Service Source

Performa/Power Macintosh 6400 and 6500 Series

Performa 6400/180, 6400/200
Power Macintosh 6400/180, 6400/200,
6500/225, 6500/250, 6500/275, 6500/300
International Performa 6410, 6420

Basics

Performa/Power Macintosh
6400 and 6500 Series

System Overview

The Performa/Power Macintosh 6400 and 6500 computers combine RISC-based PowerPC performance with full multimedia features. Several features are implemented as plug-in modules available as configuration options or later upgrade, such as PCI cards, internal storage devices, and the Apple TV/FM Radio System. The modules are designed to be user installed.

User controls include the following:
• Soft power-on control from keyboard
• Front panel sound-control push buttons
• Front panel brightness-control push buttons
• Optional infrared remote control
• Voltage switch
• Subwoofer balance control

Configurations

Performa 6400

The 6400 has a PowerPC 603ev processor. Expansion connections on the logic board include the following:

- DRAM DIMM expansion socket
- Communications slot for modems and Ethernet
- TV/FM tuner port
- Video-in slot
- External video port
- Two PCI expansion slots
- Two GeoPort serial ports

Power Macintosh 6400

The Power Macintosh 6400 has the same feature set as the Performa 6400. It is available with a PowerPC 603ev processor running at 180 MHz or at 200 MHz.

Performa 6410 and 6420

These computers are sold in Japan, Australia, and Europe. They both ship with 8X-speed CD-ROM drives. The 6410 has 16 MB of RAM and a 1.6 GB hard drive. The 6420 has up to 24 MB of RAM, a 2.4 GB hard drive, and a 256K level-2 cache card.

Performa 6400/200 with Zip Drive

The 6400/200 with Zip drive is sold in the United States. It has the same feature set as the 6400/200, but differs with these features:

- 32 MB RAM
- 2.4 GB hard drive
- 8x CD-ROM drive
- 100 MB Zip drive

Power Macintosh 6500

The Power Macintosh 6500 is similar to the Performa/Power Macintosh 6400, but differs with these features:

- Processor bus runs at 50 MHz
- DRAM expandable to 128 MB using extended data out (EDO) mode, 60 ns or faster DIMMs (no onboard RAM)
- 2 MB built-in video RAM
- Tray-loading, 12X-speed CD-ROM drive
- Zip drive option
- More monitor video modes supported
- 2D and 3D built-in hardware graphics acceleration.

Power Macintosh 6500/225

The Power Macintosh 6500/225 has the 6500 feature set
with a CPU running at 225 MHz and a 2 GB hard drive.

Power Macintosh 6500/250

The Power Macintosh 6500/250 has the 6500 feature set
with a CPU running at 250 MHz.

A configuration of the 6500/250 sold to the education
market in the Americas comes with
• 4 GB hard drive
• Ethernet

A configuration of the 6500/250 sold to the consumer market in the Americas comes with
- 4 GB hard drive
- 24X-speed CD-ROM drive
- 56.6K Apple/GV Modem
- Home Software bundle
- Mac OS 8.0

A configuration sold in Europe comes with
- 4 GB hard drive
- 24X-speed CD-ROM drive
- Zip drive
- 33.6 modem
- Mac OS 8.0

A configuration sold to the consumer market in Latin America comes with

- 4 GB hard drive
- 24X-speed CD-ROM drive
- 33.6 modem
- Mac OS 8.0

Power Macintosh 6500/275

The Power Macintosh 6500/275 has a 603e processor
running at 275 MHz and comes with
- 48 MB DRAM on the logic board
- 4 GB hard drive
- 512K L2 cache card

All other hardware features are the same as previous 6500
series computers.

A configuration sold to the education market in the Americas
comes with
- 32 MB DRAM
- Zip drive
- Video in
- NTSC out
- Ethernet
- Mac OS 8.0

A configuration of the 6500/275 sold to the consumer market in the Americas comes with
- 32 MB DRAM
- 6 GB hard drive
- 24X-speed CD-ROM drive
- Zip drive
- 56.6K Apple/GV modem
- Home Software bundle
- Mac OS 8.0

Another configuration of the 6500/275 sold to the consumer market in the Americas comes with

- 48 MB DRAM
- 6 GB hard drive
- 24X CD-ROM drive
- Zip drive
- 56.6K Apple/GV modem
- Microsoft Small Office software bundle
- Mac OS 8.0

A configuration sold in Asia and the Pacific comes with

- 32 MB DRAM
- 24X-speed CD-ROM drive
- Avid Cinema
- Video in
- Mac OS 8.0

Power Macintosh 6500/300

The Power Macintosh 6500/300 has a 603e processor
running at 300 MHz and comes with
• 64 MB DRAM on the logic board
• 4 GB hard drive
• 512K L2 cache card.

All other hardware features are the same as previous 6500
series computers.

A configuration sold to the consumer market in the Americas
comes with
• 6 GB hard drive
• 24X-speed CD-ROM drive
• Zip drive
• 56.6K Apple/GV modem
• Home Software bundle
• Mac OS 8.0

A configuration of the 6500/300 sold to the consumer market in Latin America comes with
- 6 GB hard drive
- 24X-speed CD-ROM drive
- Zip drive
- 33.6 modem
- Mac OS 8.0

A configuration of the 6500/300 sold in Asia and the Pacific comes with
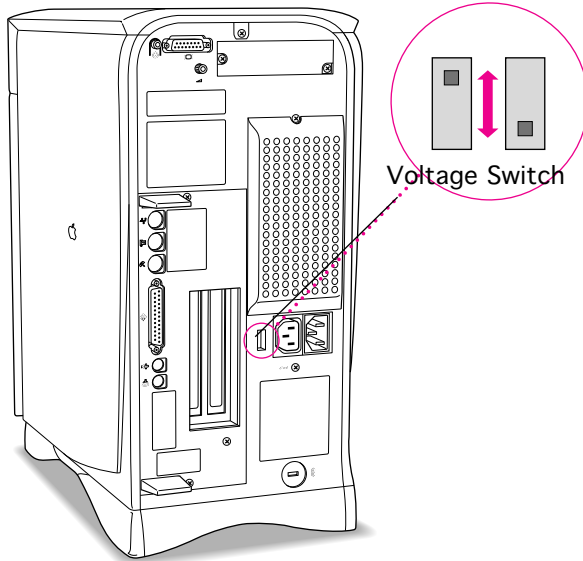- 24X-speed CD-ROM drive
- Mac OS 8.0

A configuration sold in Europe comes with
- 6 GB hard drive
- 24X-speed CD-ROM drive
- TV/FM tuner
- Video in
- Avid Cinema
- 33.6 modem
- Mac OS 8.0

Voltage Switch

Voltage Switch

The voltage switch must be set correctly to avoid damaging the computer. Insert a screw driver in the slot to set the switch to show "115" for voltages between 100 and 130. Set the switch to show "230" for voltages between 200 and 270. Some countries use two standardized voltages. If you aren't sure which voltage is available, check with the electricity supply company before plugging in the computer.

Here is a table listing voltages for some countries:

Country	Voltage
Japan	100
Algeria, Indonesia, Lebanon, Libya, Peru, S. Korea, Vietnam	100 or 220
Ecuador, Jamaica, Philippines, Taiwan	110
Bermuda, Canada, Puerto Rico, United States, Venezuela	120
Colombia, Mexico, Saudi Arabia	127
Brazil	127 or 220
Hong Kong	200
India, South Africa	220-250
Israel, Pakistan, Singapore	230

Country	Voltage
Australia, Kuwait, Malta, New Zealand, Northern Ireland, Papua New Guinea, Oman, Qatar, United Kingdom	240
Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland	220-230
Bahrain, Chile, China (People's Republic), Czechoslovakia, Egypt, Greenland, Hungary, Iceland, Iran, Jordan, Liechtenstein, Nepal, Paraguay, Poland, Romania, United Arab Emirates, Russia and the Commonwealth of Independent States (CIS), Yemen, Yugoslavia	220

Subwoofer Internal

Subwoofer Balance Control

With external speakers attached, the subwoofer functions as a bass speaker to augment the stereo sound. Without external speakers, the subwoofer produces full-range sound instead of just bass.
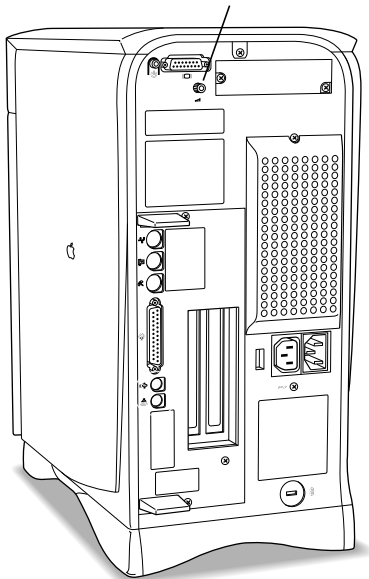
Subwoofer Balance Control

Adjust the subwoofer balance using the subwoofer balance control. The subwoofer balance control only works with external speakers attached. To increase or decrease the bass coming from the subwoofer in relation to the sound coming from the external speakers, adjust the subwoofer balance control.

TV/FM Radio Tuner Card

The TV/FM radio tuner card turns the computer into a television and FM radio receiver, complete with remote control. An expansion ribbon connector for the optional TV/FM radio tuner card provides NTSC and PAL input from an external TV antenna or cable. Change channels by typing the channel number on the keyboard or with the remote control. Switch between the current and previous channel by pressing the Tab key. The computer displays the user-assigned channel name on the picture in the video window.

Apple Video Player software supports the TV/FM tuner card. The user can disable channels and require a password to access the disabled channels. Users can also capture or freeze a single frame of video or record a segment of video as a QuickTime movie. It isn't possible to resize the window while recording a movie.

The TV picture is in its own window on the desktop, and the default size of the window is 320x240 pixels. The picture can be resized from 160x120 pixels up to 640x480 pixels. The resolution of the picture does not increase at larger window sizes, but the image is expanded by doubling the pixel size or by two-dimensional linear interpolation.

The TV signal is carried in YUV format for improved picture clarity. The YUV format is 16-bit, with 8 bits for the Y (luminance) channel and 8 bits for the U and V (chrominance) channels to share by multiplexing. The picture is clearer because the YUV format carries more levels of luminance information.

The card is available in versions for NTSC, PAL, and SECAM television systems. The features of the TV tuner include the following:

- Remote tuner for 181 broadcast and cable channels (U.S. version)
- Coaxial connector for TV antenna or cable input (F-type connector in U.S. and Japanese version, IEC-type connector in Europe)
- TV picture in a resizable and movable window
- YUV format for improved clarity
- Closed captioning and teletext support
- Software password protection
- Automatic and manual channel programming
- Single remote control for TV and for playback of audio CDs

The features of the FM radio tuner include the following:

- FM radio frequencies received and displayed
- Stations scanned and searched up and down the frequency spectrum
- Step frequency
- DX mode to tune out harmonic spillover from other stations
- Stereo/mono station indicator
- Preset station programming

Digital Audio Video (DAV) Technology

The optional video input card has a separate connector called the DAV connector. The DAV connector provides access from a PCI card to the video input card by means of a 60-pin cable. This allows the PCI expansion card to use the video card to transfer real-time video data to the computer. The video card accepts video from an external source and displays it in a window on the computer's monitor.

Note: The interface of the 60-pin DAV connector is a superset of the interface on the 34-pin DVA connector on the Power Macintosh 5200, Power Macintosh 6200, and Quadra 630 computers. An adapter cable is provided with the Performa 6400 video-in cards to connect 34-pin DVA compatible cards developed for the Power Macintosh 5200 and 6200 computers to the new 60-pin DAV connector.

Video Input Card

DAV Connector

DAV Connector

PCI Card
with DAV
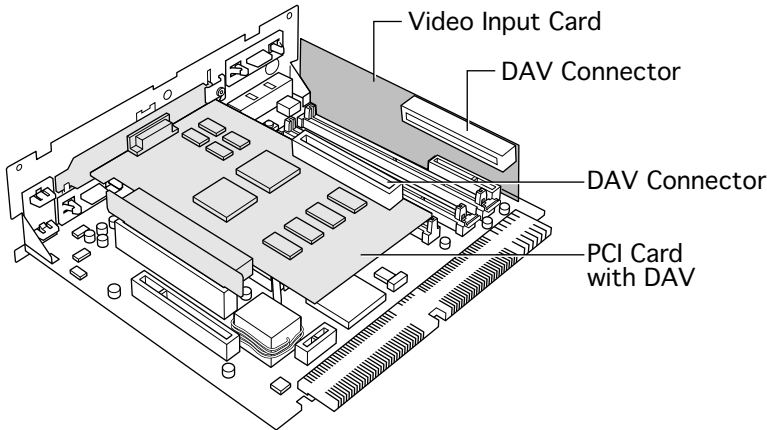
Note: The DAV connector on the video input card provides some of the functionality of the DAV connectors found on the Power Macintosh 7100 and 8100 models, and the Macintosh Quadra AV models, but it is not compatible with any of those connectors.

Sound

The sound system supports 8-bit and 16-bit stereo sound output and input. It can create sounds digitally and play the sounds through the internal speakers or send the sound signals through the sound output jacks.

Digitizing Sound

The 6400 and 6500 computers digitize and records sound as 16-bit samples. It can use two of these sampling rates—11k, 22k, or 44k samples per second. It can record sound from the following sources:

• Built-in microphone
• Microphone connected to the sound input jack
• Video input module
• Compact disc in the CD-ROM player

Sound Output

The 6400 and 6500 computers have one built-in speaker/subwoofer and two sound output jacks, one on the front and one on the back. Both output jacks are connected to the sound amplifier. Inserting a plug into either jack disconnects the internal speakers. The jack on the front is intended for headphones, and the jack on the back is intended for external speakers. The rear jack is muted when headphones are plugged in the front jack.

Sound Input

One sound input port for stereo sound input supports the
Apple PlainTalk Microphone, and it supports non-Apple
microphones. It also supports a standard stereo (miniplug-
to-RCA) cable adapter for connecting stereo equipment to
the computer.

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

Expansion Bay

The expansion bay includes audio, data, and power connectors for adding a SCSI CD-ROM or other SCSI device. The bay is configured for 5.25-inch devices, but with modification to the carrier, a 3.5-inch SCSI device could be installed. In some computers, the bay may already be occupied by a Zip drive.

Intelligent Device Electronics (IDE) Hard Drive

The internal hard drive uses IDE technology, commonly used in DOS-compatible systems, and the standard ATA-2 or IDE interface. The hard drive has a standard 40-pin ATA connector, and a separate 4-pin power connector.

The IDE hard drive functions the same as a typical SCSI hard drive. You must replace IDE drives like for like. The IDE drive does not affect SCSI ID selections or SCSI termination schemes. Six external SCSI devices may be daisy-chained through the external SCSI port.

Peripheral Component Interconnect (PCI) Technology

The 6400 and 6500 computers offer a peripheral component interconnect (PCI) expansion bus. Because the PCI bus is an industry standard, most existing PCI 2.0-compliant cards (with the addition of a Macintosh OS-specific software driver) will work in these computers.

PCI offers significantly higher performance than the NuBus architecture used in previous Macintosh models. Running at 33 MHz, the PCI bus is up to three times faster than NuBus, offering overall enhanced system performance, particularly in the areas of video and networking.

Note: PCI expansion slots are compatible with all PCI 2.0 specification-compliant cards with the addition of Macintosh-OS-specific software driver. Nubus cards **cannot** be used in this expansion slot. PDS cards for the Macintosh LC family, the Macintosh Quadra 630 computer, or cards that operate in the I/O expansion slot in Power Macintosh 5200 and 6200 computers are **not** compatible with the PCI expansion slots.

Communications

The logic board has a communications slot for adding a communications module without occupying the PCI expansion slots. The slot uses a PCI bus, and supports the following cards:

- 10Base-T (twisted pair) Ethernet card
- 10Base-2 (thin coax) Ethernet card
- AAUI (Apple standard) Ethernet card
- 28.8 bps fax/data modem card

Note: This PCI bus-compatible slot is **not** compatible with communications cards for the Macintosh LC family and Macintosh Quadra 630 or with cards that operate in the Power Macintosh 5200 and 6200 communication slots. The exception is that cards that do not use the bus, such as serial modem cards, have been designed to work in either type of communications slot.

Modems

Some Performa 6400/180 and 6400/200 computers shipped with internal GeoPort modems and some with internal Global Village modems. If the modem isn't replaced like-for-like, the communications software is incompatible with the modem.

To identify the modem originally shipped in the computer look at the last three characters of the serial number to compare with characters found in this table.

Modem	6400/180	6400/200
Global Village Platinum	7U7	836
GeoPort	95R	95S

GeoPort Technology

Geoport is a hardware and software communications architecture that has been optimized for computer-telephony integration. It has three main attributes:

• It lets any GeoPort-compatible computer connect to any telephone (analog or digital, public or private) anywhere in the world.

• Once connected, it supports an arbitrary number of independent data streams up to a total bandwidth of 2 MB/second.

• Unlike traditional asynchronous data communications (such as AppleTalk), GeoPort also supports isochronous data streams (such as real-time voice and video) and provides the real-time Application Program Interfaces (APIs) necessary to hide the implementation details from both the recipient and the sender.

Dual In-Line Memory Modules (DIMMs)

The 6400 and 6500 come with 16 MB of DRAM. Two 168-pin sockets allow for memory expansion.

The 6400 and 6500 use DRAM Dual In-Line Memory Modules (DIMMs) instead of DRAM Single In-Line Memory Modules (SIMMs). Whereas SIMMs have 72 pins, DIMMs have 168 pins. The extra pins provide a 64-bit data path, compared to a 32-bit data path for SIMMs.

Important: The SIMMs used in previous Macintosh models are **not** compatible with the 6400 or 6500. For the Performa 6400, use 168-pin, fast-paged, 70 ns or faster, 2K refresh rate DIMMs. For the Power Macintosh 6400, use 168-pin extended data out (EDO) mode, 60 ns or faster, and 1K or 2K refresh count. For the Power Macintosh 6500, use 168-pin, 5-volt buffered extended data out (EDO) mode, 60 ns or faster, 2K refresh rate DIMMs. Do **not** use DIMMs with a 4K refresh count.

Also, the JEDEC MO-161 specification shows three possible heights for the 8-byte DIMM. For these computers, use only the shortest of the three (1.100 inches). Taller DIMMs put excessive pressure on the DIMM sockets due to mechanical pressure inside the case.

Performa/Power Macintosh 6400

DRAM DIMMs can be installed individually. However, if you wish to take advantage of the computer's interleaving capability, which provides maximum performance, you must install the DIMMs in matching pairs.

Memory interleaving allows the computer to read or write to its memory while other memory reads or writes are occurring, thus providing for faster performance.

Note: DIMMs purchased from different manufacturers can be paired as long as they are the same size and speed.

Power Macintosh 6500

The 8-byte DIMMs can be installed one or more at a time. The logic board supports only linear memory organization, and no performance gains result when two DIMMs of the same size are installed. Any supported size DIMM can be installed in either DIMM slot, and the combined memory of all installed DIMMs is configured as a contiguous array of memory.

The DIMM slots accommodate 168-pin, 5-volt, fast-paged and EDO DRAM DIMMs. The largest DIMM supported is a two-bank DIMM holding 64 MB.

Note: The logic board does **not** support 3.3-volt EDO DIMMs. These DIMMs don't mechanically fit into the DIMM slots.

Cache Expansion

The optional 256K (512K for the 6500/275 and 6500/300) level-2 cache is on a 160-pin DIMM card that plugs into a 160-pin edge connector on the logic board and includes an integrated cache controller.

Note: Apple does **not** support third-party cache cards for these computer models. The 160-pin cache expansion slot is **not** compatible with cache cards for previously released Power Macintosh computer models.

6500 Supported Monitor Resolutions

The system software on Power Macintosh 6500 computers allows selecting monitor resolutions above 1152 x 870. But these higher resolutions cause poor video output, such as misaligned or skewed video, low brightness, and so on.

Monitors connected to Power Macintosh 6500 computers should not be set to resolutions above 1152 x 870. Check the Monitors and Sound Control Panel to make sure the resolution is set to 1152 x 870 or below.

Here is a chart of Power Macintosh 6500 supported monitor resolutions.

Display Resolution	Pixel Depth	Vertical Scan Rate	Video Input	QuickDraw 2D Acceleration	QuickDraw 3D Acceleration
512 x 384	8	70 Hz	Yes	Yes	No
512 x 384	16,32	70 Hz	Yes	Yes	Yes
640 x 480	8	60,67,72, 75,85 Hz	Yes	Yes	No
640 x 480	16	60,67,72, 75,85 Hz	Yes	Yes	Yes
640 x 480	32	60,67,72, 75,85 Hz	Yes	Yes	Depends on application window size
640 x 870	16	75 Hz	Yes	Yes	No

Display Resolution	Pixel Depth	Vertical Scan Rate	Video Input	QuickDraw 2D Acceleration	QuickDraw 3D Acceleration
800 x 600	8,32	56,60,72, 75,85 Hz	Yes	Yes	No
800 x 600	16	56,60,72, 75,85 Hz	Yes	Yes	Depends on application window size
832 x 624	8,32	75 Hz	Yes	Yes	No
832 x 624	16	75 Hz	Yes	Yes	Depends on application window size
1024 x 768	8,16	60,70,75 Hz	Yes	Yes	No
1152 x 870	16	75 Hz	Yes	Yes	No

Front View

Expansion Bay

CD-ROM Drive Open/Close Button

CD-ROM Drive (optional)

Floppy Disk Drive

Remote Control Sensor

Sound Control Buttons

Power-On Light

Headphone Jack

Internal Hard Drive

Rear View

Standby Power Button

Monitor Video Port

Apple Desktop Bus (ADB) Port

Printer Port

External Modem Port

SCSI Port

Sound Input Port

Sound Output Port

TV Tuner Card (optional)

Subwoofer Balance Control

Video Input Card (optional)

Power Socket

Monitor Power Socket

PCI Card Access Covers (2)

Internal Communication Card (optional)

Security Lock Port

Logic Board

PCI Slots

Communications Slot

Cache Slot

Battery

Monitor-Out Slot

DRAM DIMM Slots

Video-In Slot

Repair Strategy

Service the Power Macintosh/ Performa 6400 and 6500 series computers through module exchange and parts replacement. Customers can request on-site service from an Apple Authorized Service Provider Plus (AASP+) Apple Assurance (US only), or Apple Canada Technical Answerline (Cananda only). They can also choose carry-in service from an AASP.

Ordering

Apple Service Providers planning to support the computer systems covered in this manual may purchase Service modules and parts to develop servicing capability. To order parts, use the AppleOrder (US only) or ARIS (Canada only) system and refer to the Power Macintosh G3 "Service Price Pages."

Large businesses, universities, and K-12 accounts must provide a purchase order on all transactions, including orders placed through the AppleOrder (US only) or ARIS (Canada only) system.

USA Ordering

US Service providers not enrolled in AppleOrder may fax their orders to Service Provider Support (512-908-8125) or mail them to

Apple Computer, Inc.
Service Provider Support
MS 212-SPS
Austin, TX 78714-9125

For US inquiries, please call Service Provider Support at 800-919-2775 and select option #1.

Canadian Ordering

Canadian Service providers not enrolled in ARIS may fax their orders to Service Provider Support in Canada (1-800-903-5284). For Canadian inquiries, please call Service Provider Support at 905-513-5782 and select option #3.

Warranty/AppleCare/ARIS

US Only

The Power Macintosh/ Performa 6400 and 6500 series computers are covered under the Apple One-Year Limited Warranty. The AppleCare Service Plan is also available for these products. Service Providers are reimbursed for warranty and AppleCare repairs made to these computers. For pricing information, refer to "Service Price Pages."

Canada Only

The Power Macintosh/ Performa 6400 and 6500 series computers are covered under AppleCare. The Extended AppleCare Service Plan is also available for these products. Service Providers are reimbursed for warranty and AppleCare repairs made to these computers. For pricing information, refer to "Service Price Pages."

Specifications

Performa/Power Macintosh
6400 and 6500 Series

Introduction

Specifications information for this product can be found in this chapter and also in the Spec Database, which you can access in one of three ways:

— Launch it directly by double-clicking the Apple Spec Database runtime alias at the top level of the Main Service Source CD.
— Select "Apple Spec Database" from the Service Source drop-down main menu.
— Click the Acrobat toolbar icon for the database, which is near the right end of the toolbar with the letters "SP."

Processor

CPU

6400/180, 6410	PowerPC 603ev processor 180 MHz
6400/200, 6420	PowerPC 603ev processor 200 MHz
6500	PowerPC 603ev processor 225 MHz, 250 MHz, 275 MHz, or 300 MHz

Processor Bus

| 6400 | 64-bit wide, 40 MHz, supporting split address and data tenures |

| 6500 | 64-bit wide, 50 MHz, supporting split address and data tenures |

Memory

DRAM

Performa 6400, 6410, 6420	16 MB DRAM (6420 ships with up to 24 MB DRAM) Expandable to 136 MB using JEDEC-standard DIMM devices in two sockets (168-pin fast-paged mode, 70 ns or faster, 2K refresh rate DIMMs)
Power Macintosh 6400	16 MB DRAM Expandable to 136 MB using JEDEC-standard DIMM devices in two sockets (168-pin, extended data out [EDO] mode, 60 ns or faster, 1K or 2K refresh rate DIMMs)

DRAM

6400/200 with Zip Drive	32 MB DRAM Expandable to 136 MB using JEDEC-standard DIMM devices in two sockets (168-pin, extended data out [EDO] mode, 60 ns or faster, 1K or 2K refresh rate DIMMs).
6500/225, 6500/250	32 MB DRAM Expandable to 128 MB using JEDEC-standard DIMM devices in two sockets (168-pin, 5-volt buffered extended data out [EDO] mode, 60 ns or faster, 2K refresh rate DIMMs)
6500/275	32 MB or 48 MB DRAM Expandable to 128 MB using JEDEC-standard DIMM devices in two sockets (168-pin, 5-volt buffered extended data out [EDO] mode, 60 ns or faster, 2K refresh rate DIMMs)

DRAM

6500/300	64 MB DRAM Expandable to 128 MB using JEDEC-standard DIMM devices in two sockets (168-pin, 5-volt buffered extended data out [EDO] mode, 60 ns or faster, 2K refresh rate DIMMs)

ROM   4 MB of read-only memory (ROM)

PRAM   8K nonvolatile parameter memory

VRAM

6400	1 MB built-in video RAM
6500	2 MB built-in video RAM, 88 MHz synchronous graphic RAM

Cache Memory

6400, 6410, 6500	Optional 256K Level 2 high performance module
6400/200 with Zip Drive, 6420	Standard 256K Level 2 high performance module
6500/225, 6500/250	Standard 256K Level 2 high performance module
6500/275, 6500/300	Standard 512K, Level 2 high performance module

Disk Storage

Floppy Drive   1.4 MB Apple SuperDrive

Expansion   Expansion bay for one 5.25-inch SCSI CD-ROM or other SCSI
                            device

CD-ROM Drive

    6400   AppleCD 600i

    6400/200 with Zip   AppleCD 1200i 8X CD-ROM drive
    Drive, 6410, 6420

    6500   Tray-loading, AppleCD 1800i (12X-speed) or 24X-speed

Hard Drive

6400	1.2 GB IDE 3.5-inch hard drive
6410	1.6 GB IDE 3.5-inch hard drive
6400/200 with Zip Drive, 6420	2.4 GB IDE 3.5-inch hard drive
6500/225	2 GB IDE 3.5-inch hard drive
6500/250	3 GB or 4 GB IDE 3.5-inch hard drive
6500/275, 6500/300	4 GB or 6 GB IDE 3.5-inch hard drive

Zip Drive (6400/200 with Zip Drive and 6500)   100 MB Zip drive

I/O Interfaces

Apple Desktop Bus   One Apple Desktop Bus (ADB) port supporting up to three ADB input devices daisy-chained through a synchronous serial bus

PCI Expansion   Two PCI expansion slots, compatible with all PCI 2.0 specification-compliant cards with the addition of Macintosh-OS-specific software driver. Nubus cards cannot be used in this expansion slot.

