SCSI-3 bus.

It is possible to connect an external device and observe error-free operation. However, there are many factors that can affect the reliability of the SCSI bus; the transmission characteristics of the SCSI bus can change, resulting in data transfer errors that previously did not occur.

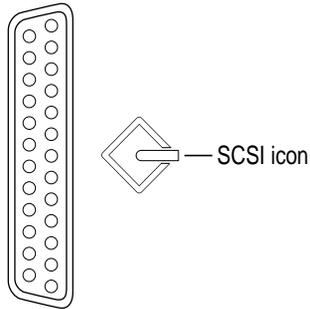
To connect an external Ultra Wide SCSI-3 device and guarantee error-free data transfer, do one of the following:

- Remove the device from its external enclosure and install it internally. See Chapter 3 for more information about installing internal SCSI devices.
- Obtain and install another Ultra Wide SCSI-3 PCI card that is similar to the one that came with the server; connect external devices to the additional card. (For external SCSI bus configurations, Apple recommends obtaining an Ultra Wide SCSI-3 PCI card and external devices that support the differential method of signal transmission instead of the single-ended method.)

IMPORTANT For additional information, refer to the SCSI card manual that came with your server.

About the external SCSI-1 narrow bus

You can connect up to seven devices to the external SCSI-1 bus. The SCSI port for the SCSI-1 bus is on the server's back panel.



DB-25 SCSI-1 narrow connector

You connect SCSI devices to the SCSI port in a chain. The first device in the chain plugs into the SCSI port; the second device plugs into the first device, and so on.

Each device connected to the SCSI-1 bus must have a unique ID number from 0 to 6. Because the internal CD-ROM drive, hard disk drives, and optional tape backup drive are connected to separate internal SCSI buses, all seven SCSI ID numbers are available on the external SCSI-1 bus.

Connecting an external SCSI-1 device

IMPORTANT In addition to these instructions, read the instructions that came with your hard disk or other SCSI device before connecting it to your server.

To connect a SCSI device to the port on your server's back panel:

- 1 **Make sure that the server and SCSI device are turned off.**

WARNING Do not connect or disconnect any device while the device or your server is turned on. Doing so could damage the device, your server, or both.

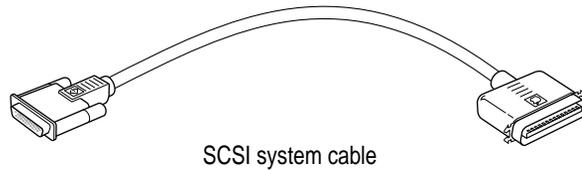
- 2 **Check that the device has its own, unique ID number between 0 and 6. The ID number must be different from any other SCSI devices connected to the SCSI-1 bus.**

See the instructions that came with that device for information on setting its SCSI ID number.

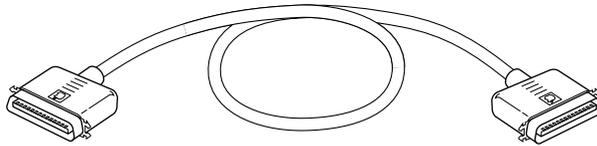
WARNING Using two or more devices with the same ID number (on the same SCSI bus) will cause your equipment to malfunction.

- 3 **Use a SCSI cable to connect the device either to the server's SCSI port or to the last SCSI device already in the chain.**

If the device is the first or only one you're connecting, use a SCSI system cable to connect it to the server's SCSI port.



If the device is not the first one, use a SCSI peripheral interface cable to connect it to the last device in the chain.



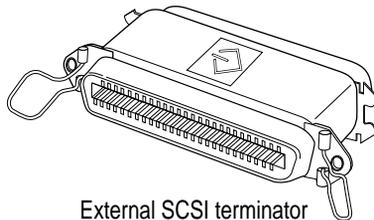
SCSI peripheral interface cable

IMPORTANT To get the best results with SCSI devices, be sure to use high-quality SCSI cables and check that the total length of the cables in a SCSI chain does not exceed 3 meters (10 feet). Use SCSI cables manufactured by Apple Computer or those of similar quality.

- 4 Make sure that only the last device in the SCSI chain has a terminator and that no other external SCSI device has a terminator.**

To ensure accurate transmission of information, a terminator must be at each end of a SCSI chain.

Some external SCSI devices from manufacturers other than Apple have a built-in terminator. (Check the information that came with the device.) If the device at the end of the SCSI chain does not have a built-in terminator, you need to attach an external terminator.



External SCSI terminator

If your SCSI device has a built-in terminator, you can use it as either the only device or the last device in the chain, or you can have your Apple-authorized service provider remove any extra built-in terminators. You can attach or remove external terminators yourself.

Note: If only one external device has a built-in terminator, rearrange the SCSI chain so that the device is at the end.

IMPORTANT Always turn on any external SCSI devices connected to your server before turning on the server itself. Otherwise, your server cannot recognize the SCSI devices.

Before using the newly installed SCSI device, you may need to install associated software; see the following section, “Installing a Device Driver.” If you installed a hard disk, see also the subsequent section, “Do You Need to Initialize a Hard Disk?”

Installing a device driver

A SCSI device driver is software that lets the server communicate with a particular SCSI device. If no drivers come with the device, then it doesn't need any.

Note: If you have set up your server and connected additional devices, but not yet turned the server on, return to the section “Plugging In the Server” in Chapter 1 before installing a device driver.

To install a driver:

- 1 If your server is turned off, start up your server.
- 2 Insert the floppy disk that contains the driver.
- 3 If there is an Installer icon on the disk, use the installer to install the driver. Otherwise, drag the driver icon to the System Folder icon on your startup disk.
- 4 If you see a dialog box, click OK.
- 5 If necessary, restart your server to activate the driver.

Do you need to initialize a hard disk?

You need to initialize a hard disk only in the following cases:

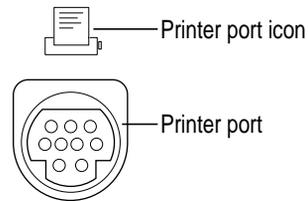
- *The disk is new and uninitialized.* Your internal hard disk and most external hard disks are initialized at the factory and do not have to be initialized again. If you are adding a new, non-Apple hard disk to your server, check your owner's manual to see if it needs to be initialized.
- *You've experienced repeated errors using this disk.* If problems persist after you reinitialize the disk, the disk needs repair.

