Power Mac G4/ Macintosh Server G4

Power Mac G4 (AGP Graphics),
Power Mac G4 (PCI Graphics),
Macintosh Server G4,
Macintosh Server G4 with Mac OS X Server

Basics

Power Mac G4/ Macintosh Server G4

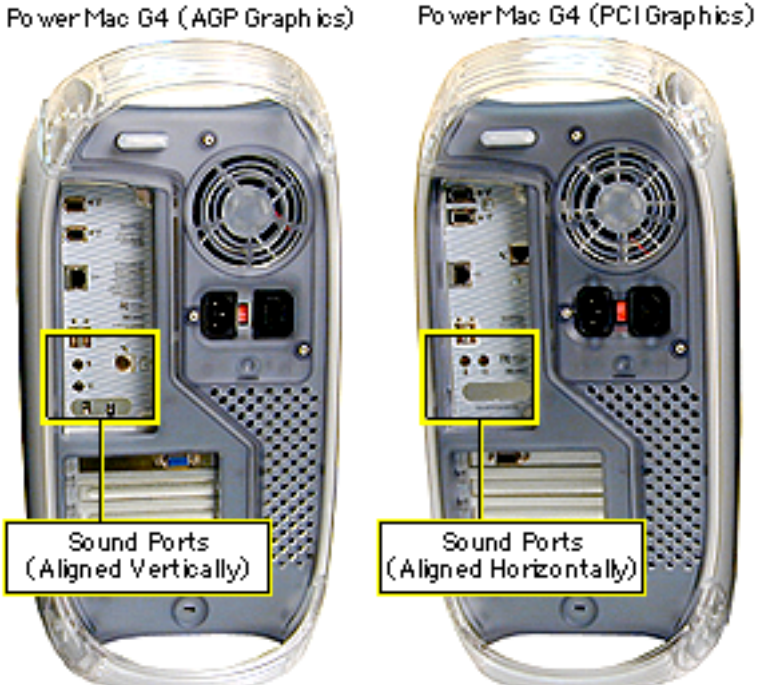
Overview

The Power Mac G4 is the first Power Macintosh desktop computer based on the PowerPC G4 processor. In addition to greater processing power, the computer offers a new logic board, support for more than 100 GB of hard disk storage, and up to 1.5 GB SDRAM. Some configurations also include support for AirPort wireless networking, dual-channel USB, and a new wake/sleep power management feature.

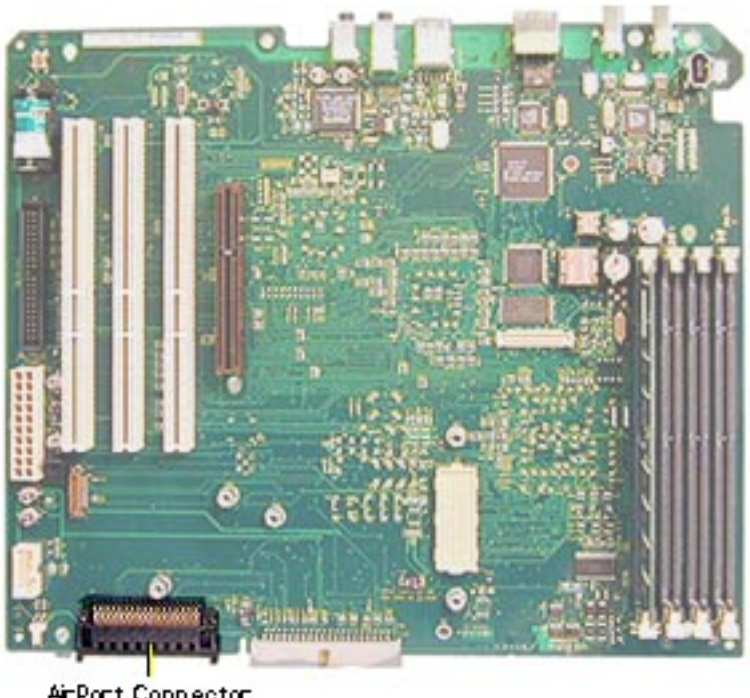
Power Mac G4: AGP/PCI Versions

There are two different versions of Power Mac G4 computers that support two different types of graphics cards: AGP and PCI. You can easily identify the two versions by any of the following methods.

If the machine is running, you can check Apple System Profiler for the model name: “Power Mac G4 (AGP Graphics)” or “Power Mac G4 (PCI Graphics).”



You can also identify the versions by checking the I/O panel at the back of the computer. The sound ports align vertically on the Power Mac G4 (AGP Graphics) and horizontally on the Power Mac G4 (PCI Graphics).



Another way to identify the versions is by their logic boards. There is an AirPort connector at J32 on Power Mac G4 (AGP Graphics) logic boards; Power Mac G4 (PCI Graphics) boards do not include this connector.

The following table outlines other differences between the two versions. Note that Macintosh Server G4 computers are based only on the Power Mac G4 (AGP Graphics).

Power Mac G4 Version Differences

	Power Mac G4 (PCI Graphics)	Power Mac G4 (AGP Graphics) and Macintosh Server G4
Processor	G4 w/ jumper (350, 400)	G4 w/o jumper (350, 400, 450)
Logic Board	Similar to Blue & White, but no ADB connector Diagnostic LEDs on board	New, Core99 chipset No diagnostic LEDs on board
Bus	100 MHZ, 60x bus	100 MHz, Max bus
Memory (Hware support)	PC 100 SDRAM, up to 1 GB	PC 100 SDRAM, up to 2 GB
Video	Rage 128 PCI	Rage 128 AGP and Rage 128 Pro
AirPort	Not compatible	Optional
USB	Same as Blue & White	Dual independent (2 controllers)
FireWire	Similar to Blue & White	Built into logic board
Ethernet	Same as Blue & White	New
Modem	Same as Blue & White	New (requires modem filter)
PCI Slots	Same as Blue & White	One AGP slot and three PCI slots
Hard Drives	Ultra ATA/33	Ultra ATA/66 CTO option: Ultra2 LVD SCSI
CD/DVD Drives	32x CD (new short carrier) Audio cable	DVD configs only (new short carrier) No audio cable
DVD Video	Hardware decoder	Software decoder
Power Mgmt	Same as Blue & White	New (lower power sleep)
Chassis	New, p/n 922-3983	New, p/n 922-4045
Power Supply	New, p/n 661-2256	New, p/n 661-2256 Redundant power supply in servers
Frnt Panel Brd	Similar to Blue & White	New (no power/FireWire connectors)
I/O Panel	Sound ports horizontal	Sound ports vertical

Note: Although there are similarities between Power Mac G4 and Power Macintosh G3 (Blue and White) computers, the logic boards are not interchangeable. Apple does not offer upgrades from the Power Macintosh G3 (Blue and White) to any model of Power Mac G4.

Features

Processor

- 350-, 400-, or 450-MHz PowerPC G4 processor
- Velocity Engine vector processing unit with 162 integrated Single Instruction Multiple Data (SIMD) instructions
- Full 128-bit internal memory data paths
- Powerful new floating-point unit supporting single-cycle, double-precision calculations
- Data stream prefetching operations supporting four simultaneous 32-bit data streams
- 1MB backside level 2 cache running at half the processor speed
- 100-MHz system bus supporting up to 800-MBps data throughput

Memory

- 64 MB, 128 MB or 256 MB of PC100 SDRAM (3.3-volt, unbuffered, 64-bit-wide, 168-pin, running at 100 MHz)
- Four DIMM slots support up to 1.5 GB of PC100 SDRAM (999MB maximum per application) using the following DIMMs:
  - 32 MB, 64 MB, or 128 MB DIMMs (64-bit-wide, 64-Mbit technology)
  - 128 MB or 256 MB DIMMs (64-bit-wide, 128-Mbit technology)
  - 512 MB DIMMs (64-bit-wide, 256-Mbit technology)

Storage

- One of the following hard drives:
  - 10 GB 5400-rpm Ultra ATA/33
  - 20 GB 7200-rpm Ultra ATA/66
  - 27 GB 7200-rpm Ultra ATA/66
- One of the following optical drives:
  - 32x-speed (maximum) CD-ROM drive
  - DVD-ROM drive with DVD-Video playback
  - DVD-RAM drive with DVD-Video playback
- 100 MB Zip drive (some configurations)
- Three 3.5-inch hard drive expansion bays
  - One ATA drive preinstalled in standard configurations
  - Support for up to two internal ATA drives
  - Support for up to three internal SCSI drives

Graphics Support

- ATI Rage 128 Pro graphics card with 16MB of SDRAM graphics memory installed in a dedicated graphics slot (either a 66-MHz PCI slot or a 133-MHz AGP 2X slot)*
- Support for up to 1,600 by 1,200 pixel resolution at 32 bits per pixel (millions of colors) and up to 85-Hz refresh rate
- 15-pin mini D-Sub VGA connector
- DVI connector for digital flat-panel display (AGP only)

Keyboard and Mouse

Apple USB Keyboard with 2-meter cable and Apple USB Mouse

Electrical Requirements and Agency Approvals

- Line voltage: 115V AC (90V to 132V AC) or 230V AC (180V to 264V AC)
- Frequency: 47 to 63 Hz, single phase
- Maximum continuous power (not including display): 200W EPA ENERGY STAR and Blue Angel compliant (some configurations)

Environmental Requirements

- Operating temperature: 50° to 95° F (10° to 35° C)
- Storage temperature: -40° to 116° F (-40° to 47° C)
- Relative humidity: 5% to 95% noncondensing
- Maximum altitude: 10,000 feet (3,048 m)

Size and Weight

- Height: 17.0 inches (43.2 cm)
- Width: 8.9 inches (22.6 cm)
- Depth: 18.4 inches (46.7 cm)
- Weight: 30.0 pounds (13.6 kg)

*Storage devices and interfaces vary among configurations.

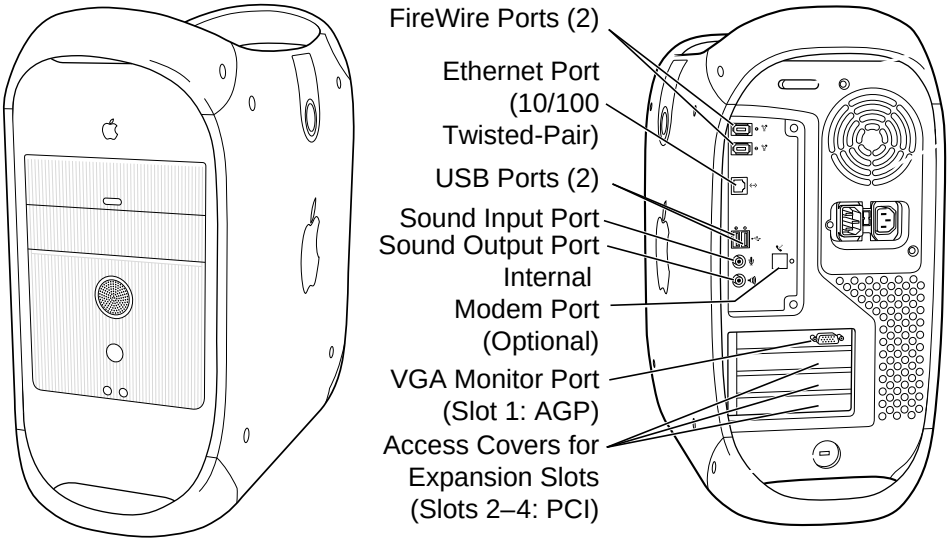
Configure-to-Order

The configure-to-order options that follow are available from the Apple Store. For more information, view the configure-to-order options online at the following address: http://store.apple.com.

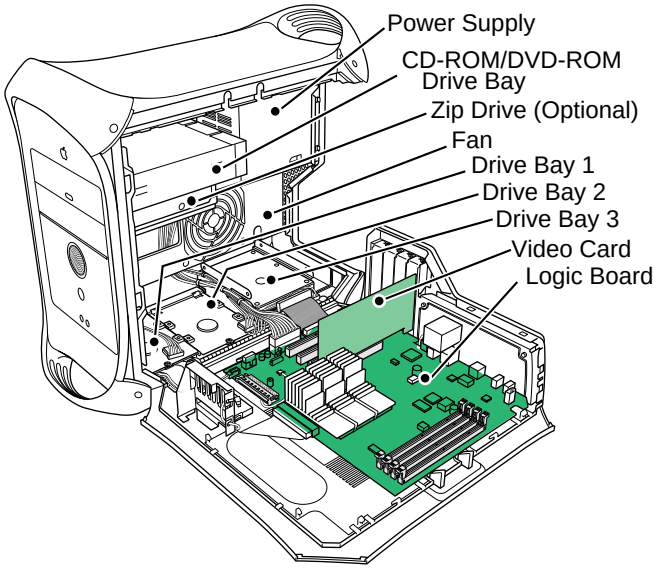
- SDRAM DIMMs: 64, 128, 256 MB
- Ultra ATA hard drives: 10, 13, 20, 27 GB
- Ultra2 LVD SCSI hard drives: 18 and 36 GB
- Ultra2 LVD SCSI PCI card, dual channel
- Zip drive
- CD-ROM drive (for Power Mac G4 (PCI Graphics) only)
- DVD-ROM drive
- DVD-RAM drive
- DVD video card (for Power Mac G4 (PCI Graphics) only)
- Rage 128 video card (PCI and AGP Graphics)
- Rage 128 Pro video card (AGP Graphics only)

- Ultra SCSI PCI card that comes with a 50-pin-to-25-pin SCSI adapter
- Internal 56K modem
- AirPort Card
- AirPort Base Station

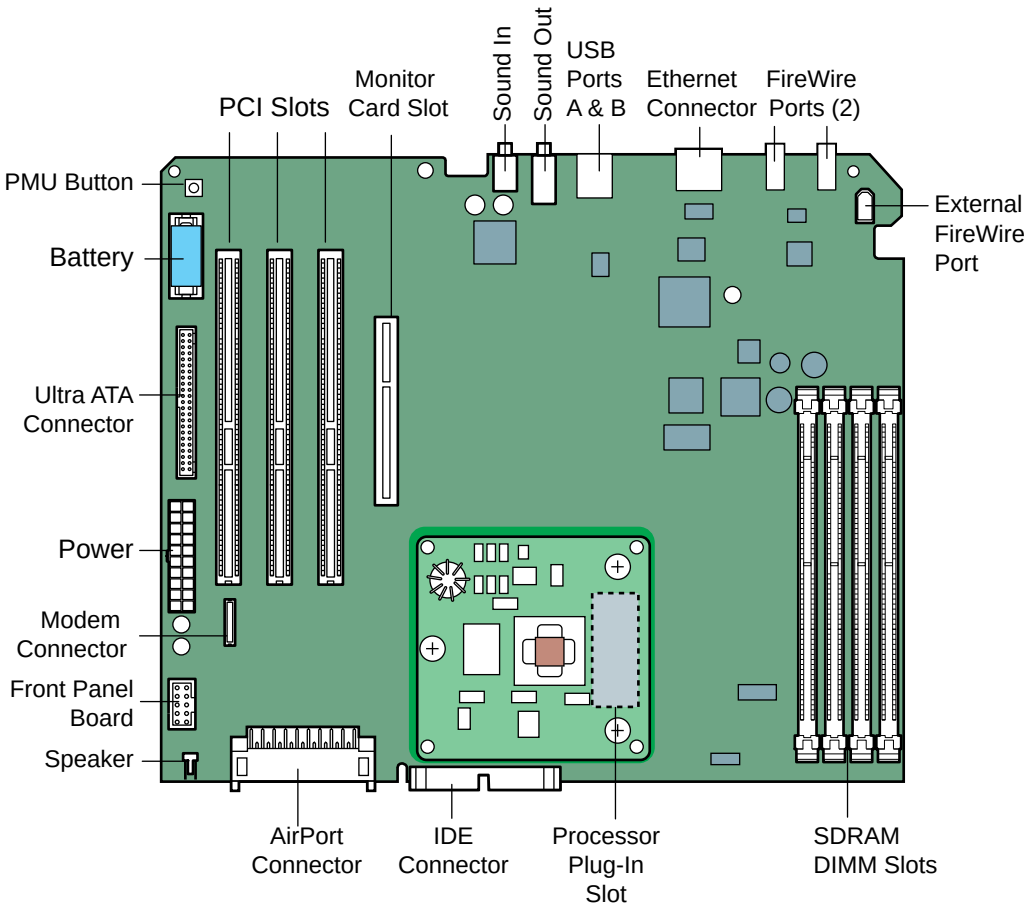
Front and Back Views, Power Mac G4 (AGP Graphics)



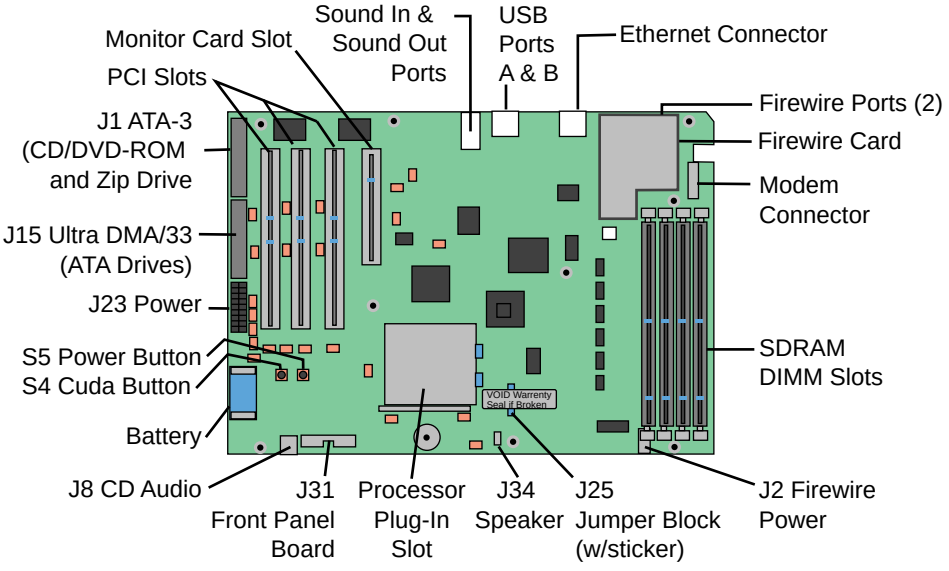
Internal Locator



Power Mac G4 (AGP Graphics) Logic Board Diagram



Power Macintosh G4 (PCI Graphics) Logic Board Diagram



New Technologies

While the Power Mac G4 family of computers all use the innovative PowerPC G4 processor, the Power Mac G4 (AGP Graphics) also includes a range of other new hardware and architectures. The following sections provide a quick overview of these technologies.

Logic Board

The Power Mac G4 (AGP Graphics) incorporates a new logic board design based on two key chipsets that perform over 80 percent of all computing tasks. By using these new chipsets, Apple is able to offer a more powerful architecture at a lower cost than a comparable computer that requires many different chipsets from different vendors.

Processor

The PowerPC G4 (also called Generation 4, or PowerPC 7400) provides increased processor performance through a number of enhancements and new technologies added to the CPU. It also ensures the same level of compatibility with current applications as the PowerPC G3.

The G4's powerful performance is based on its Velocity Engine, a kind of miniaturized supercomputer on a chip. The Velocity Engine can process data in 128-bit chunks, instead of the smaller 32-bit or 64-bit chunks used in traditional processors. In addition, it can perform four (in some cases eight) 32-bit floating-point calculations in a single cycle—two to four times faster than traditional processors.

AGP Video

The Power Mac G4 (AGP Graphics) comes with an AGP (Accelerated Graphics Port) video card installed. Older PCI video cards share data bandwidth with all installed PCI cards as well as internal I/O controllers such as IDE and SCSI. AGP technology allows the video card to be taken off that PCI bus and put onto it's own dedicated 133 MHz data bus directly to system memory. AGP also uses a new slot type allowing AGP cards to transfer data faster. Because of the new design, PCI video cards will not work in the AGP slot (although they can still be used in other PCI slots).

The Power Mac G4 AGP video card has the following specifications:

- ATI Rage 128 Pro graphics chipset
- 16 MB SDRAM
- VGA style connector for an analog video monitor

- DVI connector for a digital flat-panel display
- support for up to 1280 by 1024 pixels at 32 bpp on an analog monitor

Ultra ATA

The Power Mac G4 (AGP Graphics) is equipped with an internal Ultra ATA/66 bus. Ultra ATA/66 (also called Ultra DMA/66 or DMA/66) provides a performance increase of around 30 percent over the Ultra ATA/33 used in the Power Macintosh G3 (Blue and White) and Power Mac G4 (PCI Graphics). Even though the name indicates that there may be a 2x speed improvement, that increase is only when the internal disk transfers data from the disk to the disk drive controller (which then transfers data to the computer).

USB

The Power Mac G4 (AGP Graphics) includes a separate USB controller for each USB port. This means that each port supports up to 127 devices and 12 Mbps. With the Power Mac G4 (PCI Graphics), both USB ports support a total of 127 devices.

There are two new USB features available on Power Mac G4 (AGP and PCI Graphics) computers:

- USB audio devices - The Power Mac G4 now supports USB audio devices, including any device using the Isochronous USB protocol (mostly audio in nature). Supported devices include USB speakers, microphones, and other record/playback devices.
- USB bootable drives - The Power Mac G4 supports booting from USB devices. Third-party USB hard drives are also supported.

FireWire

The Power Mac G4 (AGP Graphics) is the first Apple product to include an internal FireWire port on the main logic board. This port can be used for internal FireWire hard drives when they become more readily available. The internal port is not limited to any specific use; it will connect any FireWire device.

PCI Expansion Slots

The Power Mac G4 (AGP Graphics) has three 33 MHz slots that can take 32- or 64- bit cards. You can also install 66 MHz cards into these 33 MHz slots; however, the card will run only at 33 MHz and may be less stable. (Contact the manufacturer of the card for more information.)

Important: Because of the new power management provided in the Power Mac G4 (AGP Graphics), customers who wish to use the new low power sleep mode will need to make sure any installed PCI card is compliant with the PCI 2.1 and Power Manager 2.0 specification. If the card is not compliant, the new sleep mode will not engage. Instead, the computer will go into the traditional sleep mode and give the user an error dialog when the computer wakes. Apple System Profiler provides some information about the unit's ability to engage low power sleep.

Audio Support

The Power Mac G4 (AGP Graphics) has added two new features to its audio support: spatializer virtual surround sound support and support for USB audio devices.

Spatializer (also called N-2-2) is a technology that enables playback of multi-channel audio from two conventional speakers or headphones, instead of the standard five (or more) speakers normally required for home theater systems. N-2-2 is a family of real-time processing algorithms that deliver multi-channel audio to the broadest possible population and expand the playback “sweet spot.”

The new Power Mac G4 support for USB audio devices covers peripherals that:

- provide audio input - for example, microphones or some midi input devices
- provide audio output - for example, speakers or some

midi output devices

- use the USB Isochronous protocol - for example, some conferencing cameras that rely on Isochronous protocols for better quality

To use any of these devices, customers need only plug the device in and make sure it is selected in the Sound control panel (Input for microphone, Output for speakers).

AirPort Wireless Networking

The Power Mac G4 (AGP Graphics) supports wireless networking using the optional AirPort wireless networking card. To participate in wireless networking, a system must have the following:

- internal radio antenna - The radio antenna necessary for wireless networking is already installed inside the Power Mac G4 (AGP Graphics) computer.
- AirPort card - This small card (about the size and shape of a credit card) is installed in the wireless networking slot inside the computer. Users can purchase cards from an Apple-authorized dealer or from The Apple Store.

In addition, to access another computer network or Internet service provider, users need to connect a wireless access device to their network. This access device can be an AirPort Base Station (a standalone hardware product with a wireless

antenna and network/modem connections) or an AirPort Software Base Station (software running on a wireless-equipped computer).

Repair Strategy

Service Power Mac G4 computers through module exchange and parts replacement.

Ordering

Apple-authorized 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 (U.S. only) or ARIS (Canada only) system and refer to the Power Mac G4 Service Price Pages.

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

USA Ordering

U.S. 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 U.S. inquiries, please call Service Provider Support (800-919-2775, option #1).

Canadian Ordering

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

Warranty/AppleCare/ARIS

U.S. Only

Power Mac G4 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. For pricing information, refer to Service Price Pages.

Canada Only

Power Mac G4 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. For pricing information, refer to Service Price Pages.

Specifications

Power Mac G4/ Macintosh Server G4

Introduction

Specifications information for this product can be found in the Spec Database, which you can access at Service Source Online (http://service.info.apple.com) or on Service Source CD.

Spec Database at Service Source Online

From the Service Source Online home page, click Troubleshoot and Repair to access the main repair procedures page. Then click either Apple Spec in the navigation table in the upper right corner of the page, or click Apple Spec Database from the list of reference tools below.