Communications   One internal expansion slot for modem or Ethernet card (PCI bus configuration). Depending on configuration, a modem card may already be installed.

TV Tuner   One port for TV/FM tuner card. Depending on configuration, a
                      tuner card may already be installed.

Video-in   One internal expansion slot for video input cards using NTSC, PAL,
                      and SECAM. Depending on configuration, a video input card may
                      already be installed. A 60-pin DAV connector on the video input
                      card supports an optional video card for real-time video
                      display, capture, and overlay. An adapter cable provides
                      backward compatibility with DVA cards designed for the Power
                      Macintosh 5200 computer.

Graphics   2D and 3D built-in hardware graphics acceleration.
Acceleration (6500)

Video-out   Supports these video modes:

6400   640x480 resolution with 16-bit color, 60 Hz and 67 Hz vertical
                   scan rate, and video input

                   800x600 resolution with 16-bit color, 60 Hz vertical scan rate,
                   and video input at 8-bit or less color depth

                   800x600 resolution with 8-bit color, 72 Hz vertical scan rate,
                   and no video input

                   832x624 resolution with 8-bit color, 75 Hz vertical scan rate,
                   and video input

                   1024x768 resolution with 8-bit color, 60 Hz vertical scan rate,
                   and no video input

6500   512x384 resolution with 32-bit color, 70 Hz vertical scan rate,
                   and video input

                   640x480 resolution with 32-bit color, 60 Hz and 67 Hz vertical
                   scan rate, and video input

                   640x870 resolution with 16-bit color, 75 Hz vertical scan rate,
                   and video input

800x600 resolution with 32-bit color, 60 Hz vertical scan rate, and video input at 8-bit or less color depth

800x600 resolution with 32-bit color, 72 Hz vertical scan rate, and no video input

800x600 resolution with 16-bit color, 75 Hz vertical scan rate, and video input

832x624 resolution with 8-bit color, 75 Hz vertical scan rate, and video input

1024x768 resolution with 16-bit color, 60 Hz, 70 Hz, and 75 Hz vertical scan rate, and no video input

1152x870 resolution with 16-bit color, 75 Hz vertical scan rate, and video input

1280x960 resolution with 8-bit color, 75 Hz vertical scan rate, and video input

1280x1024 resolution with 8-bit color, 60 Hz and 75 Hz vertical scan rate, and video input

Sound Output   16-bit stereo output featuring SRS 3D Surround Sound
                     technology
                     One 3.5 mm sound output port for line-level devices, such as
                        powered loudspeakers, on the back of the computer
                     One 3.5 mm headphone jack on the front of the computer

Sound Input   16-bit stereo input
                     Sample rates of 11.025, 22.05, and 44.1 KHz
                     One 3.5 mm sound input port for stereo sound input. Supports the
                        Apple PlainTalk Microphone that comes with some Macintosh
                        computers, as well as non-Apple microphones. Also supports a
                        standard stereo (miniplug-to-RCA) cable adapter for
                        connecting stereo equipment to the computer.

                     Note: Does **not** support the Apple Omni microphone (the round
                     microphone shipped with some earlier Macintosh models) or
                     the attenuated RCA adapter provided with some models.

Keyboard   Supports all Apple Desktop Bus (ADB) keyboards

Mouse   Supports all models of the ADB mouse

Controls   Infrared remote control option
                    Front-panel pushbutton controls for volume and picture
                    Softpower control from keyboard

SCSI   One external standard SCSI port that supports up to six external
                    SCSI devices (or up to five external SCSI devices if the optional
                    Zip drive is installed)

Serial   Two RS-232/RS-422 serial GeoPort-compatible ports

I/O Devices

Speaker   Built-in, full-range, monophonic speaker. Stereo sound through
                     attached external speakers or headphones or through the
                     speaker built in to the monitor.

Electrical

Line Voltage   90–130 or 180–264 VAC configured manually

Frequency   47–63 Hz

Power

    6400   220 W maximum continuous

    6500   140 W maximum continuous

Physical

Dimensions   Height: 16" (406 mm)
                        Width: 7 13/16" (198 mm)
                        Depth: 16 7/8" (428 mm)

Weight   44.5 lb. (20.18 kg) without CD-ROM
                        Weight varies depending on type of hard disk and other options.
                           Does not include monitor.

Environmental

Temperature	Storage: -40° F to 116.6° F (-40° C to 47° C)
6400	Operating: 50°–104° F (10°–40° C)
6500	Operating: 50°–97° F (10°–35° C)
Humidity	Noncondensing, 5–95%
Altitude	0–10,000 ft. (0–3,048 m)

Troubleshooting

Performa/Power Macintosh 6400 and 6500 Series

General

The Symptom Charts included in this chapter will help you diagnose specific symptoms related to your product. Because cures are listed on the charts in the order of most likely solution, try the first cure first. Verify whether or not the product continues to exhibit the symptom. If the symptom persists, try the next cure. (Note: If you have replaced a module, reinstall the original module before you proceed to the next cure.)

If you are not sure what the problem is, or if the Symptom Charts do not resolve the problem, refer to the Flowchart for the product family.

For additional assistance, contact Apple Technical Support.

Symptom Charts

System

System
intermittently
crashes or hangs

1 Verify that system software is version 7.5.3 or later.
2 Verify that software is known-good.
3 Verify that software is PowerPC-compatible (contact developer).
4 Clear parameter RAM. Hold down Command-Option-P-R during startup, but before "Welcome to Macintosh" appears.
5 Disconnect all external devices attached (except monitor) and restart.
6 Replace DIMMs.
7 Replace logic board. Retain customer's DIMMs.
8 Replace power supply.

System

System does not start up

1 Reset logic board. Refer to Additional Procedures.
2 Replace power supply.
3 Replace logic board. Retain customer's DIMMs.

System does not start up from keyboard, but starts up from power switch

1 Check keyboard connection.
2 Verify keyboard as known-good.

Menu bar constantly flashes or system constantly beeps

Verify that front-panel control buttons are not jammed.

Audio

Distorted or garbled
sound

1   Check volume level.
2   Check volume level in Sound control panel.

No sound output from
speaker

1   Check speaker connection to logic board.
2   Replace speaker assembly.
3   Attach headphones. If you hear sound through headphones,
    replace speaker assembly.

Video

No video, fan is running

1 Check monitor connection.
2 Try known-good monitor.
3 Replace monitor-out card.
4 Remove all DRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.
5 Replace logic board. Retain customer's DIMMs.
6 Replace power supply.

Blurry image over entire screen at resolutions of 832 x 624 and higher.

Power Macintosh 6500 serial number falls within the range from XB708xxxxx to XB723xxxxx, replace audio/monitor connection subassembly (P/N 922-2996). To identify audio/monitor connection subassembly that needs replacing, see Additional Procedures chapter.

Video

Pixels shimmer at edge of screen, dialog boxes, or windows.

If Power Macintosh 6500 serial number falls within the range from XB708xxxxx to XB719xxxxx, replace the logic board with a reworked logic board (P/N 661-1322 for 225 MHz, P/N 661-1332 for 250 MHz). To identify a reworked logic board, see Additional Procedures chapter.

Poor video output (misaligned or skewed video, low brightness, blurriness, etc.)

In Macintosh 6500 Monitors and Sound Control Panel, make sure resolution is set to 1152 x 870 or lower. See chart in Basics chapter for supported resolutions.

Floppy Drive

Audio and video are present, but internal floppy drive does not operate

1 Replace bad disk with known-good disk.
2 Replace floppy drive.
3 Replace logic board. Retain customer's DIMMs.

Disk ejects; display shows icon with blinking "X"

1 Replace bad system disk with known-good system disk.
2 Replace floppy drive.
3 Replace logic board. Retain customer's DIMMs.

Unable to insert disk all the way

1 Eject previously inserted disk by inserting opened paper clip into hole beside floppy drive.
2 Switch off system and hold mouse button down while switching system on (to complete eject cycle).
3 Replace floppy drive.

Floppy Drive

Disk does not eject
1. Insert opened paper clip into hole beside floppy drive.
2. Switch off system and hold mouse button down while switching system on (to complete eject cycle).
3. Replace floppy drive.

Internal floppy drive runs continuously
1. Replace bad disk with known-good disk.
2. Replace floppy drive.
3. Replace logic board. Retain customer's DIMMs.

Hard Drive

Internal or external
hard drive does not
spin up

1 Verify that all hard drive connections are secure.
2 Verify that external drive is properly terminated.
3 Reseat logic board.
4 Replace internal IDE hard drive.
5 Replace logic board. Retain customer's DIMMs.
6 Replace chassis/wiring harness.
   Note: The chassis/wiring harness is not a separate
   replacement part. Order the metal chassis that contains the
   chassis/wiring harness.

Internal hard drive
runs continuously

1 Verify that system software is version 7.5.3 or later.
2 Replace hard drive cable.
3 Replace internal hard drive.
4 Replace logic board. Retain customer's DIMMs.

Hard Drive

Hard drive not found when booted from CD-ROM drive

Use Drive Setup to attempt to recognize or mount hard drive.

Flashing ? appears at startup in 6400/180 or 6400/200 with 1.6 GB (p/n 661-1107) or 2.4 GB (661-1202) ATA hard drive , and may be corrected with restart.

1 Be sure system software is not corrupted. See the Software Troubleshooting document in the HW-SW Procedures topic under the Troubleshooting tab on the Service Source CD startup screen.
2 Remove the 1.6 GB or 2.4 ATA hard drive and look at the serial number on the bar code label.
3 If serial number is within range XXX**6099**XXXXX to XXX**6131**XXXXX, replace hard drive.

CD-ROM Drive

CD-ROM drive does
not accept disc

1 If compact disc is dirty or damaged, use known-good compact
  disc.
2 Replace CD-ROM drive.

Volume control does
not operate correctly
when playing Audio
CD, but does work
when playing system
sounds.

Check Sound control panel setting.

Spinning disc causes
vibration sounds in
12x CD-ROM drive.

The 12x CD-ROM drive reads CD-ROM discs very quickly, and
because of the drive's high rotation speed, unexpected vibration
sounds may occur. This sound is normal for a 12-speed (12x)
CD-ROM drive.

CD-ROM Drive

Computer cannot mount known-good CD-ROM discs

1 Check that CD-ROM drive software is installed correctly.
2 Reseat CD-ROM adapters.
3 Check SCSI ID setting. (Internal CD-ROM drive was originally set to 3 at factory.)
4 Replace CD-ROM drive.
5 Replace chassis/wiring harness.
   Note: The chassis/wiring harness is not a separate replacement part. Order the metal chassis that contains the chassis/wiring harness.

When an internal and external SCSI device are present, only one starts up

Verify that ID switch setting on external SCSI device is higher than 0. Verify that ID setting on external SCSI device does not duplicate ID settings on other external SCSI devices.

CD-ROM Drive

CD not recognized or
no power.

1 In a Power Macintosh 6500, reseat the logic board to reestablish logic board-to-chassis connection.
2 Remove hard drive to see white pull tab. If anything but Foxconn is printed on pull tab, replace the chassis (P/N 922-2707).
3 Check that power supply is set to the correct voltage.
4 Replace power supply if switch is in the incorrect position.

Peripheral

Cursor does not move

1 Restart system.
2 Check mouse connection.
3 If mouse was connected to keyboard, connect mouse to rear ADB port and disconnect keyboard. If mouse works, replace keyboard.
4 If mouse does not work in ADB port, replace mouse.
5 Reseat logic board.
6 Replace logic board. Retain customer's DIMMs.

Cursor moves, but when you click the mouse, nothing happens

1 Replace mouse.
2 Reseat logic board.
3 Replace logic board. Retain customer's DIMMs.

Peripheral

Cannot double-click
mouse to open
application, disk, or
server

1 Check mouse speed on Mouse control panel.
2 Unplug battery from logic board, wait 20 seconds, plug in
   battery, and restart computer.
3 If mouse was connected to keyboard, connect mouse to rear
   ADB port and disconnect keyboard. If mouse works, replace
   keyboard.
4 If mouse does not work in ADB port, replace mouse.
5 Replace logic board. Retain customer's DIMMs.

No response to any
key on keyboard

1 Verify that system software is version 7.5.3 or later.
2 Check keyboard connection to ADB port.
3 Replace keyboard.
4 Reseat logic board.
5 Replace logic board. Retain customer's DIMMs.

Peripheral

Known-good
StyleWriter does not
print

1 Verify that Chooser is set correctly.
2 Verify that printer driver and system software are not
   corrupt.
3 Verify system software is version 7.5.3 or later.
4 Replace printer interface cable.
5 Replace logic board. Retain customer's DIMMs.

Known-good
LaserWriter does not
print

1 Verify that Chooser is set correctly.
2 Verify that printer driver and system software are not
   corrupt.

Doesn't recognize
SCSI device

1 Check for proper SCSI termination.
2 Check that the SCSI cable is good and firmly connected.
3 Check the SCSI device manual for required software.
4 Use the 6360/64xx/54xx Update disk to correct a possible
   SCSI timing problem.

Zip Drive

Zip drive not   1   Insert known-good Zip disk.
displayed on desktop   2   Check that drive cable connections are secure.
when disk inserted   3   Reinstall system software.
                           4   Replace Zip drive.

Type 4 errors appear   1   Check that drive cable connections are secure.
                           2   Replace Zip drive.

Modem

Communications
software doesn't
work with newly
installed modem.

Some Performa 6400/180 and 6400/200 computers shipped
with internal GeoPort modems and some with internal Global
Village modems. If the modem wasn't replaced like-for-like, the
communications software is incompatible with the modem.

Identify the modem originally shipped in the computer by the last
three characters of the serial number found in this table.

Modem	6400/180	6400/200
Global Village Platinum	7U7	836
GeoPort	95R	95S

If the wrong type of modem has been installed in the computer,
replace it with the type of modem originally shipped in the
computer.

Miscellaneous

No audio, and no drive operation

1   Connect power cable.
2   Switch power on.
3   Replace power cable.
4   Replace logic board. Retain customer's DIMMs.

"Sad Macintosh" icon

1   Start up from known-good disk.
2   Replace RAM DIMMs on logic board.
3   Replace logic board. Retain customer's DIMMs.

Miscellaneous

Screen shows "Sad Macintosh" icon and black vertical lines; screeching sound

1 Replace RAM DIMMs on logic board.
2 Replace logic board. Retain customer's DIMMs.

Headphone jack does not operate correctly

1 Verify that headphone jack is seated properly.
2 Replace front panel control board.
3 Replace chassis/wiring harness.
   Note: The chassis/wiring harness is not a separate replacement part. Order the metal chassis that contains the chassis/wiring harness.

Miscellaneous

When installing software, error message appears: "Unable to decompress file 'xxxxx' because of a data mismatch error." System hangs, freezes, or Type 10 error requires restart.

If serial number of Power Macintosh 6500 falls within the range from XB708xxxxx to XB718xxxxx, and logic board is manufactured by OPC, and L2 cache DIMM is incompatible with OPC boards, replace L2 cache with P/N 661-1477. See details for identifying OPC logic boards and incompatible L2 cache DIMMs in Additional Procedures chapter.

Take Apart

Performa/Power Macintosh
6400 and 6500 Series

Front Bezel

No preliminary steps are required before you begin this procedure.

1 Put the front of the computer on a workbench edge directly in front of you.

Front Bezel

2 Push up the release tabs under the front bezel.

Front Bezel

Release Tab

Release Tab
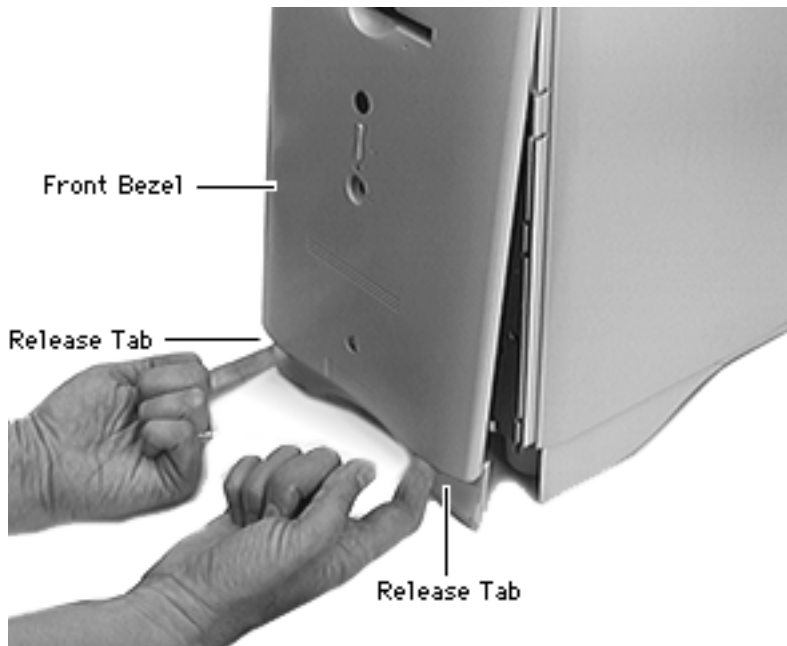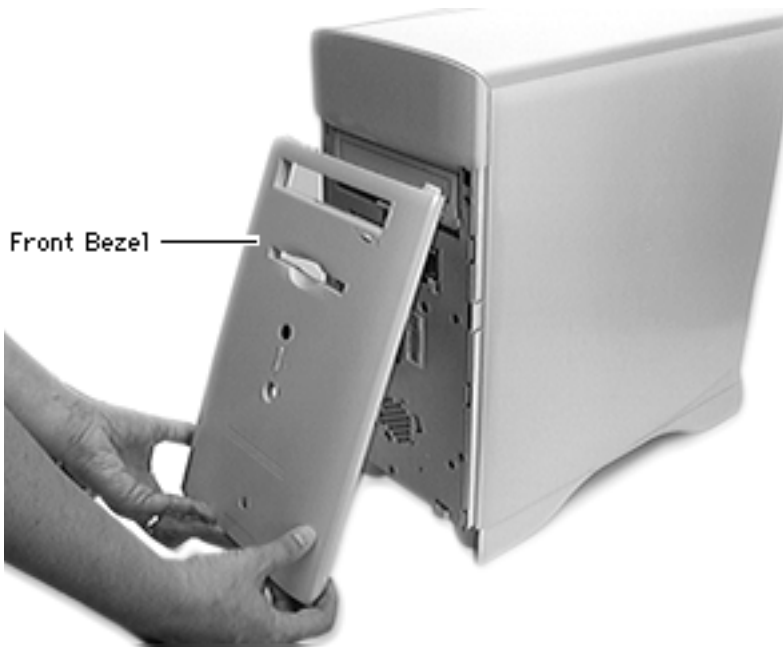
Front Bezel

3 Pull the bottom of the front bezel out and away from the computer.

Replacement Note: Align the two plastic tabs at the top of the front bezel with the slots in the front metal chassis below the expansion bay cover. Press the front bezel into place. Press the bottom corners and the middle of the panel on each side to be sure it is firmly in place.

Expansion Bay Cover
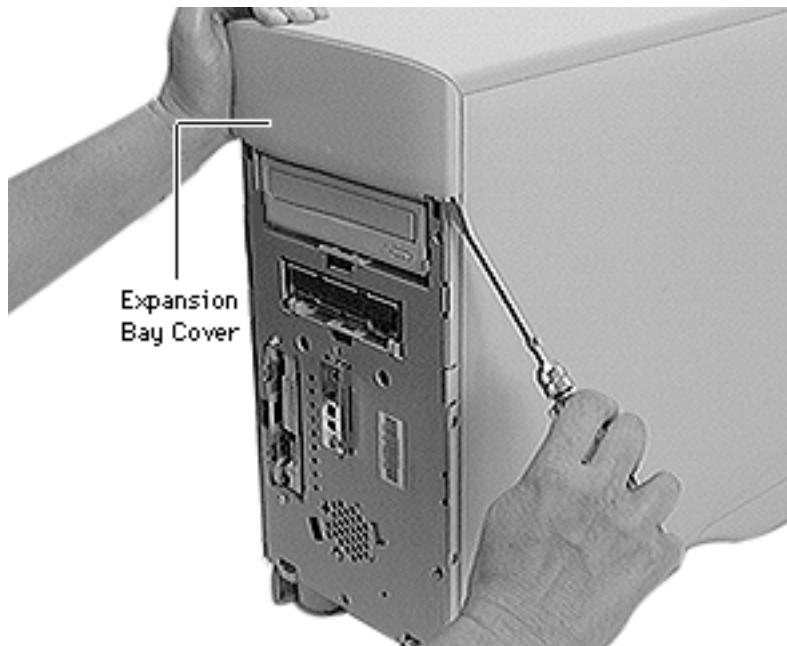
Expansion Bay (or Zip Drive) Cover

Before you begin, remove the front bezel.

Note: Expect a loud cracking noise as you remove the bay cover.

1 Press on one side of the bay cover.

2 Insert a screw driver under the lower corner of the opposite side, and pry off the cover plate.

Tab   Tab   Tab

—Expansion Bay
Cover

Tab   Tab   Tab

Zip Drive
Cover —
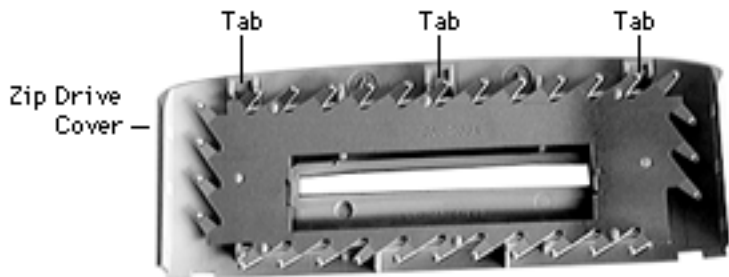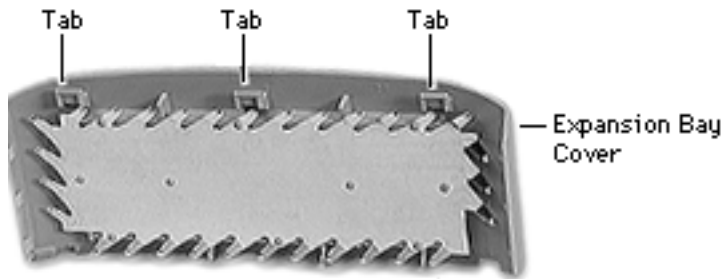
Note: Alternatively, you can insert screw drivers under each lower corner of the cover plate and pull the sides outward to release it.

Replacement Note: Align the three plastic tabs at the top of the bay cover with slots under the top cover.

Expansion
Bay
Cover
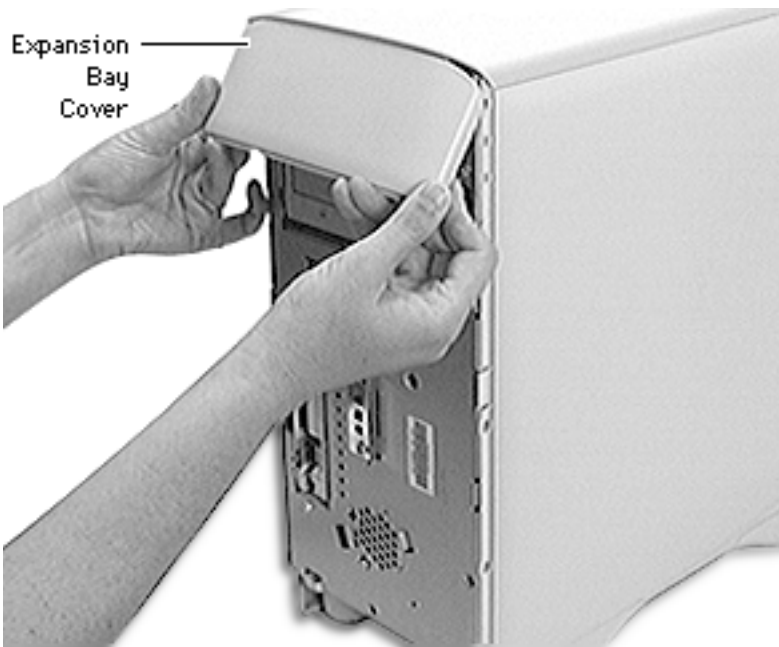
Replacement Note: Press the cover into place. You know that the bay cover is secure when you see a space of about 1 mm between the cover and the other plastic panels above and at the sides of the cover.

Top Cover

Before you begin, remove the following:

- Front bezel
- Expansion bay cover

Caution: Never operate the computer with the top cover removed. Failure to comply may result in irreparable damage to internal components.