For more information about initializing a hard disk, see Chapter 4, "Managing Hard Disks," in the *Workgroup Server Administrator's Manual*.

If you are using the RAID software that accompanied your Workgroup Server, you may want to use this software to reinitialize your hard disk(s) to optimize your server's performance. See the documentation for your RAID software for instructions.

Connecting a printer

Your server has a printer port, which you use to connect a printer.



The printer port accepts either a direct cable connection (to printers such as the StyleWriter 2500) or a network cable connection (to printers such as most LaserWriter models). A printer can also be connected to the modem port.

IMPORTANT If you are using AppleShare and you are using a direct cable connection to the printer port or the modem port, you must disable multihoming; otherwise the printer will not work. For information on disabling multihoming, see the *AppleShare Administrator's Manual*.

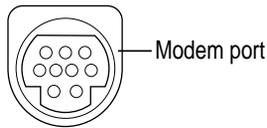
See the manual that came with your printer for more detailed information and instructions on setting up and using the printer. Your server comes with most Apple printer software (called “printer drivers”) already installed. If you are using a printer from a manufacturer other than Apple, you may need to install printer driver software for the printer to work properly.

You use the Chooser program to indicate the port you used to connect your printer. For more information on using the Chooser and printing, see “Choosing a Printer” in Chapter 1, “Configuring Your Server,” in the *Workgroup Server Administrator's Manual*.

A GeoPort Telecom Adapter, or similar device, can also be connected to the printer port.

Connecting a modem or GeoPort Telecom Adapter

Your server has a port, called the modem port, which is a serial port designed for use with modems and devices such as the GeoPort Telecom Adapter. These devices, when used with appropriate telecommunications software, take advantage of the server's built-in modem capabilities. The GeoPort Telecom Adapter comes with communications and fax software and can be purchased from Apple-authorized dealers.



You can connect a standard modem to the modem port, using a standard modem cable. To connect an adapter or modem to your server, follow the instructions that came with your adapter or modem.

A GeoPort Telecom Adapter can also be connected to the printer port.

You can also connect a printer to the modem port.

Connecting multiple monitors

You can connect more than one monitor to your server if one monitor doesn't provide enough screen space.

To connect another monitor, purchase a video card and install it in one of the server's PCI expansion slots, or have an Apple dealer install it for you. (If you are installing the expansion card yourself, follow the instructions that came with the card and the instructions in Chapter 3 of this manual.) Then connect the monitor to the port provided by the card.

Make sure that the ventilation openings on the server and the monitors are clear and unobstructed.

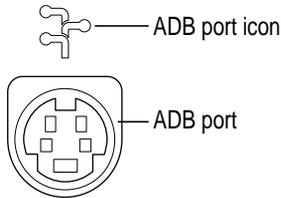
If necessary, configure the monitor options. See the documentation that accompanied the monitor and “Configuring Your Monitor” in Chapter 1 of the *Workgroup Server Administrator's Manual*.

If there is interference on your screens or on a television or radio near your server, separate or reposition the affected equipment. You may need to increase the distance between two monitors so that they don't interfere with each other.

Connecting an ADB input device

Your server has an Apple Desktop Bus (ADB) port, which connects the mouse and the keyboard to your server. You can add other ADB devices, such as a “smart” power strip that can detect when the server has crashed and automatically restart the server.

The ADB port is marked with the  icon.



You can connect up to three ADB devices in a chain to a single ADB port. The exact number depends on how much power the devices require.

Before you attach or remove an ADB device, turn off the server. Attaching or removing an ADB device while the server is turned on could damage the ADB device or your server.

IMPORTANT The total power used by all ADB devices connected to your server must not exceed 500 milliamperes (mA). Before attaching another ADB device, check Appendix B, “Technical Information,” and the information that came with the ADB device for power requirements.

Connecting audio equipment

Your Workgroup Server can play and record stereo sound from a variety of sources. Your computer has sound input and output ports (also known as “jacks”) like those found on most Macintosh models.

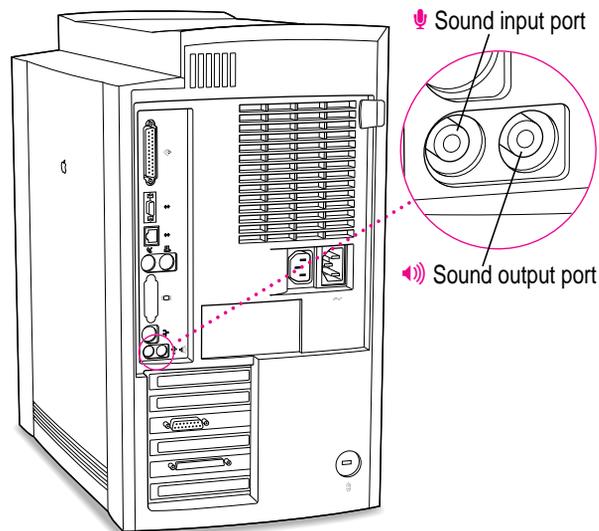
The sound input and output ports

Your Workgroup Server can handle stereo sound from a sound input device—also called a sound source—such as a microphone, tape deck, or audio CD player. (If you have an internal CD-ROM drive, it can also be used to play audio CDs.) The term “sound input device” is used because the signal goes into your server for you to record or process in various ways.

Sound input devices can be attached to the sound input port, which is marked with an icon of a microphone (🎤).

Your server comes with a built-in speaker, but you can attach an additional sound output device, such as amplified speakers or headphones.

Sound output devices can be attached to the sound output port, which is marked with an icon of headphones (🎧) or a speaker (🔊).



The server's sound input and output ports accept 3.5-mm connectors. There are two types:

- The stereo miniplug is found most often on stereo equipment; it will work in both the sound input and sound output ports.
- The extended miniplug, which is slightly longer and is found on voice-quality microphones (such as the Apple PlainTalk Microphone), works only in your server's sound input port (♫). (Even though it will fit into the sound output port, it won't work there.)