Spec Database on Service Source CD

Open the CD and double-click the Apple Spec Database alias located at the top level of the CD.

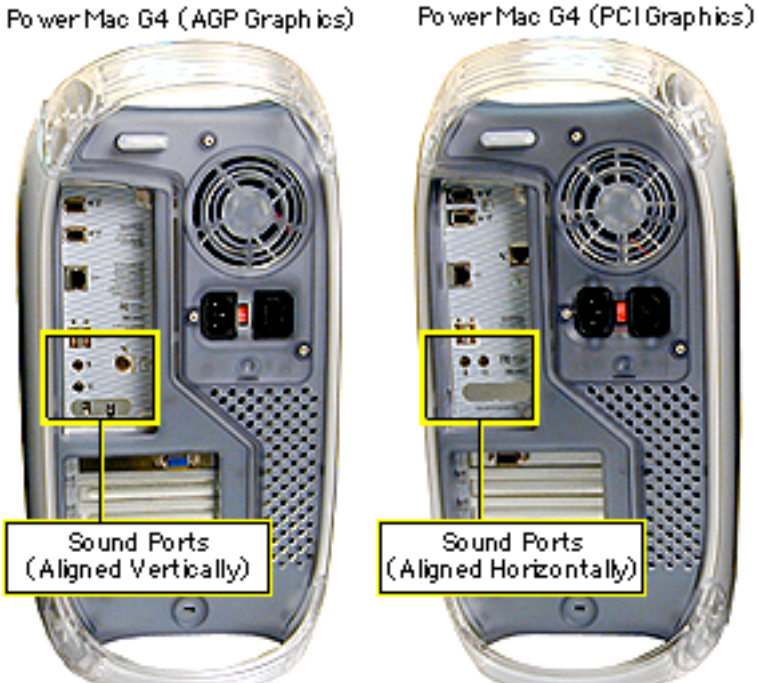
Take Apart

Power Mac G4/ Macintosh Server G4

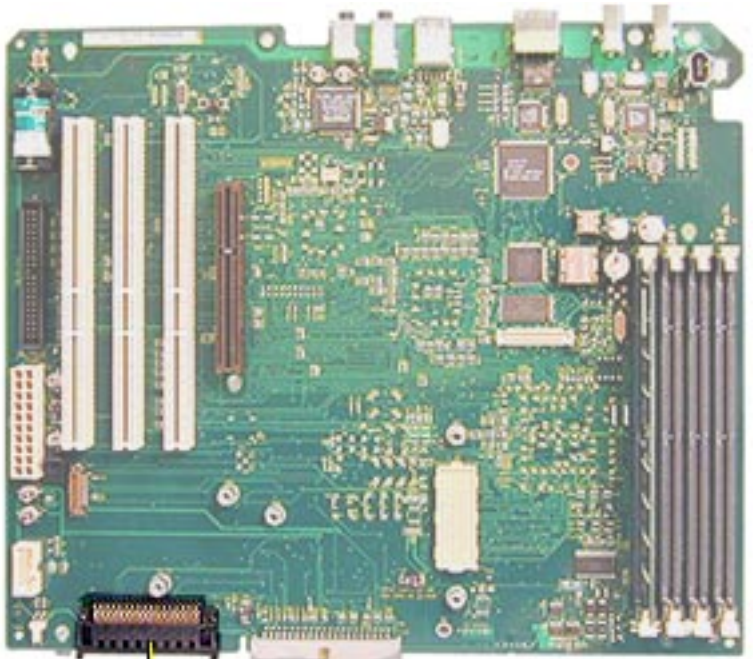
Power Mac G4: AGP/PCI Graphics

There are two different versions of Power Mac G4 computers that support two different types of graphics cards: AGP and PCI. You can easily identify the two versions by any of the following methods.

If the machine is running, you can check Apple System Profiler for the “Model name”: Power Mac G4 (AGP Graphics) or Power Mac G4 (PCI Graphics).



You can also identify the versions by checking the I/O panel at the back of the computer. The sound ports align vertically on Power Mac G4 (AGP Graphics) computers and horizontally on Power Mac G4 (PCI Graphics) computers.



You can further identify the versions by their logic boards. There is an AirPort connector at J32 on Power Mac G4 (AGP Graphics) logic boards; Power Mac G4 (PCI Graphics) boards do not include this connector.

Note: The following procedures apply to both AGP and PCI computers, except where a specific version is indicated. Procedures differ between versions for the logic board, processor module, modem, FireWire board, and I/O panel.

Tools

- Flatblade screwdriver
- Phillips screwdriver
- Allen wrench (2.5 mm) to remove the power supply, side panels, top and rear handles, and front and rear supports
- Jeweler's screwdriver to remove the I/O panel cover and antenna
- Needlenose pliers to remove the right and left side panels
- ESD mat

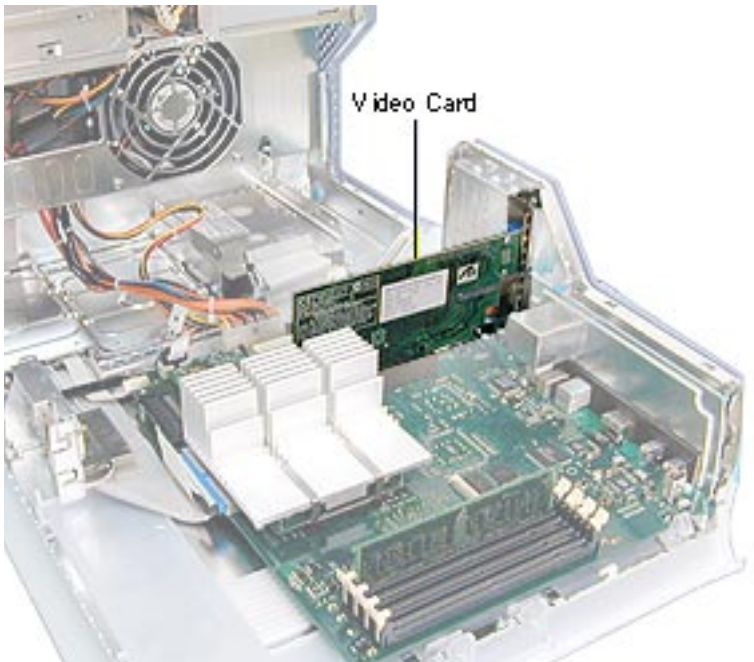
Opening the Computer

No preliminary steps are required before you begin this procedure.

1 Lift the latch to unlock the right side access panel.

Note: Make sure the security bar is in the unlock position.

2 Gently lower the side panel onto a clean, ESD-safe mat to avoid scratching the case. Lower the side panel until it lies flat.

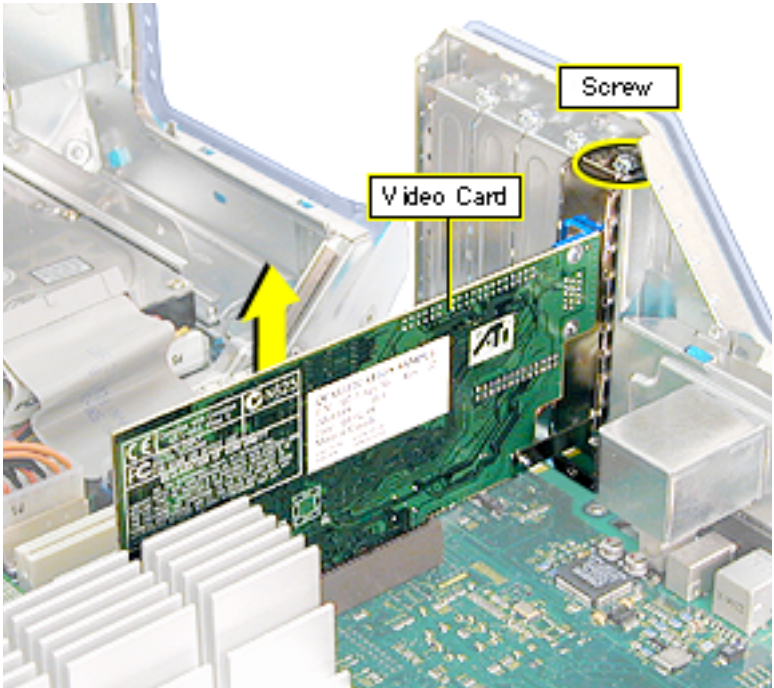


Video Card

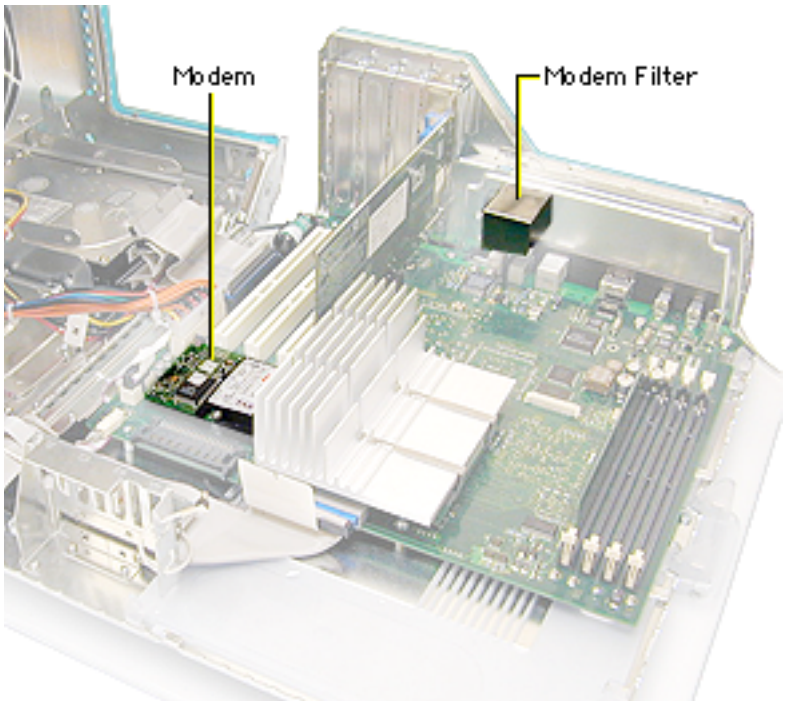
Before you begin, do the following:

- Open the side access panel.
- Remove the external video cable.

Note: The video card is always installed in slot 1 (short slot). The DVD decoder module is used only in Power Mac G4 (PCI Graphics) computers.



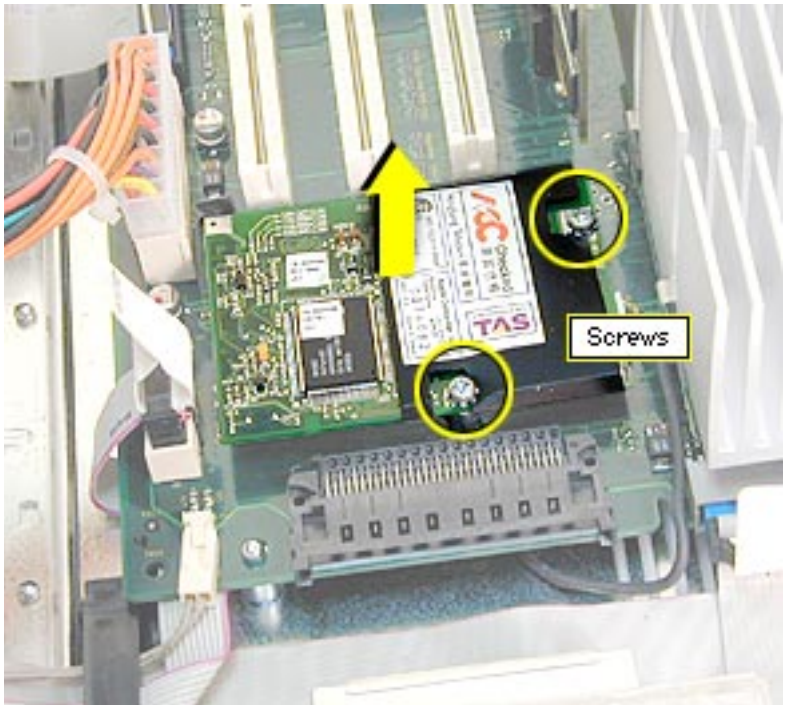
1. Remove the video card mounting screw.
2. Gently lift up on the video card to remove it from slot 1.
3. Power Mac G4 (PCI Graphics): If you are replacing the DVD decoder module, remove it by pulling it straight off the card.



Modem, Power Mac G4 (AGP Graphics)

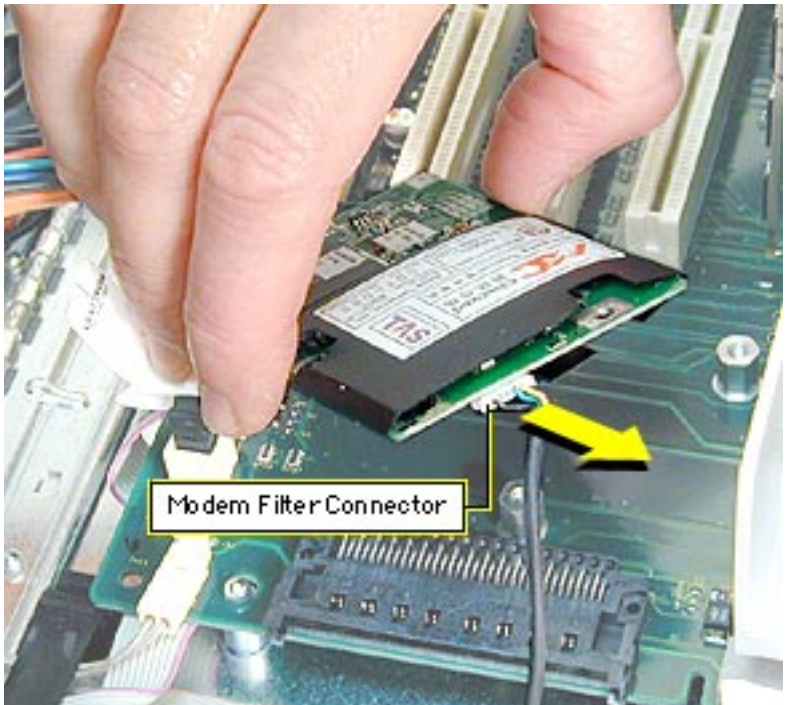
Note: The Power Mac G4 (AGP Graphics) modem requires a modem filter; the two are separate parts. To remove the modem, you do not need to remove the modem filter. For instructions on removing the modem filter, see the following Take Apart topic.

Before you begin, open the side access panel.



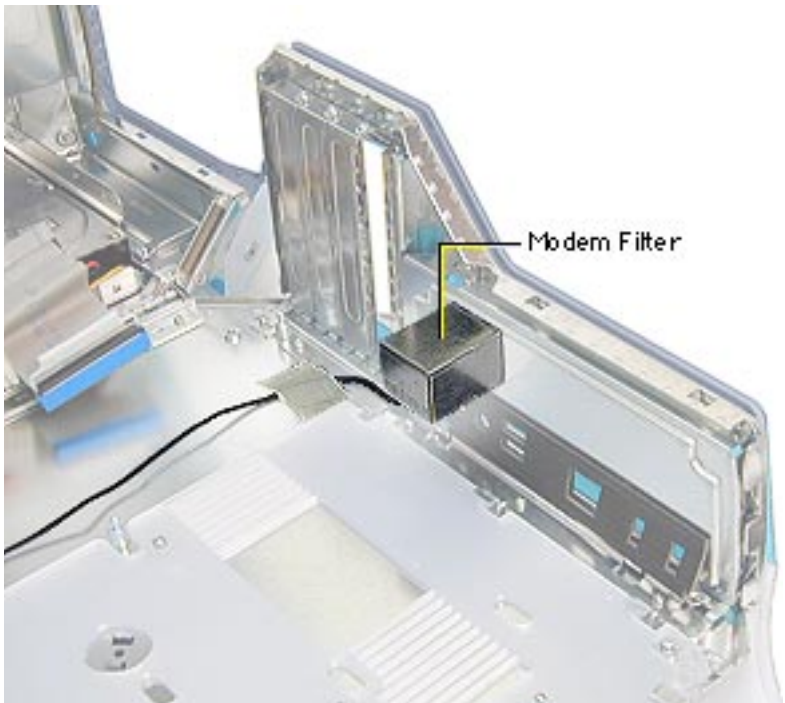
1 Remove the two modem mounting screws.

2 Lift the modem straight up to disconnect it from the logic board.



3 Disconnect the modem filter cable from the modem.

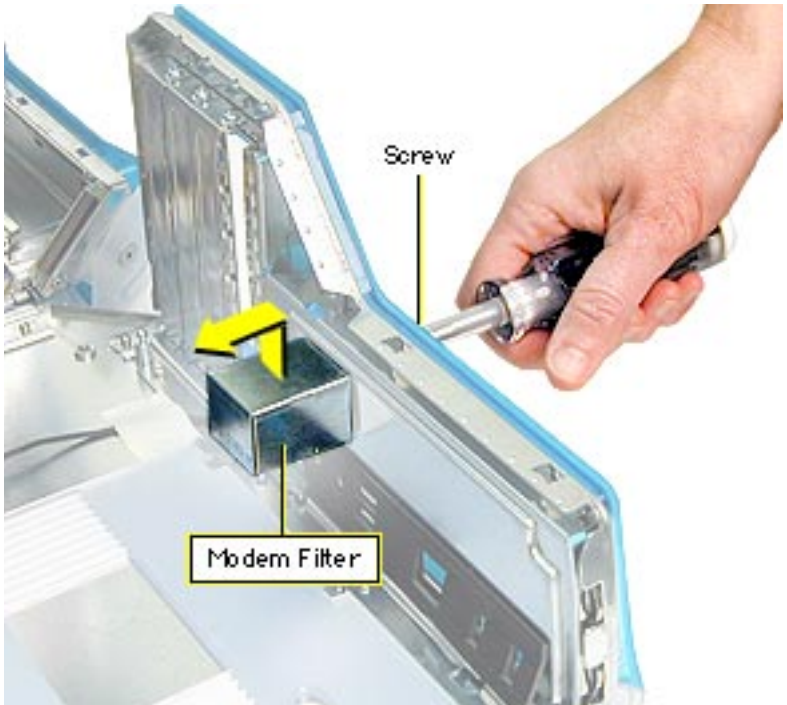
4 Remove the modem from the computer.



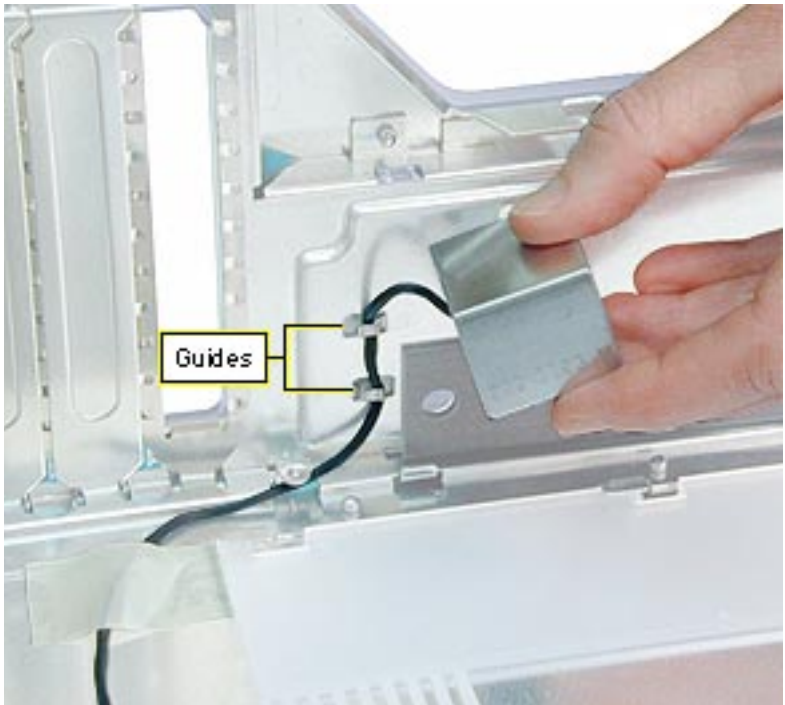
Modem Filter, Power Mac G4 (AGP Graphics)

Before you begin, do the following:

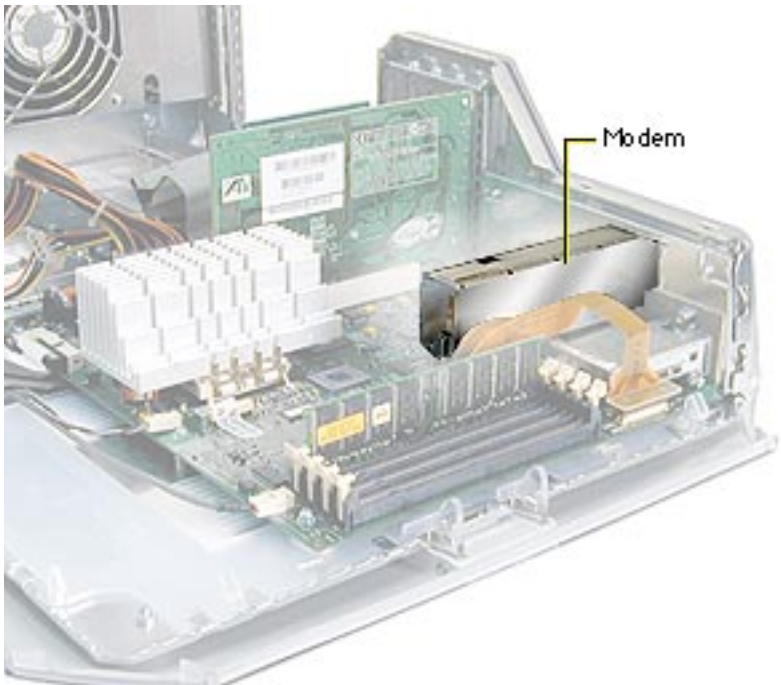
- Open the side access panel.
- Remove the logic board.



1 Remove the screw that secures the modem filter to the I/O panel.

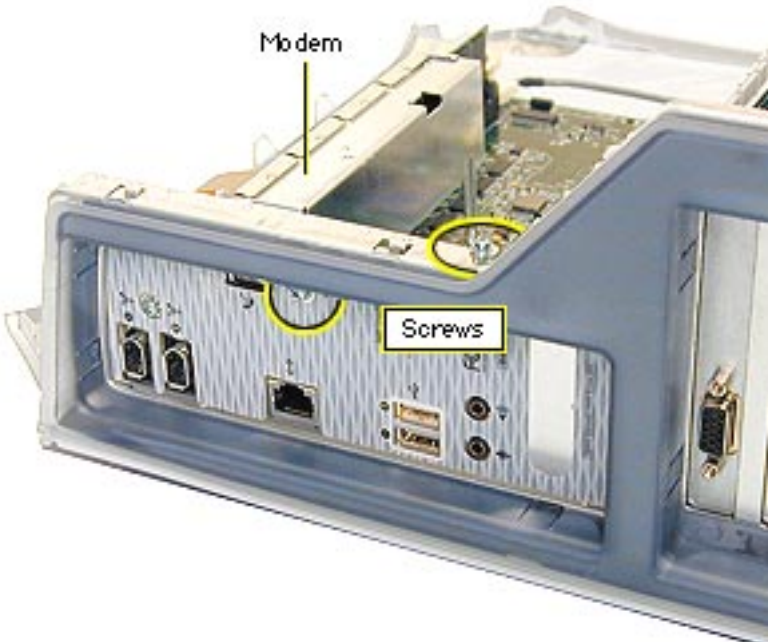


2 Free the modem filter cable from the chassis guides and remove the modem filter from the computer.



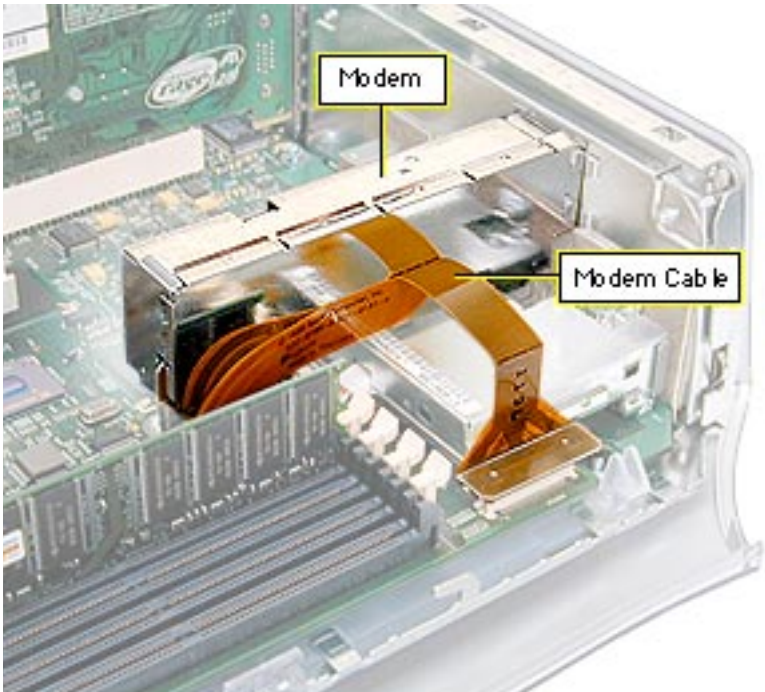
Modem, Power Mac G4 (PCI Graphics)

Before you begin, open the side access panel.