1 Remove the captive cover screw on the rear panel.
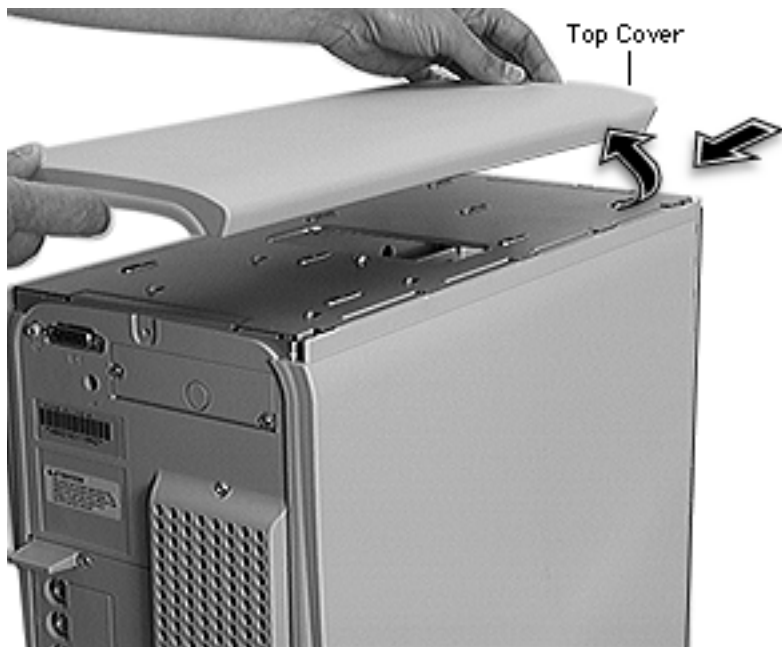
Top Cover

2 Slide the top cover back about one-half inch.

3 Lift the top cover from the computer.

Replacement Note: Place the top cover on top of the chassis, about a half inch from the front of the computer. Slide the cover forward until it is firmly in place. Replace the captive cover screw on the rear panel.

Plastic Tab

Left Panel

Side Panels

Before you begin, remove the following:

- Front bezel
- Expansion bay cover
- Top cover

Note: This procedure shows removing the left panel. Remove the right panel following the same steps.

1 With a screw driver, pry up the plastic tab at the front middle of the left panel far enough to clear the metal panel.
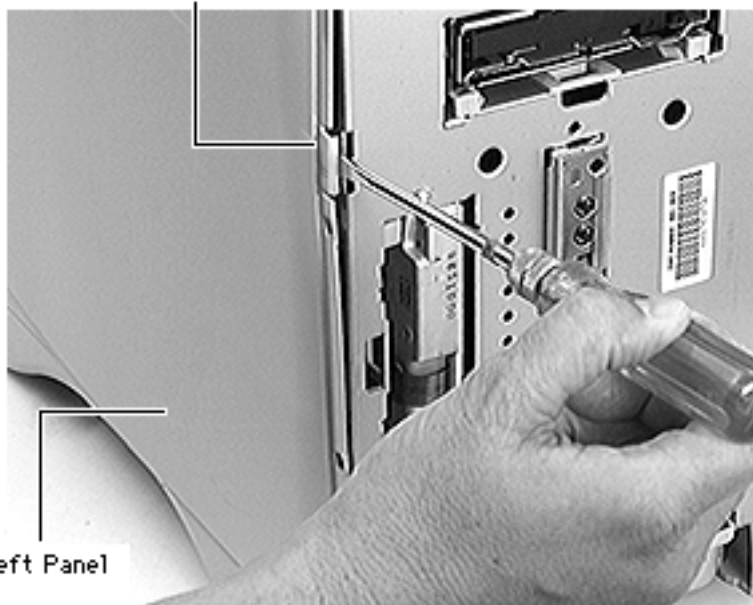
Left Panel

2 Slide the panel back
   about an inch.

3 Remove the left panel
   from the computer.
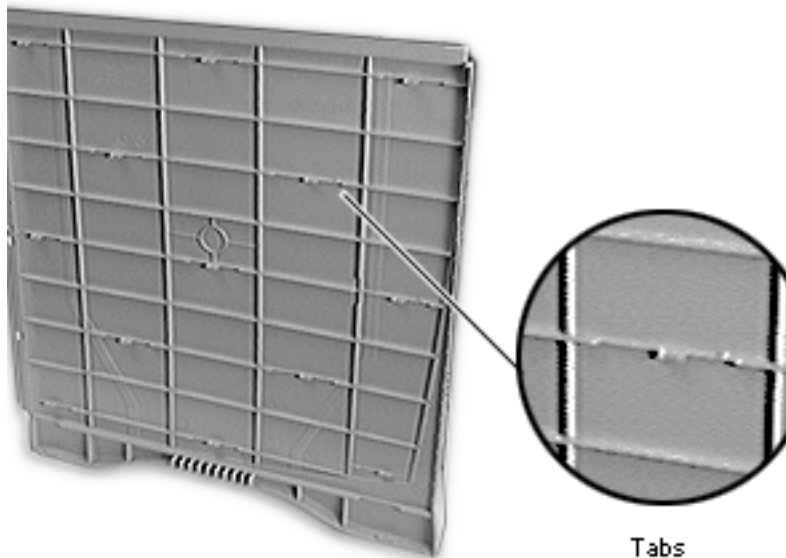
Tabs

Replacement Note: Place the left panel over the left metal panel, about an inch from the front of the computer. Be sure the panel covers the feet at the bottom. Slide the panel forward to engage the plastic tabs with the slots in the metal panel and push the panel firmly into place.

Rear Panel

Before you begin, remove the following:

- Front bezel
- Expansion bay cover
- Top cover
- Left panel
- Right panel
- Logic board

Caution: Review the ESD precautions in Bulletins/ Safety.

1. Remove the two screws that secure the power supply to the rear panel.
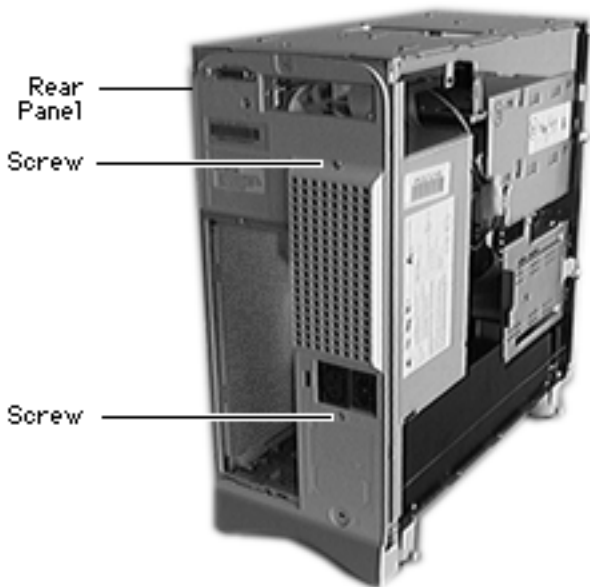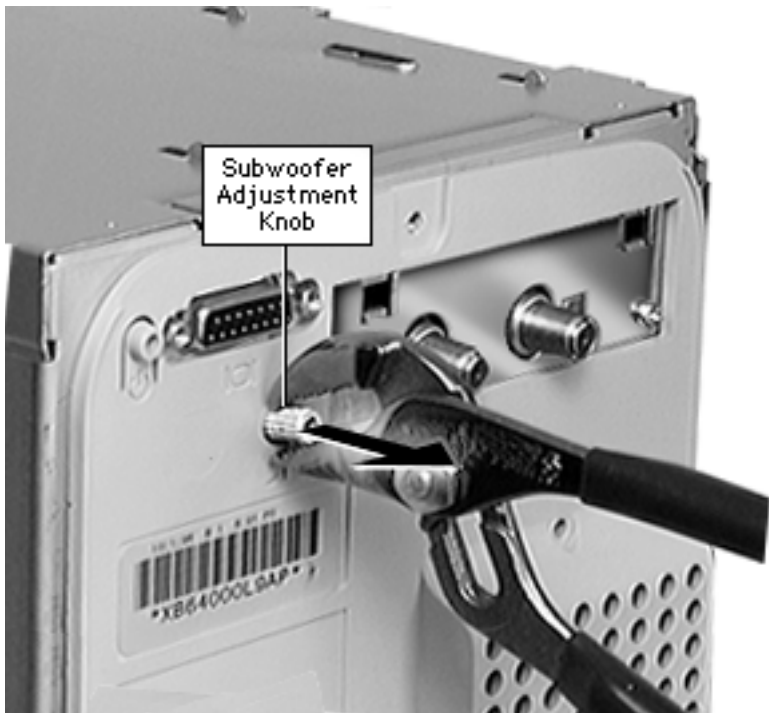
Subwoofer
Adjustment
Knob

2   Remove the subwoofer
    adjustment knob by
    grasping it firmly with a
    pair of pliers and
    pulling straight out.

3 Push up the bottom of
   the rear panel to release
   the two tabs that fasten
   it to the chassis.

Rear Panel
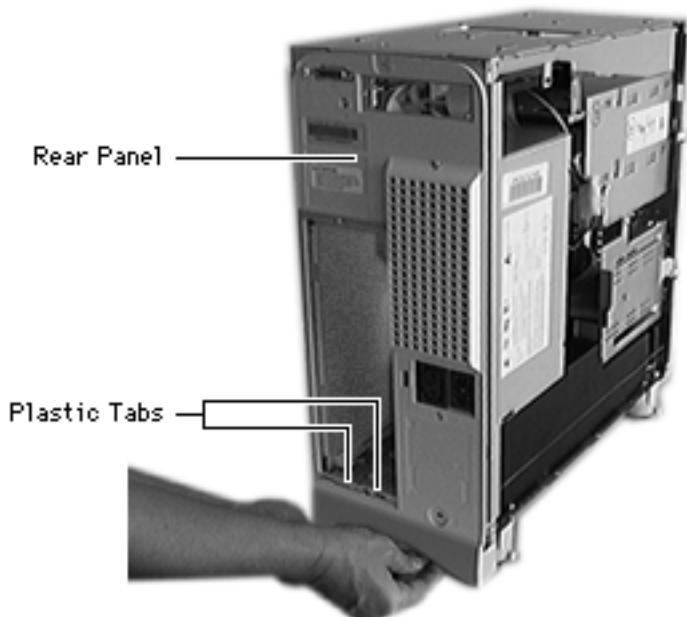
Plastic Tabs
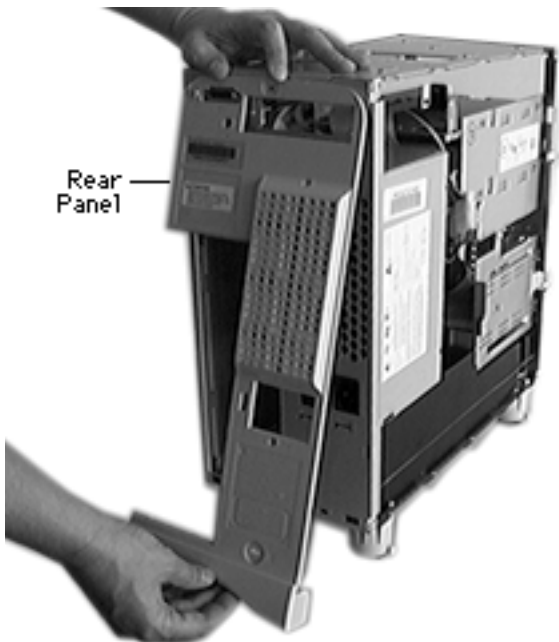
Rear Panel

4 Push the rear panel up slightly and remove it from the computer.
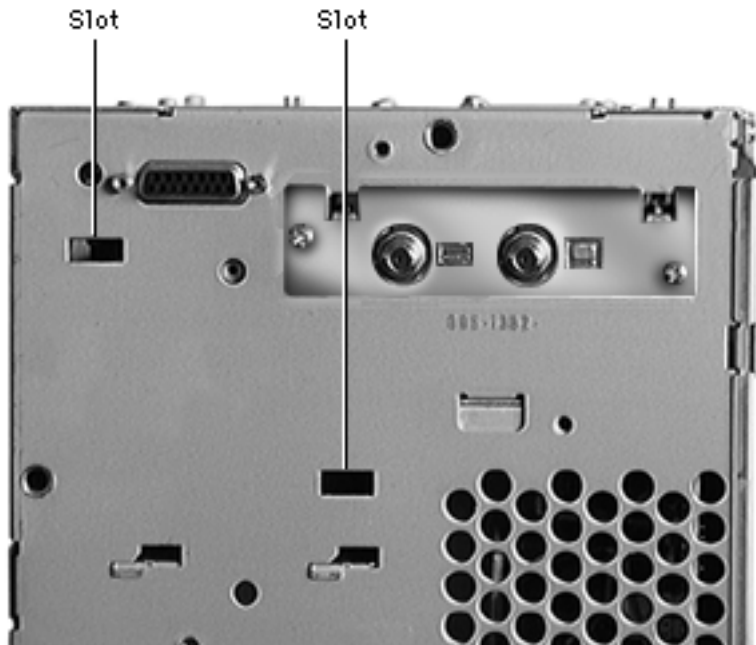
Replacement Note: Two plastic tabs on the upper part of the rear panel must fit into two slots in the rear chassis. Position the top of the rear panel over the back of the chassis and press downward to insert the tabs into the slots. Press along the sides and bottom of the rear panel to snap it into place.

Left Metal Panel

Before you begin, remove the following:

- Front bezel
- Expansion bay cover
- Top cover
- Left panel

Caution: Review the ESD precautions in Bulletins/ Safety.

1 Remove the screws that fasten the left metal panel to the computer.
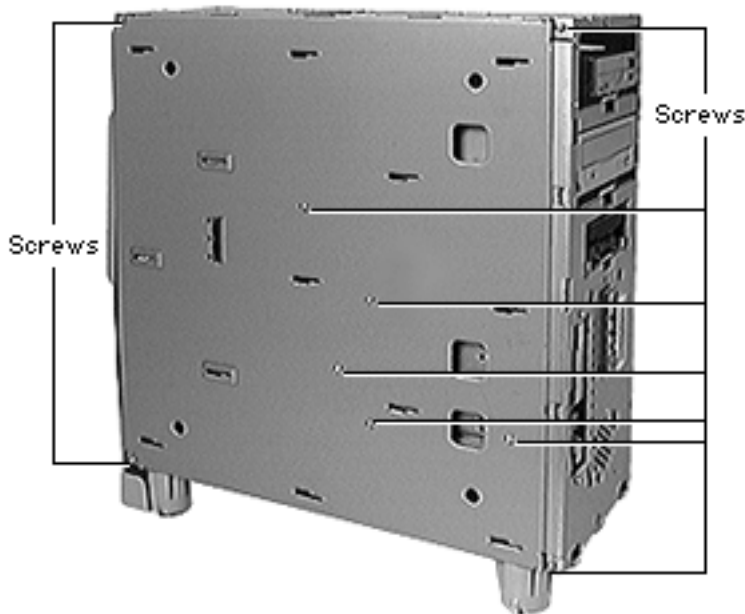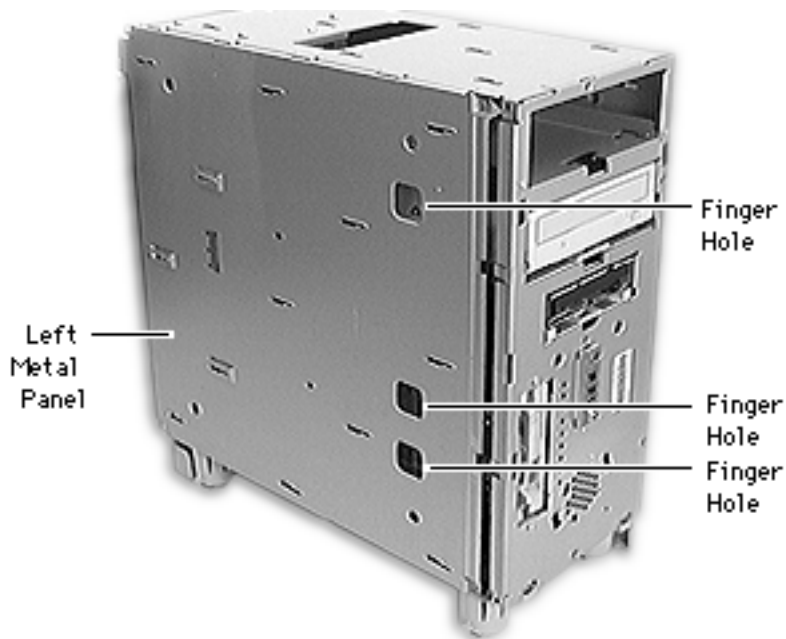
2 Place your fingers in the metal panel holes near the front and pull back about an inch to release the metal panel.

Finger
Hole

Left
Metal
Panel

Finger
Hole
Finger
Hole

Left
Metal
Panel

3 Remove the metal panel
   from the computer.
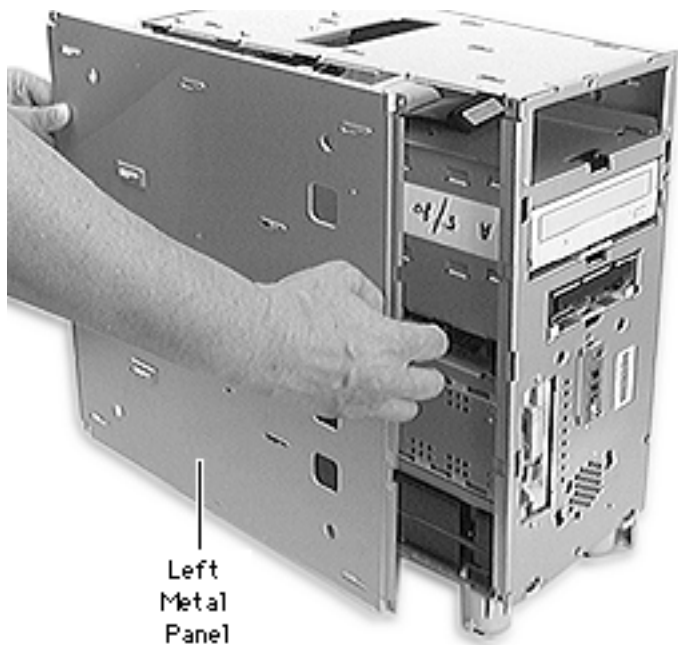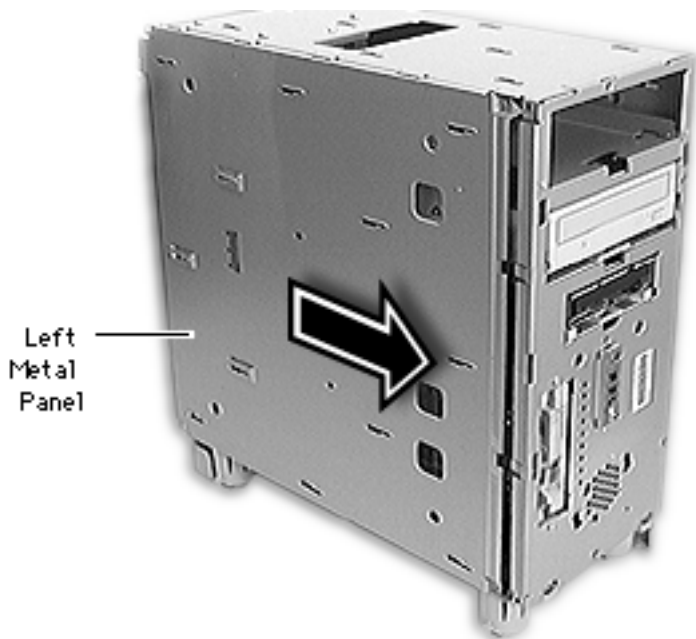
Left Metal Panel

Replacement Note: Place the left metal panel over the left side of the computer, about an inch from the front. Slide the metal panel forward until it snaps into place. Replace the metal panel screws.

CD-ROM Drive

CD-ROM Drive

Before you begin, remove the front bezel.

Caution: Review the ESD precautions in Bulletins/ Safety.

Note: The CD-ROM drive is located in the top drive bay.
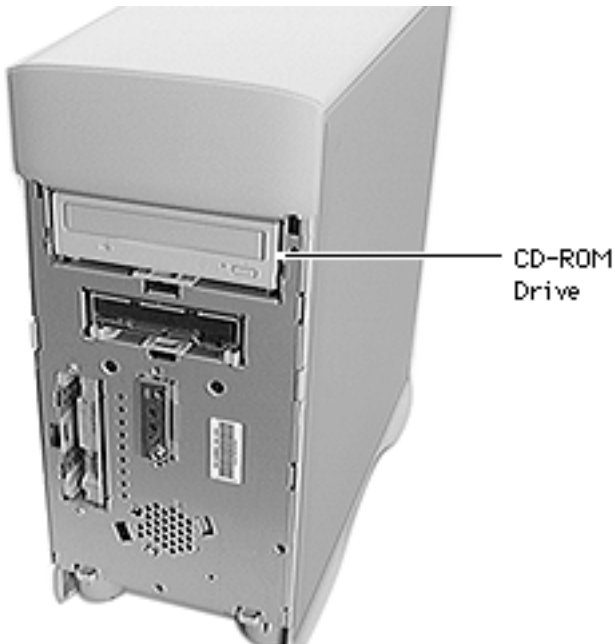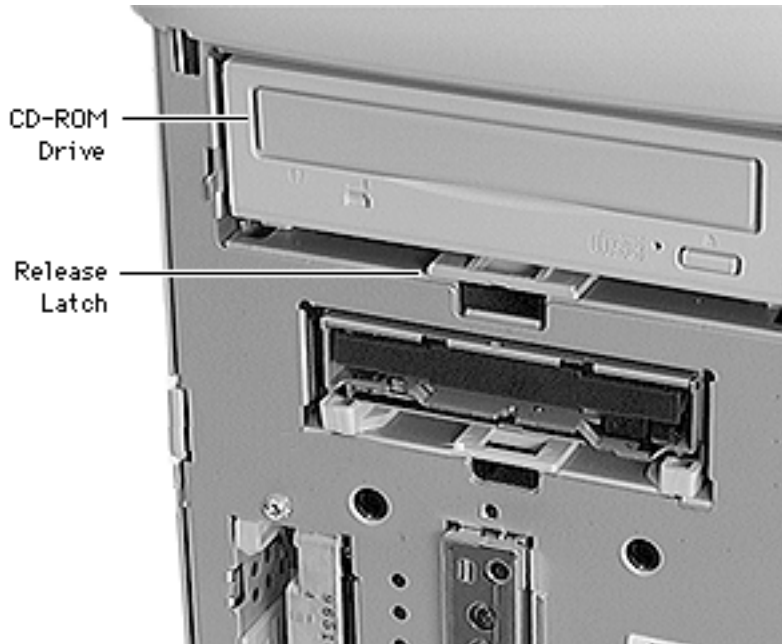
With needle nose pliers, pull up the release latch beneath the CD-ROM drive and slide the drive out of the computer.

Note: Be sure to remove the CD-ROM drive from its carrier before returning the drive to Apple.

CD-ROM Drive

Release Latch

Floppy Drive

Floppy Drive

Before you begin, remove the front bezel.

Caution: Review the ESD precautions in Bulletins/ Safety.

Note: The floppy drive is located in the second drive bay from the top.
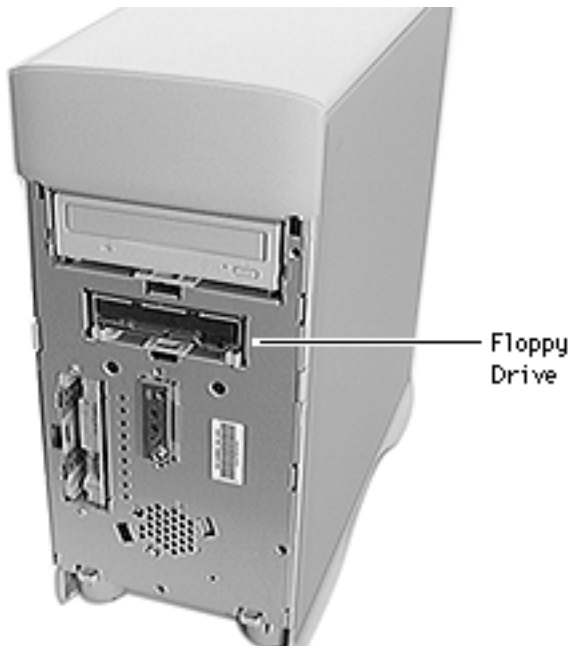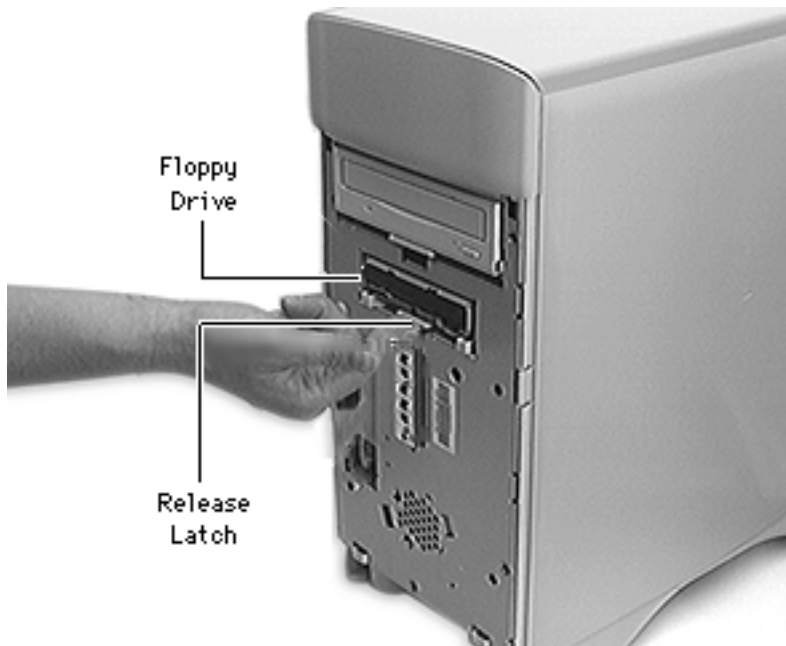
1 Push up the release latch
beneath the floppy drive
and slide the floppy
drive forward just far
enough to reach the cable
on the back.
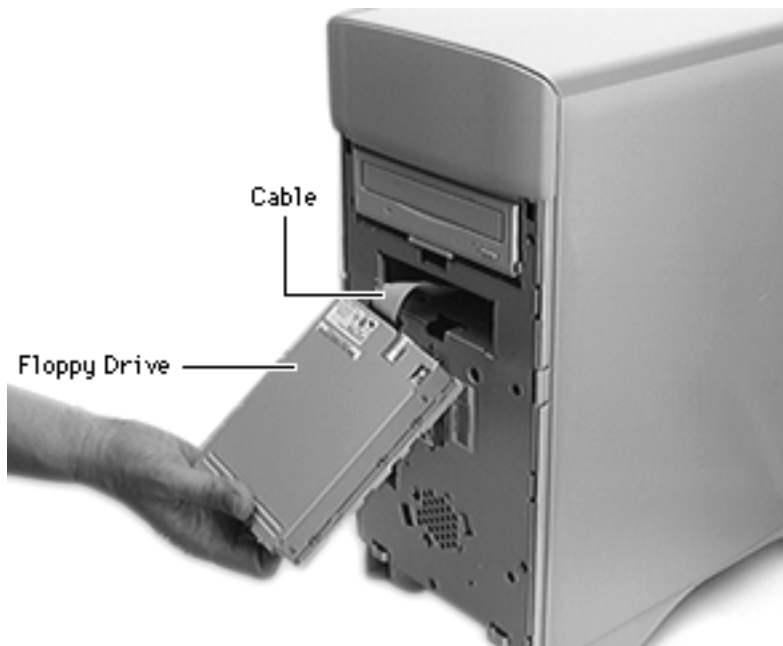
Cable

Floppy Drive

2 Disconnect the floppy drive cable from the back of the floppy drive.

Replacement Note: Be sure to remove the floppy drive from its carrier before returning the drive to Apple.