Stereo miniplug



Extended miniplug

If your equipment has a different type of connector from those shown here, you can purchase an adapter at an electronics supply store.

Connecting most audio equipment

To connect most audio equipment, follow the steps below. For specific instructions on connecting a microphone, skip to the next section, “Connecting and Positioning a Microphone.”

- 1 **Make sure that the audio equipment has a cable with a stereo miniplug connector.**



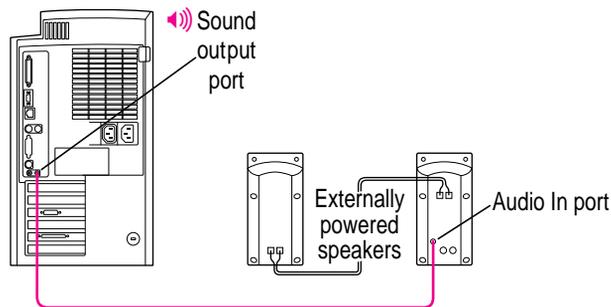
- 2 **Place the audio equipment near the server.**
- 3 **Shut down the server and turn off the audio equipment.**

- 4 **Attach cables to the audio equipment following the instructions that came with the equipment.**

Some equipment (such as most headphones) comes with cables already attached.

- 5 **If your audio equipment is a sound input device such as a tape deck, audio CD player, or VCR, attach it to the sound input port (🎧).**
- 6 **If your audio equipment is a sound output device such as headphones or amplified speakers, attach it to the sound output port (🔊).**

The illustration below shows a typical cable arrangement for amplified speakers that provide a single cable with a single stereo miniplug. (The two speakers are joined to each other by standard speaker wires.) Some speaker pairs have two cables (one per speaker) that must be joined by a dual-plug adapter before they can be attached to the server's sound output port.

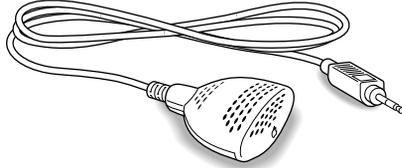


- 7 **Turn on the server and the audio equipment.**

You're now ready to begin listening to and working with sound. For more information on setting sound options, recording an alert sound, or playing audio CDs, see “Choosing Sound Devices and Alert Sounds” in Chapter 1 of the *Workgroup Server Administrator's Manual*.

Connecting and positioning a microphone

With appropriate software, you can use the Apple PlainTalk Microphone to give spoken commands to your Workgroup Server and to record your voice or other sounds.



Apple PlainTalk Microphone

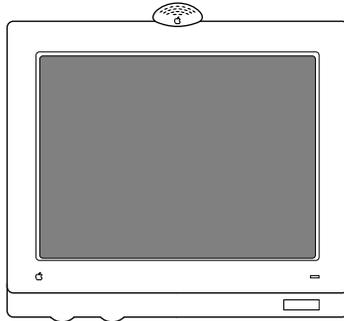
Note: Do not use the Apple Omni microphone (the round microphone supplied with some Macintosh models) or the attenuated RCA adapter provided with some models of Macintosh.

If your monitor has a built-in microphone that you want to use, see the information that came with the monitor to connect the microphone.

To connect and position an external microphone, follow these steps:

- 1 Shut down the server.**
- 2 Plug the microphone's connector into the sound input port (🔊) on the back of the server.**

- 3 Place the Apple PlainTalk Microphone at the top center of the monitor, so that the microphone's Apple (🍏) icon is facing you.**



If you're using a different microphone, position it according to these guidelines:

- The microphone should be between 1 and 3 feet away from you.
- The microphone should be directly in front of you to minimize the effect of background noises.

- 4 Turn on the server.**

You're now ready to begin using your microphone.

You may want to install software that enables you to give spoken commands to the server, get computer-voice feedback to your spoken commands, and have the server read text to you. For information about installing software on your server, see Chapter 3, "Using Application Software," in the *Workgroup Server Administrator's Manual*. To set the sound options for your microphone, see "Choosing Sound Devices and Alert Sounds" in Chapter 1 of the *Workgroup Server Administrator's Manual*.

Appendix A Safety, Maintenance, and Health Information

Important server safety instructions

For your own safety and that of your equipment, always take the following precautions.

Turn off the server and disconnect the power plug (by pulling the plug, not the cord) if any of the following conditions exists:

- The power cord or plug becomes frayed or otherwise damaged.
- You spill something into the case.
- Your server is exposed to rain or any other excess moisture.
- Your server has been dropped or the case has otherwise been damaged.
- You suspect that your server needs service or repair.
- You want to clean the case (use only the recommended procedure described later in this section).

For additional safety:

- If you ever need to remove the cover of your server, replace it before you use the server.
 - Never turn on your server with any of the internal parts removed.
 - Never turn on your server with any parts of the external closure removed.
-

Be sure that you always do the following:

- Keep your server away from sources of liquids, such as wash basins, bathtubs, shower stalls, and so on.
- Protect your server from dampness or wet weather, such as rain, snow, and so on.
- Read all the installation instructions carefully before you plug your server into a wall socket.
- Keep these instructions handy for reference by you and others.
- Follow all instructions and warnings dealing with your system.

WARNING Electrical equipment may be hazardous if misused. Operation of this product, or similar products, must always be supervised by an adult. Do not allow children access to the interior of any electrical product and do not permit them to handle any cables.

Handling your computer equipment

To clean the case, do the following:

- 1 Turn off the server and then disconnect the power plug. (Pull the plug, not the cord.)**
- 2 Wipe the surfaces lightly with a clean, soft cloth dampened with water.**

IMPORTANT If you have a problem with your server and nothing in the manuals that came with the server solves the problem, consult the service and support information that came with your server for information on how to contact an Apple-authorized service provider or Apple for assistance.

Handling the server

Follow these guidelines for handling your server and its components:

- When setting up your server, place components on a sturdy, flat surface, and carefully follow all setup instructions.
- When connecting or disconnecting a cable, always hold the cable by its connector (the plug, not the cord).