1 Remove the screw (located next to the modem port) that secures the modem to the I/O panel.

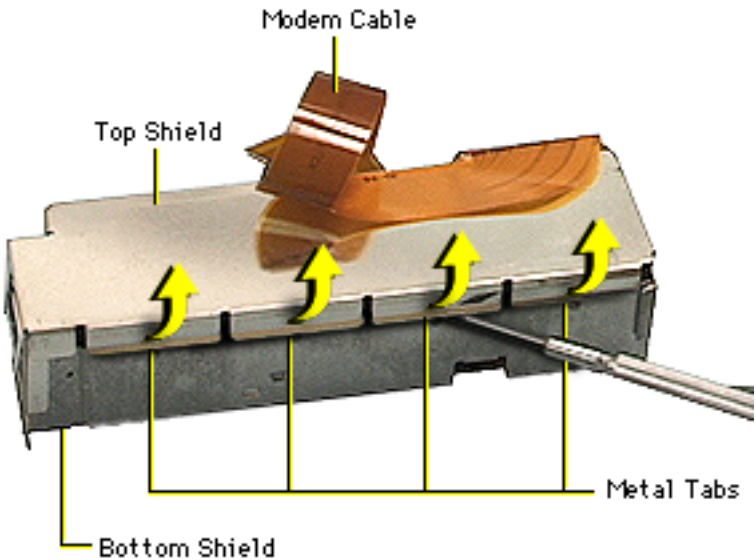
2 Remove the screw that secures the modem leg standoff to the logic board.



3 Carefully disconnect the flexible modem cable from the logic board.
Important: The modem cable is very fragile.

4 Gently lift up the modem to remove it from the logic board.

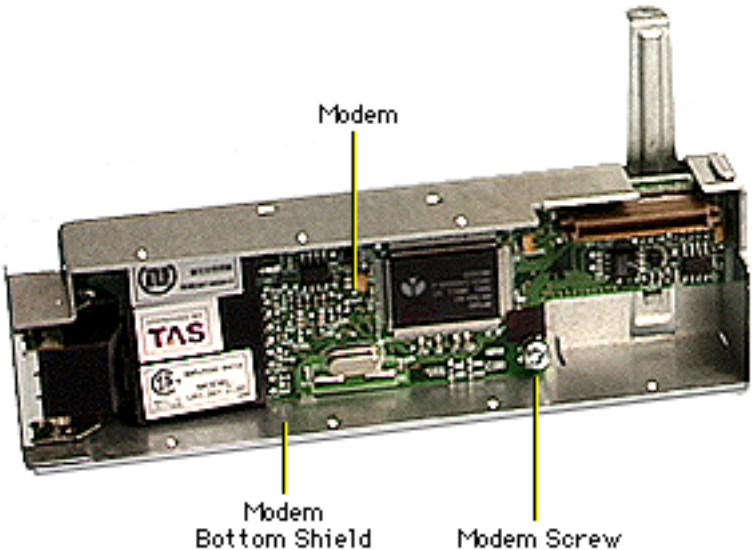
Note: If you are replacing the modem, continue with the Take Apart procedures to remove the modem from the bottom modem shield.

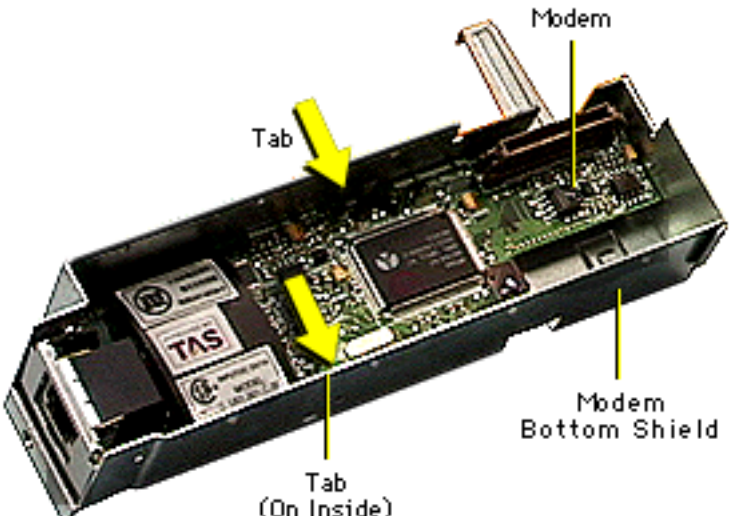


5 With a jeweler's screwdriver, pry up the metal tabs on the top shield.

6 Carefully disconnect the flexible modem cable from the modem board.

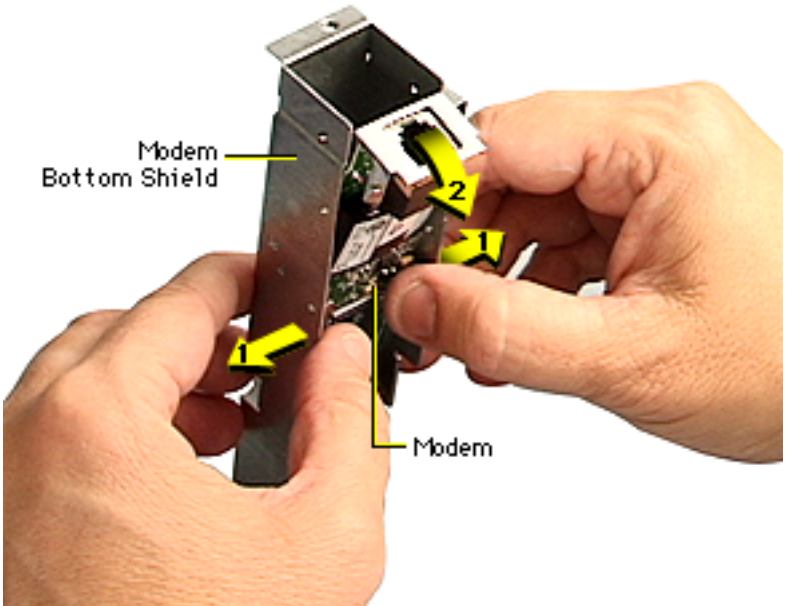
7 Remove the screw securing the modem to the bottom shield.





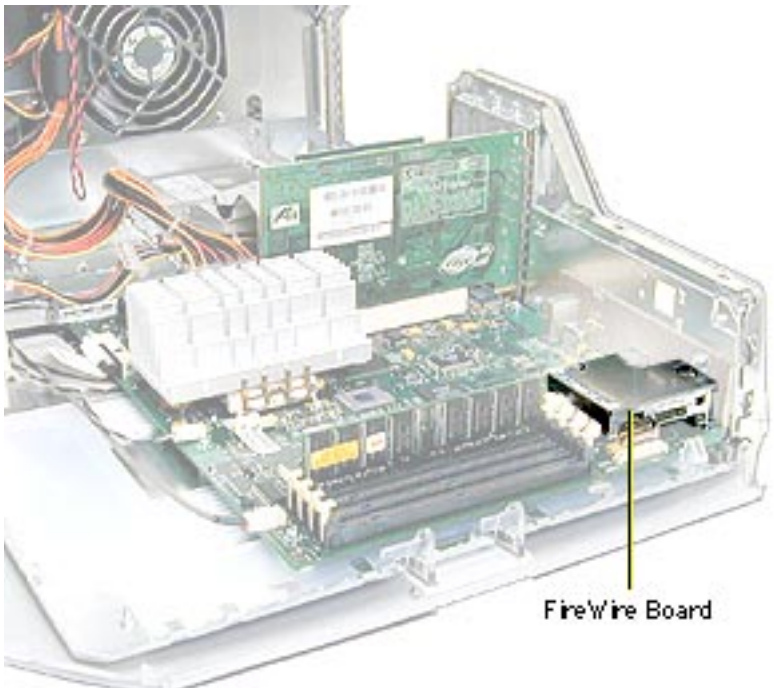
8 **Note:** There are two tiny metal tabs on the inside of the bottom shield. The modem rests on these tabs so it does not make contact with the bottom shield.

With a needlenose pliers, pinch the tiny metal tabs flat so the modem board can be removed from the bottom shield.



9 Carefully spread the sides of the bottom shield out just enough so the modem clears the tabs, and starts to fall out of the bottom shield.

10 Carefully remove the modem from the bottom shield.

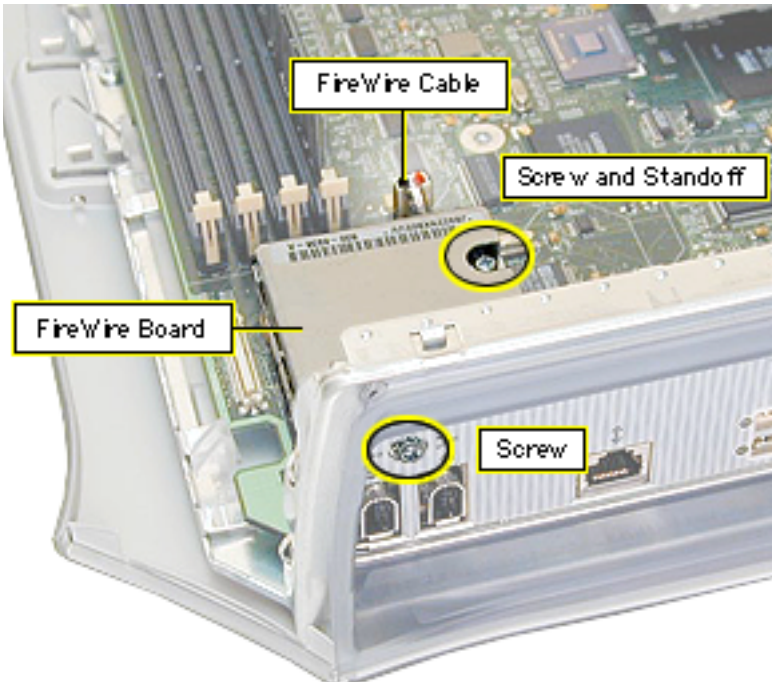


FireWire Board, Power Mac G4 (PCI Graphics)

Note: The FireWire board is used only in Power Mac G4 (PCI Graphics) computers. Power Mac G4 (AGP Graphics) computers have FireWire built into the logic board.

Before you begin, do the following:

- Open the side access panel.
- Remove the modem.

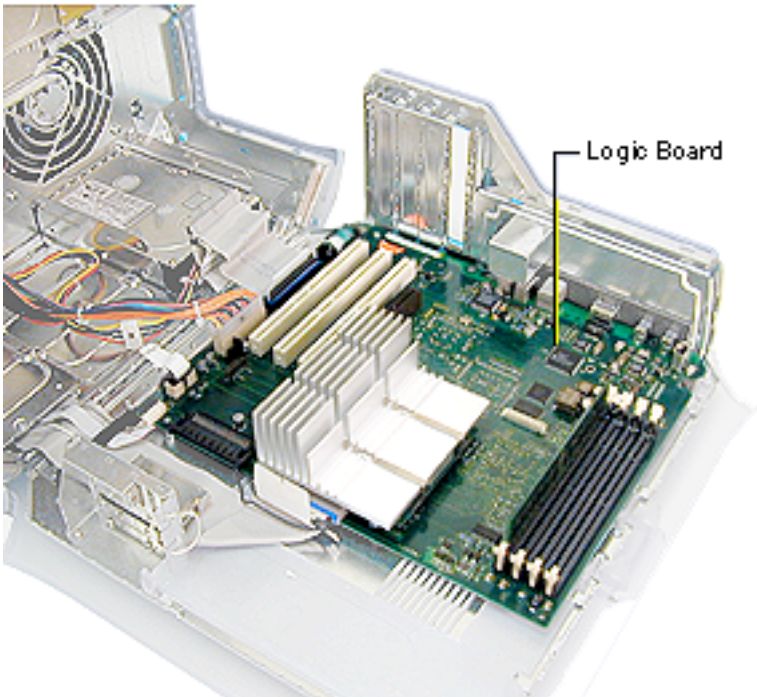


1 Remove the screw securing the FireWire board to the I/O panel.

2 Remove the screw that secures the FireWire board to the metal standoff.

3 Disconnect the FireWire cable, the short 3-pin cable from the back of the FireWire board or logic board.

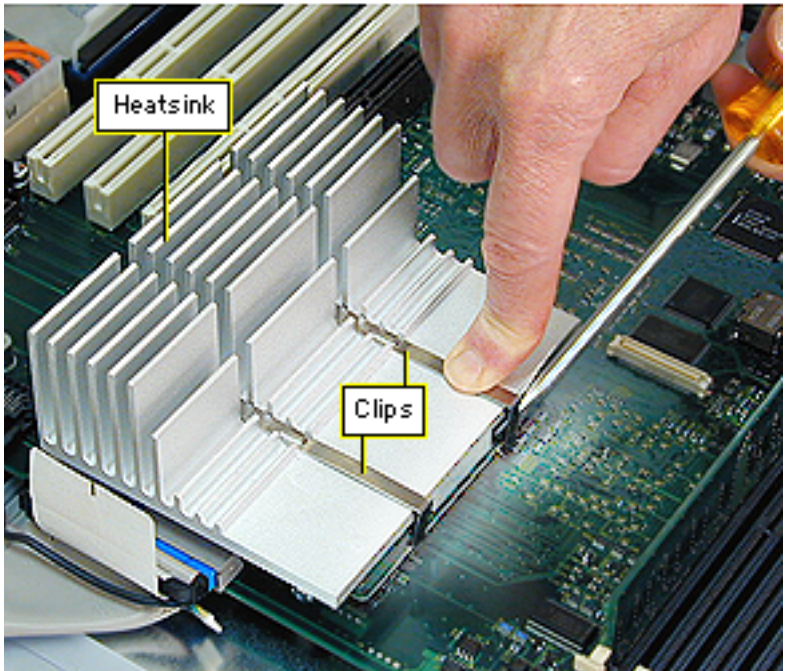
4 Gently lift up the FireWire board to remove it from the logic board connector.



Logic Board, Power Mac G4 (AGP Graphics)

Before you begin, open the side access panel and remove the following:

- video card
- PCI cards (if present)
- modem (if present)
- AirPort card (if present)

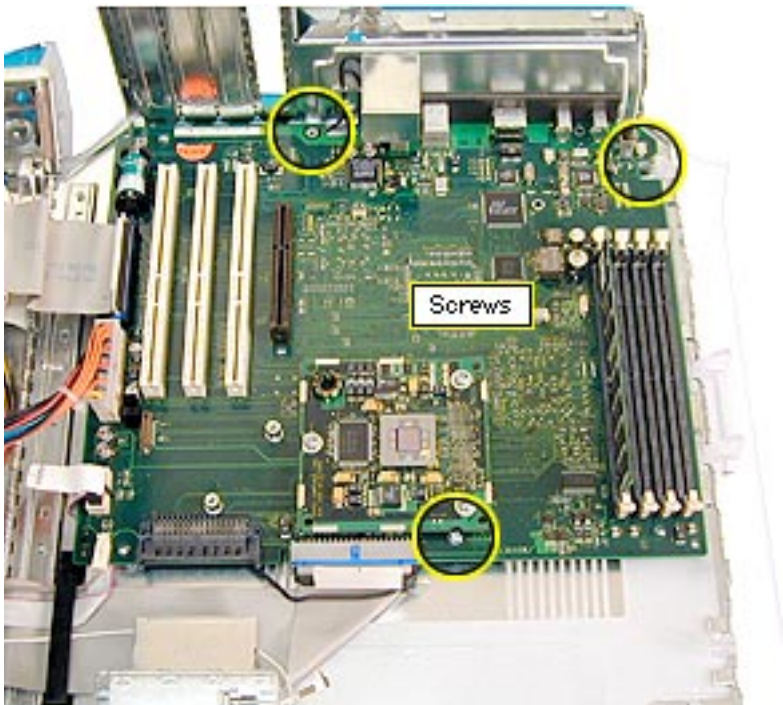


Warning: The heatsink may be hot to the touch.

1 While pressing down on the top of the heatsink clip, use a small flatblade screwdriver to lift up and out on the front tab of the clip to release it.

2 Remove the heatsink clip and lift the heatsink off the processor module.

Caution: When removing the heatsink, be careful not to bend the processor module beneath it.



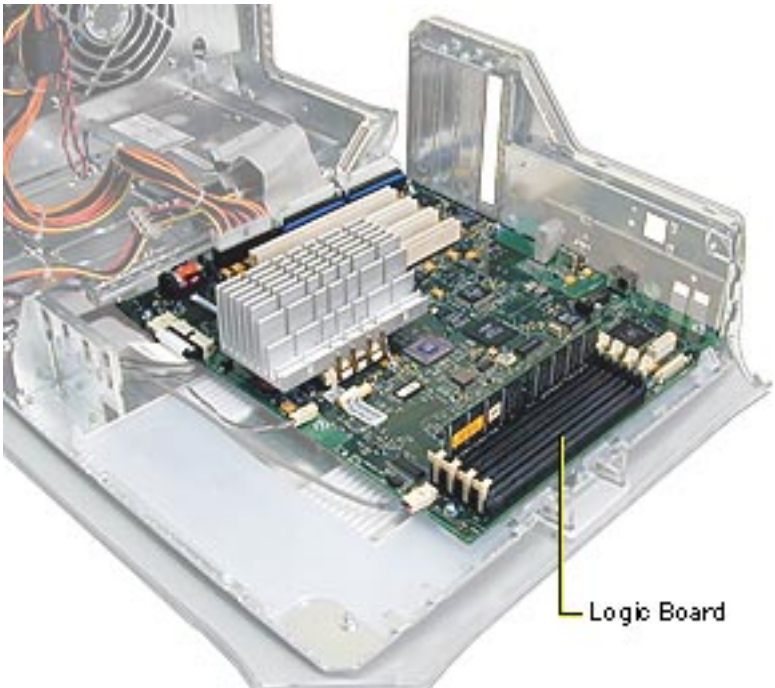
3 Disconnect all cables from the logic board.

4 Using a Phillips screwdriver, remove the logic board mounting screws.

5 Slide the logic board away from the I/O panel to clear the board guides.

6 Tilt the logic board so that the ports clear the openings in the I/O panel and lift the board out of the computer.

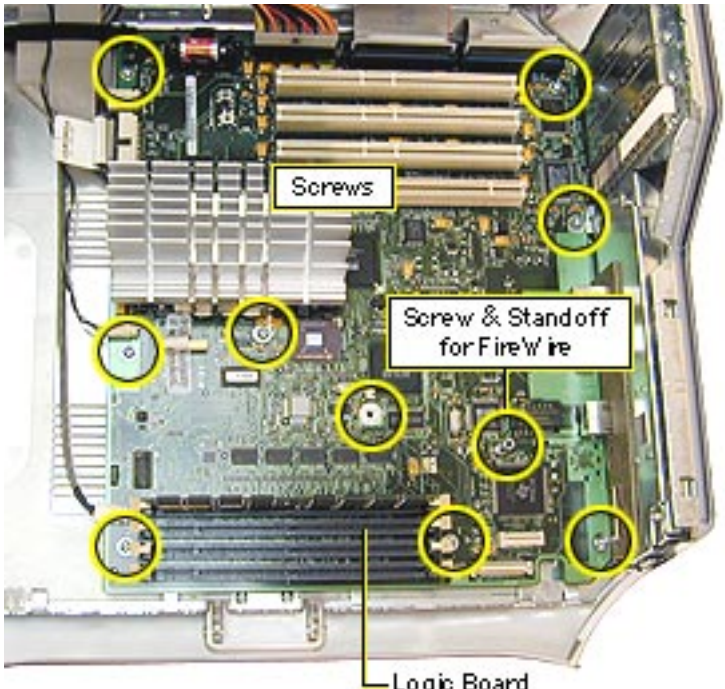
Important: If you are replacing the logic board, you must transfer the processor module, video card, PCI cards, AirPort card, SDRAM, and modem from the original logic board to the replacement board.



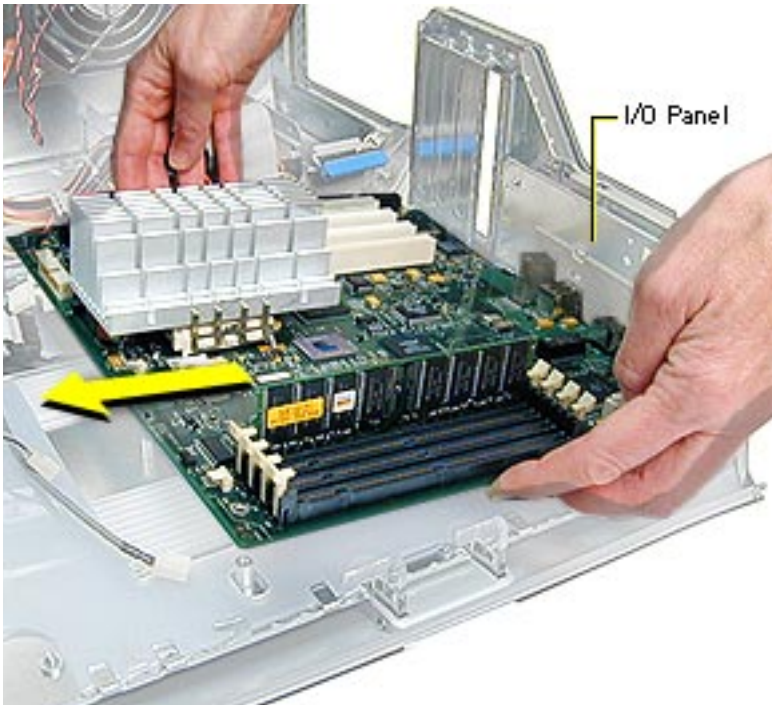
Logic Board, Power Mac G4 (PCI Graphics)

Before you begin, open the side access panel and remove the following:

- video card
- PCI cards (if present)
- modem (if present)
- FireWire board



1. Disconnect all cables from the logic board.
2. Using a Phillips screwdriver, remove the logic board mounting screws.
3. Remove the standoff that attaches to the FireWire board.

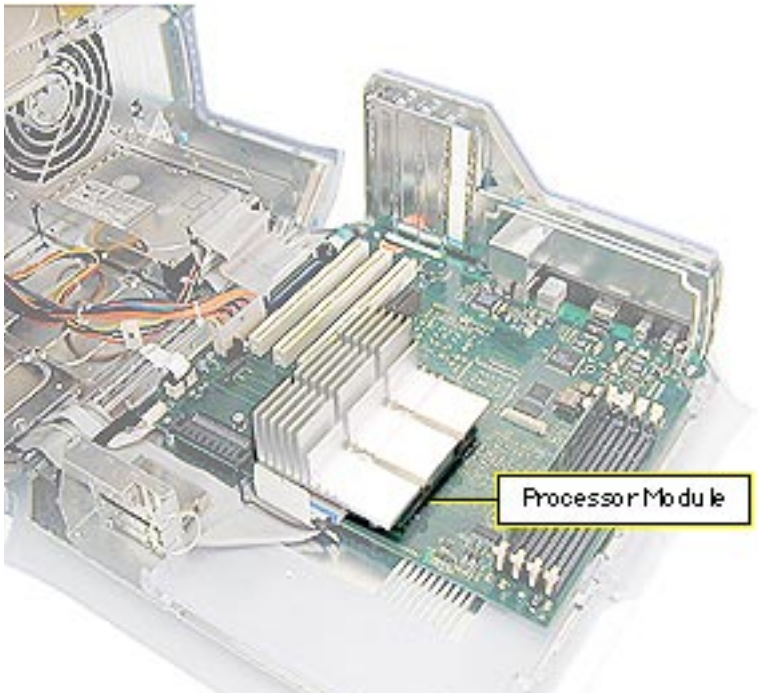


4 Tilt the logic board so that the ports clear the openings in the I/O panel.

5 Lift the board out of the computer.

Important: If you are replacing the logic board, you must transfer the processor module, jumper, video card, PCI cards, SDRAM, FireWire board, and modem from the original logic board to the replacement board. You must also cover the processor jumper with a new warranty

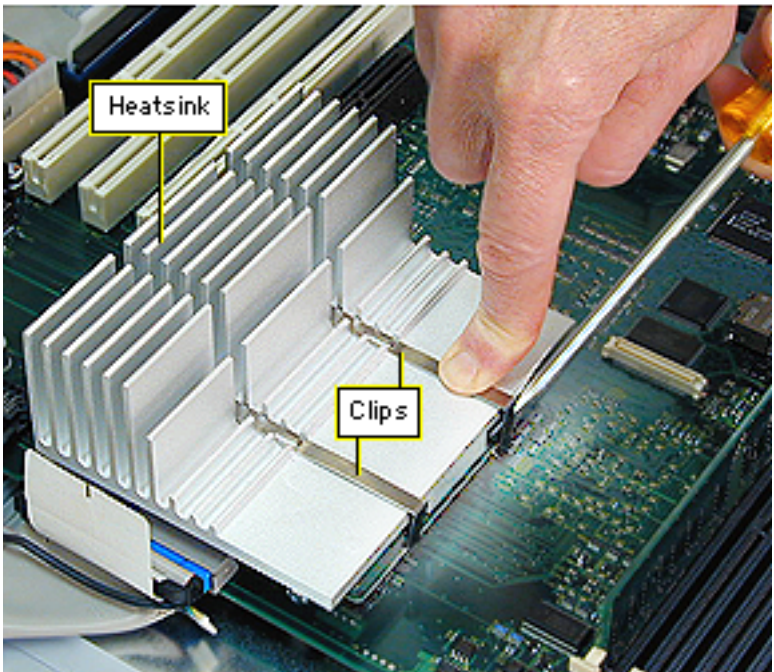
sticker, which comes with the replacement logic board. For more information, see the Take Apart instructions for “Processor Module, Power Mac G4 (PCI Graphics).”