Replacing the Floppy Drive

Before you begin, remove the following:

- Logic board
- Front bezel
- Expansion bay cover
- Top cover
- Left panel
- Left metal panel

Replacement Caution:
Carefully push the drive into the bay. The cable may be damaged if caught between the drive and the metal

chassis, resulting in serious damage to the equipment.

1 Connect the floppy drive cable to the back of the floppy drive.

2 Reach through the open side into the back of the floppy drive bay, and grasp the floppy drive cable.

3 Keep tension on the floppy drive cable while sliding the floppy drive into the floppy drive bay.

Hard Drive

Hard Drive

Before you begin, remove the front bezel.

Caution: Review the ESD precautions in Bulletins/ Safety.

Note: The hard drive is located in the lower left drive bay.

Hard Drive
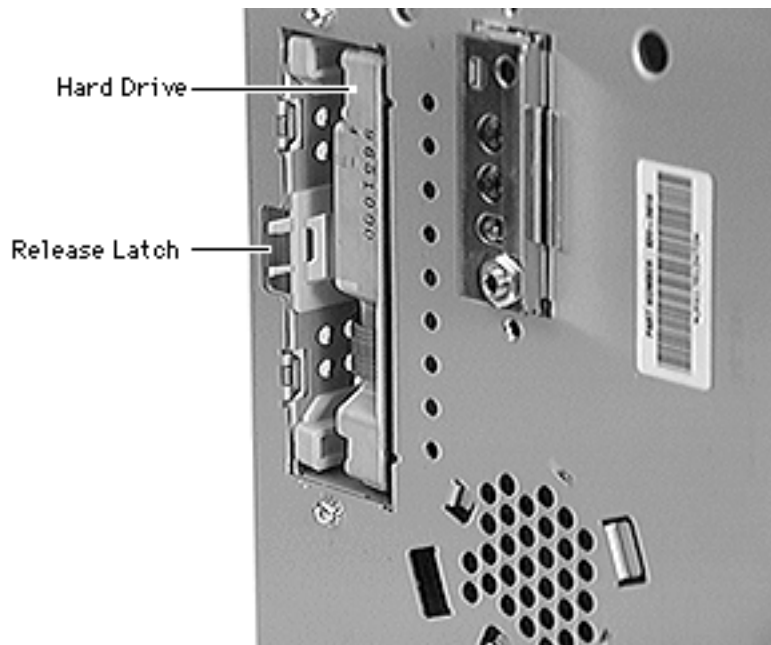
Release Latch

1 Press the hard drive release latch to the right.

2 Slide the hard drive forward far enough to reach the cables connected to the back of the hard drive.

Power Cable

Convenience Tab
on Data Cable
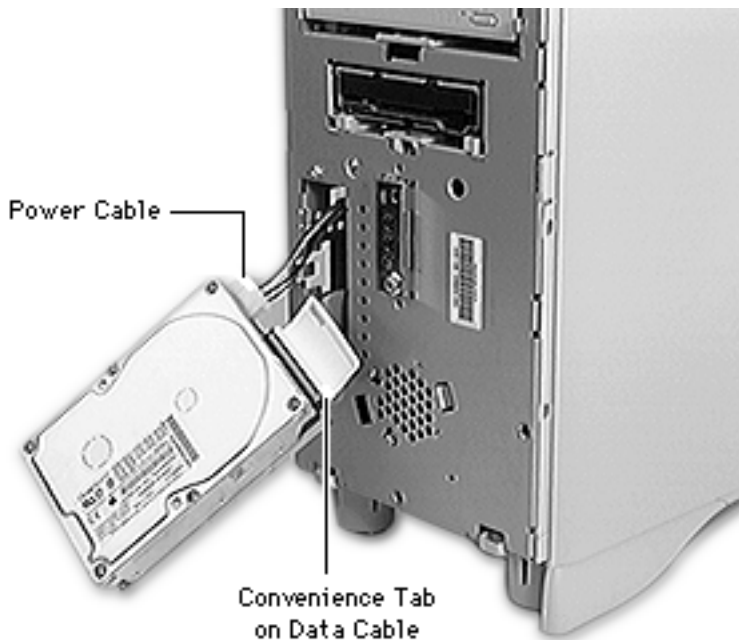
3 Disconnect the power
   cable from the hard
   drive.

4 Pull the convenience tab
   to disconnect the data
   cable from the hard
   drive.

Note: For information about
removing the hard drive
from its carrier and
returning drives, cables,
and carriers to Apple, refer
to Additional Procedures in
the Hard Drives manual.
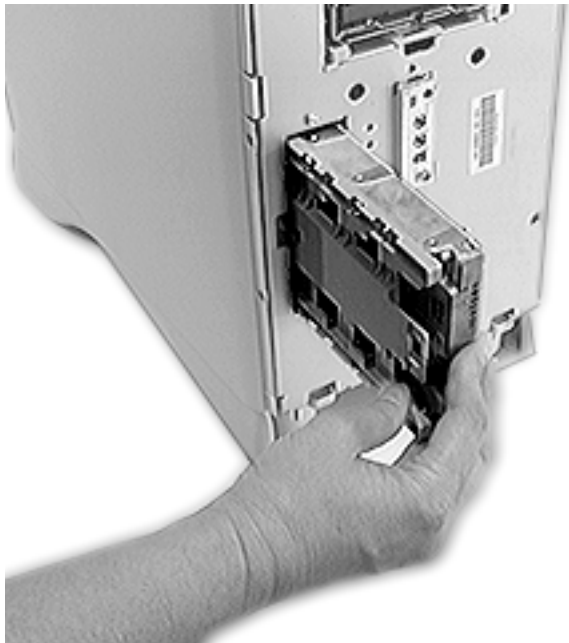
Replacement Caution:
Carefully push the drive into the bay. The cable may be damaged if caught between the drive and the metal chassis, resulting in serious damage to the equipment.

Replacement Note:
Reconnect the power cable and data cable. Align and insert the hard drive vertically so that it engages the guides on the top and bottom left side of the hard drive bay.

Front Panel Control Board

Before you begin, remove the following:
- Front bezel
- Hard drive

Note: It isn't necessary to remove the cables from the hard drive.

Note: The front panel control board is located to the right of the hard drive.

Front
Panel
Control
Board
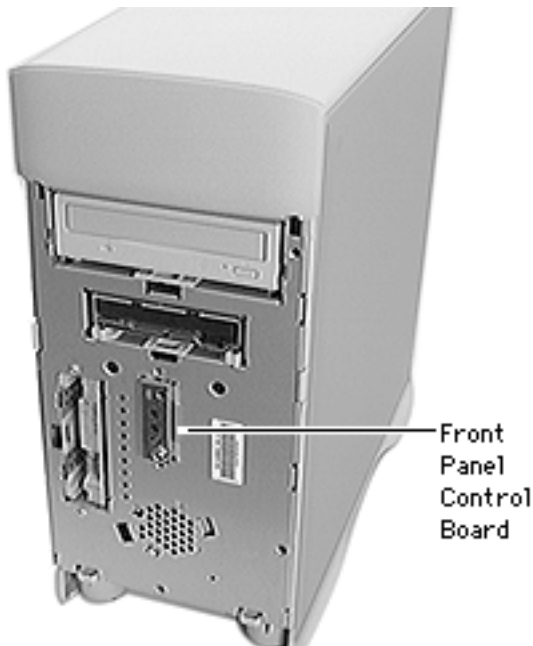
Front Panel Control Board

Hard Drive
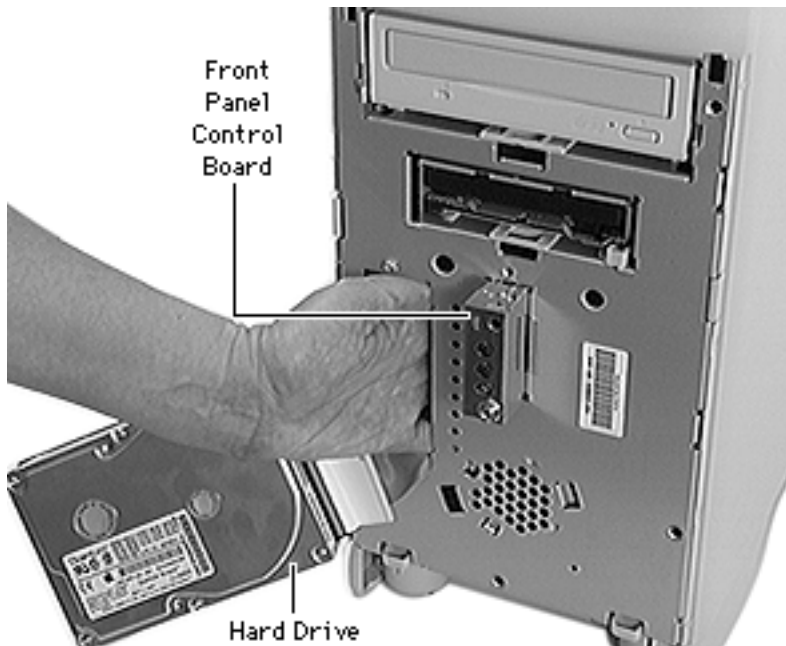
Caution: Review the ESD precautions in Bulletins/Safety.

1   Reach through the hard drive bay and behind the front panel control board to push the board forward.

Cable

Front Panel
Control Board
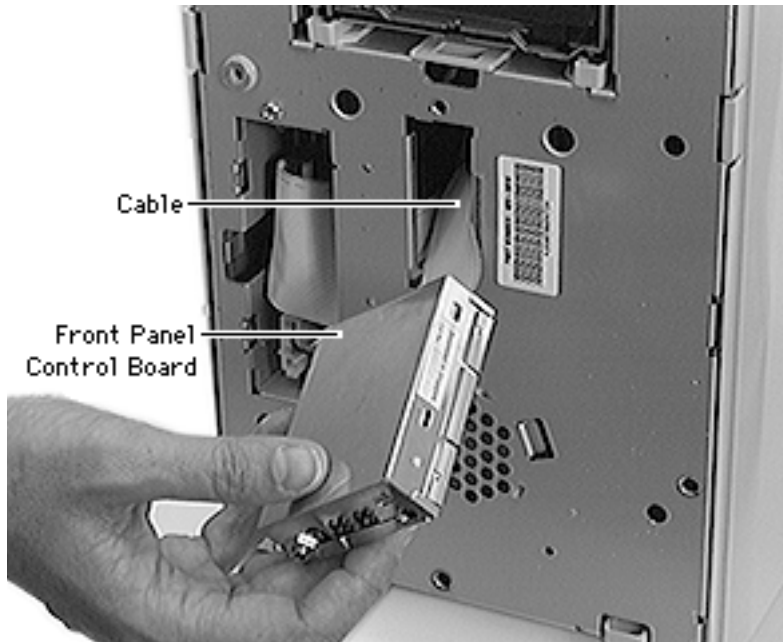
2 Pull the front panel
   control board out of the
   computer far enough to
   reach the cable on the
   back.

3 Remove the cable
   attached to the back of
   the front panel control
   board.

Zip Drive

Before you begin, remove the following:

- Front bezel
- Zip drive cover

Release Tab

1 Pull up the release tab
   and bring the Zip drive
   forward enough to reach
   the cables on the back.

2 Disconnect the power and
   SCSI cables from the Zip
   drive.

3 Remove the four screws
   that secure the drive to
   the carrier.

Power Cable   SCSI Cable

Replacement Note: Plug cables securely into the Zip drive. Avoid pulling the cables against the enclosure as this can damage the cables. Hold the power cable up and to the left while aligning carrier with guide rails. Push the drive inside the enclosure. Lock the carrier release tab down into the Zip drive bay cutout.

Logic Board ——————

Logic Board

No preliminary steps are required before you begin this procedure.

Note: If you are looking at the back of the computer, the logic board is located on the left.

Caution: Review the ESD precautions in Bulletins/ Safety.

1   Remove the two screws
    that secure the logic
    board to the rear panel.

Screw

Logic Board

Screw

Plastic Tab
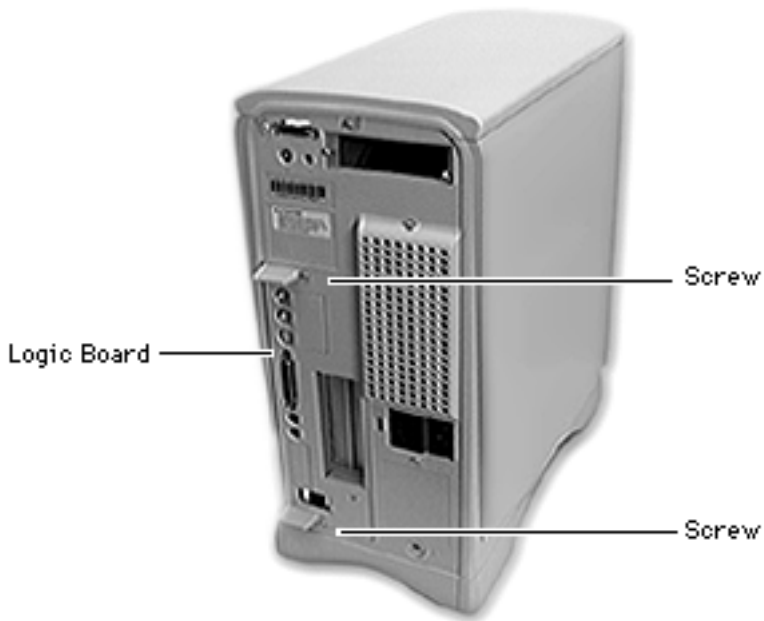
Plastic Tab

2 Grasp the two plastic tabs, and gently pull the logic board all the way out of the computer.
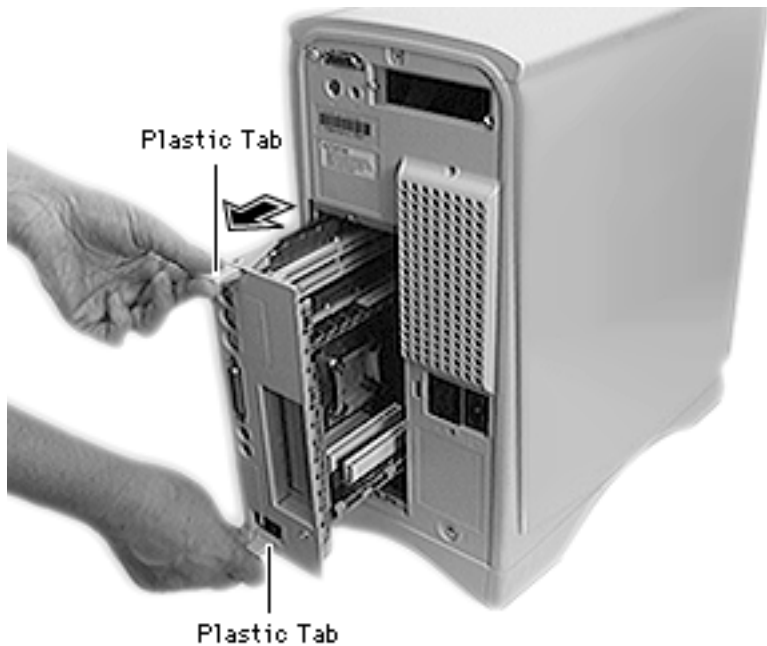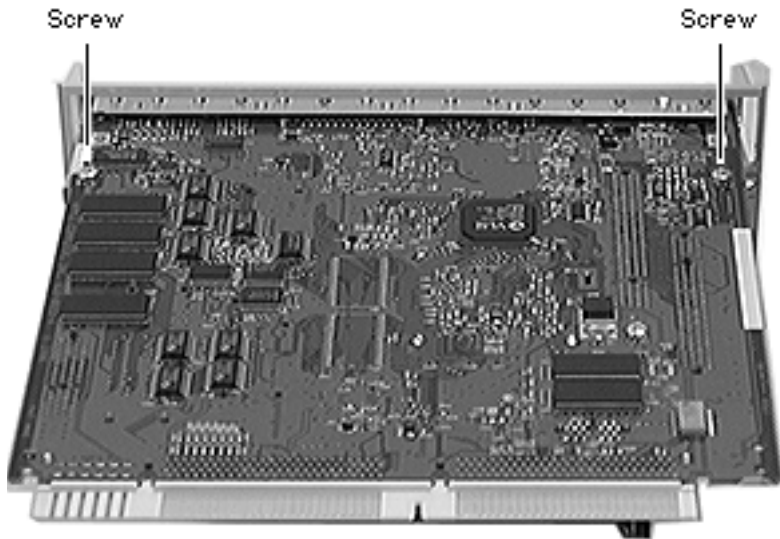
Screw   Screw

Note: Perform the following steps only if you are replacing a defective logic board.

3   Remove the two Phillips screws that secure the fence to the solder side of the logic board.

Hex Nut   Hex Nut   Screw
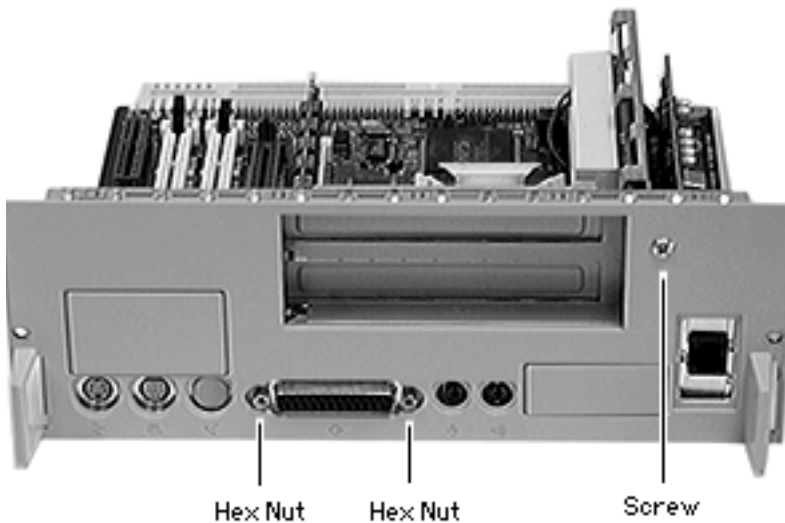
4 Using a hex nut screw driver, remove the two hex nuts that secure the logic board fence to the SCSI connector.

5 Remove the Phillips screw that secures the logic board fence to the right angle PCI adapter board.

6   Separate the logic board
    fence from the logic
    board.
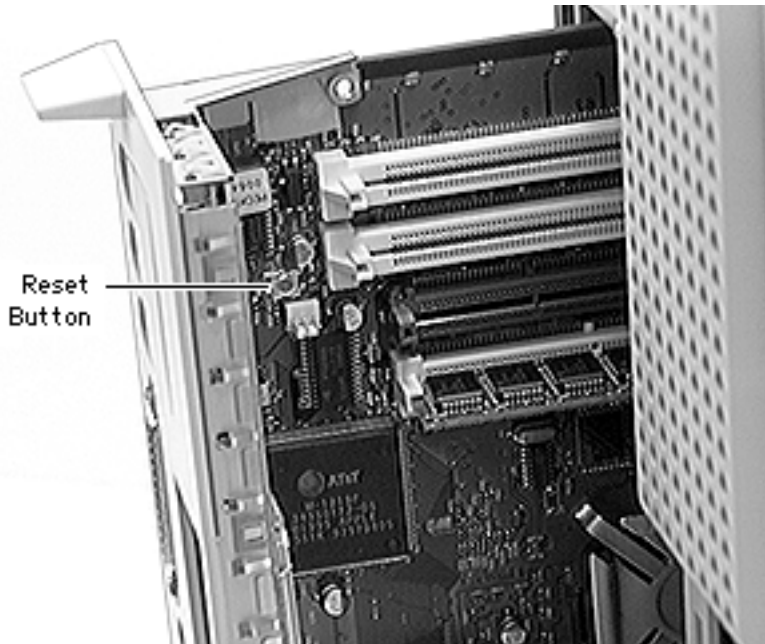
Replacement Note: Align and insert the logic board vertically so that it engages the guides on the top and bottom of the logic board slot. Press the reset button, and push on the vertical logic board fence until it snaps into place. Replace the two screws.

Note: Remove the DRAM and high performance module before returning the board to Apple. Do **not** remove the ROM SIMM.

Video Card

Before you begin, remove the following:

- I/O door
- Logic board

1 Remove the screw that secures the video card to the logic board fence.

2 Pull the video card out of the video-in slot.

Video Card   Screw
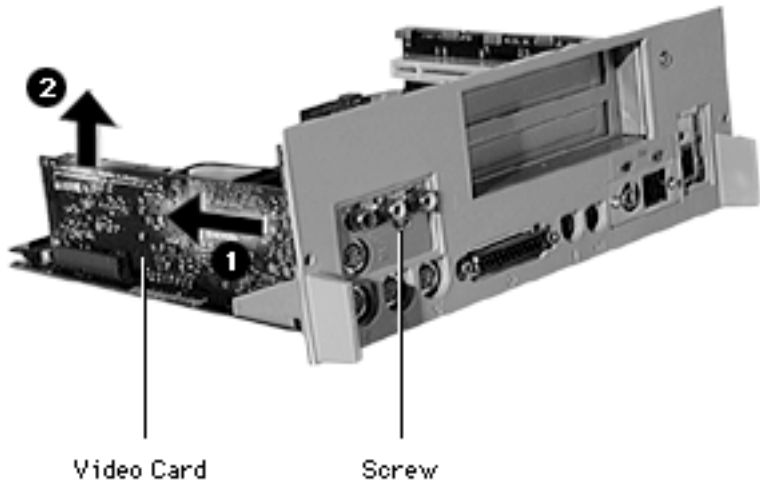
PCI Covers

Before you begin, remove the following:

- I/O door
- Logic board

1 Remove the screws that secure the PCI covers to the logic board fence.

PCI Support Bracket
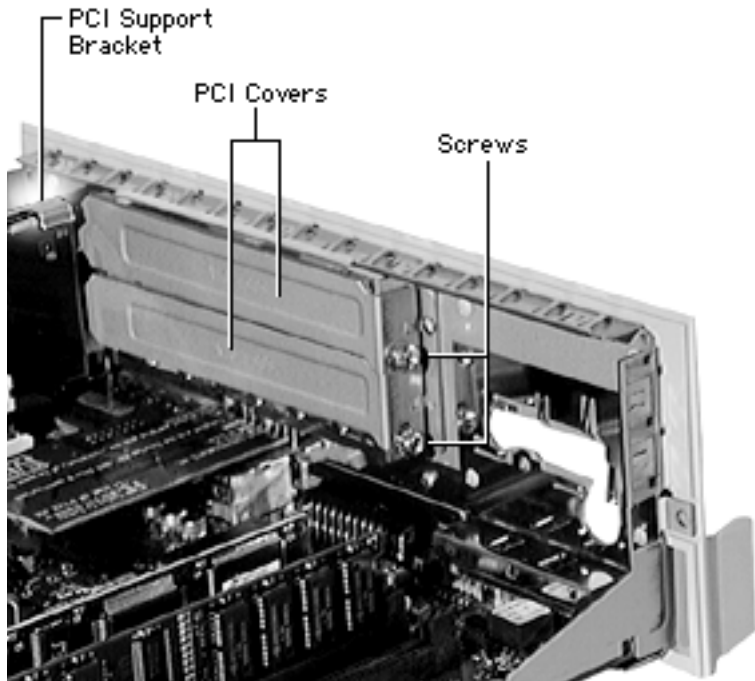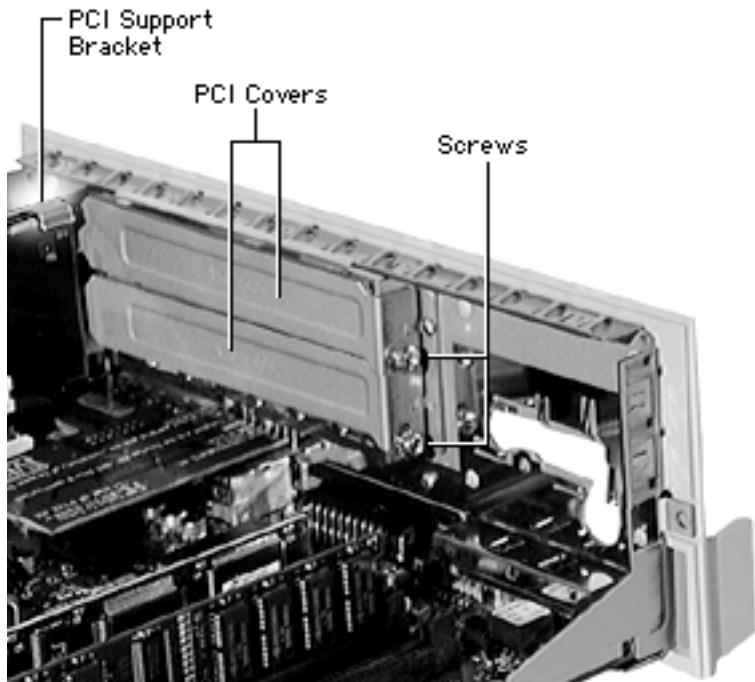
PCI Covers

Screws

2 Pull the other ends of the PCI covers out of the PCI support bracket.

PCI Adapter

Before you begin, remove the following:

- I/O door
- Logic board
- PCI covers

1 Remove the screw that secures the PCI support bracket to the logic board fence.

Screw

Screw

PCI
Adapter
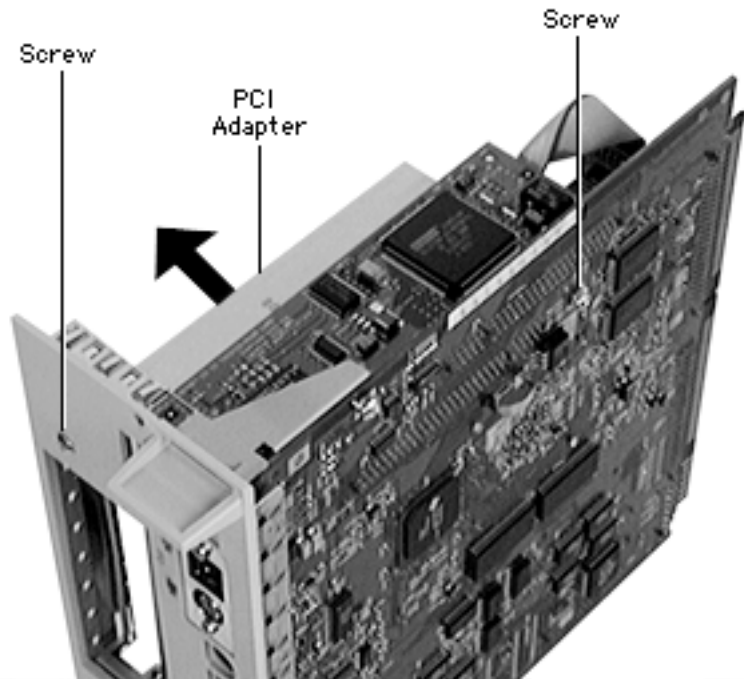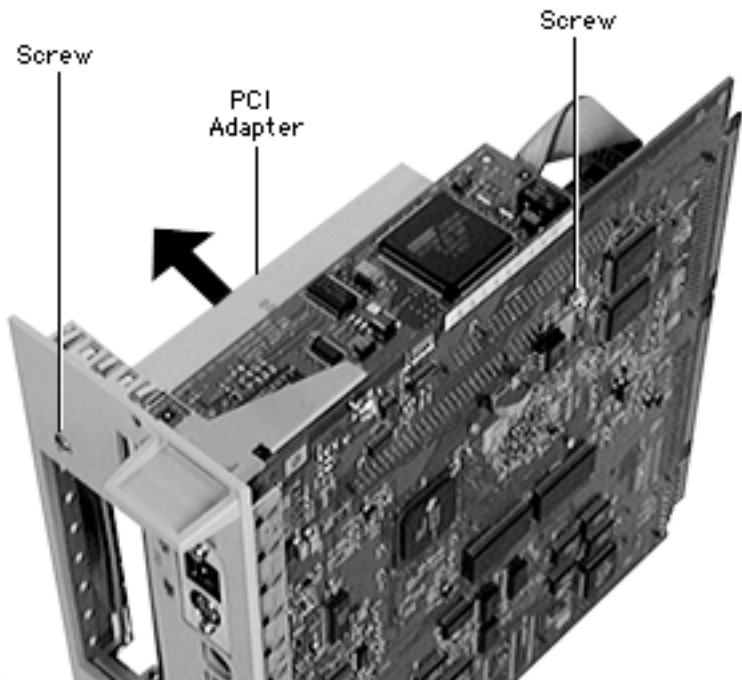
2 Remove the screw that secures the PCI support bracket to the logic board.