- Turn off your server and all its components before connecting or disconnecting any cables to add or remove any component. Failure to do so could seriously damage your equipment.
- Never force a connector into a port. If the connector and port do not join with reasonable ease, they probably don't match. Make sure that the connector matches the port and that you have positioned the connector correctly in relation to the port.
- Take care not to spill any food or liquid on the server, keyboard, mouse, or other components. If you do, turn your server off immediately and unplug it before cleaning up the spill. Depending on what you spilled and how much of it got into your equipment, you may have to bring your equipment to an Apple-authorized service provider.
- Protect the server and its components from direct sunlight and rain or other moisture.
- Keep all ventilation openings clear and unobstructed. Without proper air circulation, components can overheat, causing damage or unreliable operation.

Handling the monitor

Follow these procedures for handling a monitor:

- Turn down the screen brightness control if you leave the server turned on for extended periods. If the brightness is not turned down, the image on the screen could “burn in” and damage the screen.

You can also use a “screen-saver” program, which dims or varies the image on the screen when the server has been idle for a specified period of time. These programs are available from independent suppliers and user groups.
- Make sure that the ventilation openings on the server and the monitor are clear and unobstructed.
- If there is interference on the monitor's screen or on a television or radio near your server, move the affected equipment farther away.

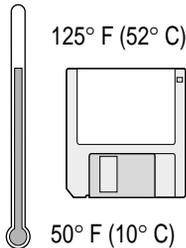
Handling the keyboard

Take care not to spill any liquid on the keyboard. If you do, turn off your server immediately.

- If you spill liquid that is thin and clear, unplug the keyboard, turn it upside down to let the liquid drain out, and let it dry for 24 hours at room temperature. If, after you take these steps, the keyboard doesn't work, take it to an Apple-authorized service provider for repair.
- If you spill liquid that is greasy, sweet, or sticky, unplug the keyboard and take it to an Apple-authorized service provider for repair.

Handling floppy disks

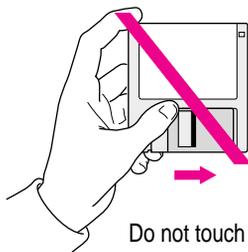
Store disks at temperatures between 50° F and 125° F.



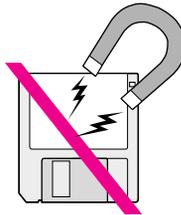
Do not use a pencil or an eraser on a disk or disk label.



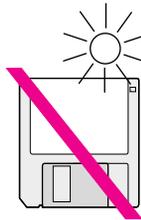
Keep disks dry.



Do not touch the exposed part of the disk behind the metal shutter.



Keep disks away from magnets.



Avoid exposing disks to extremely hot temperatures.

Handling CD-ROM discs

Keep these important safety instructions in mind as you use CD-ROM discs:

- Hold a disc by the edges or by one edge and the center hole. Do not touch the disc surface.
- To clean discs, wipe the shiny surface with a soft damp cloth, working in straight lines from center to edge. Do not use any form of cleaning agent.
- To avoid damage to your discs, keep these points in mind:



Do not expose discs to direct sunlight.



Do not write on discs.



Do not spill liquids on discs.



Do not put tape on discs.



Do not scratch discs.



Do not get dust on discs.

Other important safety instructions to keep in mind as you use your CD-ROM drive.

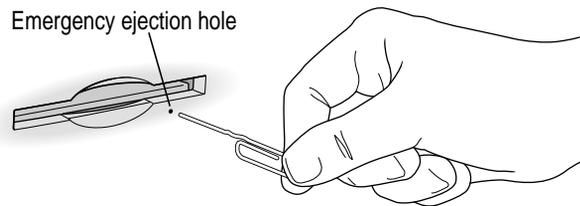
- Position your server so that when the tray opens, it doesn't bump into anything.
- Do not leave the disc tray open. If dust gets on the lens of the CD-ROM drive, the drive may have problems reading your compact discs.
- Do not put anything (for instance, a cup) on top of the tray when it is open.
- Do not force the tray open by hand.
- Do not wipe the lens with a paper towel or other abrasive surface. If you need to clean the lens, see an Apple-authorized service provider for a lens cleaner.
- Never transport your server with a disc inside the CD-ROM drive.

- Keep your computer equipment away from any source of liquid (such as wash basins, bathtubs, and shower stalls). If you drink coffee or other beverages while you're at your server, take care not to spill.
- Avoid exposing your equipment to damp or wet weather. If your system is near a window, be sure the window is closed in rainy weather.

The tray on your CD-ROM drive automatically closes when you shut down your server. You may want to open the tray and take out your CD-ROM disc before shutting down.

If you can't eject a floppy disk

If you can't eject a floppy disk in the usual way, locate the small hole near the disk drive's opening, and carefully insert the end of a large straightened paper clip into it. Push gently until the disk is ejected. Do not use excessive force.



If nothing works, take the server or disk drive to your Apple-authorized service provider to have the disk removed.

Power supply

The power supply in your server is a high-voltage component and should not be opened for any reason, even when the server is off. If the power supply needs service, contact your Apple-authorized dealer or service provider.

Cleaning your equipment

Follow these general rules when cleaning the outside of your server and its components:

- Use a damp, soft, lint-free cloth to clean the server's exterior. Avoid getting moisture in any openings.
- Don't use aerosol sprays, solvents, or abrasives.

Cleaning the server case

To clean the case, do the following:

- 1 **Turn off the server and disconnect the power plug. (Pull the plug, not the cord.)**
- 2 **Wipe the surfaces lightly with a clean, soft cloth dampened with water.**

Cleaning the monitor

To clean the screen, put household glass cleaner on a soft cloth and wipe the screen. Don't spray the cleaner directly on the screen, because the liquid might drip into the monitor or server.