Processor Module, Power Mac G4 (AGP Graphics)

Before you begin, open the side access panel.

Note: Unlike the Power Mac G4 (PCI Graphics) processor module, the Power Mac G4 (AGP Graphics) processor does not use a jumper block.

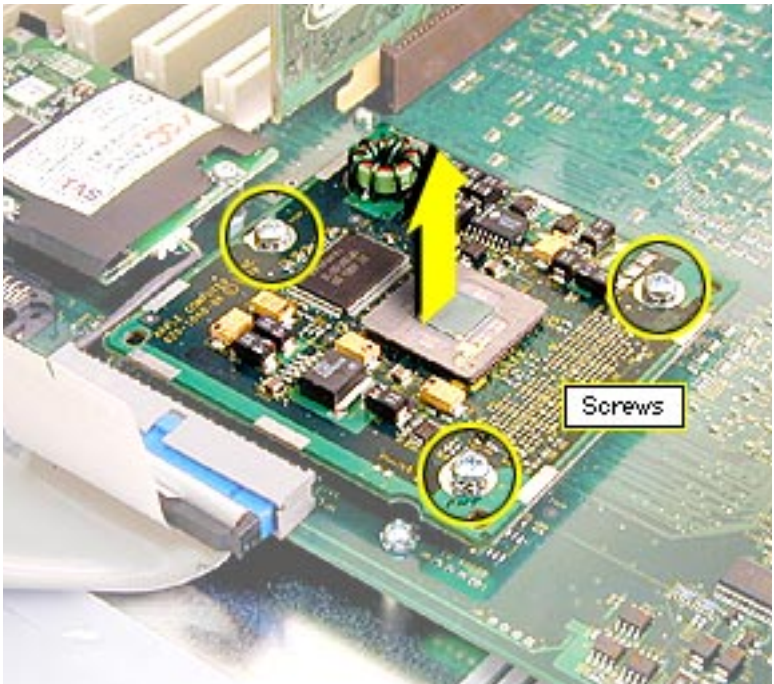


Warning: The heatsink may be hot to the touch.

1 While pressing down on the top of the heatsink clip, use a small flatblade screwdriver to lift up and out on the front tab of the clip to release it.

2 Remove the heatsink clip and lift the heatsink off the processor module.

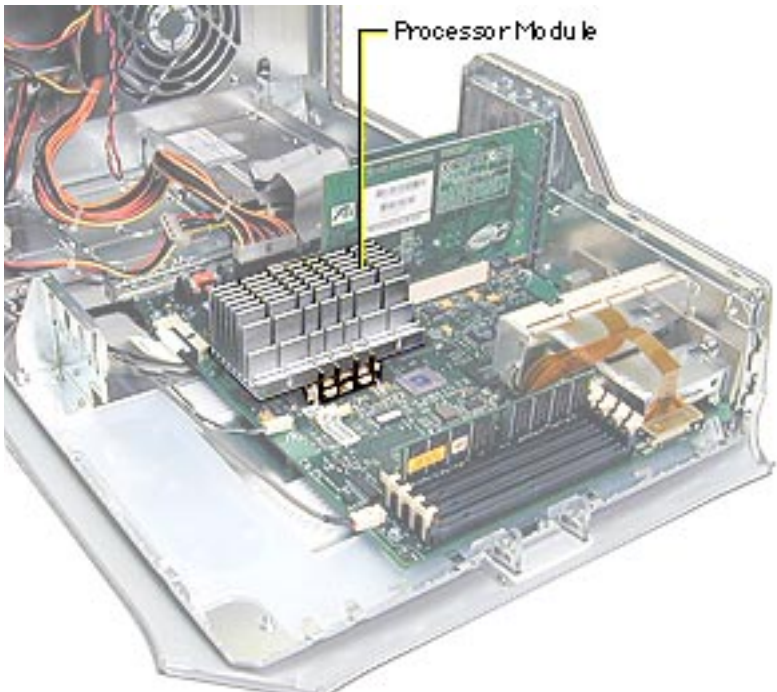
Caution: When removing the heatsink, be careful not to bend the processor module beneath it.



3 Remove the processor module mounting screws.

4 Holding the processor by the edges, gently lift it straight up to disconnect it from the logic board.

Caution: Be careful not to bend the pins underneath the module.

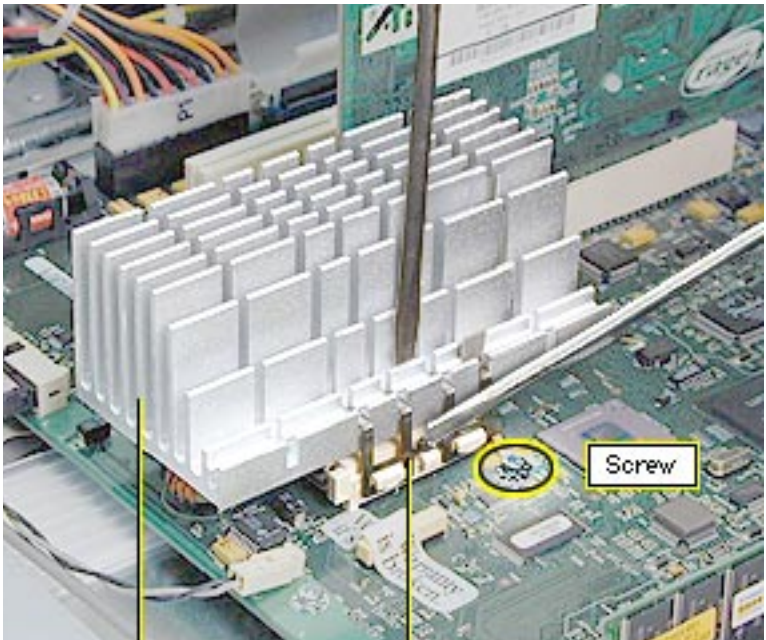


Processor Module, Power Mac G4 (PCI Graphics)

Before you begin, open the side access panel.

Note: The Power Mac G4 (PCI Graphics) processor requires a jumper installed at J25 on the logic board.

Note: While the heatsink in your unit may look different from the one pictured here, the procedure for removing it is the same.



1 Remove the screw that attaches the heatsink ground wire to the logic board.

Warning: The heatsink may be hot to the touch.

2 While pressing down on the top of the heatsink clip, use a small flatblade screwdriver to release the clip by lifting up and out on its center front tab.

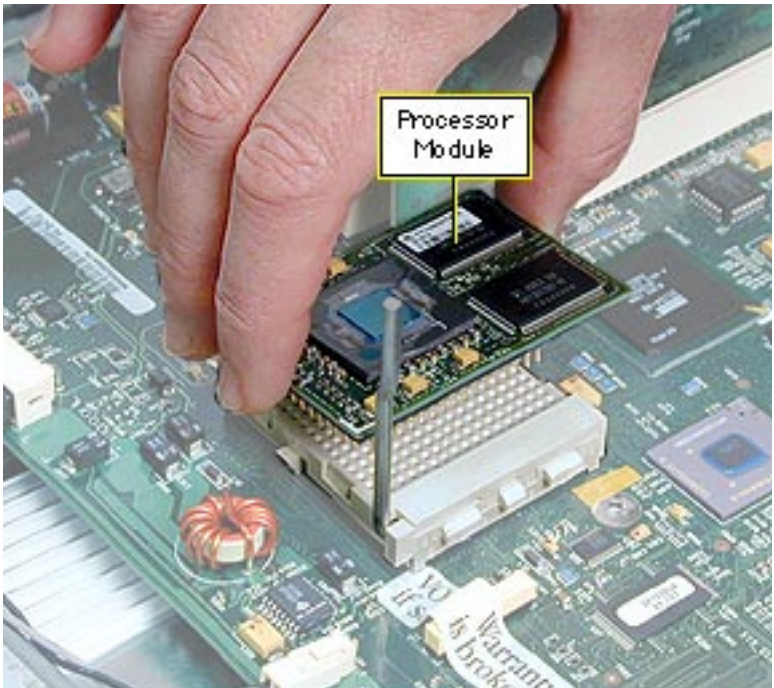
3 Remove the heatsink clip and lift the heatsink off the processor module.

4 Lift the lever to release the processor module.

5 Holding the processor by the edges, gently lift it straight up to disconnect it from the logic board.

Caution: Be careful not to bend the pins underneath the module.

Important: If you are only replacing the processor module, stop here. If, however, you are removing the processor module to replace the logic board, continue with the next page.

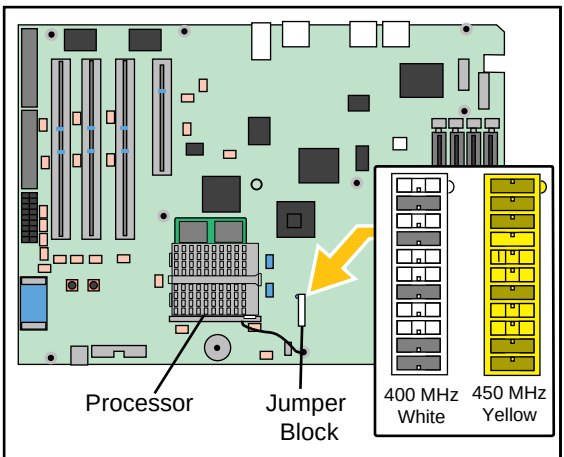


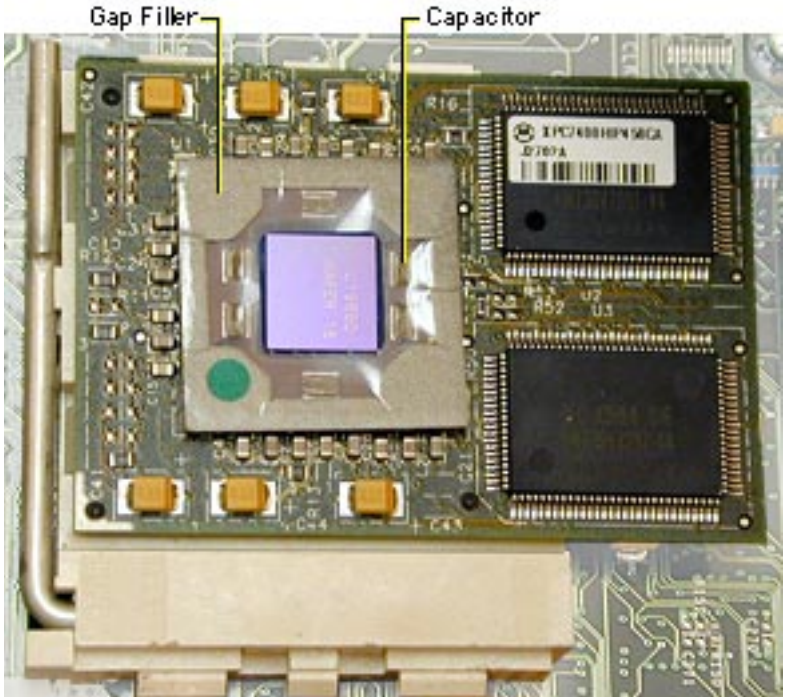
6 Remove the warranty sticker and jumper block only if you are replacing the logic board.

Yellow jumper:450 MHz
White jumper: 400 MHz

Caution: When removing the jumper, be sure not to leave its inner metal clips on the old jumper connector. If the clips are left behind, install a new jumper on the new board. If you use a jumper without clips, or improperly install the jumper, the unit could fail to start up.

7 Install the jumper block with the gold connector pins facing toward the board. Be sure the pins are covered as shown.



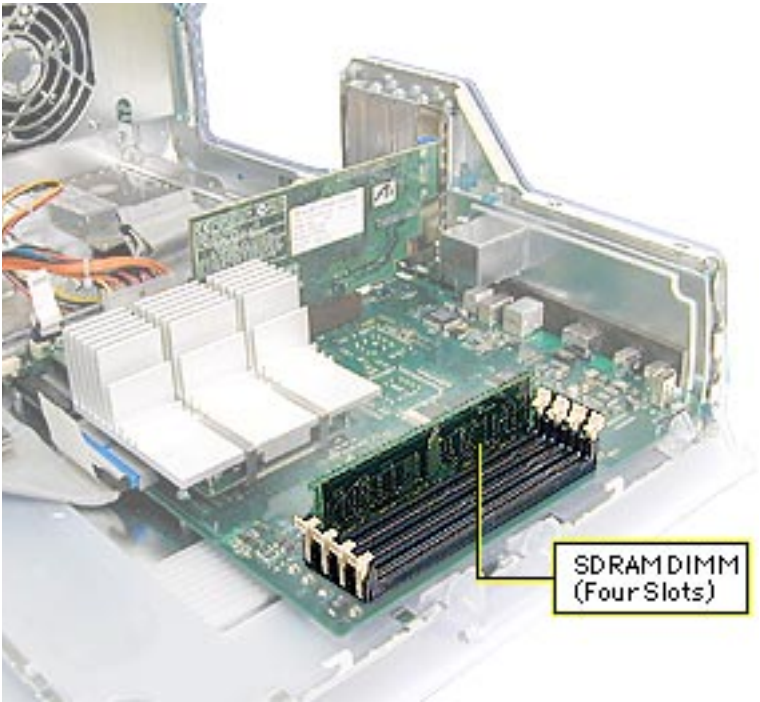


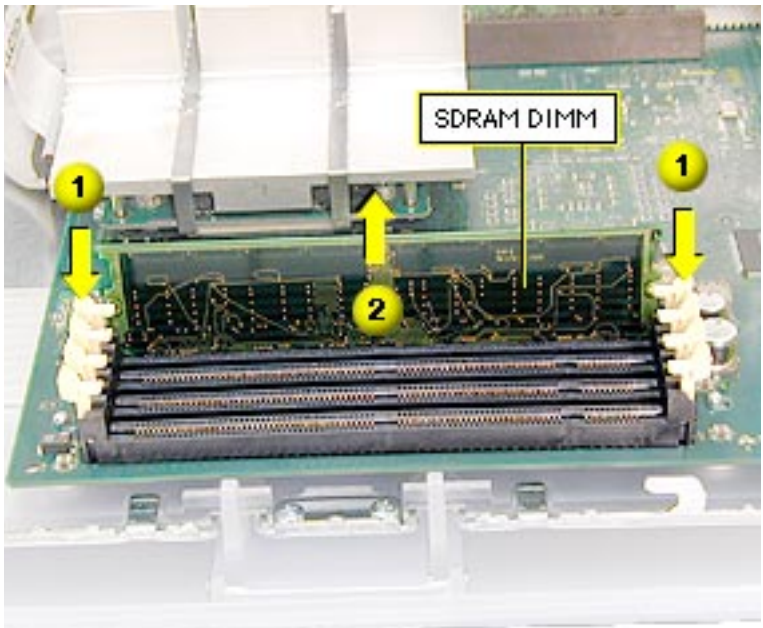
Replacement Note: Position the processor module over the slot, seat it evenly, and press down gently on the module to install it. If you are installing a new processor, install a gap filler on it as illustrated.

Caution: On modules with capacitors, make sure all capacitors show through the opening in the gap filler.

SDRAM DIMM

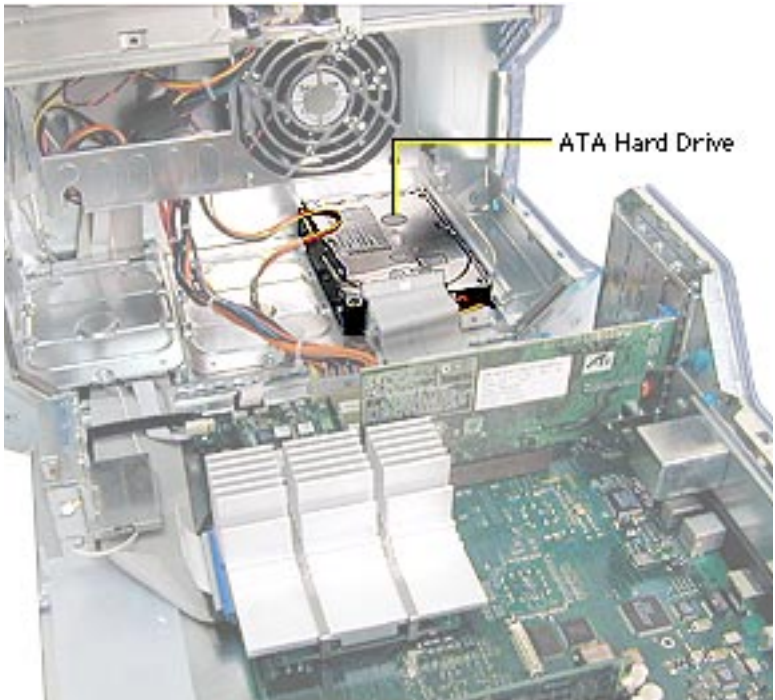
Before you begin, open the side access panel.





1 Push down on the connector clips to unlock the DIMM.

2 Lift the DIMM out of the slot.



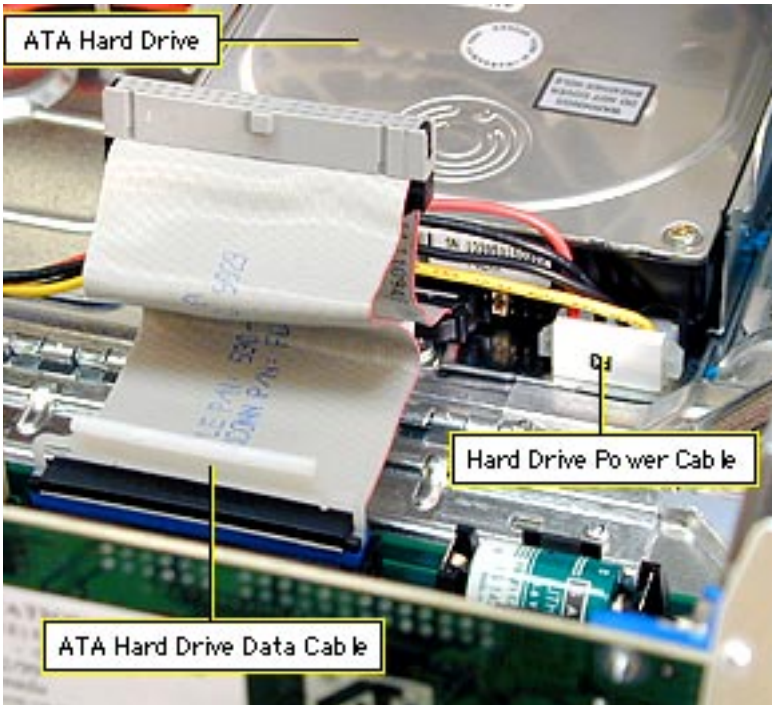
Hard Drive, IDE / ATA

Before you begin, open the side access panel.

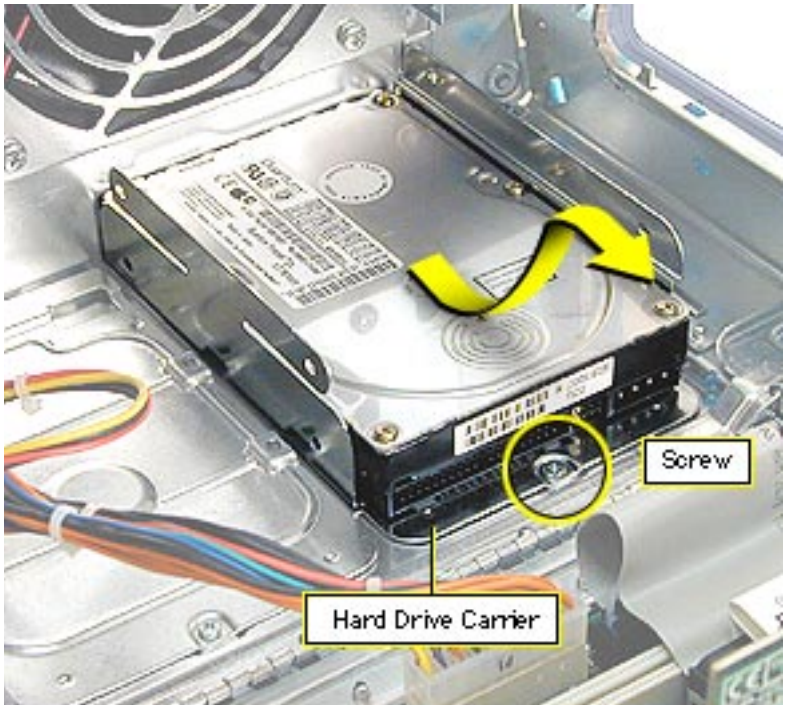
Note: The Power Mac G4 supports a total of three internal hard drives. It can accommodate up to two Ultra ATA drives in drive bay 3, near the rear of the computer. ATA drives are not supported in drive bay 1 or 2.

Note: You must assign a SCSI ID number to every

additional hard drive and the number must not conflict with the ID number already assigned to another drive. One factory-installed drive has ID 0; a second factory-installed drive has ID 1.



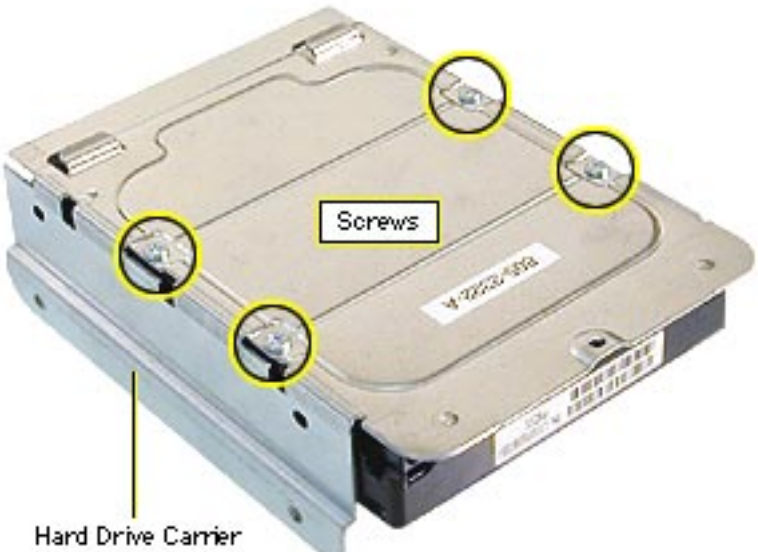
1 Disconnect the Ultra ATA hard drive data cable and the hard drive power cable (P3) from the hard drive.