3 Pull up on the PCI adapter and support bracket to remove them from the logic board.

Battery
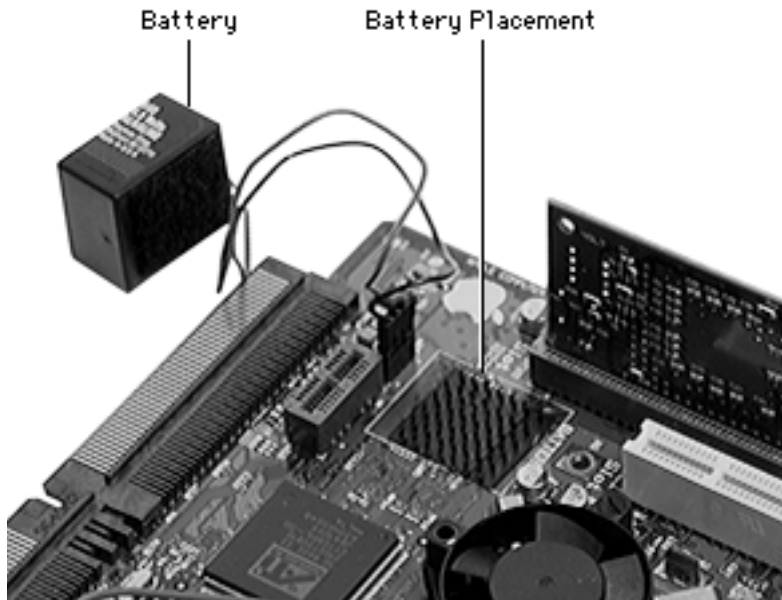
Battery Placement

Replacement Note: It is easier to replace the PCI support bracket if you temporarily remove the battery from its hook-and-loop base.

NTSC
Card

NTSC
Card

Screws

NTSC Video-Out Card (6500)

Before you begin, remove the following:

- Logic board
- Video card
- PCI adapter
- PCI covers

1 Pull out the card that is plugged into the monitor-out slot.

2 Remove the two screws that secure the card to the logic board fence.
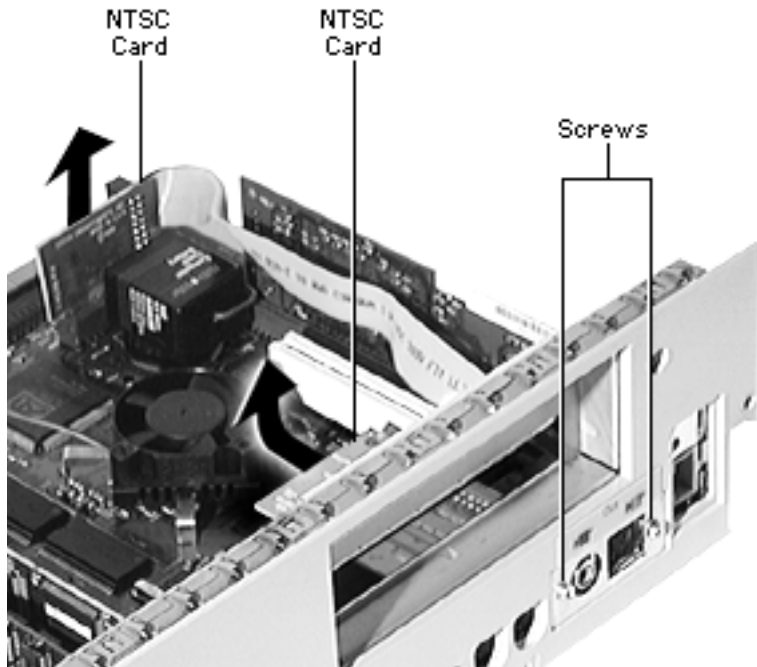
3 Pull the card away from the logic board fence to remove it from the logic board.
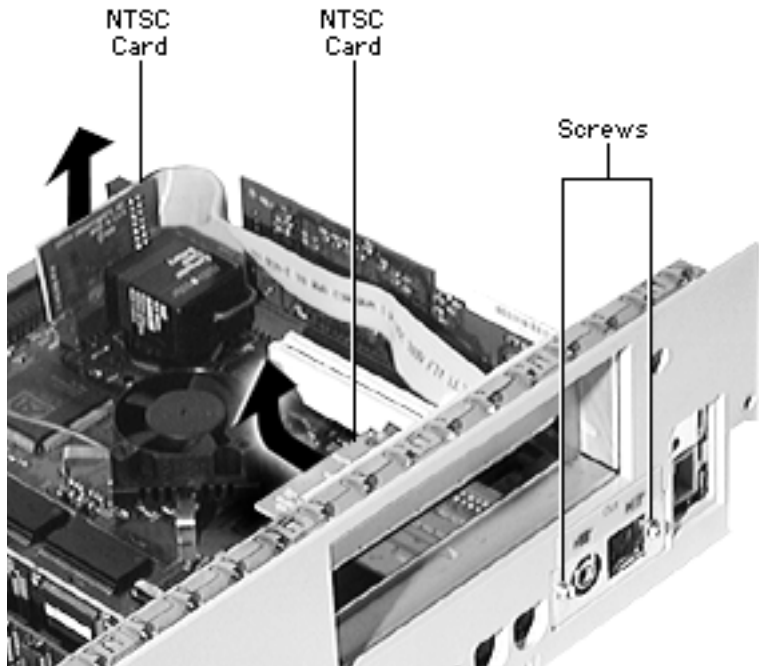
Power Supply

Power Supply

Before you begin, remove the following:

- Front bezel
- Expansion bay cover
- Top cover
- Left panel
- Left metal panel

Note: If you look at the back of the computer, the power supply is located on the right.

Caution: Review the ESD precautions in Bulletins/ Safety.

Screw
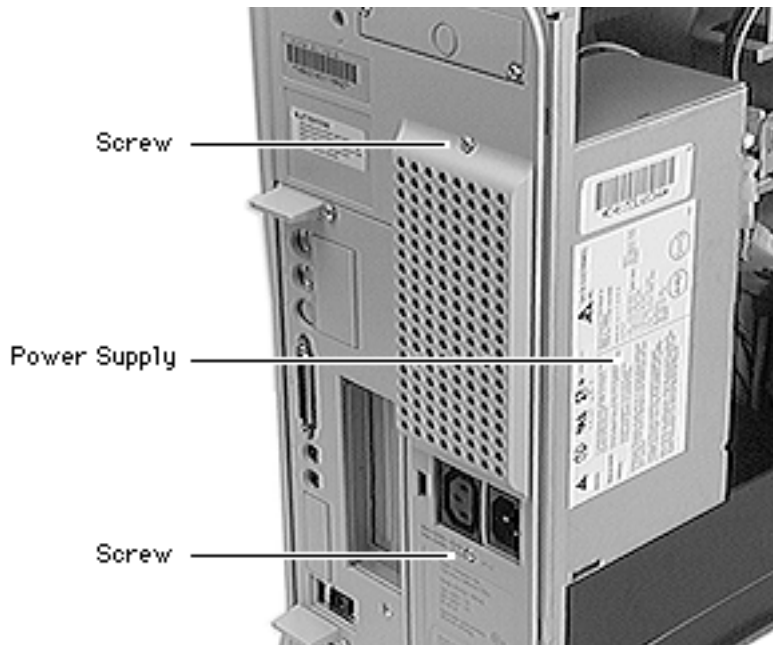
Power Supply

Screw

1 Remove the two screws that secure the power supply to the back of the computer.
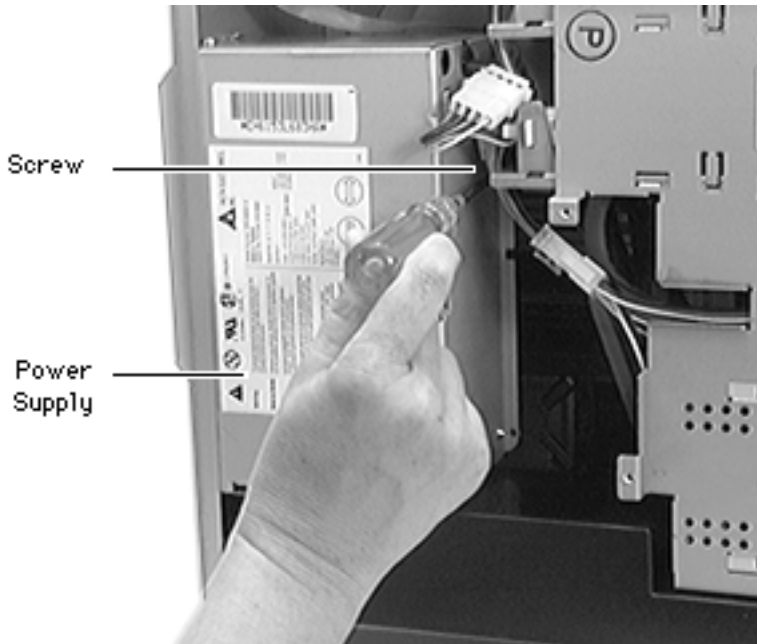
Screw

Power
Supply

2   Lay the right side of the
     computer on a clean,
     smooth surface. (The
     power supply should be
     to your left and the drive
     bays to your right.)

3   Remove the screw that
     secures the power
     supply inside the
     computer.
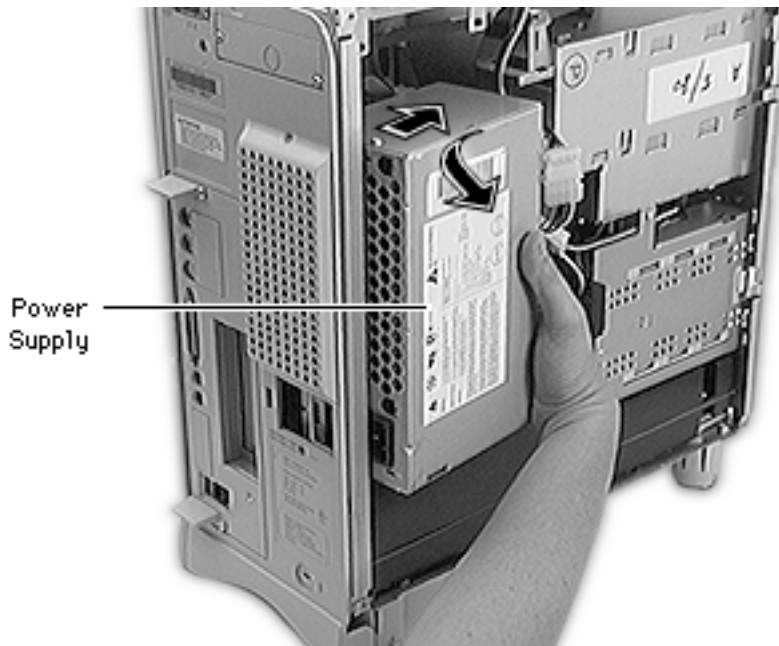
4 Set the computer upright again. Pull the power supply away from the rear of the chassis, and twist the left side out to remove it from the computer.

Power Supply
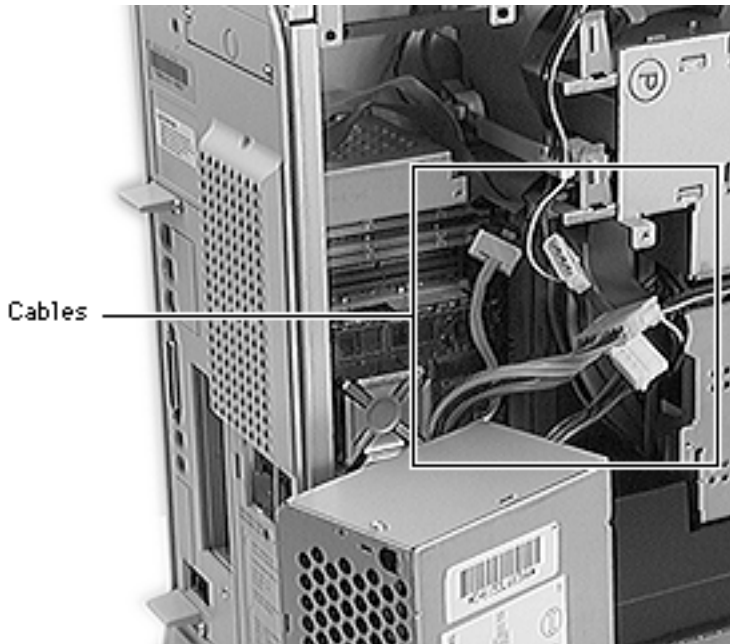
Cables

5 Disconnect the three cables attached to the power supply.

Replacement Note: Before replacing the power supply, check the voltage switch. Make sure it's in the correct position for the voltage in your region. Failing to have the correct voltage setting could damage the power supply.

Subwoofer Speaker Assembly

Subwoofer/ Speaker Assembly

Before you begin, remove the following:

- Front bezel
- Expansion bay cover
- Top cover
- Left panel
- Left metal panel

Note: The subwoofer/ speaker assembly is in the bottom of the chassis.

Caution: Review the ESD precautions in Bulletins/ Safety.
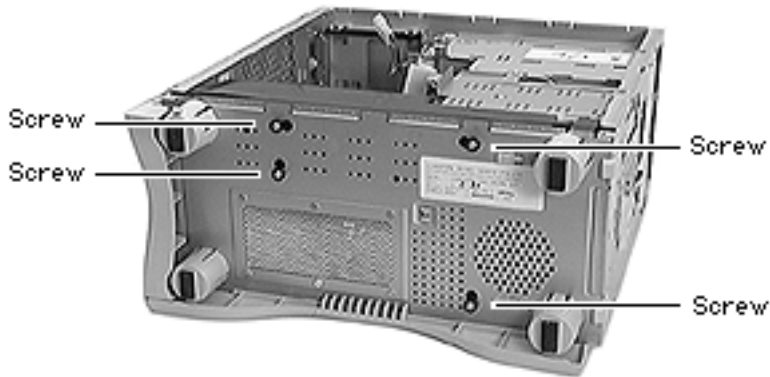
1 Lay the right side of the computer on a clean, smooth surface.

2 Using a T10 torx screw driver, remove the screws that secure the subwoofer/speaker assembly to the bottom of the chassis.

Screw

Screw

Screw

Screw
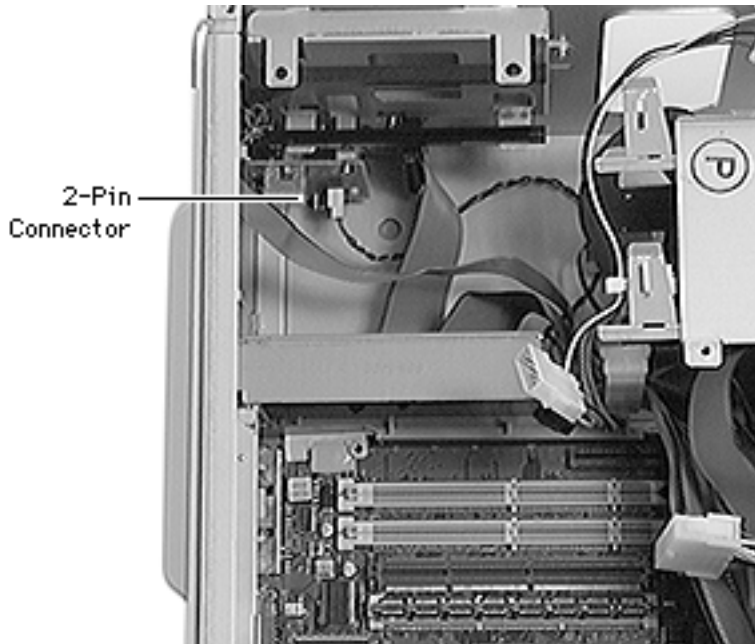
3 Pull the 2-pin connector
   from the audio/monitor
   connection subassembly
   in the upper rear corner
   inside the chassis.

Subwoofer/Speaker Assembly

4 Pull the subwoofer/ speaker assembly out of the computer.

Caution: Don't attempt to open the subwoofer/speaker assembly. It is one service part.
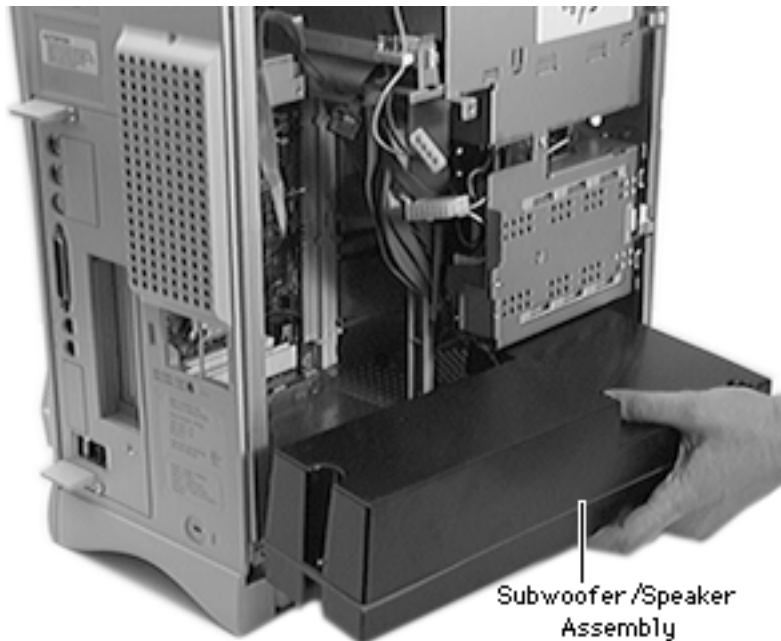
Plastic Tabs
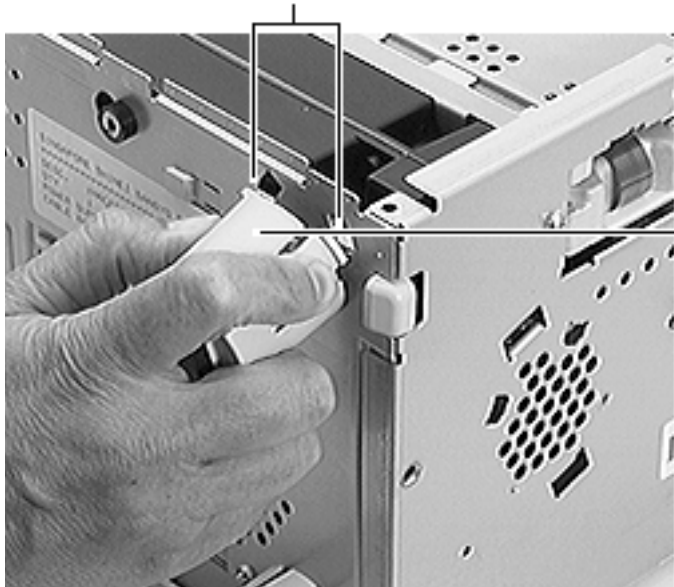
Foot

Feet

Before you begin, remove the following:

- Front bezel
- Expansion bay cover
- Top cover
- Left or right panel

Caution: Review the ESD precautions in Bulletins/Safety.

1. Place the right or left side of the computer on a clean, smooth surface.
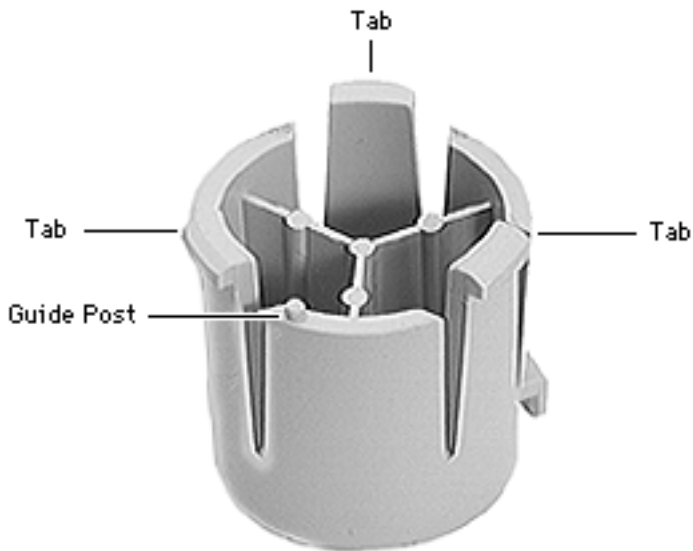
2 Press in two of the plastic tabs on a foot.

3 Tilt the foot toward the third plastic tab to clear the slots and remove the foot.

Replacement Note: There is a raised plastic guide post that fits in a notch on the bottom of the computer. Be sure to line up the guide post with the notch.

Screws

005-1382-

TV/FM Tuner Card

Caution: Review the ESD precautions in Bulletins/ Safety.