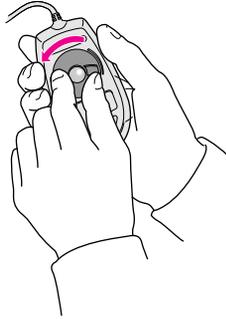
Cleaning the mouse

The mouse contains a small ball that must roll smoothly for the mouse to work properly. You can keep this ball free of dirt and grease by using the mouse on a clean, lint-free surface and cleaning it occasionally.

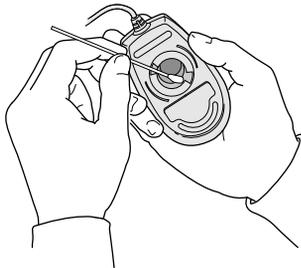
You need a few cotton swabs and a clean, soft, lint-free cloth.

- 1 **Turn off your server.**

- 2 Turn the mouse upside down and turn the plastic ring on the bottom counterclockwise to disengage it.



- 3 Turn the mouse right side up with one hand and catch the ring and the ball with your other hand.
- 4 Clean the three small rollers inside the mouse with a cotton swab moistened with water. Rotate the rollers to clean all around them.



- 5 Wipe the mouse ball with a clean, soft, dry, and lint-free cloth.
- 6 If necessary, wash the mouse ball with warm soapy water (use a mild soap such as a dishwashing liquid) and then dry the mouse ball thoroughly.
- 7 Gently blow into the mouse case to remove any dust that has collected there.
- 8 Put the ball and the ring back in place.

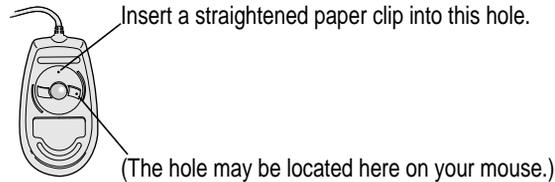
Your mouse should roll smoothly across your mouse pad or desk. If it doesn't, repeat these instructions carefully.

Locking and unlocking the mouse

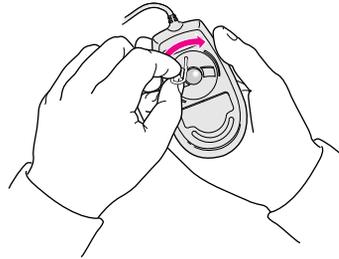
Some mouse devices can be locked so that the ball can't be removed. A locking mouse has a small hole on the plastic ring.

To lock the mouse, follow these steps:

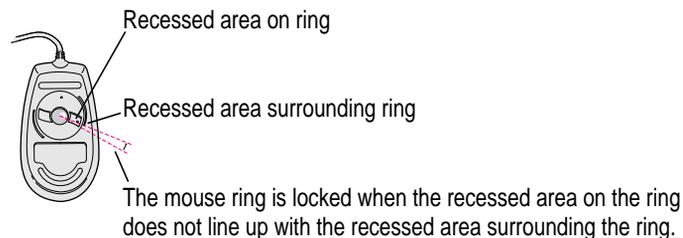
- 1 **Insert a straightened paper clip into the hole on the plastic ring.**



- 2 **Press down on the paper clip while you turn the ring clockwise.**

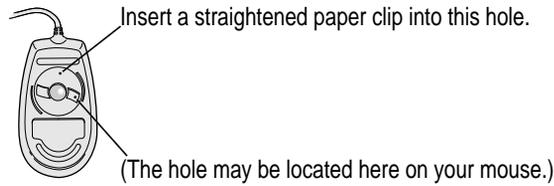


Turn the ring a very short distance, until it stops. When the recessed area on the ring is *not* lined up with the recessed area surrounding the ring, the mouse is locked.

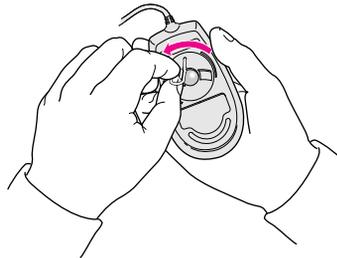


To unlock the mouse, follow these steps:

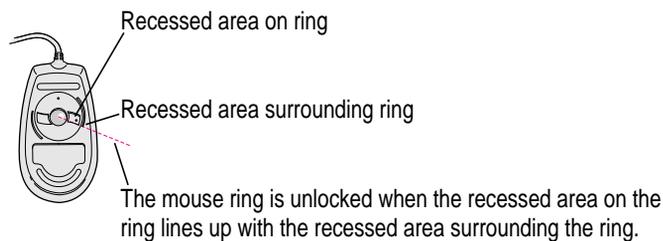
- 1 **Insert a straightened paper clip into the hole on the plastic ring.**



- 2 **Press down on the paper clip while you turn the ring counterclockwise.**



Turn the ring a very short distance. When the recessed area on the ring is lined up with the recessed area surrounding the ring, the mouse is unlocked.



Health-related information about computer use

Muscle soreness, eye fatigue, and other discomforts and injuries sometimes associated with using computers can occur from performing any number of activities. In fact, misuse of the same muscles during multiple activities can create a problem that might not otherwise exist. For example, if you engage in nonwork activities that involve repetitive stress on the wrist—such as bicycling—and also use your computer keyboard improperly, you may increase your likelihood of developing wrist problems. Some individuals are at greater risk of developing these problems because of their health, physiology, lifestyle, and general exposure to stress. Work organization and conditions, such as workstation setup and lighting, also play a part in your overall health and comfort. Preventing health problems is a multifaceted task that requires careful attention to the way you use your body every hour of every day.

The most common health effects associated with using a computer are musculoskeletal discomfort and eye fatigue. We'll discuss each area of concern below. For information about electric and magnetic emissions, look in the reference material that came with your server.

Musculoskeletal discomfort

As with any activity that involves sitting for long periods of time, using a computer can make your muscles sore and stiff. To minimize these effects, set up your work environment carefully, using the guidelines that follow, and take frequent breaks to rest tired muscles. To make working with your computer more comfortable, allow enough space in your work area so that you can change position frequently and maintain a relaxed posture.