2 Remove the hard drive carrier mounting screw.

3 Pull the drive carrier back and lift up at an angle to release the carrier tabs from the slots in the chassis.

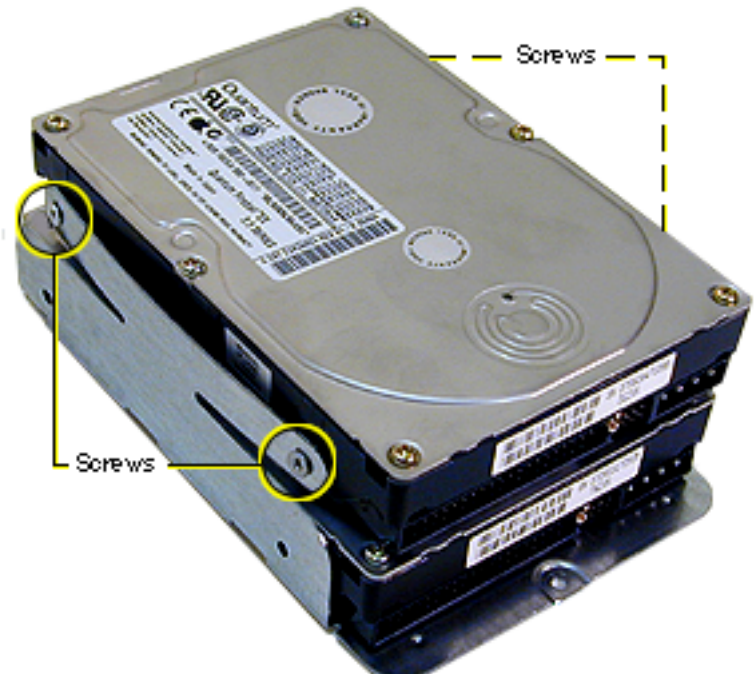
4 Remove the carrier and drive from the computer.



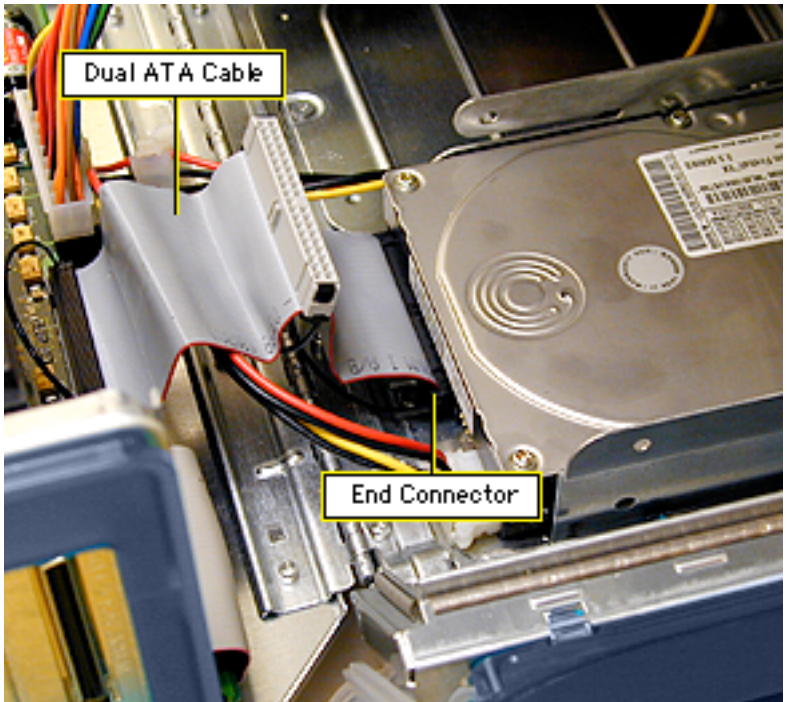
5 If you're returning the drive to Apple, remove the screws that mount the hard drive to the carrier.

6 Lift the hard drive from the carrier.

Note: Drives must be returned to Apple in Apple packaging, without cables or carriers. Failure to comply with this requirement may result in a packaging noncompliance charge. For more information, refer to the service parts database.



Replacement Note: To install two drives in the U-shaped carrier, install the first drive in the bottom of the carrier. Then place the second drive in the carrier's upper bay and attach screws through the sides of the carrier into the sides of the drive. Note that tightening screws on the left side of the carrier bends the arms of the carrier into the drive, holding it securely.



Replacement Note: When reconnecting a dual-drive ATA cable to drives installed in a U-shaped carrier, be sure to attach the end connector to the drive in the bottom of the carrier.

Hard Drive, Ultra2 LVD SCSI

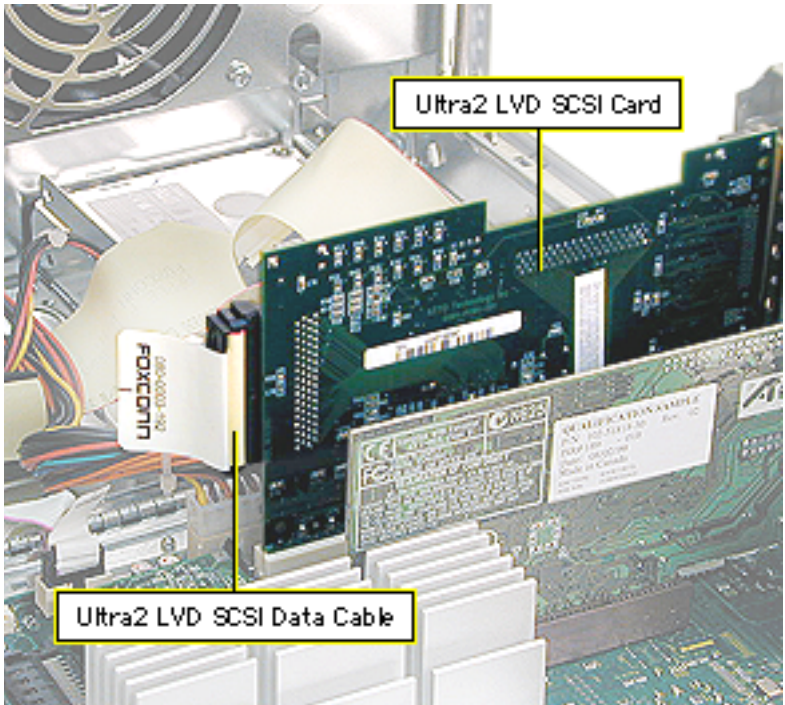
Before you begin, open the right side access panel.

Note: This computer supports a total of three internal hard drives. If a unit has at least one internal Ultra2 LVD SCSI drive, an Ultra2 LVD SCSI PCI card, and a SCSI data cable, you can connect additional internal and external Ultra2 LVD SCSI devices. The unit's SCSI data cable supports three internal SCSI drives;

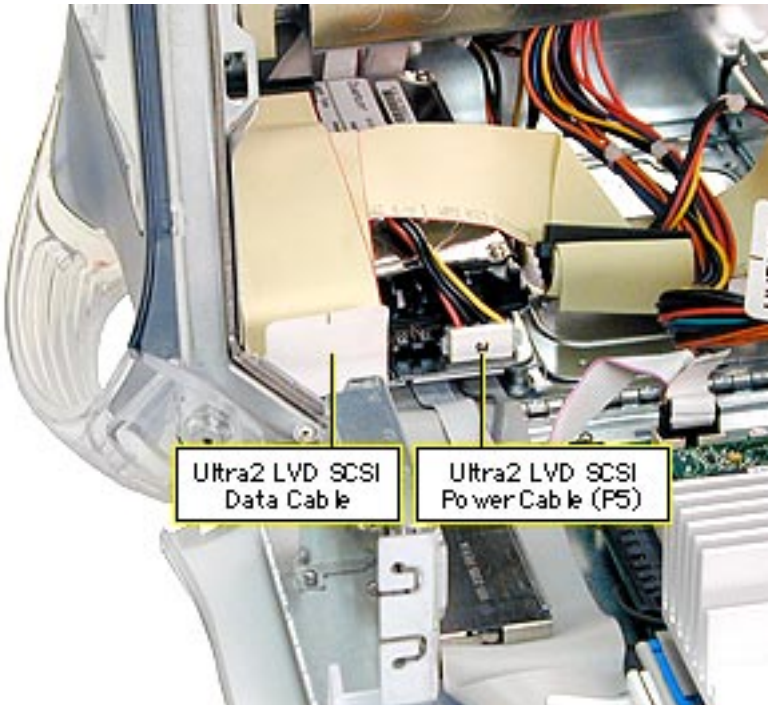
this cable has a built-in terminator so you don't need to add one. You can connect external Ultra2 LVD SCSI devices to the port on the rear of the computer.

If the computer came with one Ultra2 LVD SCSI drive, it's installed in drive bay 1, near the front of the computer. If it came with two drives, the second one is installed in bay 2. If a third drive is installed, it's in bay 3. Usually the computer uses the drive in bay 1 to start up.

You must assign a SCSI ID number to every additional hard drive and the number must not conflict with the ID number already assigned to a drive on the SCSI chain. One factory-installed drive has ID 0; a second factory-installed drive has ID 1; a third drive has ID 2. The SCSI PCI card has ID 7.



1 Disconnect the Ultra2 LVD SCSI cable from the Ultra2 LVD SCSI card.

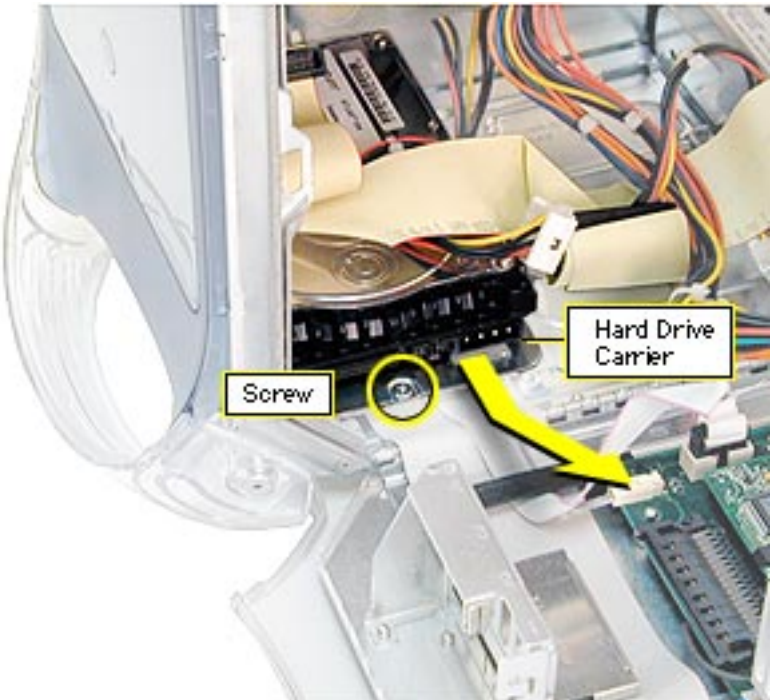


2 Disconnect the SCSI hard drive power cable (P5).

Caution: Pull the SCSI power cable straight out of the connector on the drive. Any up or down motion to the connector could damage the drive.

Replacement Note: The power cables attach to drives as follows:
P5 attaches to bay 1
P2 attaches to bay 2
P3 attaches to bay 3

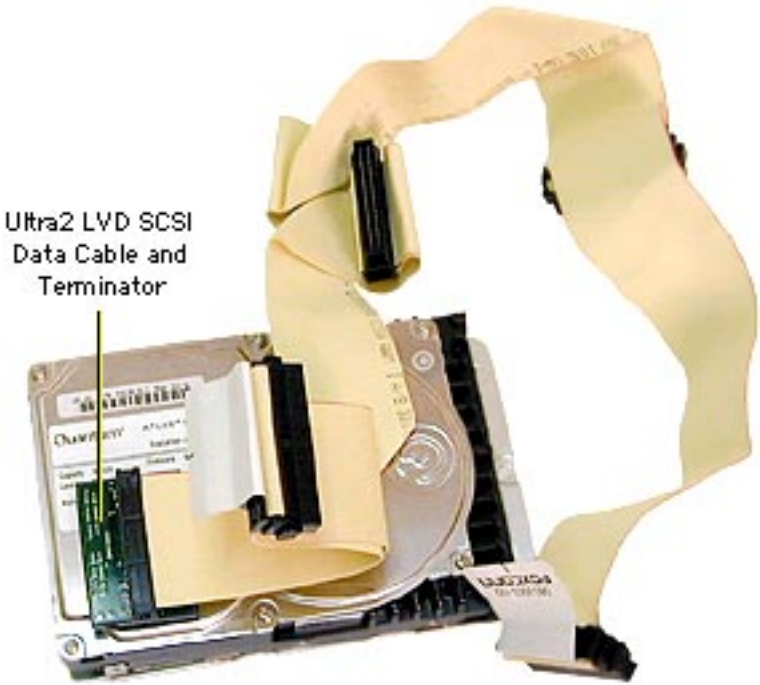
3 Disconnect the Ultra2 LVD SCSI data cable from the hard drive.



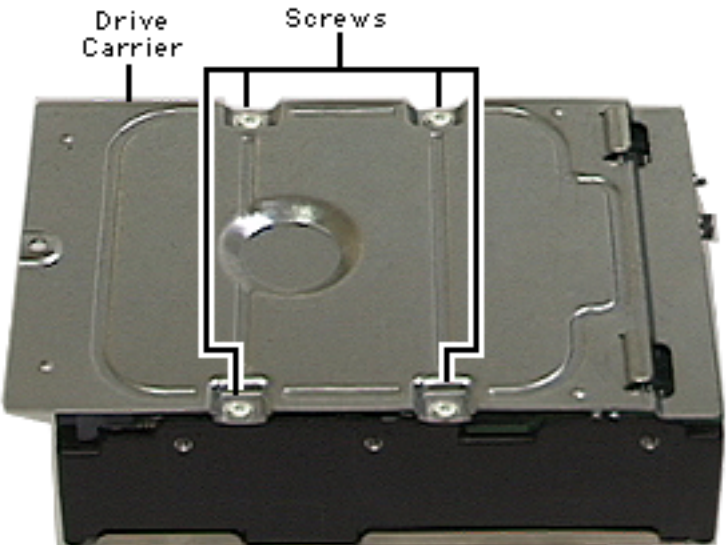
4 Remove the hard drive carrier mounting screw.

5 Pull the drive carrier back and lift up at an angle to release the carrier tabs from the slots in the chassis.

6 Remove the carrier and drive from the computer.

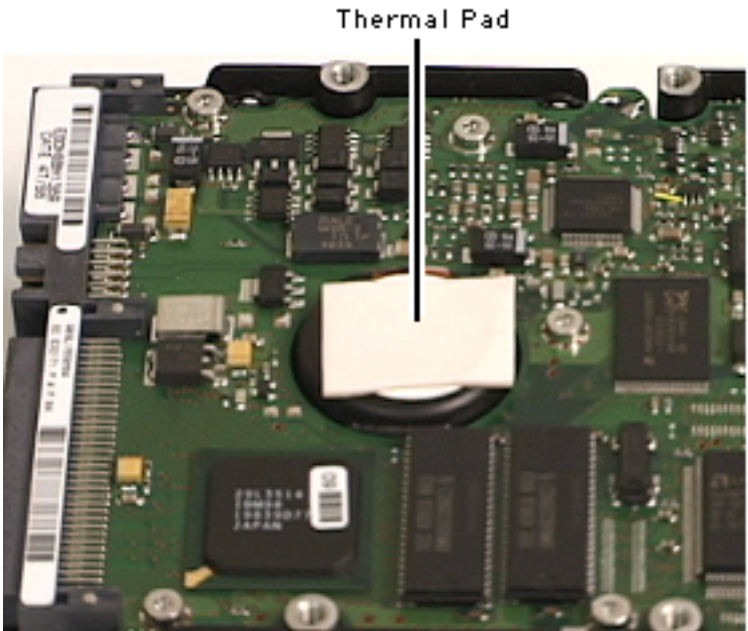


7 If you're returning the drive to Apple, remove the SCSI data cable and terminator (black plastic housing) from the top of the drive. The cable and terminator are attached to the drive with double-stick foam tape.



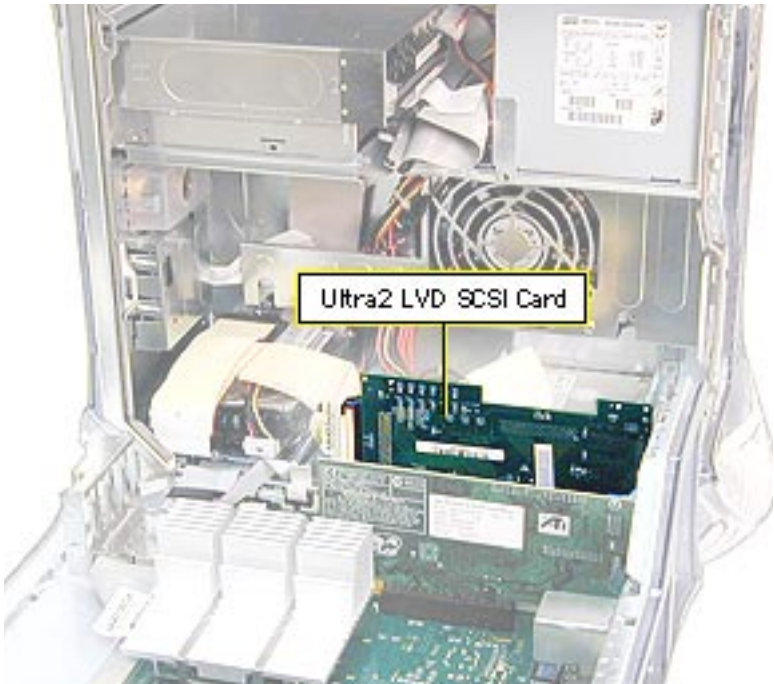
8 If you're returning the drive to Apple, you must also remove the hard drive carrier. Remove the four screws from the carrier and lift out the drive.

Note: Drives must be returned to Apple in Apple packaging, without cables or carriers. Failure to comply with this requirement may result in a packaging noncompliance charge. For more information, refer to the service parts database.



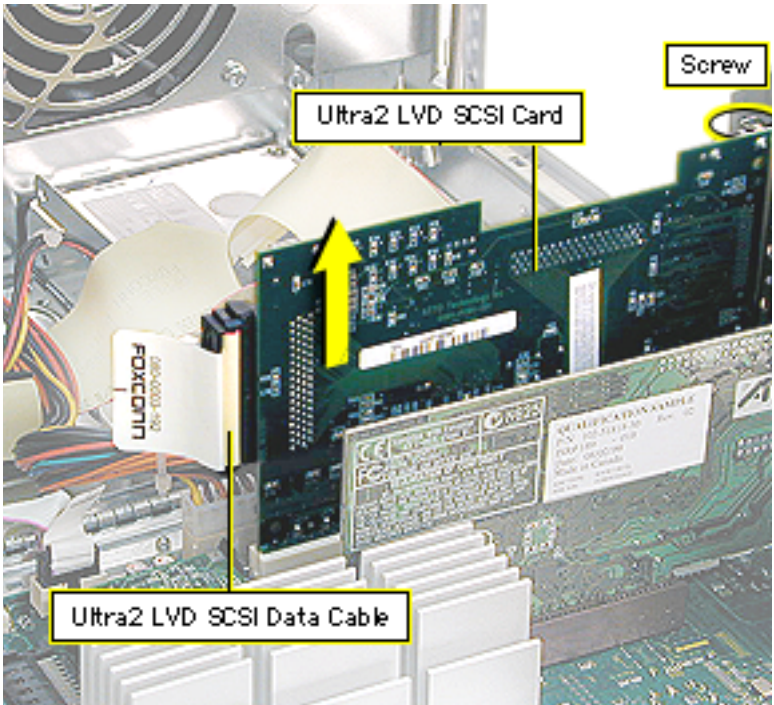
9 If you're replacing the thermal pad on the drive, remove the old pad and apply the new pad to the same area on the drive.

Important: Before installing a new 36 GB Ultra2 LVD SCSI IBM drive, you must apply a thermal pad, part number 922-3863.



Ultra2 LVD SCSI Card

Before you begin, open the side access panel.

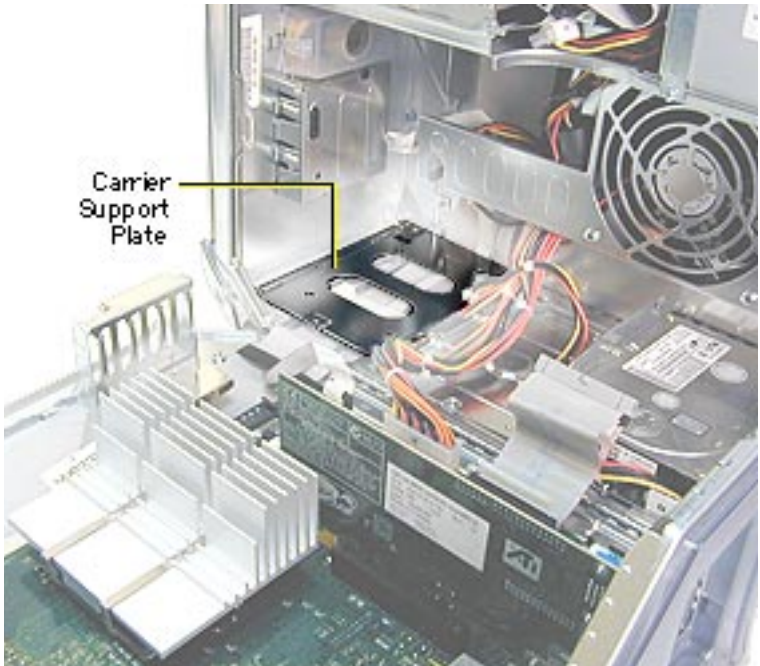


1 Remove the Ultra2 LVD SCSI card mounting screw.

2 Disconnect the Ultra2 LVD SCSI cable from the PCI card.

Note: Make sure no external cable is attached to the card.

3 Gently lift up on the Ultra2 LVD SCSI card to remove it from the PCI slot.



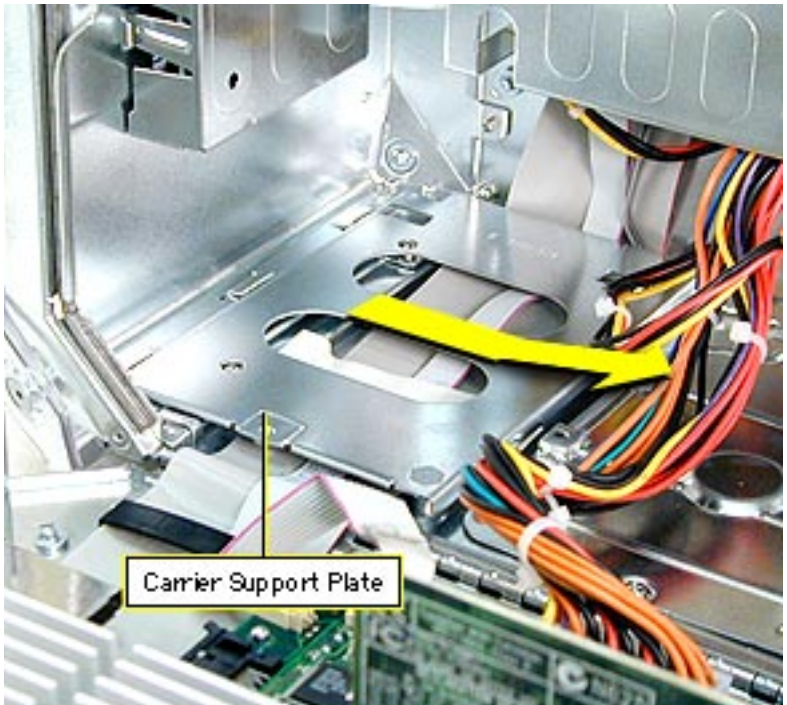
Carrier Support Plate

Note: Perform this procedure only if you must replace the support plate or the cables below the plate.

Before you begin, do the following:

- Open the side access panel.
- Remove the hard drive carrier in drive bay 1.

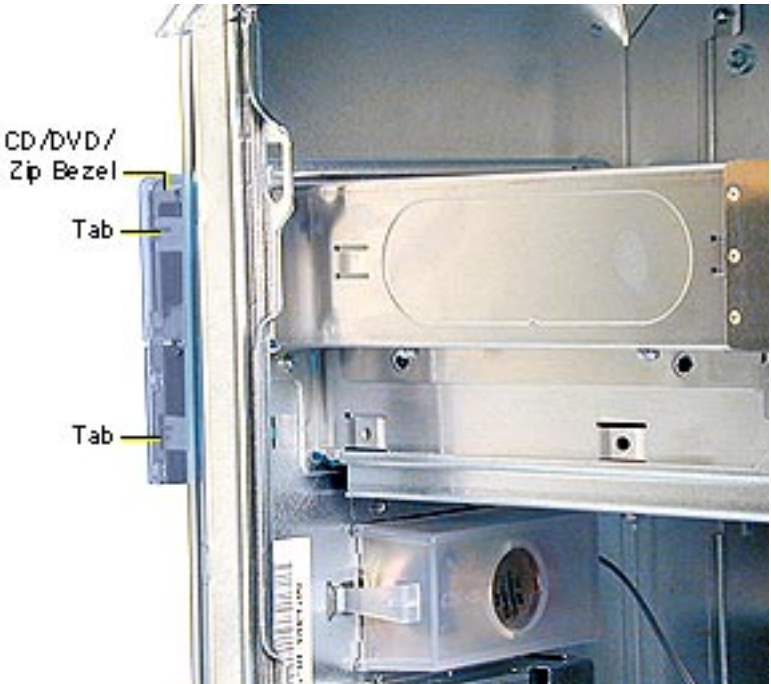
1 Remove the two support plate mounting screws from the bottom of the unit.