1 Remove the two screws from the TV/FM tuner card cover.
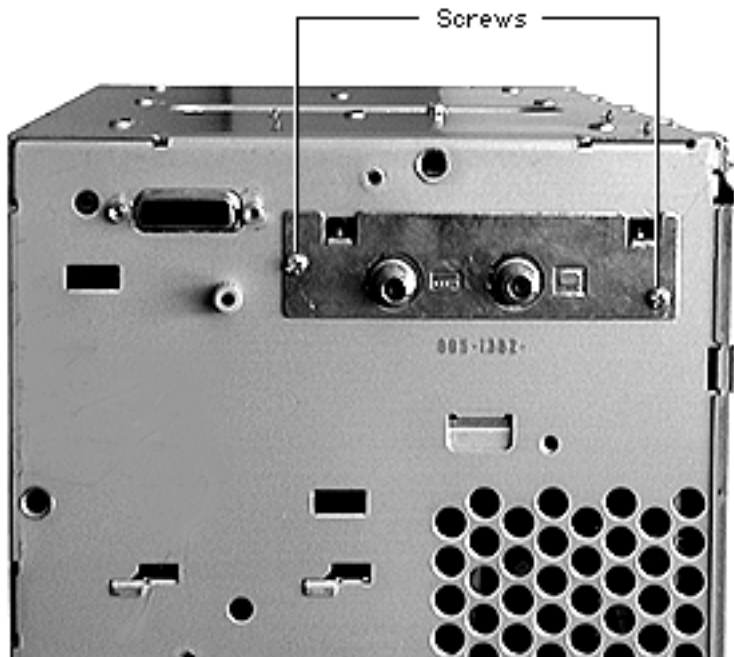
TV/FM Tuner Card

2 Pull the TV/FM tuner card from the computer.

Ribbon Cable

3 Turn the card over and disconnect the ribbon cable from the card.

Audio/Monitor
Connection
Subassembly

Audio/Monitor Connection Subassembly

Before you begin, remove the following:

- Front bezel
- Expansion bay cover
- Top cover
- Left panel
- Left metal panel
- TV/FM Tuner (if present)

Caution: Review the ESD precautions in Bulletins/Safety.
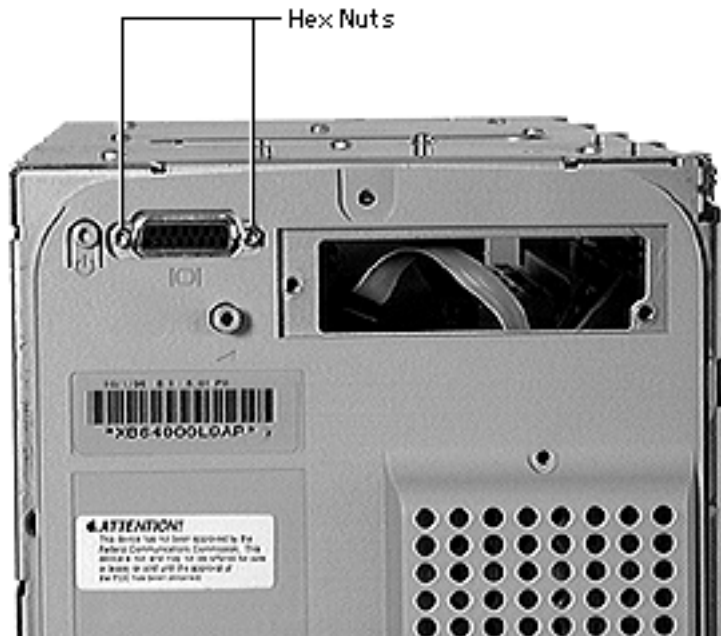
Hex Nuts

1 Using a hex nut screw driver, remove the two hex nuts on either side of the monitor-out port.
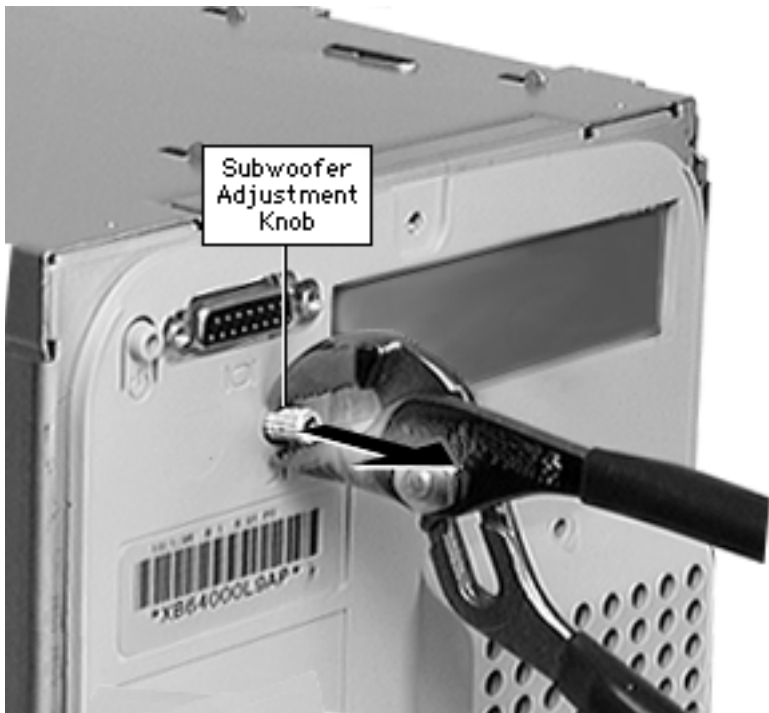
Subwoofer
Adjustment
Knob

2 Remove the subwoofer adjustment knob by grasping it firmly with a pair of pliers and pulling straight out.
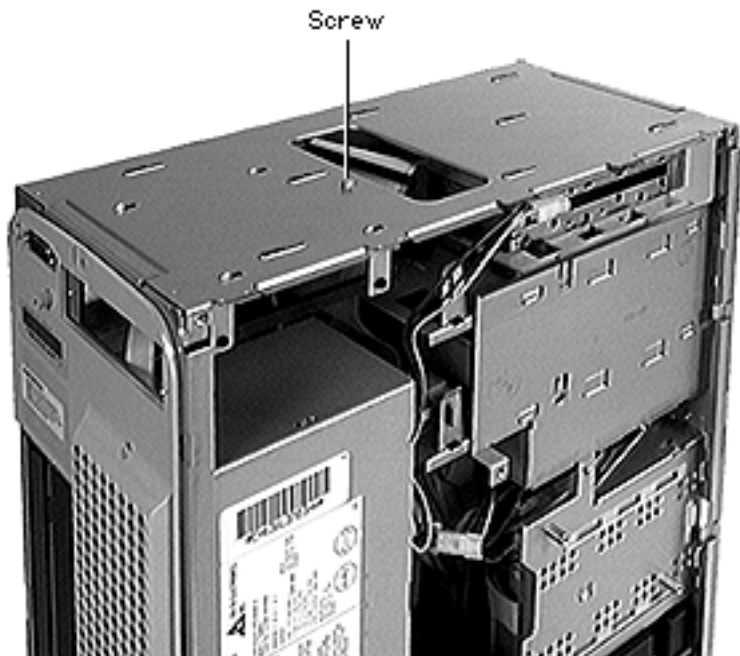
Screw

3 Remove the screw that
   secures the
   subassembly to the top of
   the chassis.
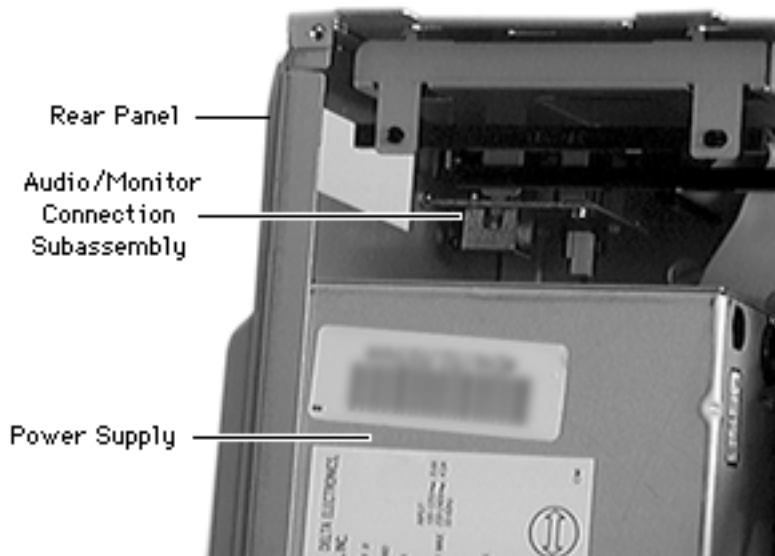
4 Reach through the left side of the computer and carefully pull the audio/ monitor connection subassembly away from the rear of the computer.

Rear Panel

Audio/Monitor Connection Subassembly

Power Supply

Ribbon Cable

2-Pin
Connector

5 Disconnect the 2-pin connector and the ribbon cable from the subassembly boards.
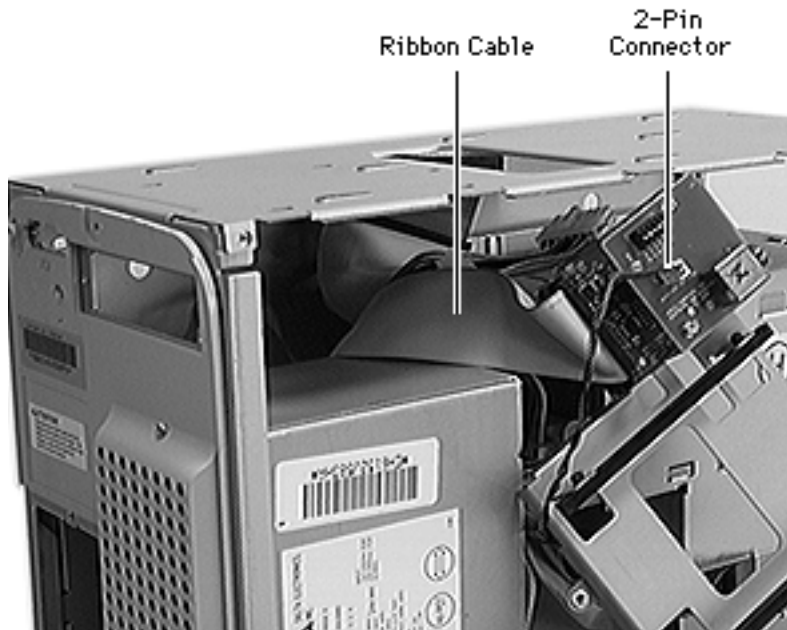
Upgrades

Performa/Power Macintosh
6400 and 6500 Series

TV Tuner Card
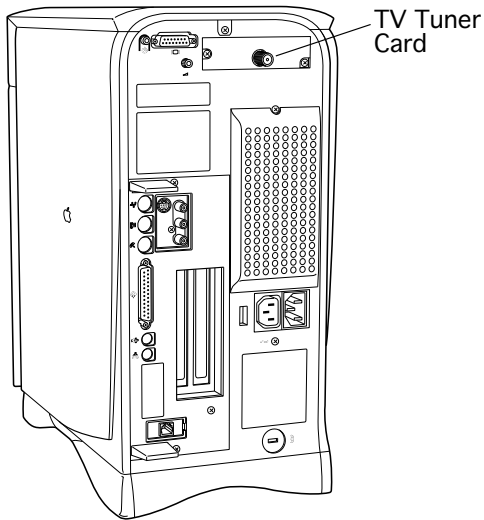
TV/FM Tuner Card

Note: The TV/FM tuner card is an option.

Caution: Review the ESD precautions in Bulletins/Safety.

Access Cover Screws
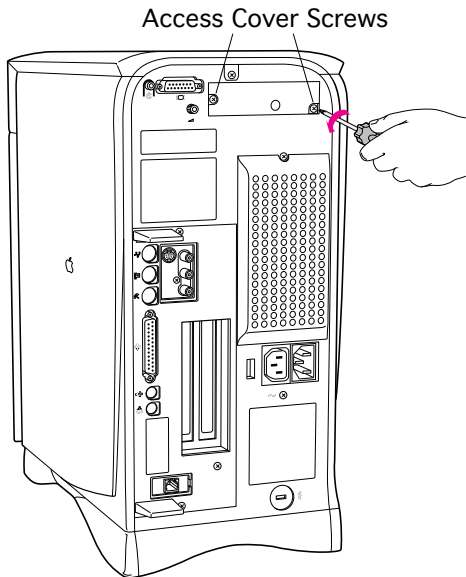
1 Remove the two screws from the TV tuner card access port cover.

2 Remove the TV tuner card access port cover from the computer.

3   Pull the TV tuner card
    ribbon cable a short
    way out of the access
    port.
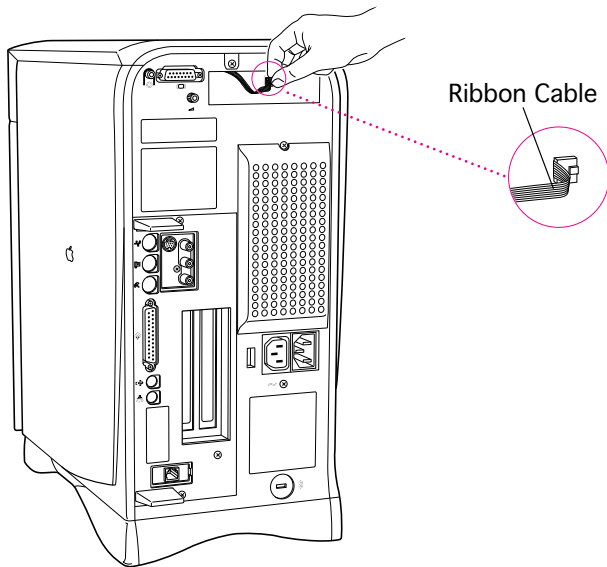
Ribbon Cable

4 Connect the ribbon cable plug to the TV/FM tuner card connector.

Connector

Ribbon Cable Plug
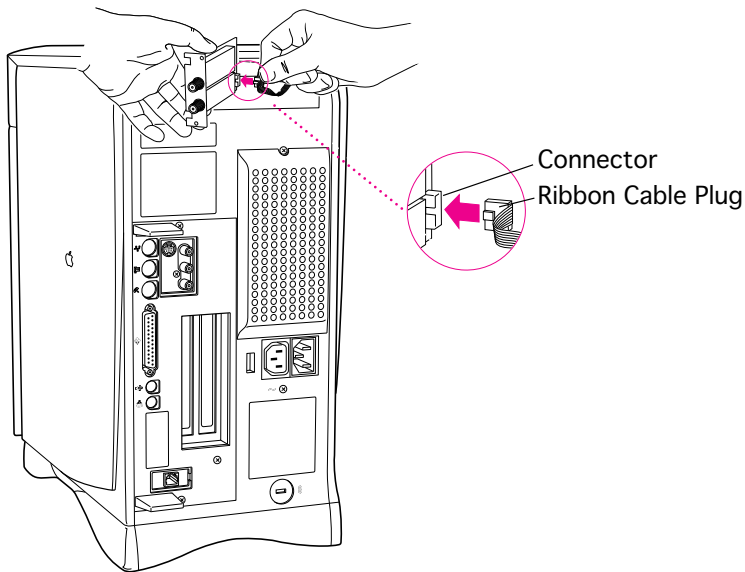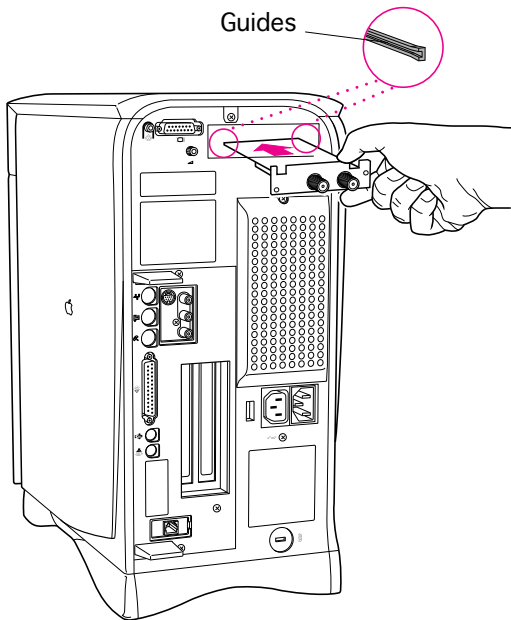
Guides

5   Slide the TV/FM tuner
    card into place along the
    guides on both sides of
    the access port.

6 Replace the two screws that hold the TV/FM tuner card in place.

Access Cover Screws
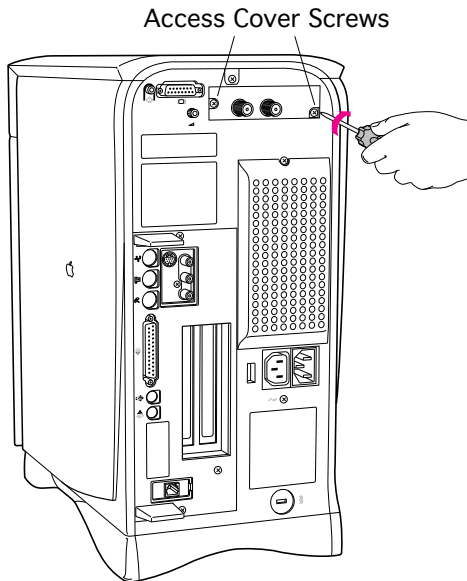
DRAM DIMM Upgrade

Before you begin, remove the logic board.

Caution: Review the ESD precautions in Bulletins/ Safety.

Note: Before servicing a 6400, read the "EDO-Compatible Logic Board Identification" topic at the end of this section.

Ejector

DRAM Slot (1 of 2)

1 Push the ejector on the
DRAM slot outward and
down to open it.

Notches

Connectors

DRAM DIMM

DRAM Slot (1 of 2)
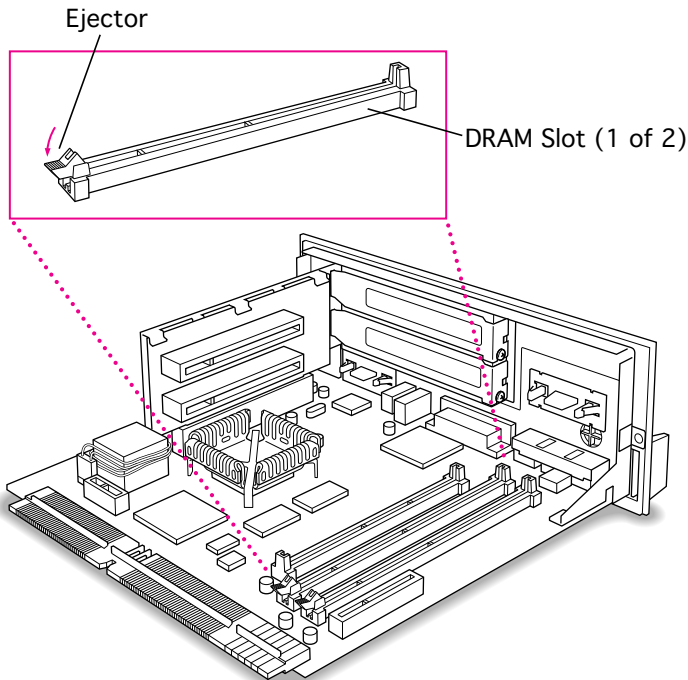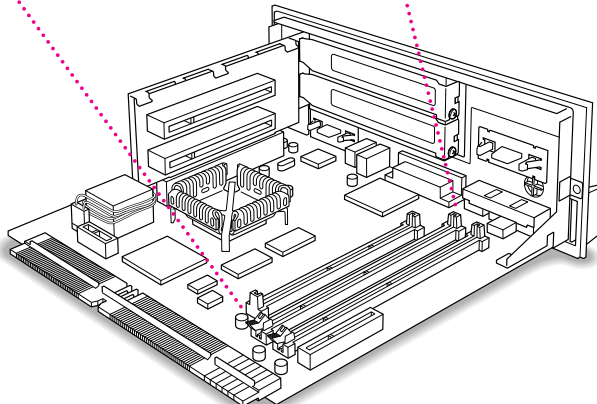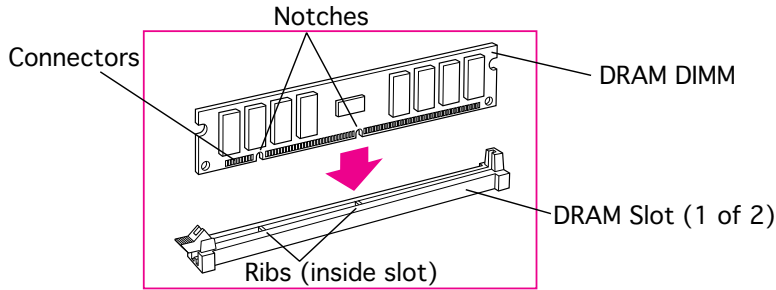
Ribs (inside slot)

2 **Note:** The DRAM DIMM
   is designed to fit into the
   slot only one way.

   With the ejector still
   pushed outward and
   down, position the
   DIMM with its notches
   aligned with the small
   ribs inside the slot.

3 Push down on the DIMM
   until it snaps into place
   and the ejector closes
   automatically.

EDO-Compatible Logic Board Identification

Before you install extended data out (EDO) memory in a Performa or Power Macintosh 6400 computer, you must verify that the logic board is EDO-compatible.

There are four ways to verify that a logic board from a Performa or Power Macintosh 6400 computer is compatible with EDO memory:

- The logic board is the original board that shipped in a Macintosh Performa 6400 equipped with an internal Zip drive
- The logic board has soldered-on EDO DRAM
- The logic board has a resistor present at chip U34
- The logic board has **no** resistor present at location R77

The details for identifying an EDO-compatible logic board by these methods are presented in the following sections.

Zip Drive

Performa 6400 with Zip Drive

If a Macintosh Performa 6400 included an internal Iomega Zip drive, the logic board shipped in the computer supports EDO memory.
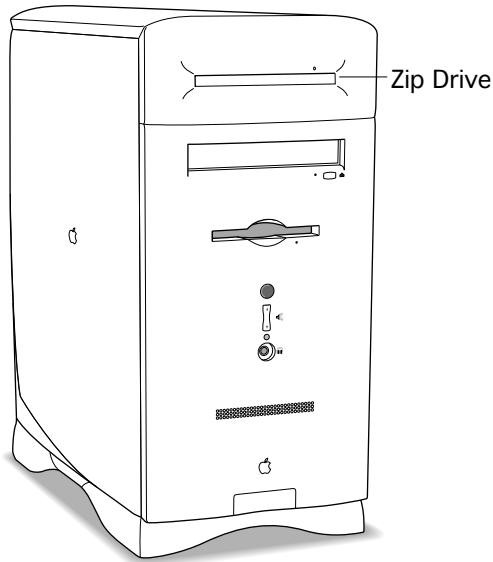
Soldered-On DRAM

Soldered-On DRAM is EDO
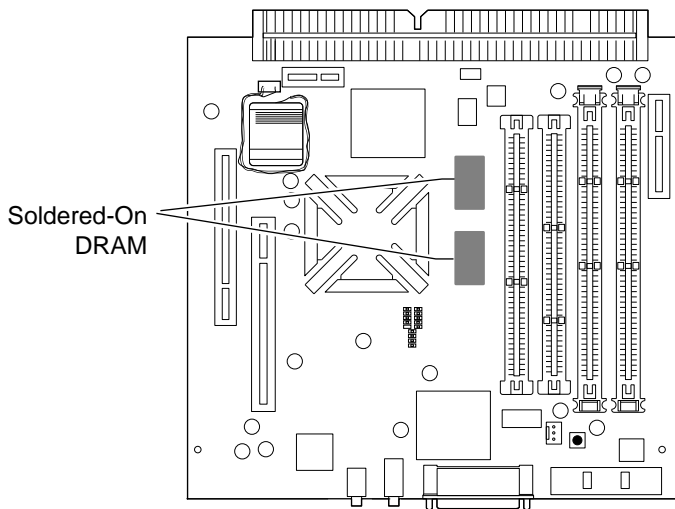
1 Locate the two soldered-on DRAM chips.

2 Compare the markings on these chips to the examples in the EDO Chip Identification table on the next page. If the soldered-on DRAM chip markings meet the criteria of an example here, the logic board supports EDO memory.

Important: Apple may use vendors not listed on this table. If the DRAM markings don't match the table criteria, use another identification method.

EDO Chip Identification

Vendor	Marking Example
SEC	The third character from the right is a non-zero number (for example, KM44C400**4**-60)
SEC	The fourth character from the right is a non-zero number (for example, KM416C120**4**BJ-6)
Hyundai	The second character from the right is a non-zero number (for example, HY511816**4**B)
Micron	A space and a capital X are present at the end of the marking (for example, MT8D264G-xx **X**)

Bottom of Logic
Board
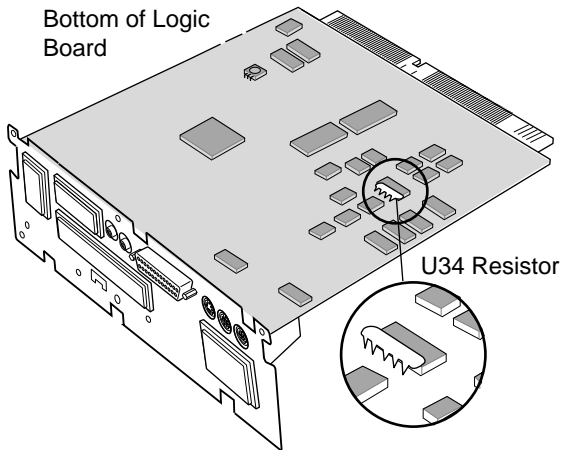
U34 Resistor

Resistor Present at U34

1   Turn the logic board
    over so that you are
    looking at the soldered-
    side of the board.

2   Locate chip U34 as
    pictured in the graphic.
    If a resistor package
    (SIP network) is on top
    of the U34 chip, as seen
    in this picture, the logic
    board supports EDO
    memory.

Top of
Logic Board
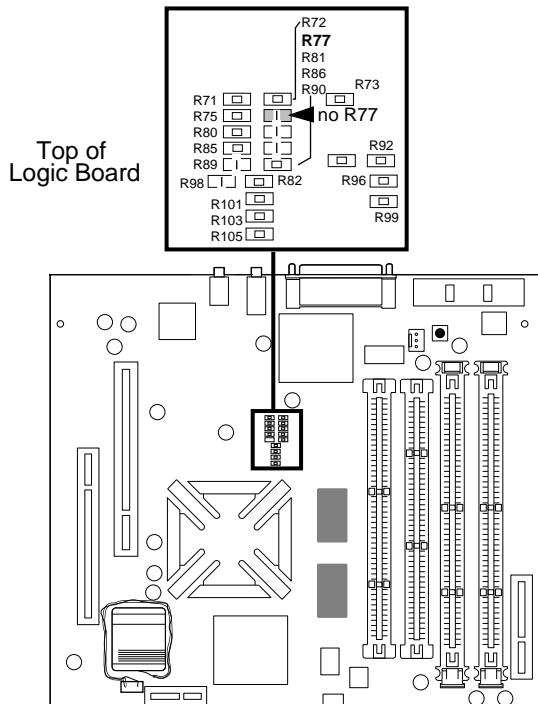
No Resistor at R77

1 Use the graphic here to locate the R77 resistor space near the SCSI port on the logic board.

2 If a resistor does not occupy the R77 location, as seen in the picture, the logic board supports EDO memory.

Communications Card

Before you begin, remove the logic board.

Caution: Review the ESD precautions in Bulletins/Safety.

Hook

Communications Card

Logic Board Fence

Communications Slot

Compatible

Communications Card — Notches

Logic Board Fence

Logic Board (Side View)   Communications Slot

Compatible

Notches

Not compatible
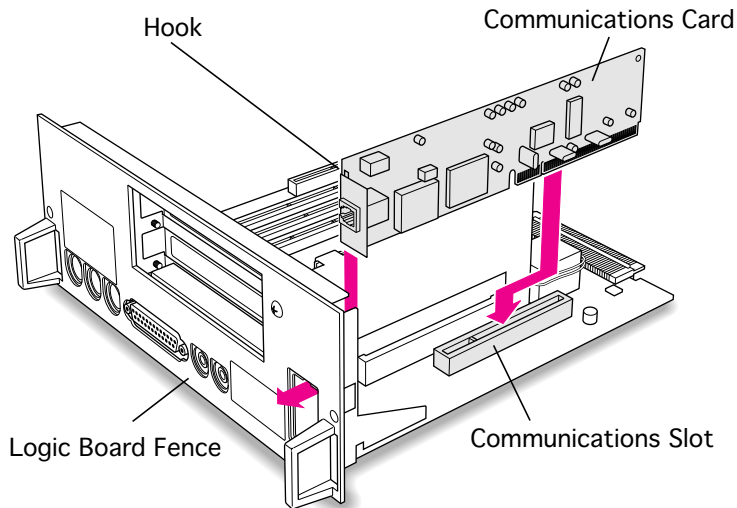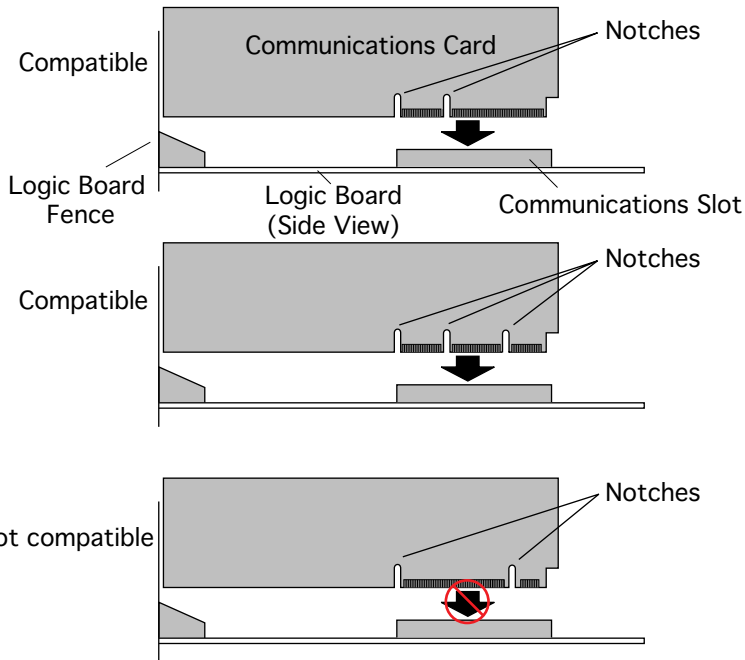
Notches

Note: Some communications cards are not compatible. Look at the placement of the notches on the card, and use this illustration to help identify a compatible card.