Another type of musculoskeletal concern is repetitive stress injuries (RSIs), also known as cumulative trauma disorders (CTDs). These problems can occur when a certain muscle or tendon is repeatedly overused and forced into an unnatural position. The exact causes of RSIs are not totally understood, but in addition to awkward posture, such factors as the amount of repetition, the force used in the activity, the individual's physiology, workplace stress level, and lifestyle may affect the likelihood of experiencing an RSI.

RSIs did not suddenly arise when computers were invented; tennis elbow and writer's cramp, for example, are two RSIs that have been with us for a long time. Although less common than other RSIs, one serious RSI discussed more often today is a wrist problem called carpal tunnel syndrome, which may be aggravated by improper use of computer keyboards. This nerve disorder results from excessive pressure on the median nerve as it passes through the wrist to the hand.

This section offers advice on setting up your work area to enhance your comfort while you use your computer. Since the effects of repetitive movements associated with using a computer can be compounded by those of other work and leisure activities to produce or aggravate physical problems, proper use of your computer system must be considered as just one element of a healthy lifestyle.

No one, of course, can guarantee that you won't have problems even when you follow the most expert advice on using computer equipment. You should always check with a qualified health specialist if muscle, joint, or eye problems occur.

Eye fatigue

Eye fatigue can occur whenever the eyes are focused on a nearby object for a long time. This problem occurs because the eye muscles must work harder to view an object that's closer than about 20 feet (6 meters). Improper lighting can hasten the development of eye fatigue. Although eye fatigue is annoying, there's no evidence that it leads to permanent damage.

Whenever you're engaged in an activity that involves close-up work—such as reading a magazine, doing craft work, or using a computer—be sure to have sufficient glare-free lighting and give your eyes frequent rest breaks by looking up and focusing on distant objects. Remember to have your eyes examined regularly.

To prevent discomfort and eye fatigue:

- Arrange your workspace so that the furniture is properly adjusted for you and doesn't contribute to an awkward working posture.
- Take frequent short breaks to give your muscles and eyes a chance to rest.

Arranging your office

Here are some guidelines for adjusting the furniture in your office to accommodate your physical size and shape.

- An adjustable chair that provides firm, comfortable support is best. Adjust the height of the chair so that your thighs are horizontal and your feet flat on the floor.

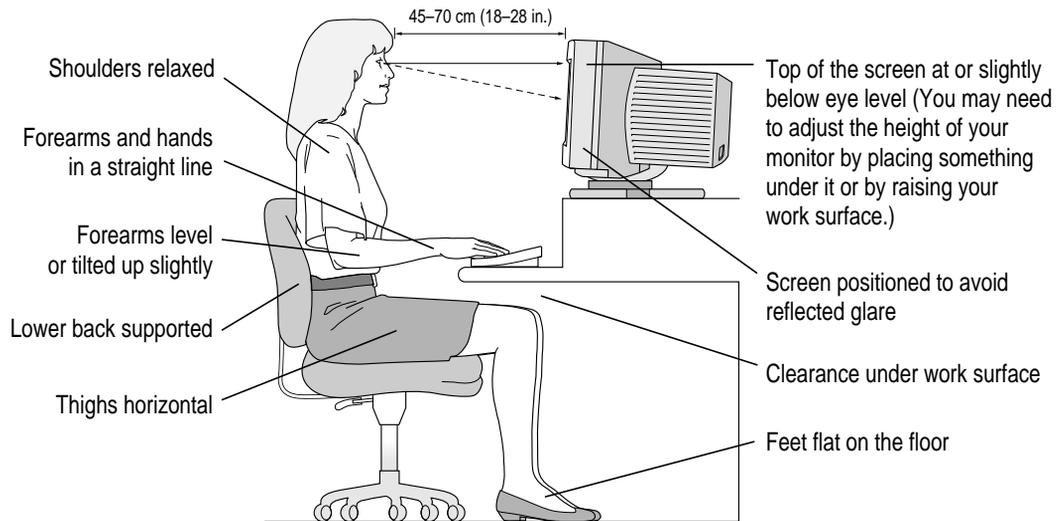
The back of the chair should support your lower back (lumbar region).

Follow the manufacturer's instructions for adjusting the backrest to fit your body properly.

- When you use the computer keyboard, your shoulders should be relaxed. Your upper arm and forearm should form an approximate right angle, with your wrist and hand in roughly a straight line.

You may have to raise your chair so that your forearms and hands are at the proper angle to the keyboard. If this makes it impossible to rest your feet flat on the floor, you can use a footrest with adjustable height and tilt to make up for any gap between the floor and your feet. Or you may lower the desktop to eliminate the need for a footrest. Another option is to use a desk with a keyboard tray that's lower than the regular work surface.

- Position the mouse at the same height as your keyboard. Allow adequate space to use the mouse comfortably.



- Arrange the monitor so that the top of the screen is slightly below your eye level when you're sitting at the keyboard. The best distance from your eyes to the screen is up to you, although most people seem to prefer 18 to 28 inches (45 to 70 cm).
- Position the monitor to minimize glare and reflections on the screen from overhead lights and windows. You may want to use a tiltable monitor stand. The stand lets you set the monitor at the best angle for viewing, helping to reduce or eliminate glare from lighting sources you can't move.

Avoiding fatigue

- Change your seated position, stand up, or stretch whenever you start to feel tired. Frequent short breaks are helpful in reducing fatigue.
- Use a light touch when typing or using a mouse and keep your hands and fingers relaxed.
- Some computer users may develop discomfort in their hands, wrists, or arms after intensive work without breaks. If you begin to develop chronic pain or discomfort in your hands, wrists, or arms, consult a qualified health specialist.
- Allow adequate workspace so that you can use your keyboard and mouse comfortably. Place papers or other items so that you can view them easily while using your computer. A document stand may make reading papers more comfortable.
- Eye muscles must work harder to focus on nearby objects. Occasionally focus your eyes on a distant object, and blink often while you work.
- Clean your screen regularly. Keeping the screen clean helps reduce unwanted reflections.

What about electromagnetic emissions?

There has been recent public discussion of the possible health effects of prolonged exposure to extremely low frequency (ELF) and very low frequency (VLF) electromagnetic fields. Such fields are associated with electromagnetic sources such as television sets, electrical wiring, and some household appliances—as well as computer monitors.