2 Lift the plate at an angle and remove it from the computer.

CD-ROM/DVD-ROM/DVD-RAM/ Zip Drive Bezel

Before you begin, open the side access panel.



1 From inside the chassis, behind the front panel, push the two bezel tabs forward to release the drive bezel from the front panel.

2 Disconnect the bezel from the hinges on the front left side and remove the bezel from the computer.

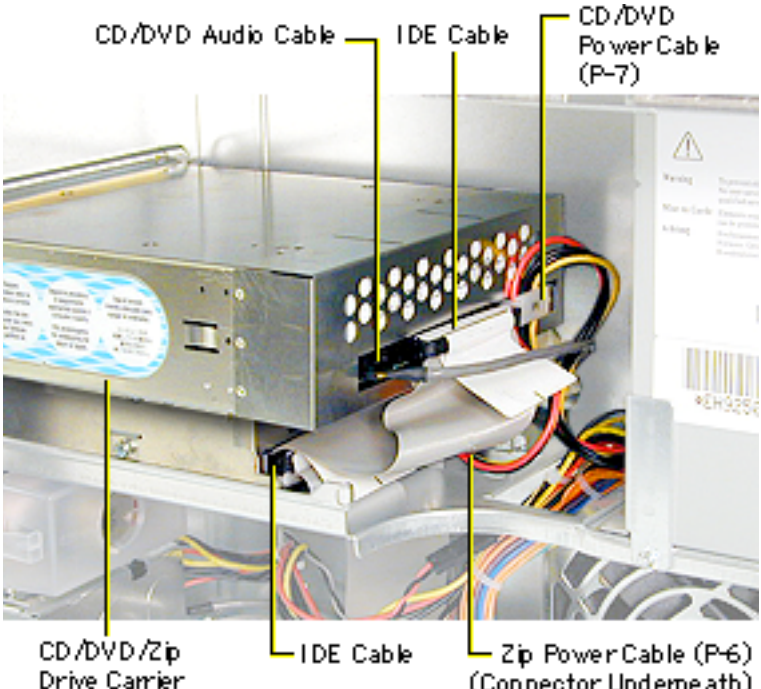
CD-ROM, DVD-ROM, or DVD-RAM Drive

Before you begin, do the following:

- Open the side access panel.
- Remove the CD-ROM/DVD-ROM/DVD-RAM/Zip drive bezel.

1 Remove the two screws on the drive carrier.

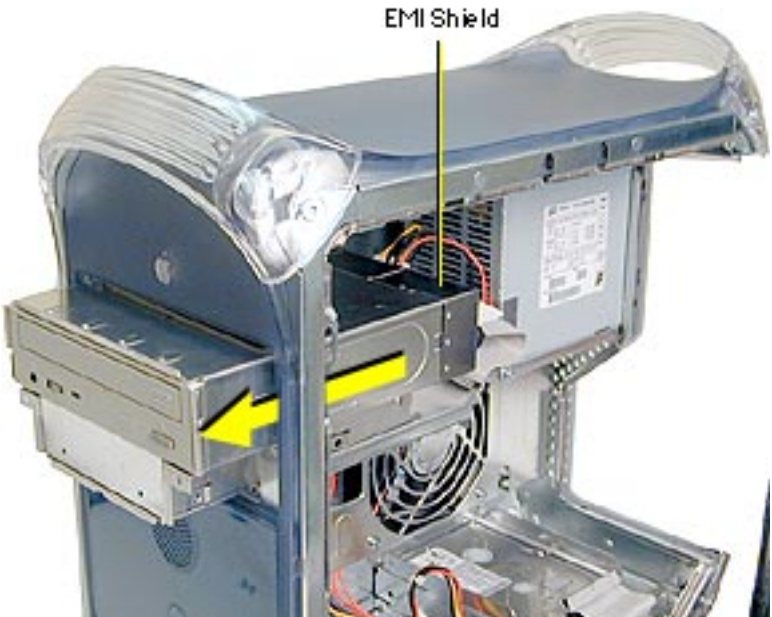
Note: You remove the drive carrier from the computer with the drives attached to the carrier.



2 From inside the chassis, push the drive carrier forward about 1 inch.

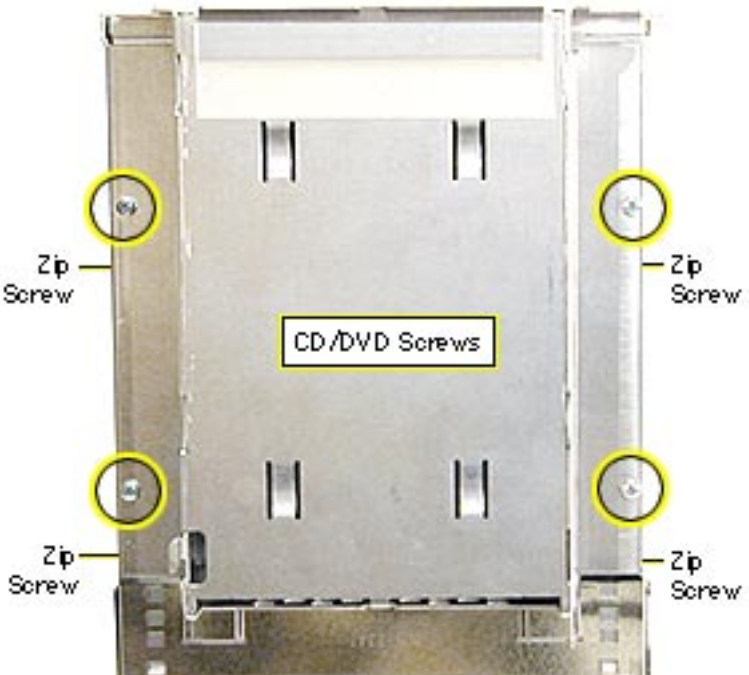
3 Disconnect the following cables from the back of the CD-ROM, DVD-ROM, or DVD-RAM drive:
- power cable (P7)
- IDE data cable
- Power Mac G4 (PCI Graphics): audio cable

4 Disconnect the following cables from the back of the Zip drive (if present):
- power cable (P6)
- IDE data cable



5 Continue sliding the drive carrier out of the computer. **Important:** The drive carrier may be difficult to push forward due to the EMI gasket and tape located on the underside of the carrier (directly below the Zip drive).

6 When the carrier is out of the computer, remove the EMI shield from the back of the CD-ROM, DVD-ROM, or DVD-RAM drive.



Note: Perform the following procedure if you are replacing the CD-ROM, DVD-ROM, DVD-RAM, or Zip drive.

7 Using a Phillips screwdriver, remove the drive carrier mounting screws.

8 Slide the drive(s) out of the carrier.

Replacement Note: The DVD-RAM drive is not as tall as the CD-ROM and DVD-ROM drives. Before screwing the DVD-RAM

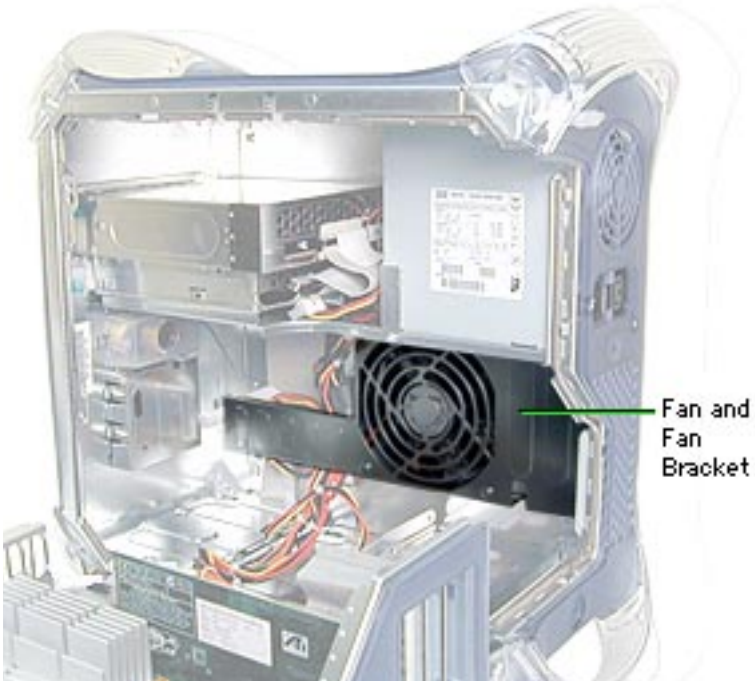
drive back into the carrier, lift the back of the drive slightly so that the drive is flush against the carrier.

Replacement Note: When inserting the drive carrier into the computer, make sure the carrier tab slides into the hole on the stationary drive shelf.

Zip Drive

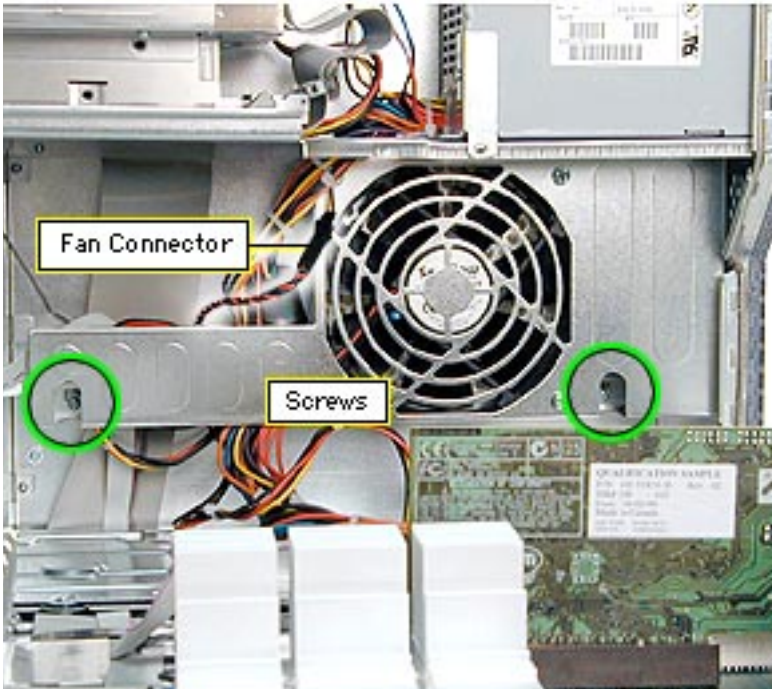
If removing the Zip drive, follow the procedures for removing the CD-ROM or DVD-ROM Drive.

Important: The Zip/CD-ROM drive carrier may be difficult to push forward after you remove the screws on the bezel. The EMI gasket/tape on the underside of the drive carrier (below the ZIP drive) holds the carrier securely in place. Continue pushing forward until the carrier is released.

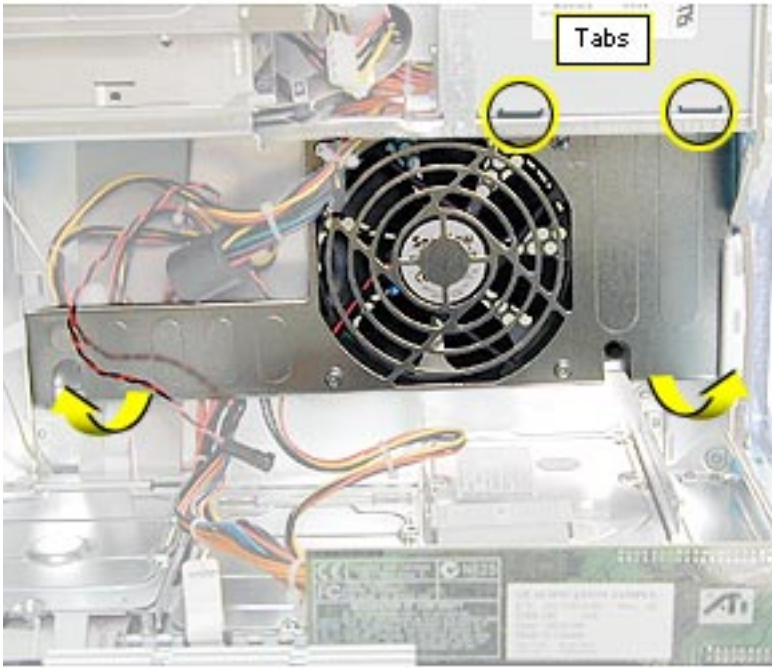


Fan

Before you begin, open the side access panel.

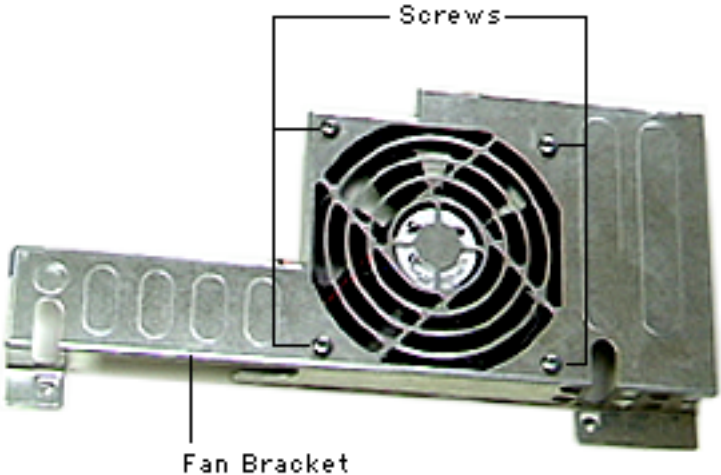


1. Remove the two screws on the fan bracket.
2. Pull the fan bracket down to access the power-to-fan connector.
3. Disconnect the power-to-fan connector.



4 Lift the fan bracket out of the computer.

Replacement Note: The fan bracket has two holes (on the top) that join with two tabs on the chassis. If the tabs aren't inserted into the holes, the screws that secure the fan bracket to the chassis won't align properly.



Perform the following procedure only if you are replacing the fan.

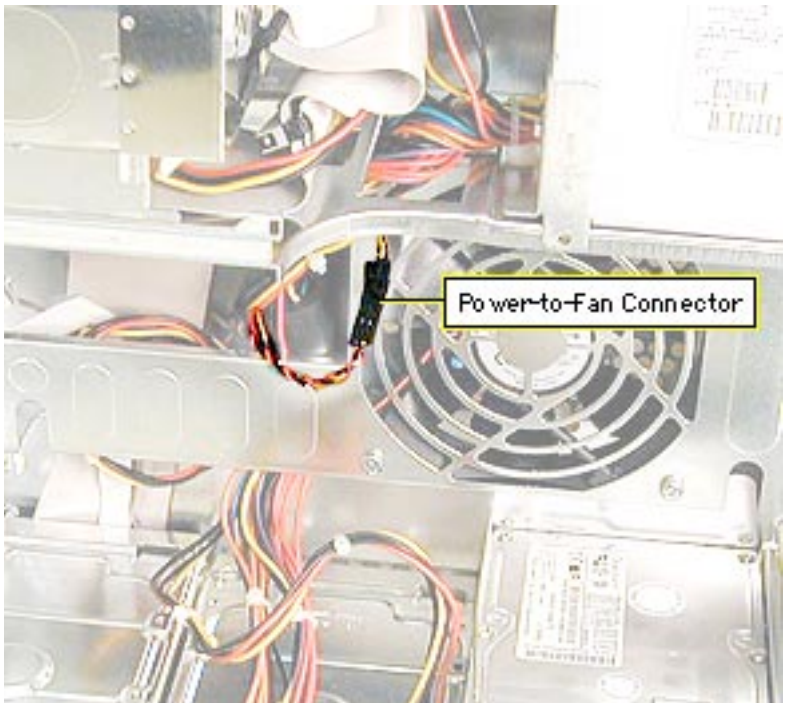
5 Using a Phillips screwdriver, remove the four screws securing the fan to the fan bracket.

6 Lift the fan from the fan bracket.

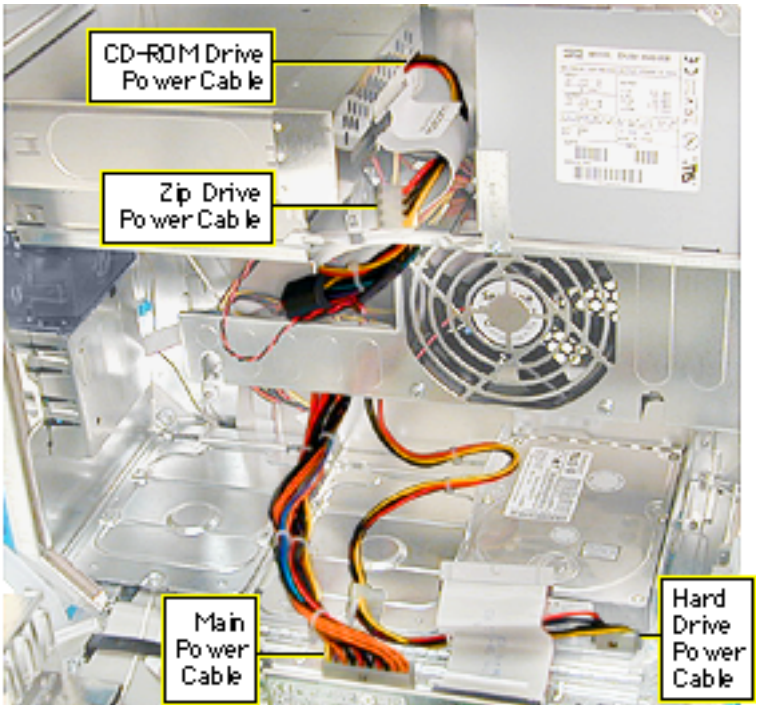
Power Supply

Before you begin, do the following:

- Open the side access panel.
- Remove the CD/DVD-ROM/Zip bezel.
- Move the CD/DVD-ROM/Zip drive carrier forward 1 inch.

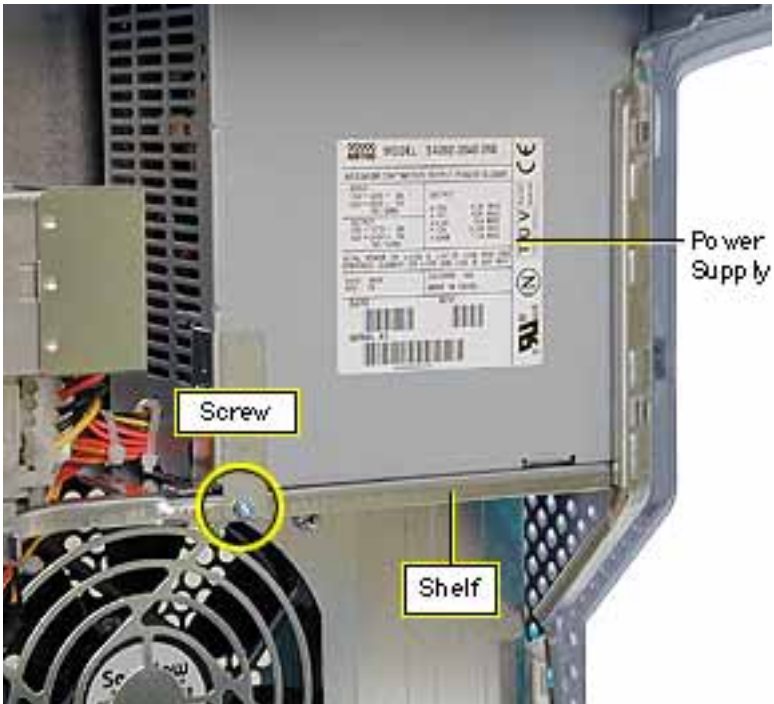


1 Disconnect the power-to-fan connector.



2 Disconnect the following power cables:
- cables P6 and P7 from the CD-ROM/Zip drive
- Power Mac G4 (PCI Graphics): cable P4 from the front panel board
- main power cable from the logic board
- cable(s) to hard drives

3 Using a 2.5 mm allen wrench, remove the three screws on the rear vented panel.



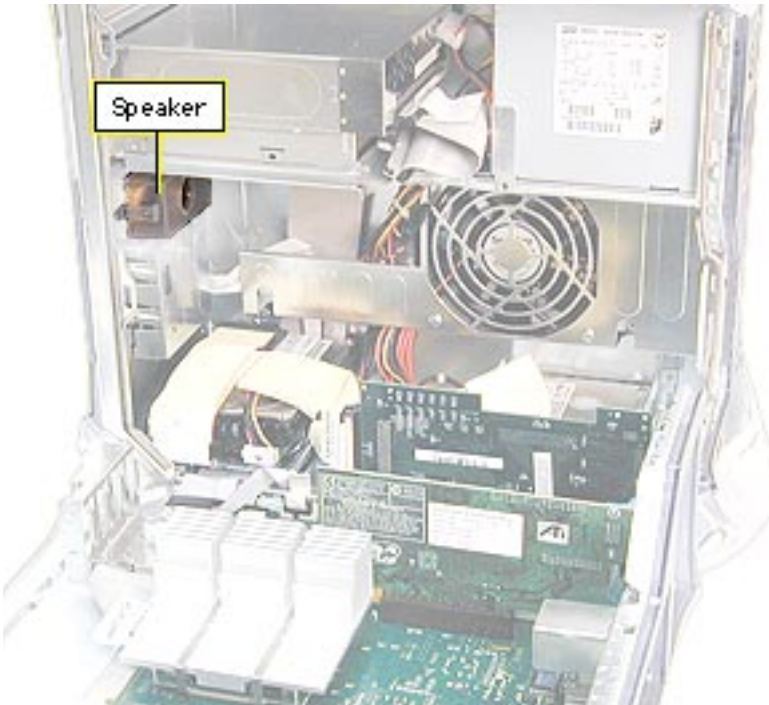
4 On the inside of the chassis, remove the screw that attaches the power supply to the power supply shelf.

5 Slide the power supply forward toward the front of the computer. Manuever the power supply (clearing the security bar on the inside and upper chassis) and its cables out of the chassis.

Note: If you are replacing the power supply, remove the power supply bracket

and reattach it to the new power supply.

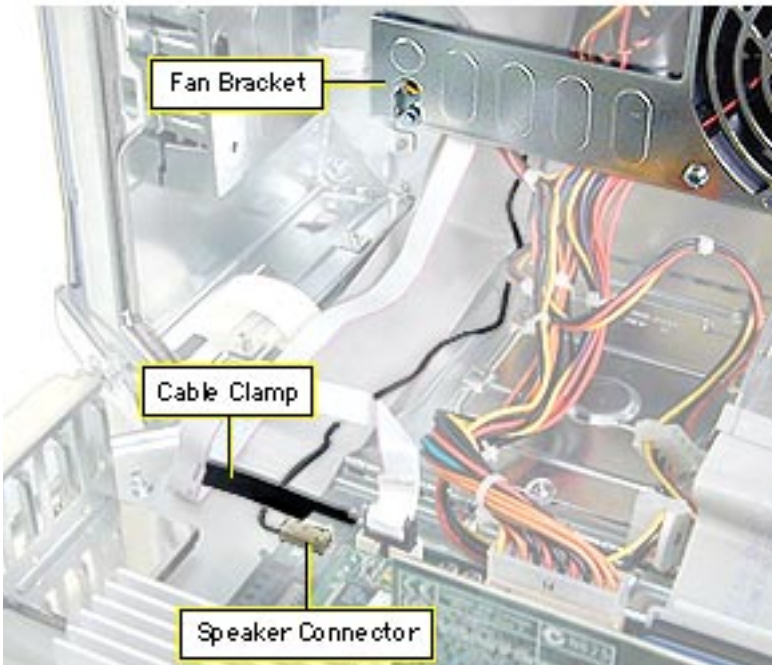
Replacement Note: You must set the power supply voltage switch to the correct setting (115 V in the U.S.) to avoid damaging the computer.