Plastic Tabs
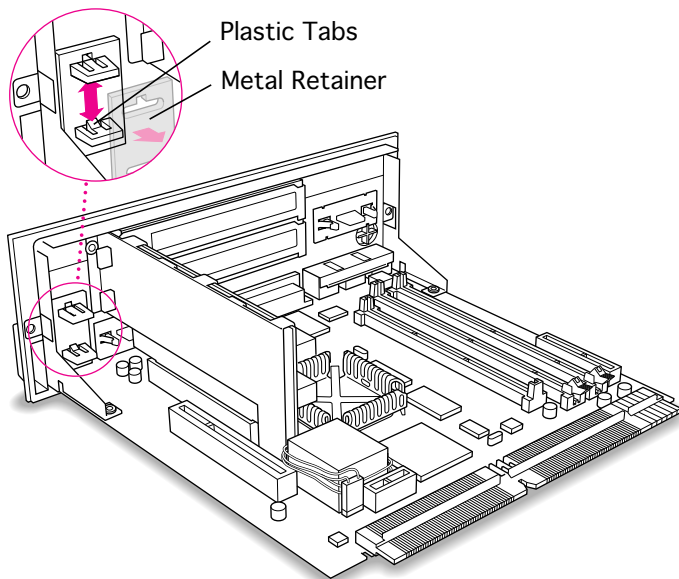
Metal Retainer

1 Remove the communica-
tions card access port
cover by pushing the two
plastic tabs apart and
removing the metal
retainer.
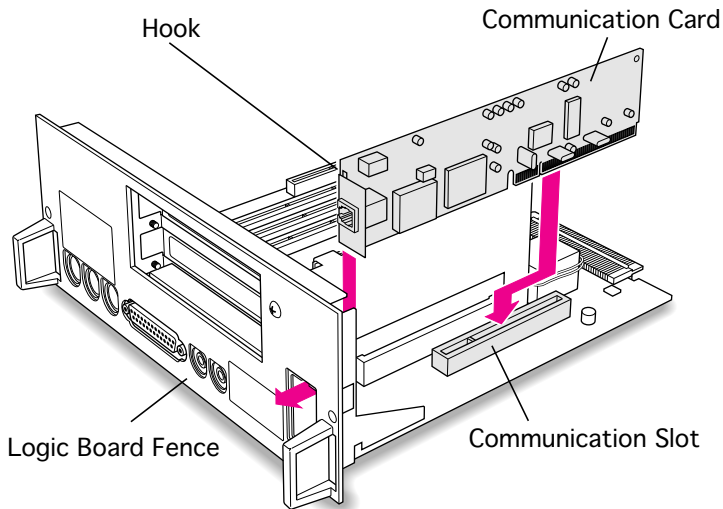
2 Align the card over the communications slot.

3 Check the external connector on your card to see if it has a hook.

   If the communications card has a hook, be sure the hook engages the metal on the inside of the logic board fence. Push down on the back end of the card until it is firmly seated in the slot.

Hook

Communication Card

Logic Board Fence

Communication Slot

Hook

Communication Card

Logic Board Fence

Communication Slot
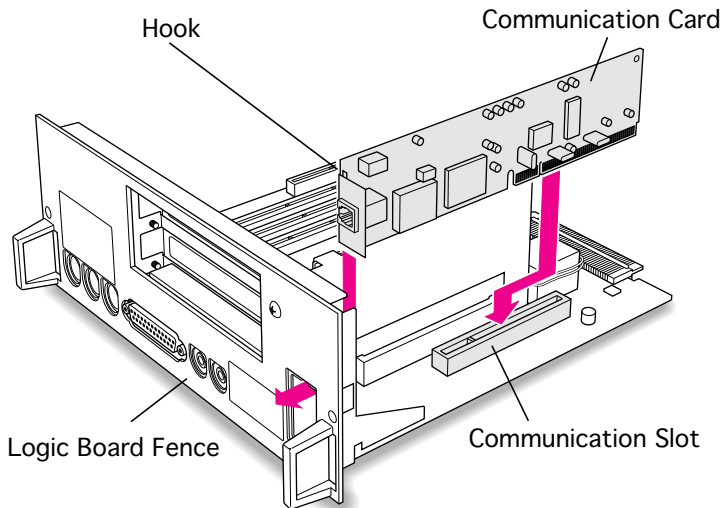
If the card does not have a hook, pass the external connector through the hole in the logic board fence, and insert the card into the communications slot. Press down on the card until the connector is solidly in place.

4 Lift gently on the card to test the connection. If the card resists and stays in place, it's connected.

Reset Button

Logic Board Fence
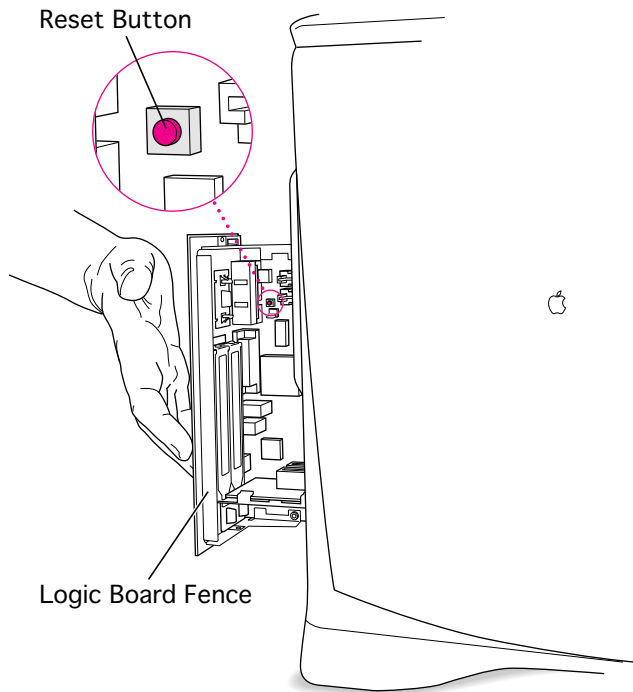
5 Press the reset button on the logic board.

6 Reinsert the logic board into the computer.

Note: The communications card may require software installation. An Ethernet card may need the network connection changed in the AppleTalk control panel.

PCI Slot

PCI Card

Before you begin, remove
the logic board.

Note: If you are installing a
PC compatibility card, see
the instructions in the
Upgrades chapter of the PC
Compatibility Card manual
under the Cards topic.

Caution: Review the ESD
precautions in Bulletins/
Safety.

Video Input Card
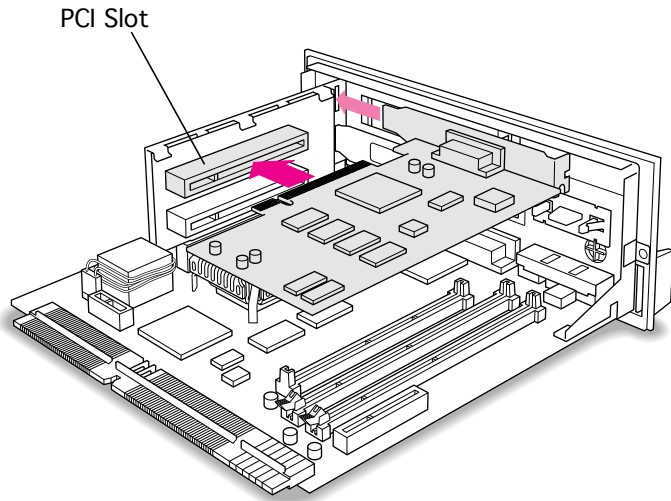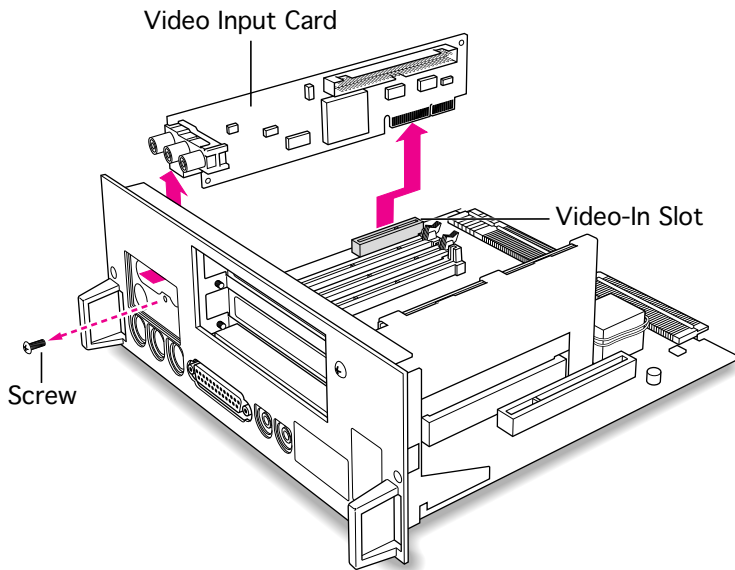
Video-In Slot

Screw

1 **Note:** If you are going to
   install a PCI card in the
   lower PCI slot, and a
   video input card is
   installed, you must
   temporarily remove the
   video input card.

   Remove the screw on the
   front of the vertical
   plate and remove the
   video card.
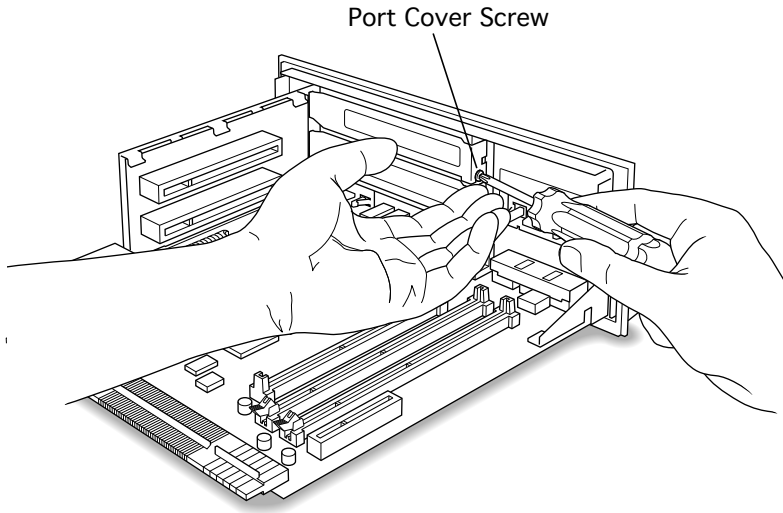
Port Cover Screw

2 **Note:** Place one hand under the screw and PCI card access cover to catch them when they come loose and thus avoid dropping them into the logic board.

Remove the screw that holds the access port cover in place.

3 Remove the access port cover.

Port Cover
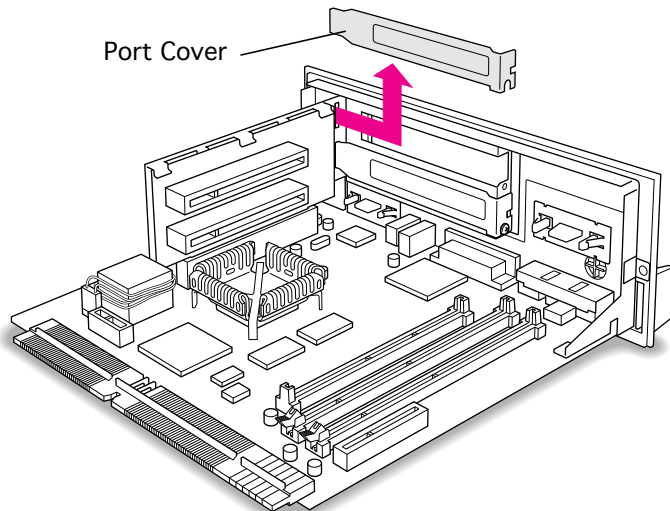
4   Hold the card by its edges
    to avoid touching any
    connectors.

Connector
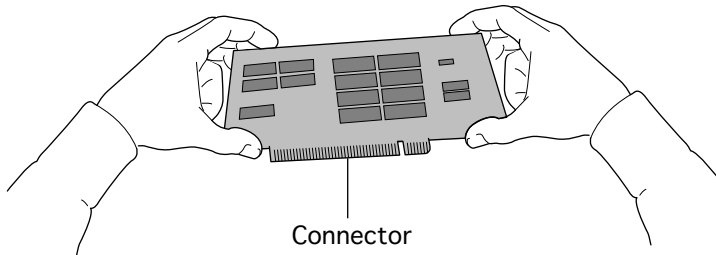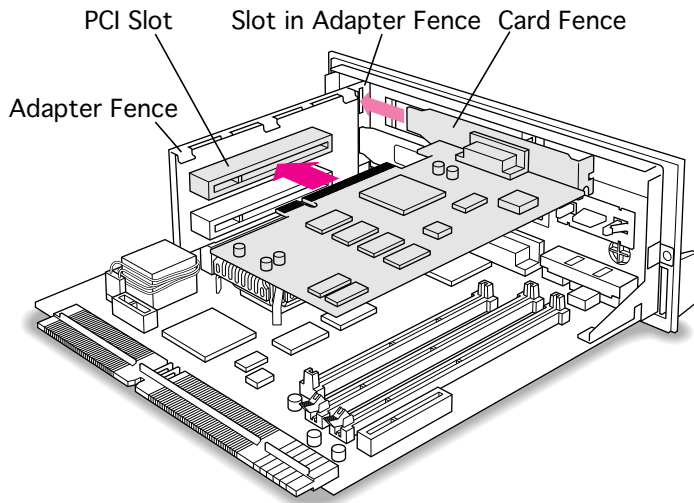
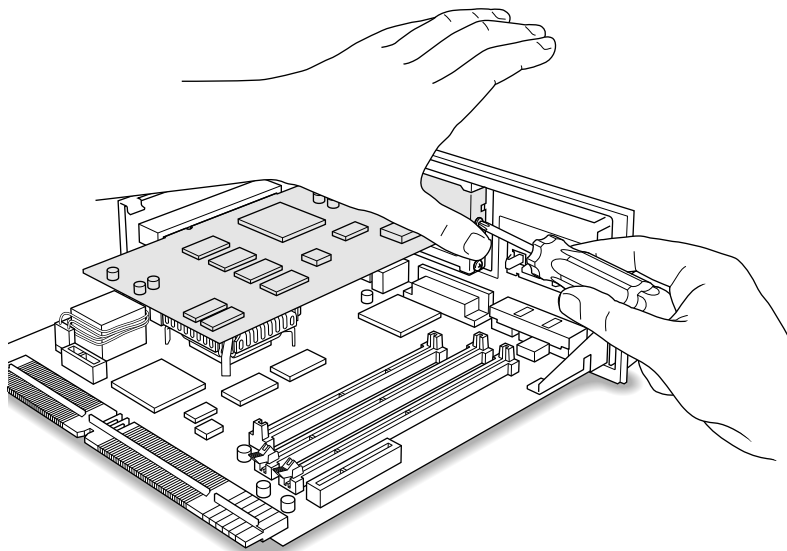5 Place the card into the PCI slot, matching the metal fence on the card to the open port.

PCI Slot   Slot in Adapter Fence   Card Fence

Adapter Fence

Adapter Fence

6 Support the adapter fence with one hand, and push on the card until it snaps into place.
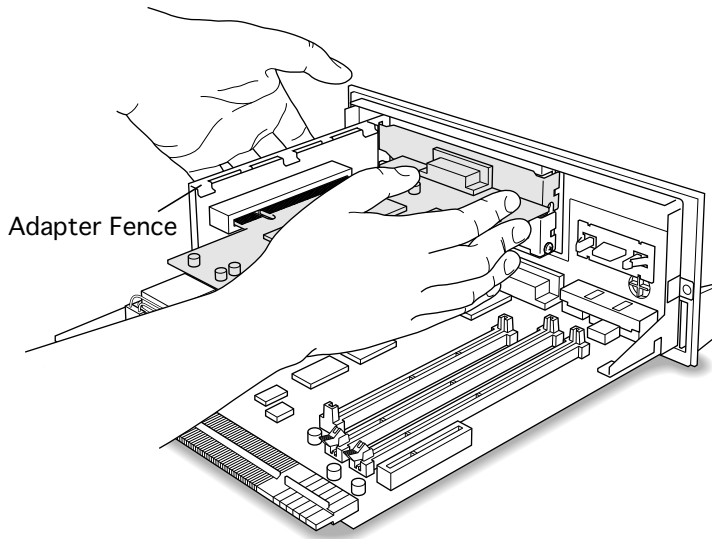
7 Replace the screw to hold
   the PCI card fence in
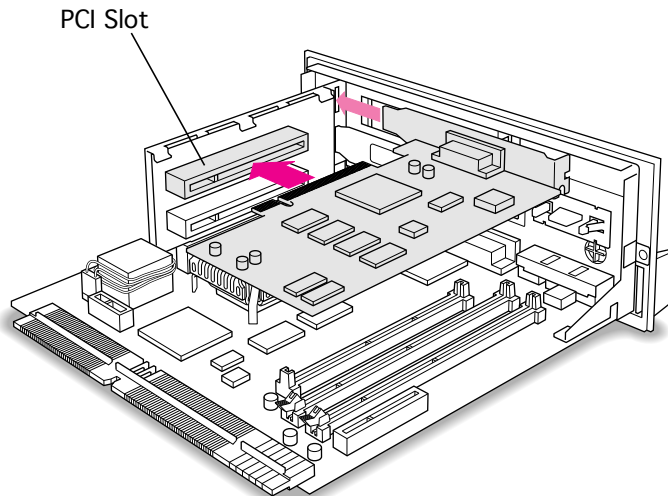   place.

8 If you removed a video input card, replace it.

Video Input Card

Video-In Slot

Screw
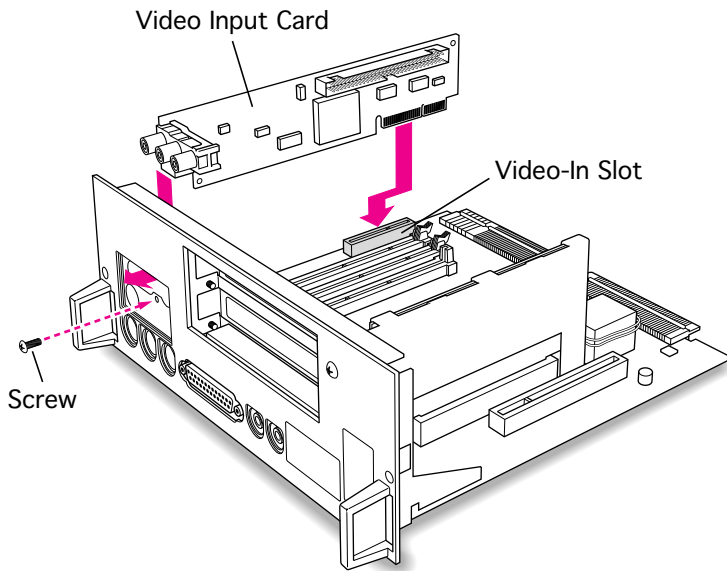
Avid Cinema Card

Before you begin, remove the logic board.

Caution: Review the ESD precautions in Bulletins/ Safety.

PCI Slot

1 Follow the steps in the PCI Card section of this chapter, choosing to place the card in the top or bottom PCI expansion slot on the PCI adapter card.

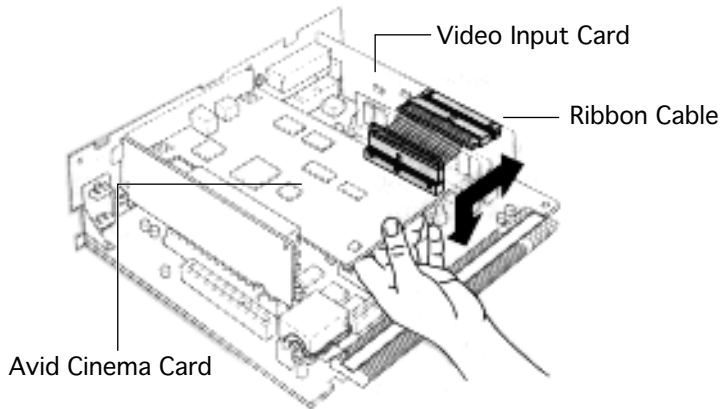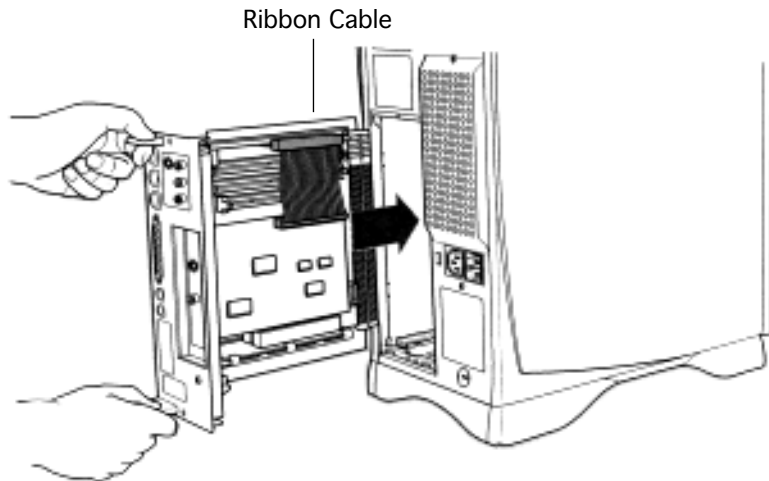2 If a video input card has
   not been installed,
   install one now.

Video Input Card

Video-In Slot

Screen

Video Input Card

Ribbon Cable
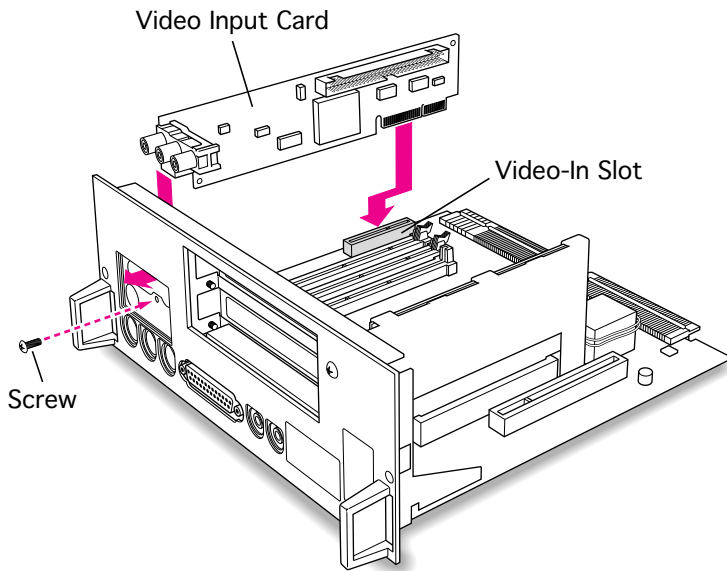
Avid Cinema Card

Connect the Avid Cinema Card to the Video Input Card

Note: Use the shorter (2.5") DAV ribbon cable. The two ends of the cable are identical. Match the notches on the card connectors to install the cable correctly.

1 Hold one hand beneath the Avid Cinema card to support the card.

2 Align the tab on the cable's connector with the notch in the card's connector.

Ribbon Cable

3   Press firmly to connect the correct end of the ribbon cable to the Avid Cinema card.

4   Connect the other end of the ribbon cable to the video input card in the same way.

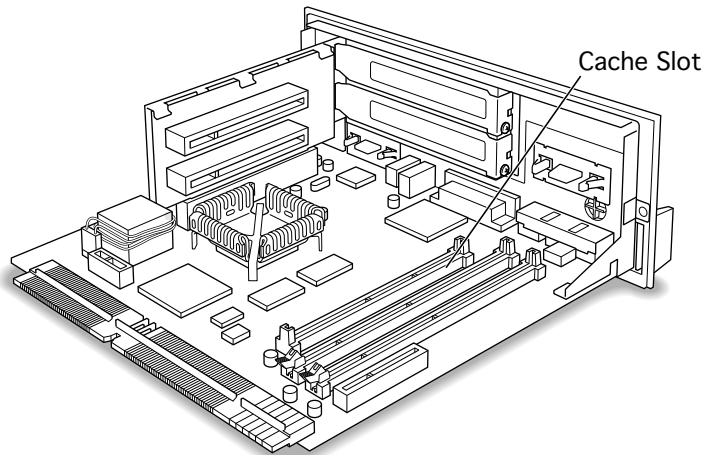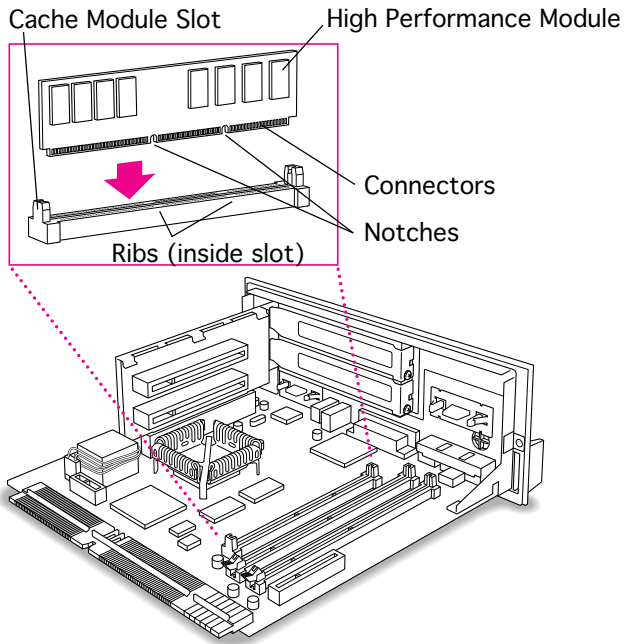5   Carefully replace the logic board to avoid catching the ribbon cable.

Cache Slot

High Performance Module (Cache)

Before you begin, remove the logic board.

Caution: Review the ESD precautions in Bulletins/Safety.

Cache Module Slot

High Performance Module

Connectors

Notches

Ribs (inside slot)

Note: The module is designed to fit into the slot only one way.

Align the notches in the module with the small ribs inside the slot, and snap the card into place on the logic board.