Apple has reviewed scientific reports and sought the counsel of government regulatory agencies and respected health organizations. Based on the prevailing evidence and opinions, Apple believes that the electric and magnetic fields produced by computer monitors do not pose a health risk.

In response to those customers who wish to reduce their exposure to electromagnetic fields, Apple has lowered the emission levels of our products. We are also actively encouraging further scientific research so we can continue to promote the health and safety of our customers and employees.

Appendix B Technical Information

This appendix contains the following technical information about your Workgroup Server 9650:

- Expanding your server
- Specifications

Expanding your Workgroup Server 9650

Your Workgroup Server 9650 was designed to grow with your needs—you can add new capabilities or improve its performance as you wish. You can plug in a number of external devices into its ports. You or your dealer can also install a number of enhancements within the case that houses the computer. However, you must make sure that each component you add is compatible with your server and does not exceed its maximum power allowance. Follow the specifications in this appendix carefully. Your dealer or the manufacturer of a component can also provide compatibility details.

You can install the following equipment yourself or have it installed by an Apple-authorized dealer:

- additional dynamic random-access memory (DRAM), up to a total of 768 megabytes (MB)
- up to six PCI cards, such as a specialized communications card (The monitor card and SCSI card are in two of the slots.)
- additional internal 3.5- or 5.25-inch devices, such as a tape backup drive or hard disks

See Chapter 3, “Installing PCI Expansion Cards, Additional Memory, and Internal Storage Devices,” for instructions on adding components to your server.

Specifications

Main unit

Processor

A PowerPC™ 604e processor with the following features:

- 233 megahertz (MHz) processor clock
- built-in floating point unit (FPU) and 64 kilobyte (KB) level 1 cache
- 46.6 MHz system bus
- mounted on a removable card so you can upgrade as faster processors become available

Memory

- 64 megabytes (MB) dynamic random-access memory (DRAM), supplied in removable Dual Inline Memory Modules (DIMMs), expandable to a maximum of 768 MB
- 4 MB of video RAM (VRAM) on the monitor (video) card
- 4 MB of read-only memory (ROM)
- 8 KB of nonvolatile parameter memory
- 512 KB of static RAM used as a level 2 cache. (The cache is not upgradable because the RAM is soldered to the logic board.)

Monitor card

The monitor card is based on the IMS Twin Turbo–128 monitor card from Integrated Micro Solutions, Inc. The card includes 4 MB of VRAM; it cannot be upgraded to a higher VRAM amount.

You can use most multiple-scan (multisynchronous) monitors with the monitor card. The following Apple monitors are compatible: Apple Multiple Scan 15 Display, Apple Multiple Scan 1705 Display, AppleVision 1710 Display, AppleVision 1710AV Display, Apple Multiple Scan 20 Display, and the Macintosh Color Display (14").

Note: On some monitors from manufacturers other than Apple, the connector pinout designates one pin for both green video and timing synchronization. These “sync on green” monitors are not compatible. If you’re not sure what type of monitor you have, check with your dealer.

You can use the Monitors & Sound control panel or the Control Strip to set a video mode that is supported by both your monitor and the monitor card. Refer to the manual that came with your monitor for a list of video modes that it supports. The monitor card supports the video modes listed in the table below.

Resolution	Color depths	Vertical refresh rate
512 x 384	256, Thousands, Millions	60 Hz
640 x 480	256, Thousands, Millions	67 Hz
640 x 870	256, Thousands, Millions	75 Hz
800 x 600	256, Thousands, Millions	75 Hz
832 x 624	256, Thousands, Millions	75 Hz
1024 x 768	256, Thousands, Millions	75 Hz
1152 x 870	256, Thousands, Millions	75 Hz
1280 x 960	256, Thousands	75 Hz
1280 x 1024	256, Thousands	75 Hz
1600 x 1200	256, Thousands	60 Hz, 66 Hz, and 75 Hz

Internal disk drives

The following drives come factory-installed in your server:

- Apple SuperDrive 1.4 MB high-density floppy disk drive
- 12x-speed CD-ROM drive
- Apple Ultra Wide SCSI-3 hard disk drive (Some models include a second internal hard disk drive.)
- Optional internal tape backup drive (Works with DDS and DDS-2 cassettes; for more information, see the *Workgroup Server Administrator's Manual*.)

Clock/calendar

- CMOS custom circuitry with long-life battery

WARNING Do not attempt to replace the clock battery yourself. If the clock begins to lose accuracy, have an Apple-authorized service provider replace the battery. The service provider will dispose of the battery according to the local environmental guidelines.

Keyboard

- Supports all Apple Desktop Bus (ADB) keyboards

Mouse

- Supports all models of the ADB mouse

Interfaces

- One ADB port supports up to three ADB input devices (such as a keyboard, mouse, and trackball) daisy-chained through a low-speed, synchronous serial bus
- Monitor port supports color and grayscale monitors of various sizes and resolutions. (See “Monitor Card” earlier in this appendix.)
- Six internal expansion slots support peripheral component interconnect (PCI) expansion cards. Install only expansion cards that come with Macintosh drivers and are compliant with the PCI 2.0 standard. (The monitor card and SCSI card are installed in two of the PCI slots.) NuBus™ cards cannot be used in these expansion slots.
- One printer port and one modem port. Both ports are RS-232/RS-422 serial ports, 230.4 Kbit per second maximum (up to 2.048 Mbit per second if clocked externally), and are compatible with GeoPort devices such as the GeoPort Telecom Adapter.
- One built-in 10Base-T Ethernet connector for direct connection to 10Base-T networks. (If both AAUI and 10Base-T connectors are plugged in, the server uses the 10Base-T connector by default.)
- One built-in AAUI Ethernet connector for connecting to high-speed Ethernet networks. Requires the appropriate AAUI transceiver adapter (10Base-T, thin coaxial, or thick coaxial).
- One 3.5-mm sound output port for headphones or line-level devices
- One 3.5-mm sound input port for stereo sound input. The sound input port supports the Apple PlainTalk Microphone that comes with some Macintosh computers. The sound input port also supports a standard stereo (miniplug-to-RCA) cable adapter for connecting stereo equipment to your server.