Speaker

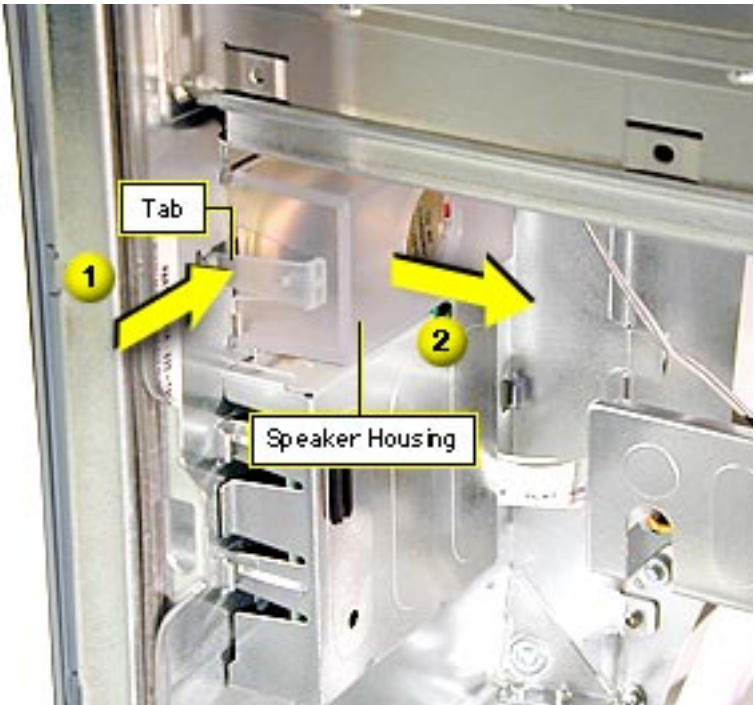
Before you begin, do the following:

- Open the side access panel.
- Remove the carrier support plate.



1 Disconnect the speaker cable from the logic board.

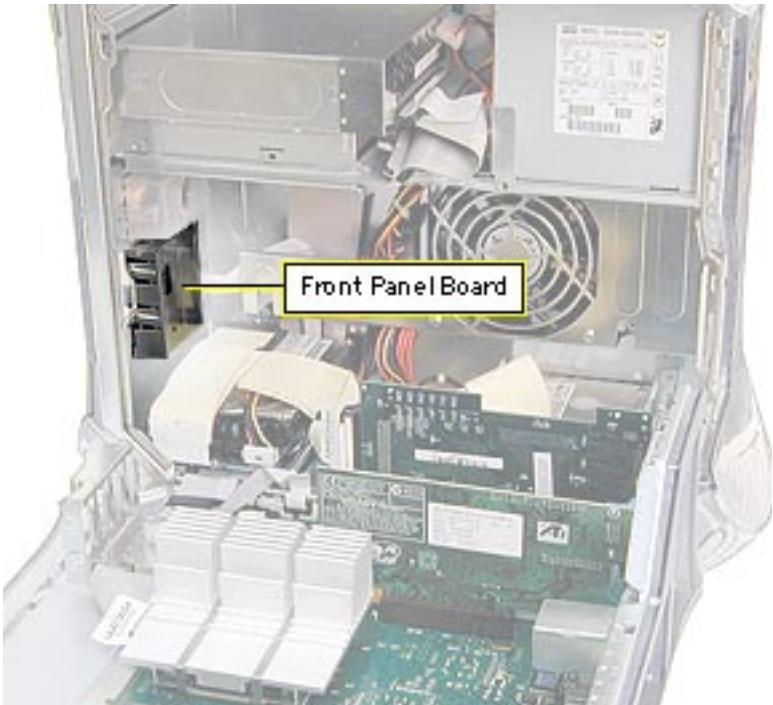
2 Free the cable from the cable clamp and the fan bracket.



3 Push the speaker tab in and pull the speaker housing back to release it.

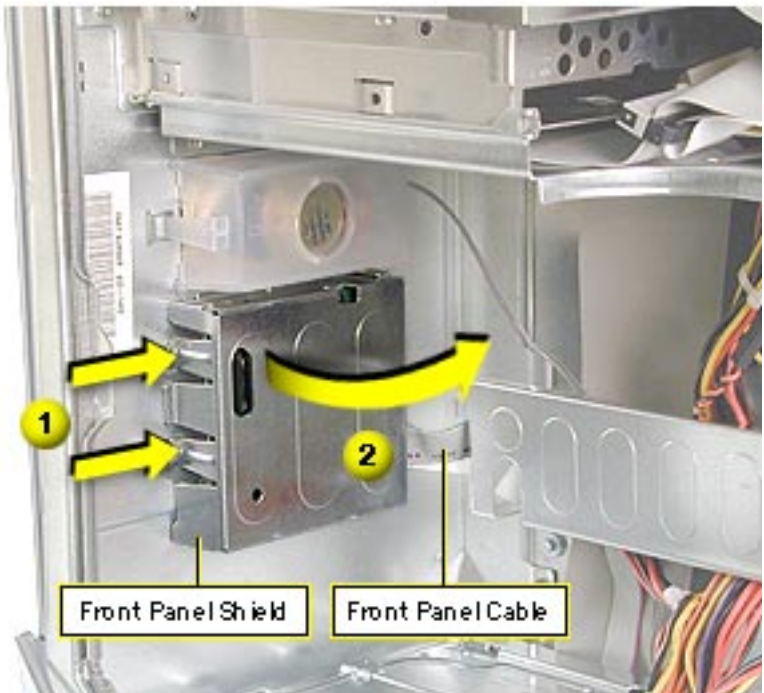
4 Remove the speaker housing from the computer.

5 Remove the speaker from the speaker housing. **Note:** The speaker and speaker housing are separate parts.



Front Panel Board

Before you begin, open the side access panel.

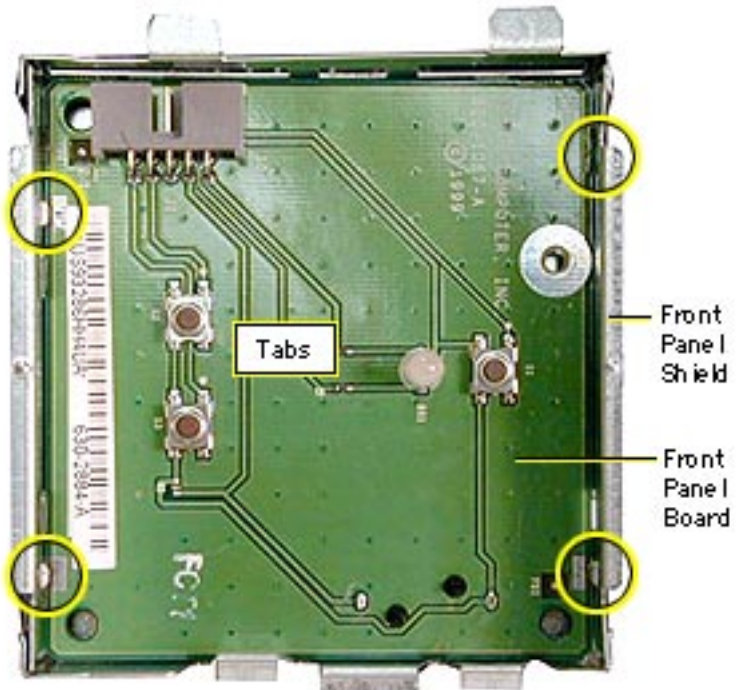


1 Using a screwdriver, press the tabs in on the front panel shield.

2 Gently pull the front panel shield away from the chassis.

3 Disconnect the front panel cable from the front panel board.

4 Power Mac G4 (PCI Graphics): Disconnect power cable P4 and the FireWire cable from the front panel board.

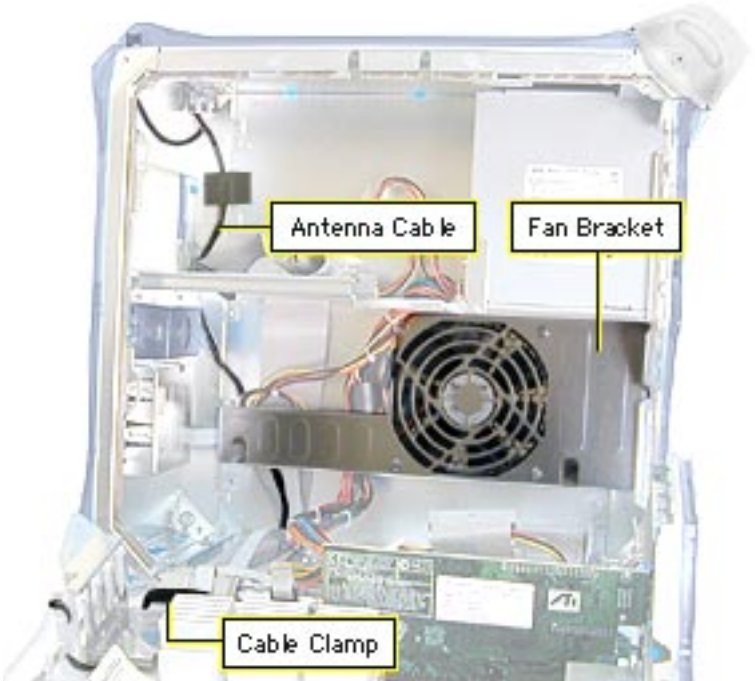


5 Push in and pry up on the three tiny metal tabs to release the front panel board from the front panel shield.

Antenna

Before you begin, remove the following:

- top front handle
- top panel
- carrier support plate (if the antenna cable is routed underneath it)
- CD-ROM drive carrier



1 Disconnect the antenna cable from the AirPort card (if installed).

2 Free the antenna cable from the cable clamp and the fan bracket.

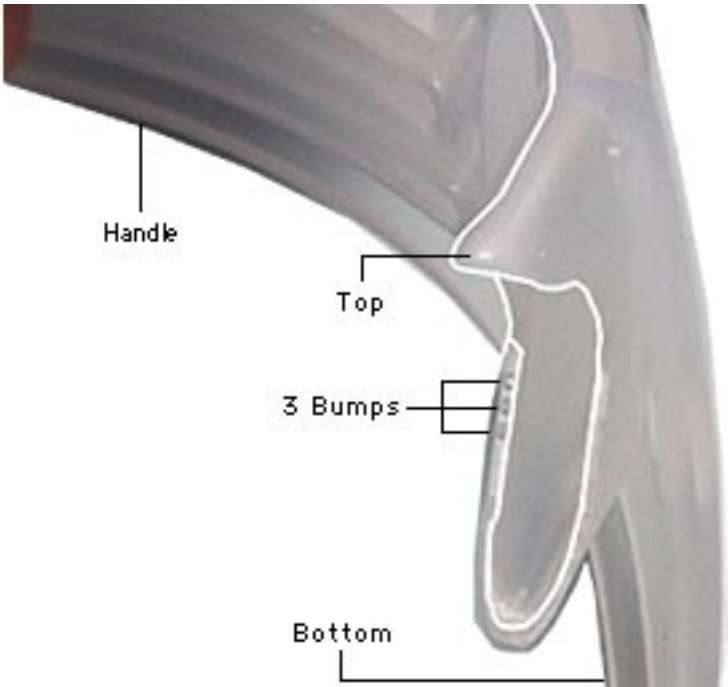
3 Using a jeweler's screw driver, remove the antenna mounting screws and lift the antenna and antenna cable out of the computer.

Top Handles, Front and Rear

No preliminary steps are required before you begin this procedure.

1 Using a 2.5 mm allen wrench, remove the two allen screws securing each handle.

2 Lift the handle from the computer.



Replacement Note: When installing the top handles (front and rear) orient them so that the three tiny bumps on the handle are in the orientation shown in the photo. The handle won't fit properly if it's turned upside down. The top front and top rear handles are interchangeable.

Top Panel

Before you begin, remove the following:

- top front handle
- top rear handle

1 Slide the top panel back, towards the power supply, to unhook the tabs.

2 Lift the top panel from the chassis.

Supports, Front and Rear

Before you begin, place the computer on an ESD mat and turn the unit upside down.

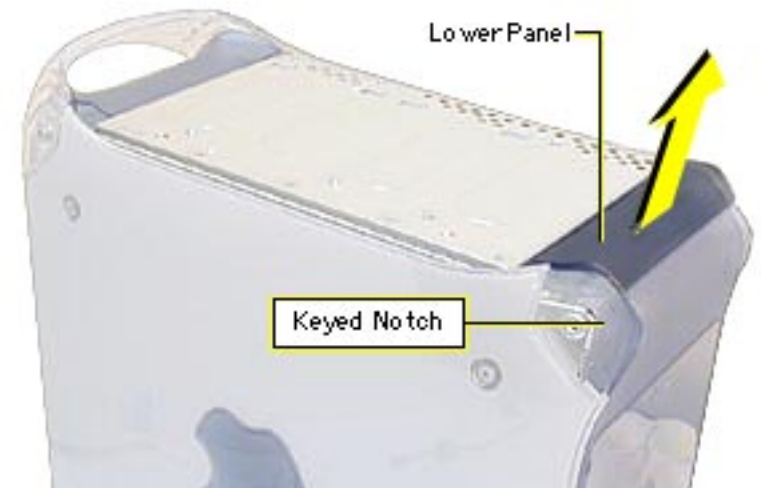
Warning: When the computer is upside down or the lower supports are removed, the computer can be unstable.

1. Using a 2.5 mm allen wrench, remove the two screws securing each support to the computer.
2. Remove the support from the computer.

Lower Panels, Front and Rear

Before you begin, remove the front and/or rear support.

Warning: When the computer is upside down or the lower supports are removed, the computer can be unstable.



Note: The computer is shown upside down.

1 Lift the lower front panel or the lower rear panel from the chassis. There are no screws holding these panels to the chassis; the front and rear supports hold them in place.

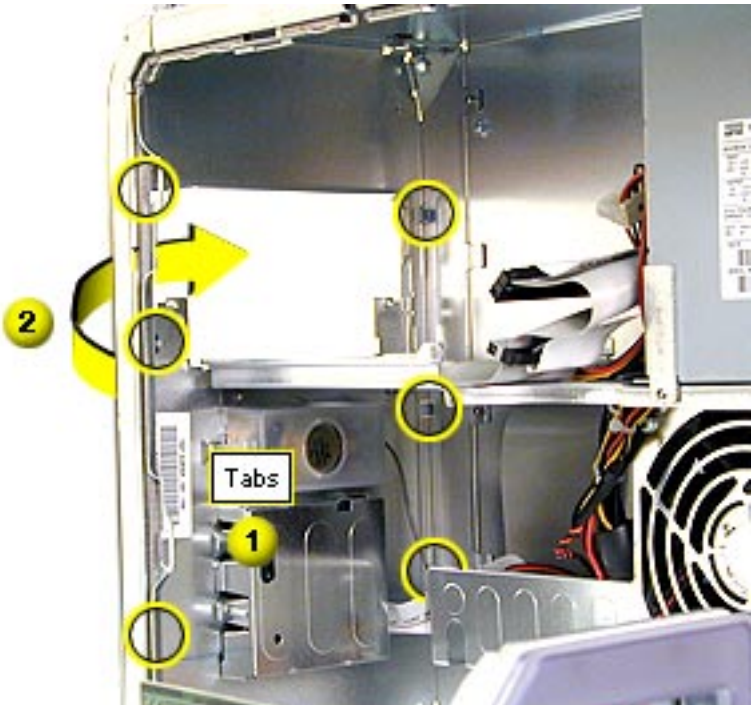
Important: These panels are keyed. The notch goes on the access panel side.

Front Panel

Before you begin, remove the following:

- top front handle
- lower front support and lower front panel
- CD-ROM drive bezel and CD-ROM drive carrier

Warning: When the lower support is removed, the computer can be unstable.

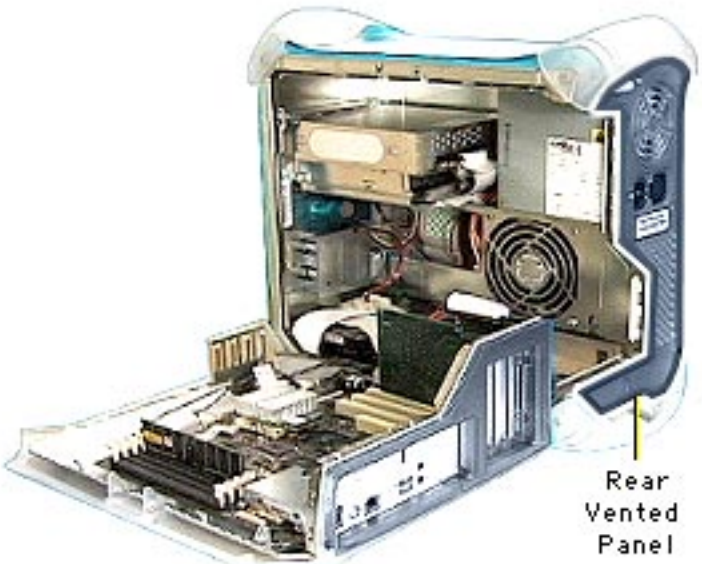


1 Open the side access panel. Locate the front panel tabs.

2 Using a screwdriver, carefully push the front panel tabs inward to release them from the chassis.

3 Pull the front panel off the chassis.

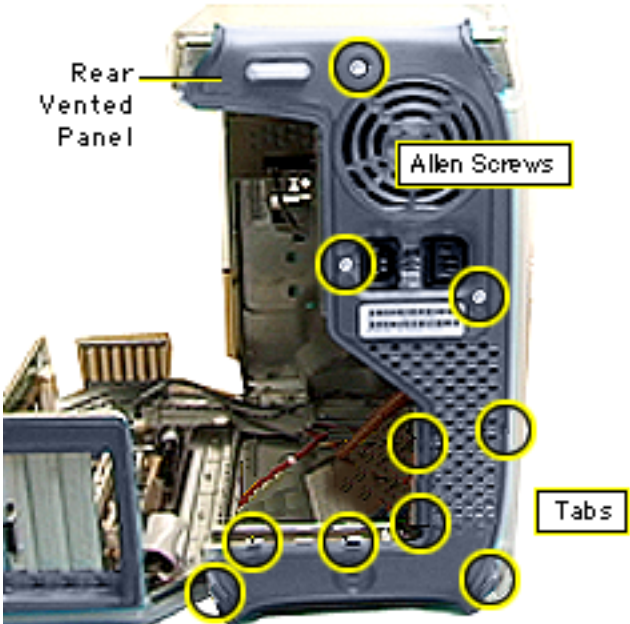
Rear Vented Panel



Before you begin, remove the following:

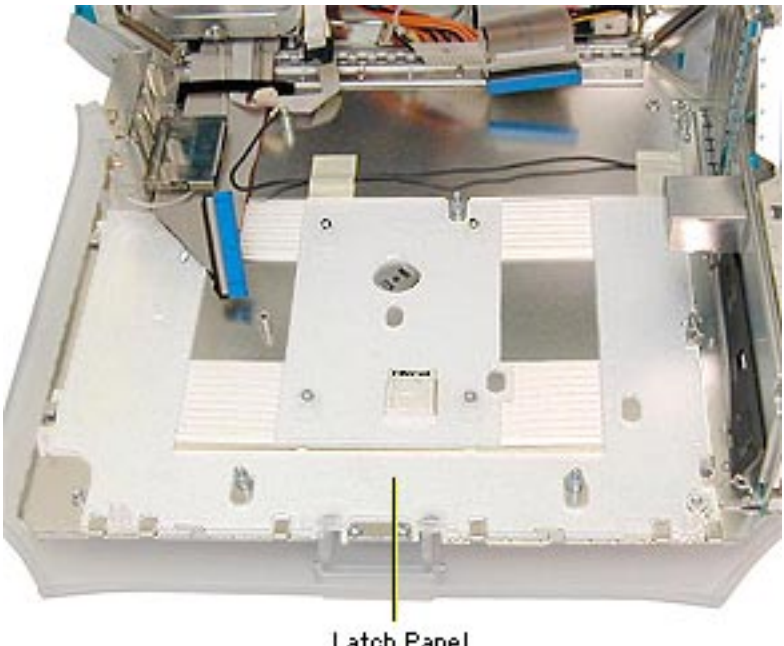
- top rear handle
- lower rear support

Warning: When the lower support is removed, the computer can be unstable.



1. Open the side access panel.
2. Remove the three 2.5 mm allen screws.
3. Push in on the six tabs to release the panel from the chassis.

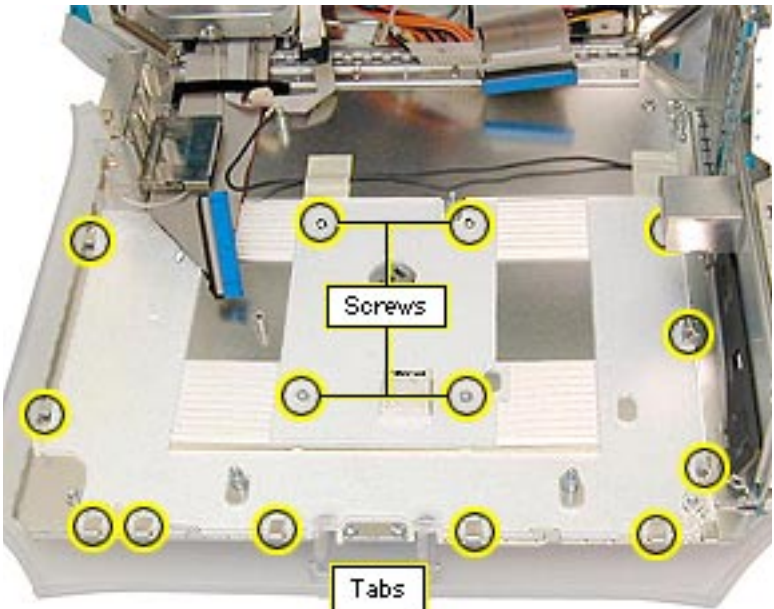
4 Once the tabs are released, carefully pull the rear panel forward to remove.



Latch Panel

Before you begin, remove the following:

- video card
- PCI cards (if present)
- Power Mac G4 (PCI Graphics): FireWire board (if present)
- Power Mac G4 (PCI Graphics): modem (if present)
- AirPort card (if present)
- logic board



1 Remove the four Phillips screws holding the panel to the chassis.

2 Slide the panel toward the hard drives, freeing the latch panel from the tabs on the chassis.

Note: Circles indicate tab locations.

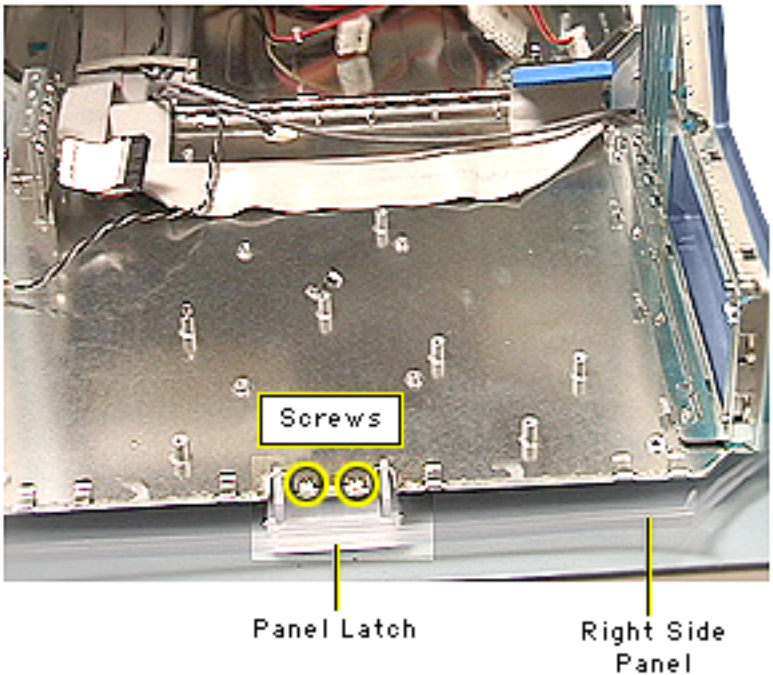
3 Remove the latch panel.