Additional Procedures

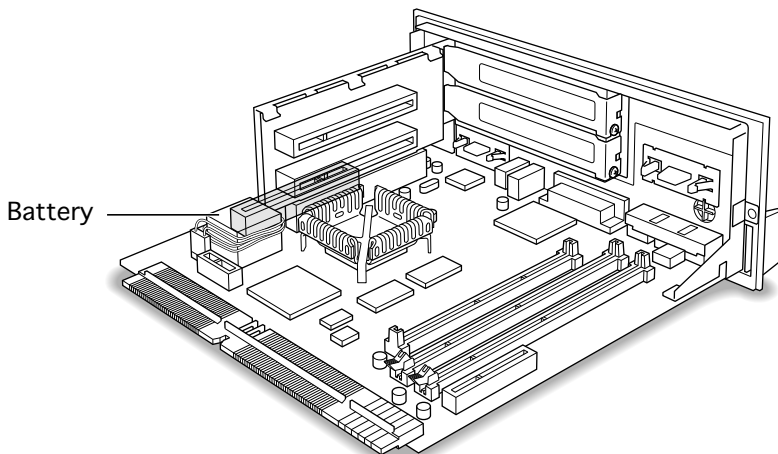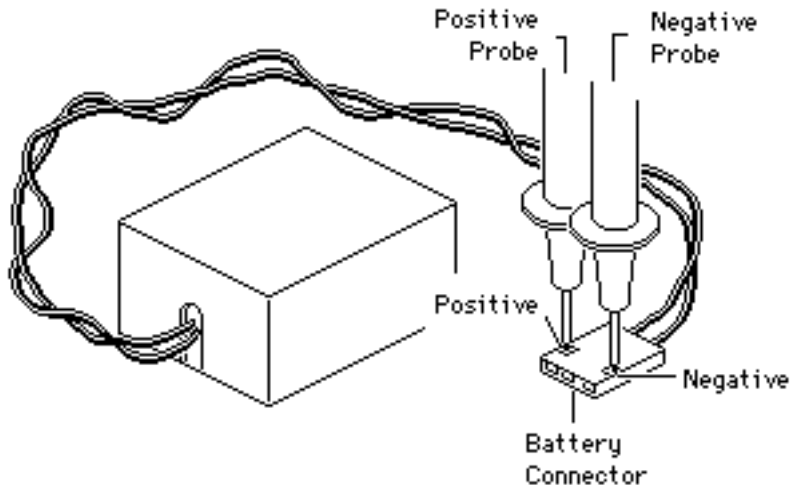Performa/Power Macintosh
6400 and 6500 Series

Battery —

Battery Verification

Before you begin, remove the logic board.

Caution: Review the ESD precautions in Bulletins/ Safety.

1 Set the voltmeter to the 10 volts DC scale.

2 Hold the positive probe of the voltmeter to the positive end of the battery and the negative probe to the negative end of the battery.

3 If the battery voltage is below 3.0 volts, replace the battery. Refer to "Battery Replacement" in this chapter.

Battery ———

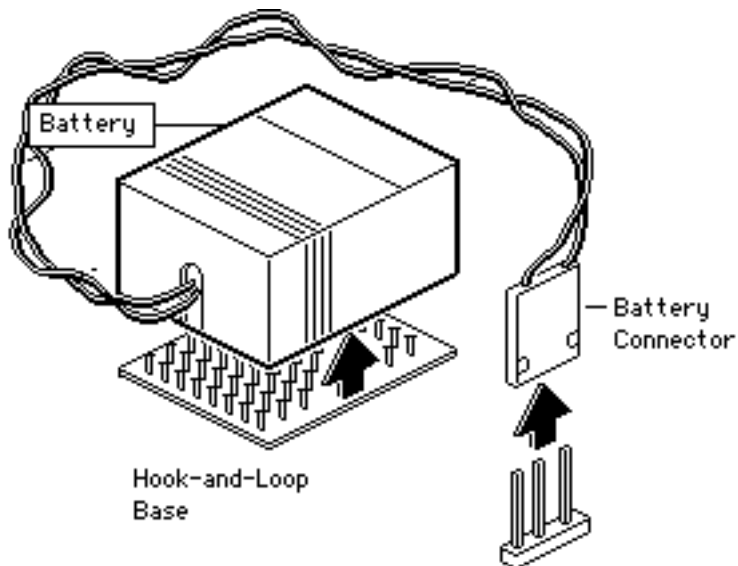# Battery Replacement

Before you begin, remove the logic board.

Caution: Review the ESD precautions in Bulletins/ Safety.

⚠**Warning:** If handled or discarded improperly, the lithium battery in the computer could explode. Review battery handling and disposal instructions in Bulletins/Safety.
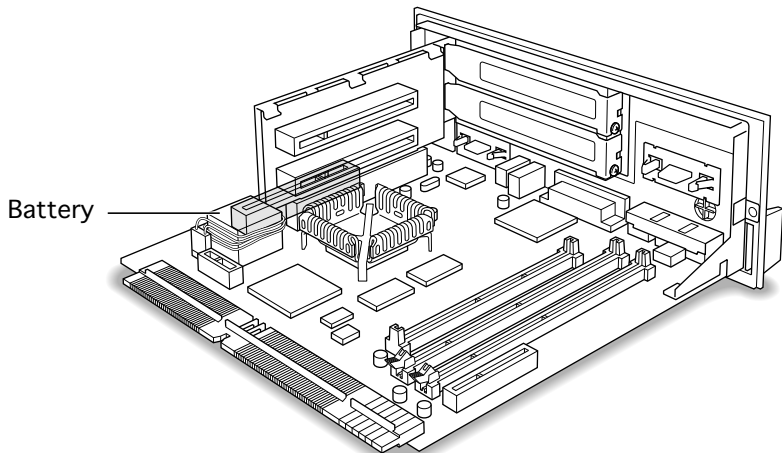
1 Pull up and disconnect the connector.

2 Pull up and remove the battery from its hook-and-loop base.

Logic Board Reset

Before you begin, remove the logic board.

Caution: Review the ESD precautions in Bulletins/ Safety.

Battery

Battery Connector
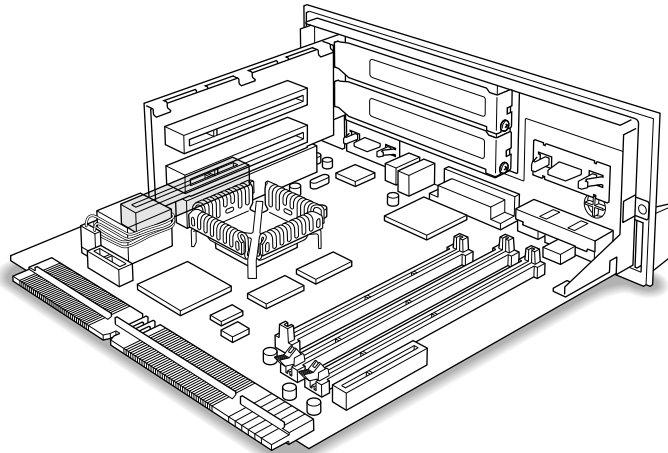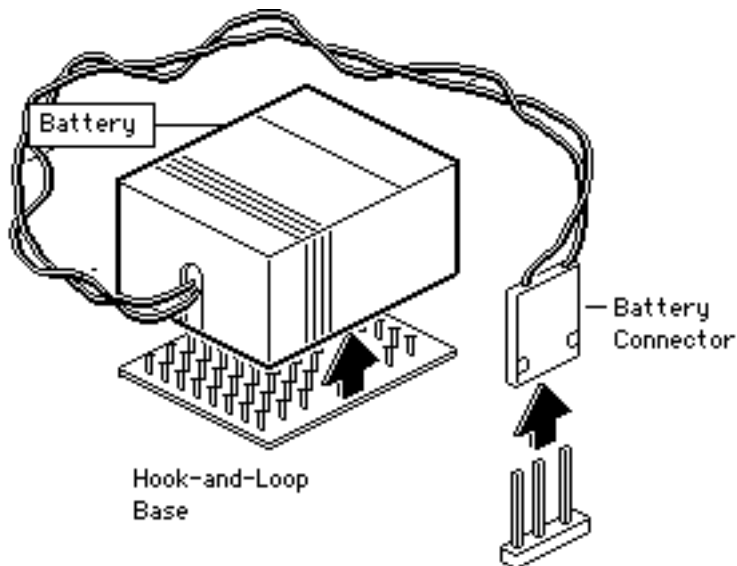
Hook-and-Loop Base

1 Pull up and disconnect the battery connector.

2 Pull up and remove the battery from its hook-and-loop base.

3 Wait 5-10 minutes and then replace the battery.

Reset Button

Logic Board Fence
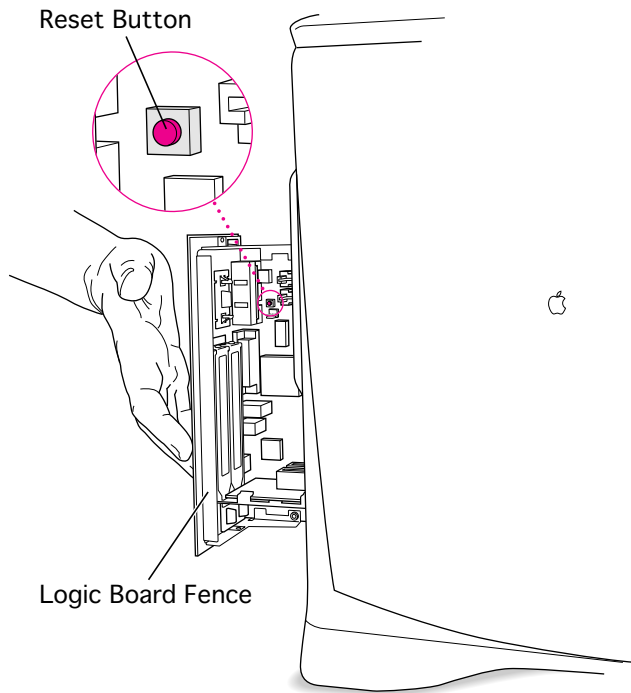
4 Press the reset switch on the logic board using a flat plastic tool.

5 Fully seat the logic board in the enclosure.

Note: This procedure resets PRAM. Be sure to check the computer's time/date and other system parameter settings following the procedure.

Note: If this procedure resolves the problem, claim an adjustment on an SRO. If not, replace defective component and **do not** claim the adjustment.

6500—Distinguishing Video Jitter from Blur

Service providers may encounter two slightly different video symptoms on monitors connected to Power Macintosh 6500 computers. The first step in troubleshooting this issue is to differentiate video jitter from blurry video. There is a different solution to each of these conditions.

Video jitter affects monitors connected to models having a 225 or 250 MHz logic board. Jitter is evident at the edges of the screen or windows and dialog boxes where the pixels shimmer or jump.

Blurry video is seen as a fuzzy image over the entire screen on monitors set to resolutions of 832 x 624 and higher.

Power Macintosh 6500 computers falling within the following serial number ranges may have these video issues.

Video Jitter:

PM 6500 from XB708xxxxx to XB718xxxxx

Blurry Video:

PM 6500 from XB708xxxxx to XB723xxxxx

R 363
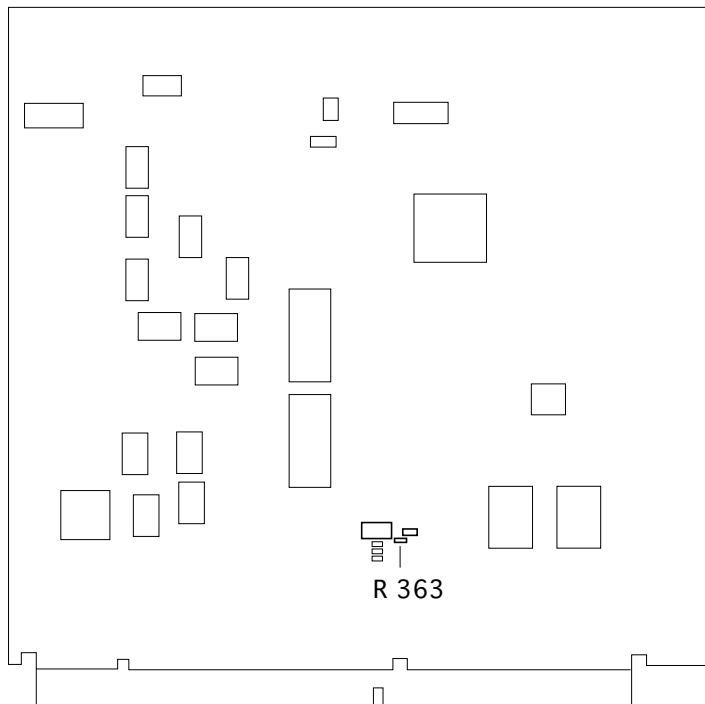
Video Jitter Solution

If you identified a video jitter symptom, you need to inspect the logic board to distinguish a reworked board from a board that hasn't been reworked. Apple has reworked 225 MHz (P/N 661-1322) and 250 MHz (P/N 661-1332) logic boards.

1   Remove the logic board.

2   Look at the resistor located at R-363 on the bottom of the board.

R 363
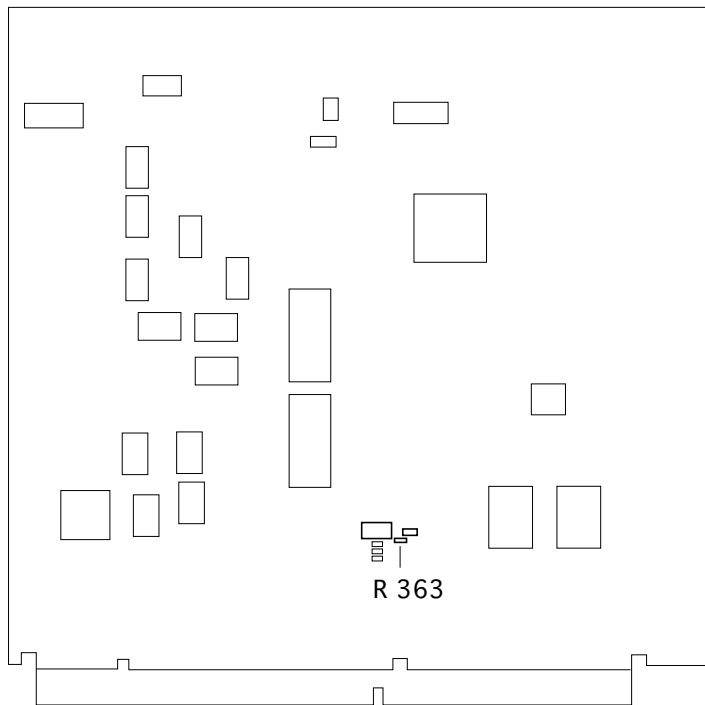
3   You may need to use a
    magnifying glass to see
    the print on this
    resistor.

    If 100 is printed on the
    resistor, the board has
    not been reworked.

    If 101 is printed on the
    resistor, the board has
    been reworked.

4   Replace a board that has
    not been reworked with a
    reworked logic board.

Blurry Video Solution

If you identified a blurry video symptom, you need to inspect the audio/monitor connection subassembly.

1   Remove the audio/ monitor connection subassembly from the computer.

2   Turn the subassembly so you can see the area of the monitor board immediately behind the monitor connector.

Monitor Connector

Monitor Board
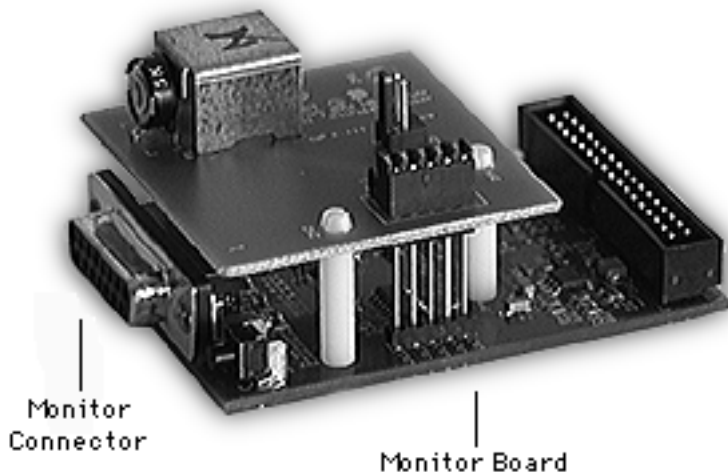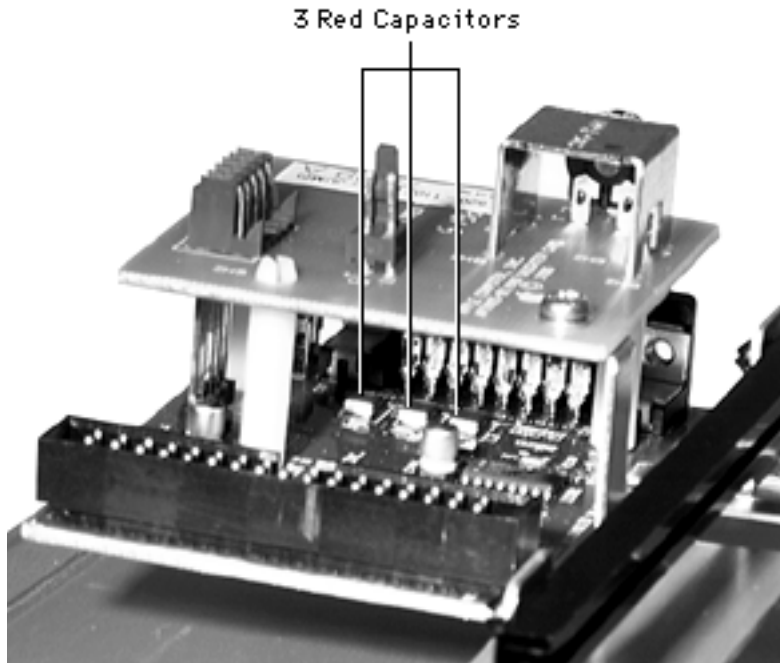
3 Red Capacitors

3   Look for three red
    capacitors as pictured
    in this graphic.

    Note: The capacitors
    may not be present. See
    the graphic on the next
    page.

3 Red Capacitors NOT Present
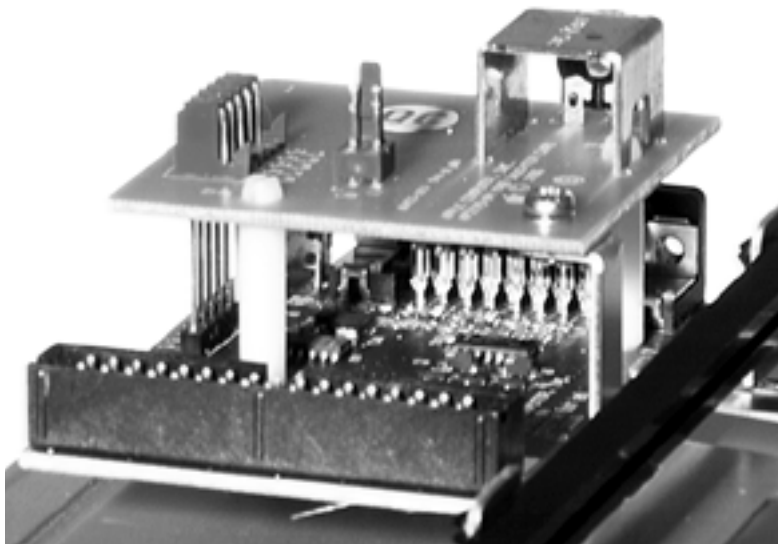
4   If three red capacitors
    are not present, replace
    the audio/monitor
    connection subassembly
    with part number
    922-2996.

6500—Software Installation Errors and L2 Cache Identification

The symptoms during software installation on a Power Macintosh 6500 may appear as follows:

- The installation is interrupted by a dialog box displaying a message like this: "Unable to decompress file 'xxxx' because of a data mismatch error." After dismissing the dialog box, the user may be able to continue installing or may only have the option to stop the installation, depending on the type of installer.
- During software installation, the system hangs (cursor arrow still moves), system freezes (cursor arrow does not move), or Type 10 errors are displayed requiring a reboot.

These symptoms may appear with any software, installer, and installation from CDs, floppy disks, Zip disks, or external hard drives.

Identifying Suspect Units

This problem is caused by a combination of a certain logic board manufacturer (OPC) together with a certain L2 cache in a small percentage of Power Macintosh 6500 computers that fall within this serial number range:

PM 6500 from XB708xxxxx to XB718xxxxx

Recommended Action

If the symptom occurs on a 6500 computer in the specified serial number range, inspect the logic board for "OPC" printed along the edge. If the logic board has "OPC" on it, verify the cache is a compatible L2 cache DIMM. If the logic board is an OPC with an incompatible L2 cache, replace the incompatible L2 cache with part number 661-1477.

Identifying an OPC Logic Board

Here is how to positively identify an OPC logic board:

1   With the logic board connector closest to you, examine the right and left edges of the board.

2   Along the right or left side you may see the letters OPC.

Identifying L2 Cache DIMM

If the logic board is an OPC, follow these instructions to positively identify the L2 cache DIMM as compatible or incompatible:

1 View the back of the cache DIMM.

2 Notice that there is one larger chip and eight smaller chips. The eight smaller chips are organized in tow groups of four at each end of the DIMM.

3 Look at the markings on any one of the smaller chips. They will look similar to this:

IDT 74FST
32384Q (This number is the identifying factor.)
F9637BFU

If this number, not counting the Q or any other letters present, has five digits, it is compatible with OPC.

If this number, not counting the Q or any other letters present, has four digits, the cache is incompatible with an OPC logic board. Replace this L2 cache DIMM with part number 661-1477.
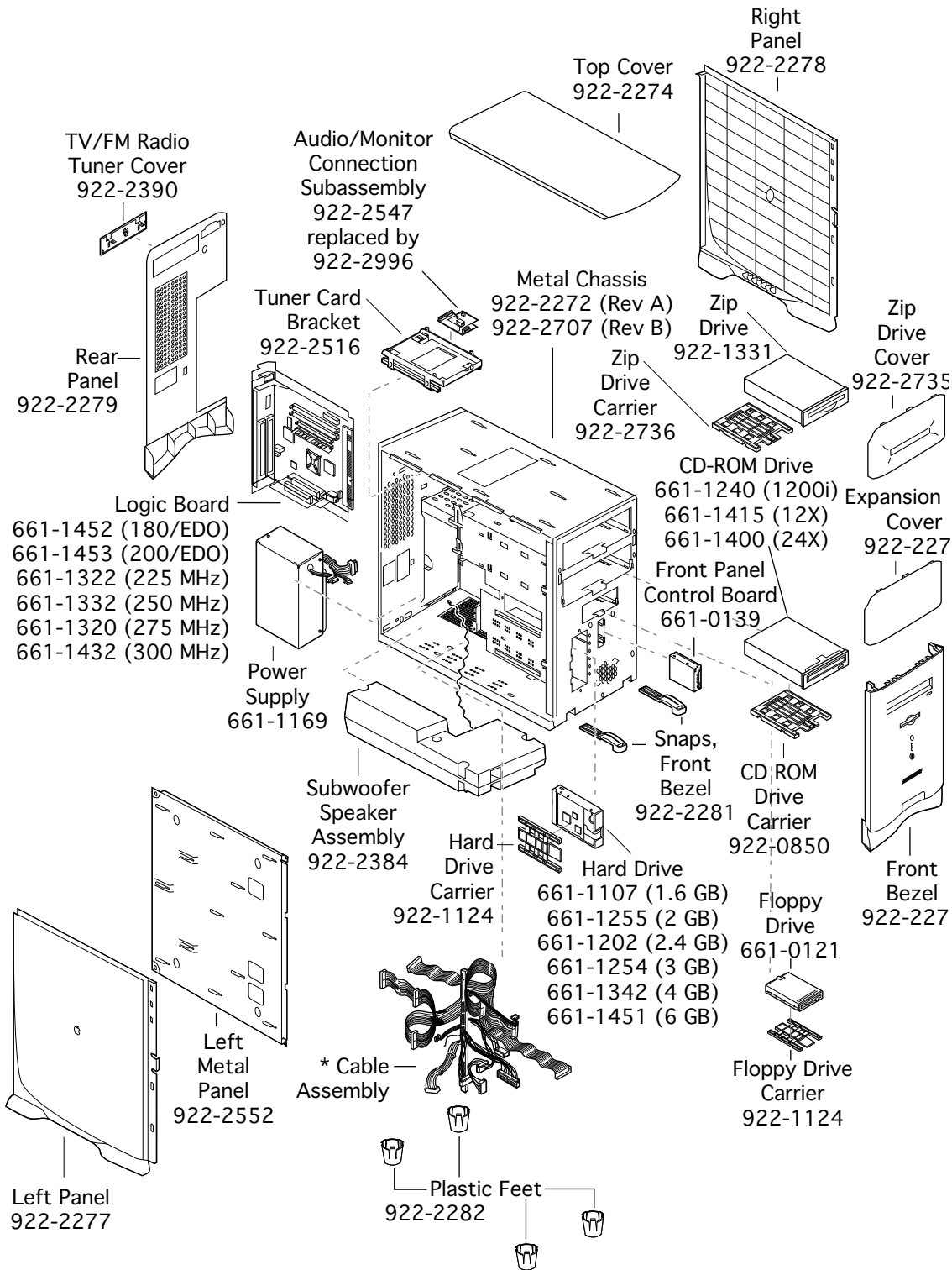
IDT 74FST
3384Q (Use this number to identify a problem DIMM.)
F9637BFU

Exploded View

Performa/Power Macintosh
6400 and 6500 Series

TV/FM Radio
Tuner Cover
922-2390

Audio/Monitor
Connection
Subassembly
922-2547
replaced by
922-2996

Top Cover
922-2274

Right
Panel
922-2278

Tuner Card
Bracket
922-2516

Metal Chassis
922-2272 (Rev A)
922-2707 (Rev B)

Zip
Drive
922-1331

Zip
Drive
Cover
922-2735

Rear
Panel
922-2279

Zip
Drive
Carrier
922-2736

CD-ROM Drive
661-1240 (1200i)
661-1415 (12X)
661-1400 (24X)

Expansion
Cover
922-227

Logic Board
661-1452 (180/EDO)
661-1453 (200/EDO)
661-1322 (225 MHz)
661-1332 (250 MHz)
661-1320 (275 MHz)
661-1432 (300 MHz)

Front Panel
Control Board
661-0139

Power
Supply
661-1169

Snaps,
Front
Bezel
922-2281

CD ROM
Drive
Carrier
922-0850

Subwoofer
Speaker
Assembly
922-2384

Hard
Drive
Carrier
922-1124

Hard Drive
661-1107 (1.6 GB)
661-1255 (2 GB)
661-1202 (2.4 GB)
661-1254 (3 GB)
661-1342 (4 GB)
661-1451 (6 GB)

Front
Bezel
922-227

Floppy
Drive
661-0121

Left
Metal
Panel
922-2552

* Cable
Assembly

Floppy Drive
Carrier
922-1124

Left Panel
922-2277

Plastic Feet
922-2282

* The cable harness must be ordered as part of the metal chassis.
Cables are not available to order or replace separately.