The sound input port does not support the omnidirectional microphone (the round microphone shipped with some earlier models of Macintosh) or the attenuated RCA adapter provided with some Macintosh models.

SCSI interfaces

Your server has three SCSI interfaces:

- an internal Ultra Wide SCSI-3 bus, available via a PCI expansion card installed in one of the PCI slots (An external connector is also available for this bus, but it should not be used. For more information, see “About the External Ultra Wide SCSI-3 Bus” in Chapter 4.)
- an internal Fast SCSI-2 bus
- an external standard SCSI-1 bus

For more information about the SCSI buses, see “About Internal Storage Options” in Chapter 3, “Connecting External SCSI Devices” in Chapter 4, and the SCSI card manual that came with your server.

Audio system

- Custom sound circuitry, including a stereo generator (digital-to-analog converter, or DAC)—capable of driving stereo miniplug headphones or audio equipment—and stereo sampling hardware (analog-to-digital converter, or ADC) for recording stereo sound
- 16-bit stereo input and output
- Sample rates of 44.1 and 22.05 kilohertz (kHz)

Typical specifications

- Sound input connector line level: 2.8 volts peak-to-peak (V_{pp}) nominal, into 6.5-kilohm (k Ω) impedance
- Sound output connector line level: 3.0 V_{pp} nominal, into 1-k Ω impedance
- Sound input signal-to-noise ratio (SNR): greater than (>) 74 decibels (dB) non-weighted
- Sound output SNR: > 82 dB non-weighted
- Frequency response: 20 hertz (Hz) to 17 kHz (+/- 0.8 dB) at 44.100-kHz sample rate; 20 Hz to 19 kHz (+/- 2.0 dB) at 44.100-kHz sample rate
- Total harmonic distortion plus noise (THD + N): less than (<) 0.05 %; measured 20 Hz to 20 kHz with a 2.5-V_{pp} sine wave input

AC line input

- Line voltage: 100–240 volts (V) alternating current (AC), RMS single phase, automatically configured
- Frequency: 50–60 Hz
- Power: 560 watts (W) maximum continuous; 700 W peak input

AC line output

- Output receptacle: 100–120 V, 3 amperes (A) AC, 220–240 V, 1.5 A AC RMS (determined by actual input voltage); 3 A maximum at 100 V

DC power

- Continuous output: 390 W
- Peak output (for 12 seconds at startup): 485 W

Output voltage	Total*
+5 V	41 A†
+3.3 V	42 A†
+12 V	3 A
-12 V	0.85 A
-5 V (trickle)	0.1 A
+5 V (drives)	7 A
+12 V (drives)	8.3 A

*Total power output cannot exceed 390 W.

†Not more than 45 A total combined current.

Power requirements for devices you can connect

Apple Desktop Bus (ADB)

- The mouse draws up to 10 milliamperes (mA).
- The keyboard draws 25–80 mA (varies with keyboard model used).
- The maximum current available for all ADB devices: 500 mA.

Note: The ADB port can support up to three daisy-chained ADB devices.

Audio and telecommunications devices

The following table shows power allowances for external devices connected to input ports.

Device	Voltage	Current	Power
Microphone	+5 V	20 mA	100 mW
A device connected to the printer port or modem port*	+5 V	500 mA	2.5 W

*Such as the GeoPort Telecom Adapter.

Expansion cards and other internal devices

If you add an expansion card, a 5.25-inch storage device, or a 3.5-inch storage device to your server, make sure the component's power requirements don't exceed the maximum power allowances allocated to it by the server.

The maximum power allowances for expansion cards in your server can accommodate six 15-watt or four 25-watt cards. Detailed guidelines are presented in the following table.

Device	Voltage	Current	Power
Expansion card (15 watts)*	+5 V	3 A	15 W
	+12 V	0.500 A	6 W
	-12 V	0.100 A	1.2 W
	+3.3 V	2 A	6.6 W
Expansion card (25 watts)†	+5 V	5 A	25 W
	+12 V	0.500 A	6 W
	-12 V	0.100 A	1.2 W
	+3.3 V	2 A	6.6 W
Storage device (such as a hard disk)	+5 V	9 A	45 W
	+12 V	3 A	36 W
	+12 V	7.5 A peak‡	—

*15-watt expansion cards should not consume more than 15 watts of total power.

†25-watt expansion cards should not consume more than 25 watts of total power.

‡Peak power is for startup only and must not occur in normal operation.

Size and weight

Device	Voltage	Current	Power
Main unit			
15.9 kg*	439 mm	246 mm	440 mm
35 lb.*	17.3 in.	9.7 in.	17.3 in.
Mouse			
0.11 kg	33 mm	61 mm	107 mm
4 oz.	1.3 in.	2.4 in.	4.2 in.

*Weight varies depending on type of hard disk and may be greater if optional devices are installed.

Environment

Operating temperature

- 10° C to 35° C (50° F to 95° F)

Storage temperature

- -40° C to 47° C (-40° F to 116.6° F)

Relative humidity

- 5% to 95% (noncondensing)

Altitude

- 0 to 3048 m (0 to 10,000 ft.)

CD-ROM drive

Disc speed

- 12x (twelve-times speed, or 1800 KB per second)

Disc diameters supported

- 120 mm (4.7 inches)
- 80 mm (3.2 inches)

Data capacity

- 656 MB, Mode 1
- 748 MB, Mode 2

Modes supported

- Audio CD
- CD-ROM: Modes 1 and 2
- CD-ROM XA: Mode 2, Forms 1 and 2
- CD-I: Mode 2, Forms 1 and 2
- Photo CD: Single-session and multisession
- Video CD

Laser

- Type: Semiconductor GaAlAs laser
- Wavelength: 795 ± 25 nanometers
- Output power: 0.2 to 0.6 milliwatts
- Beam divergence: 55°

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Apple Computer, Inc.

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Cupertino, California 95014-2084

408-996-1010

<http://www.apple.com>

033-0376-A

Printed in U.S.A.