Right Side Access Panel

Before you begin, remove the following:

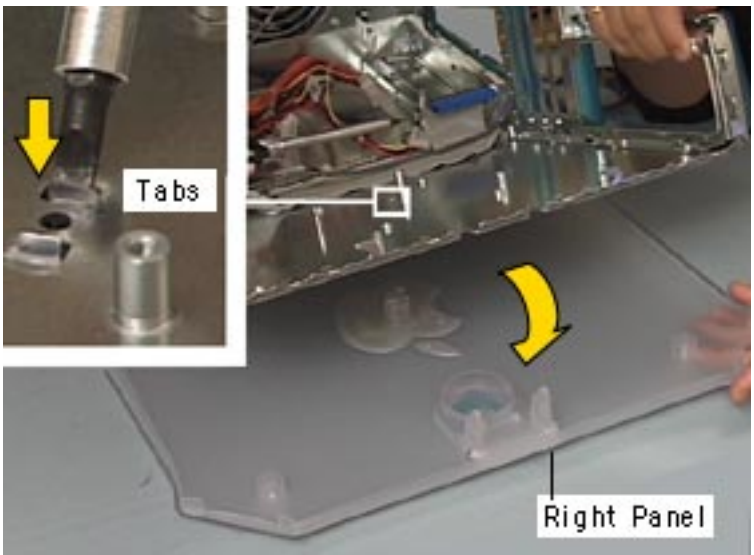
- PCI cards (if present)
- video card
- FireWire board (if present)
- modem (if present)
- AirPort card (if present)
- logic board

1 Remove the four 2.5 mm allen screws on the side panel.



2 Open the side access panel.

3 Remove the two Phillips screws attaching the right side panel to the metal chassis.



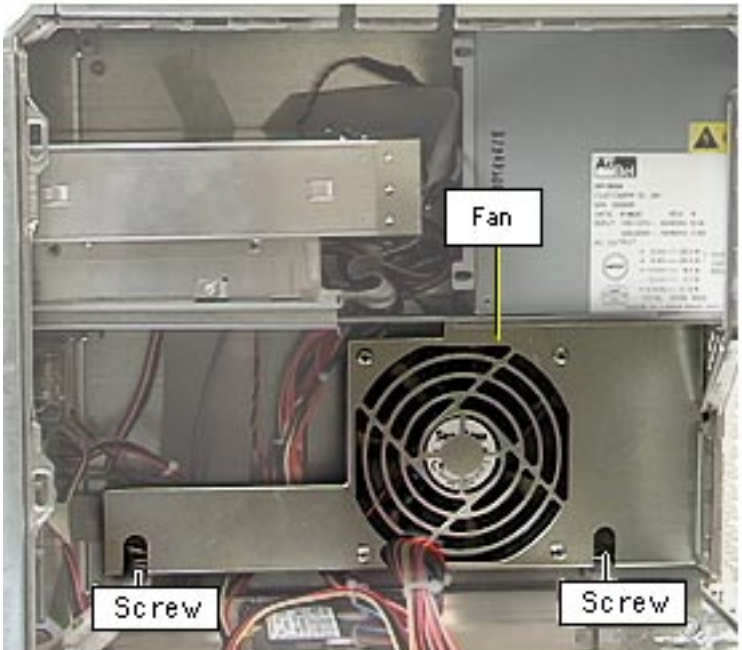
4 Using a flatblade screwdriver or needlenose pliers, push or squeeze the plastic tabs (protruding through the side chassis panel), to release the right panel from the metal chassis.

5 Remove the right side panel from the chassis.

Left Side Panel

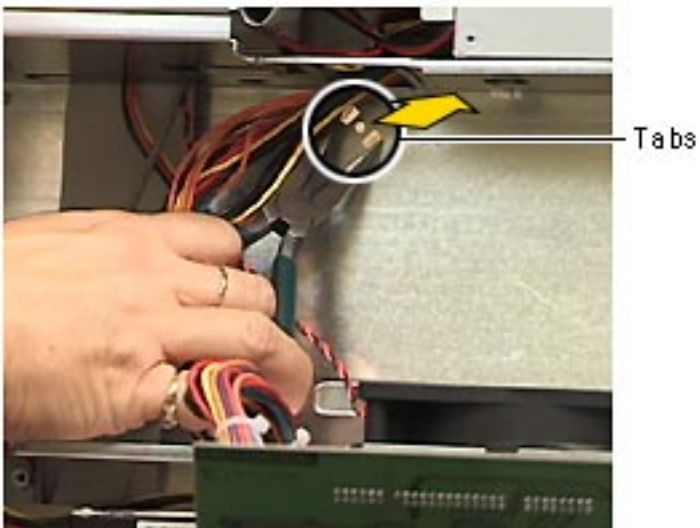
No preliminary steps are required before you begin this procedure.

1 Remove the four 2.5 mm allen screws on the side panel.



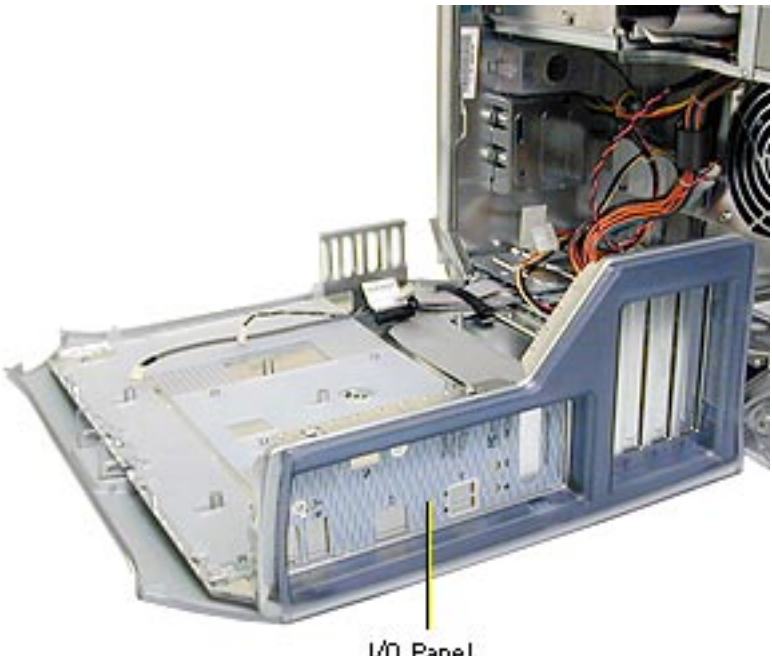
2 Open the side access panel.

3 Remove the fan screws and drop the fan bracket down to access the plastic panel tabs (protruding through the side chassis) on the left side panel.



4 Using a needlenose pliers, squeeze the tabs (located behind the fan bracket) to release the left side panel from the metal chassis.

5 Lift the left side panel from the chassis.



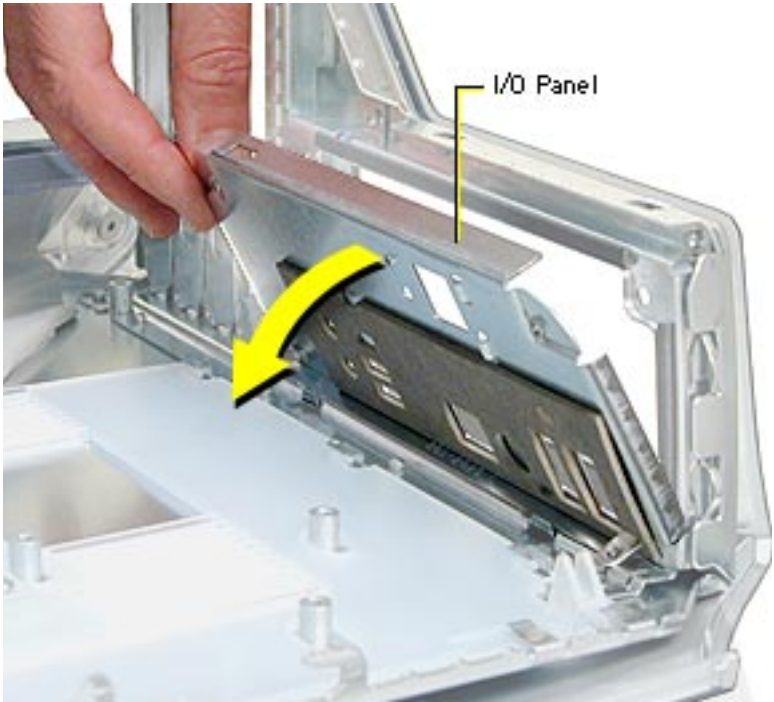
I/O Panel, Power Mac G4 (PCI Graphics)

Note: The I/O panel can be removed only in Power Mac G4 (PCI Graphics) computers. The I/O panel in Power Mac G4 (AGP Graphics) computers is part of the chassis.

Before you begin, do the following:

- Open the side access panel.
- Remove the logic board.

1 Remove the two mounting screws on the I/O panel.

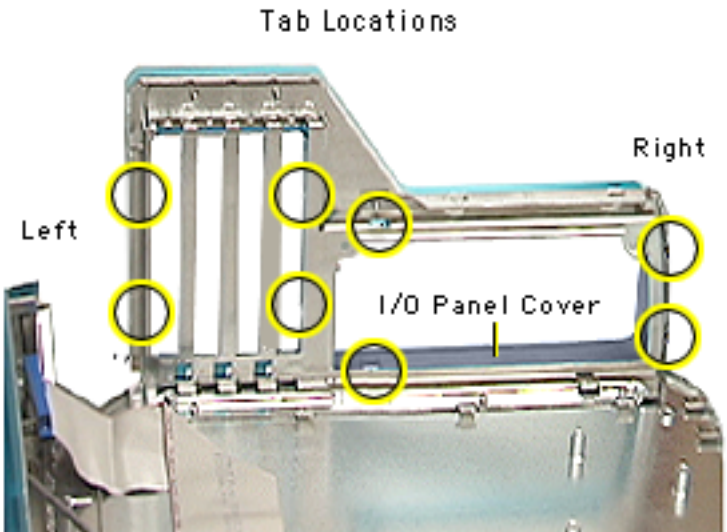


2 Tilt the I/O panel forward and remove.

I/O Panel Cover

Before you begin, do the following:

- Open the side access panel.
- Remove the logic board.
- Power Mac G4 (PCI Graphics): Remove the I/O panel.



Note: Because the I/O panel cover can be difficult to remove, take your time prying up the plastic tabs.

1. Using a jeweler's screwdriver and working from right to left, carefully pry the plastic tabs away from the metal frame. As each tab is released, pull the I/O cover away from the frame.
2. Remove the I/O panel cover from the chassis.

Troubleshooting

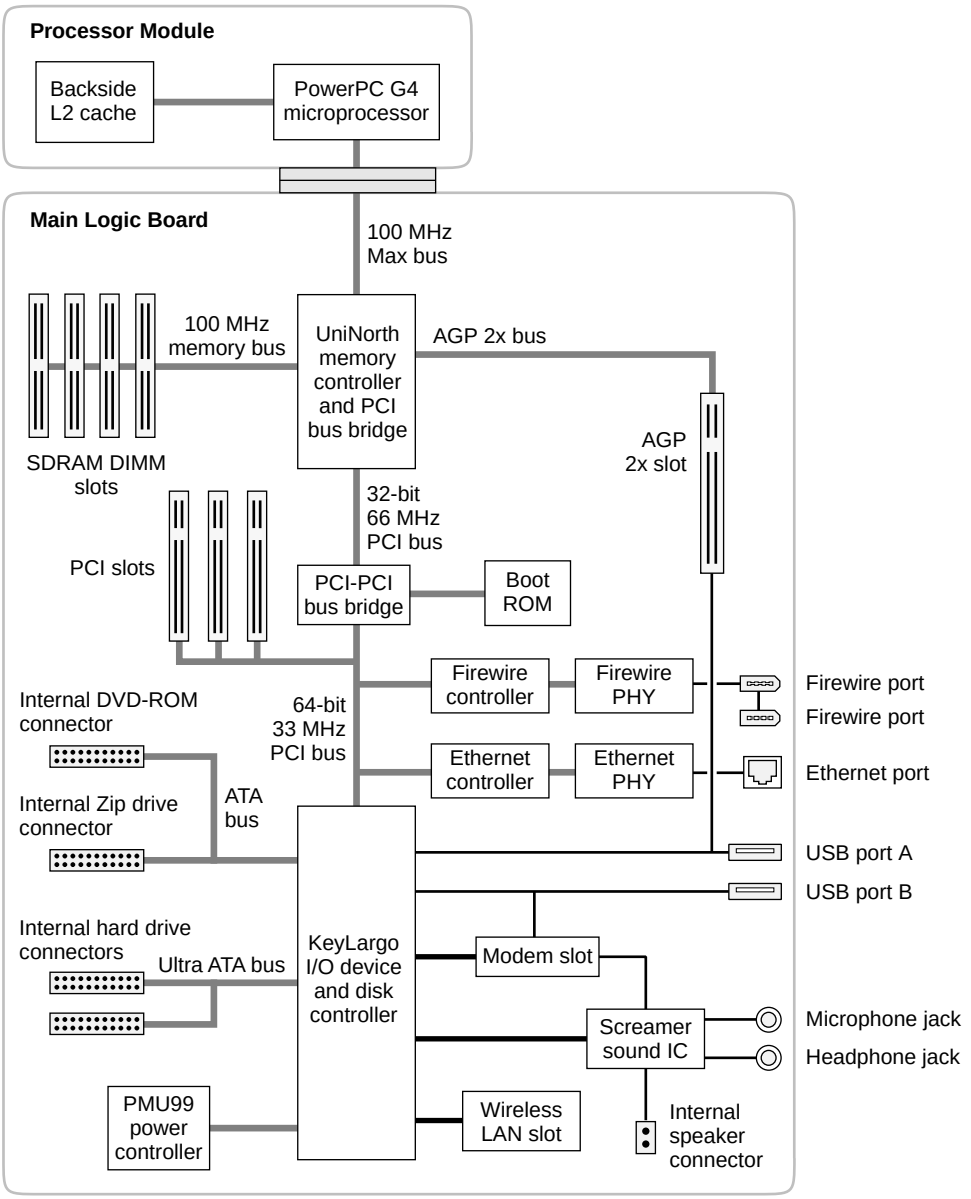
Power Mac G4/ Macintosh Server G4

Introduction

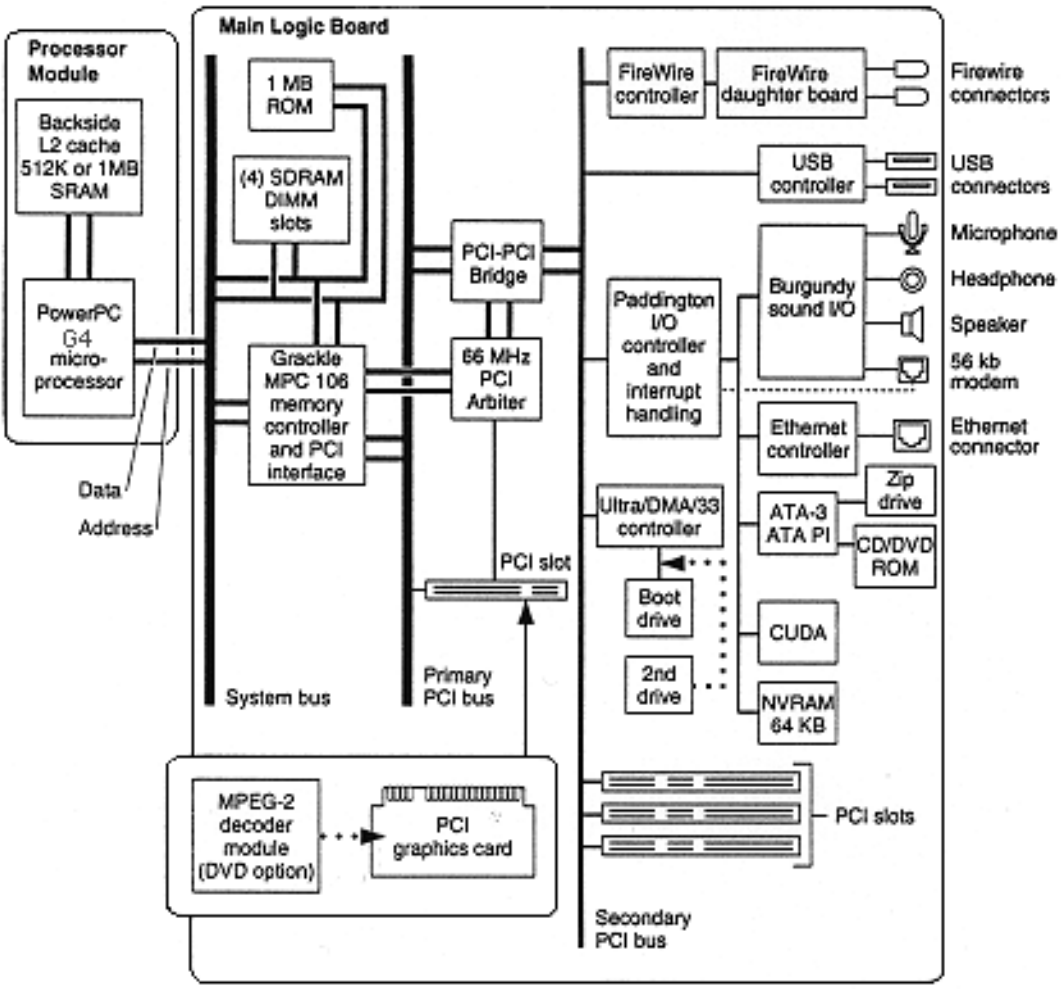
This chapter contains basic theory of operations information as well as detailed Symptom/Cure charts. The latter will help you diagnose specific symptoms related to Power Mac G4 computers. Because cures are listed on the charts in the order of most likely solution, try the cures in the order presented. For each cure, verify whether or not the computer 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.

For additional assistance, contact Apple Technical Support.

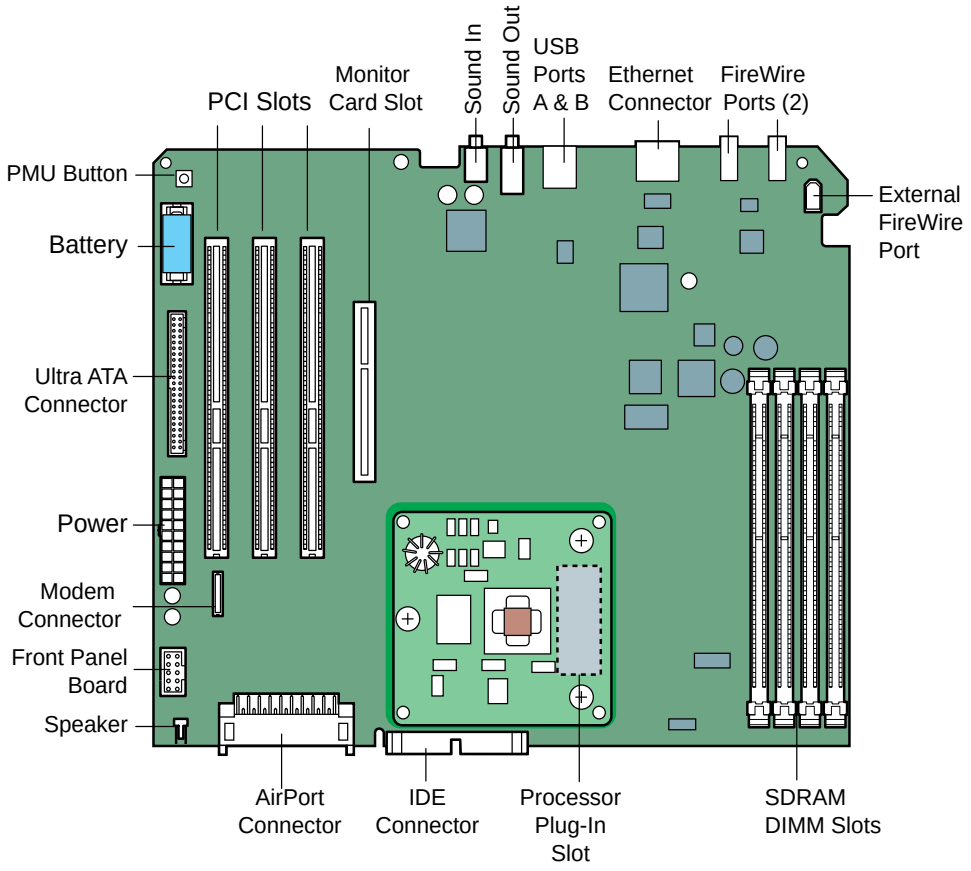
Power Mac G4 (AGP Graphics) Block Diagram



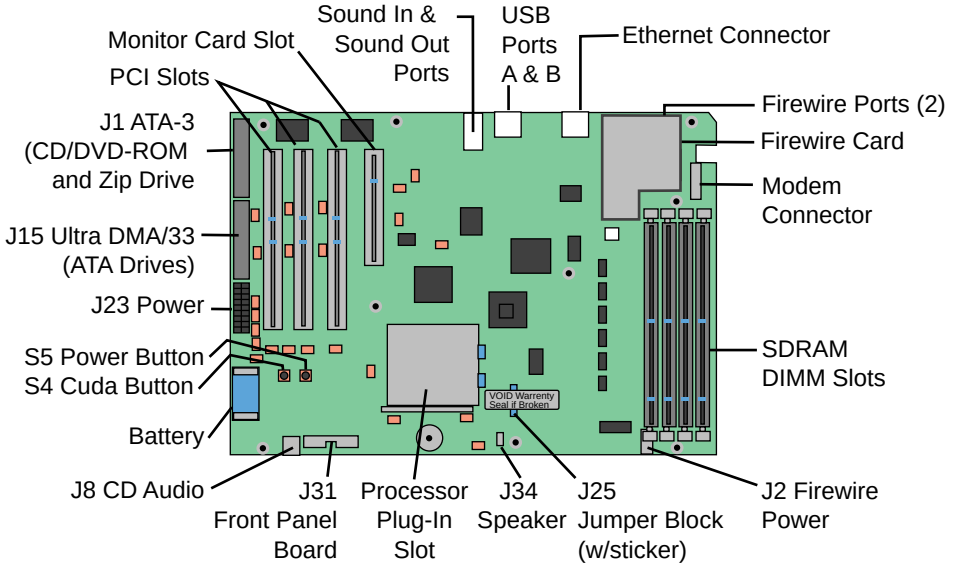
Power Macintosh G4 (PCI Graphics) Block Diagram



Power Mac G4 (AGP Graphics) Logic Board DiagramPower



Macintosh G4 (PCI Graphics) Logic Board Diagram



Processor Module

The logic board comes with a removable processor module. The processor should rarely fail and should be replaced only as a last resort. Processor modules can be ordered from Service.

Note that when you replace the logic board on a Power Macintosh G4 (PCI Graphics), you must also change the processor jumper block and warranty sticker to be compatible with the processor module. Failure to install the jumper block properly will result in a unit that does not boot up. No jumper block is required for Power Mac G4 (AGP Graphics) processors.

Refer to “Processor Module” in the Take Apart chapter for more information.

Logic Board Battery

The battery on the logic board controls the stored system settings, such as date and time. It is important to note that the battery does not affect power at startup.

The battery should be replaced if a system loses date and time settings.

The Cuda Chip

The Cuda is a microcontroller chip on the Power Macintosh G4 (PCI Graphics) logic board. Its function is to

- Turn system power on and off.
- Manage system resets from various commands.
- Maintain parameter RAM (PRAM).
- Manage the real-time clock.

Many system problems can be resolved by resetting the Cuda chip (see the Symptom/Cure tables for examples). Press the Cuda reset button on the logic board to reset the Cuda chip. The Cuda reset button is located on the logic board to the right of the battery. Refer to the Logic Board Diagram earlier in this chapter for location information. If you continue to experience system problems, refer to “Resetting the Logic Board” in this chapter.

Resetting the Logic Board

Resetting the logic board can resolve many system problems (see the Symptom/Cure tables for examples). Whenever you have a unit that fails to power up, you should follow this procedure before replacing any modules.

1 Unplug the computer.

2 Press the Power On button on the front of the unit.

3 Open the side access panel.

4 Remove the battery from the logic board.

5 Wait at least 10 minutes before replacing the battery.

6 Make sure the battery is installed in the correct +/- direction.

7 Reassemble the computer and test the unit.

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

Power-On Self Test

There is a power-on self test that resides in the ROM of the Power Mac G4. This test automatically runs whenever the computer is powered on after being fully shut down (the power-on self test does not run if the machine is only restarted). If a problem is detected during the test, you will not hear a normal startup chime. Instead, the system will beep as explained below.

Power Mac G4 (AGP Graphics):

- **1 Beep:** No RAM is installed or detected.
- **2 Beeps:** Incompatible RAM types are installed (for example, both SDRAM and EDO installed).
- **3 Beeps:** No RAM banks passed memory testing.
- **4 Beeps:** No good boot images are detected in the boot ROM (and/or there is a bad sys config block).
- **5 Beeps:** The processor is not usable.

Power Mac G4 (PCI Graphics):

- **1 Beep:** No RAM is installed or detected.
- **2 Beeps:** Incompatible RAM types are installed (for example, both SDRAM and EDO installed).
- **3 Beeps:** No RAM banks passed memory testing.
- **4 or 5 Beeps:** Bad checksum for the remainder of the boot ROM block. The ROM is bad and probably cannot be fixed.

Logic Board LEDs

Power Mac G4 (AGP Graphics)

There is one red LED on the Power Mac G4 (AGP Graphics) logic board. It indicates that there is power to the board and does not imply a fault condition. Hardware such as DIMMs and PCI cards should not be installed or removed when the LED is on.

Power Mac G4 (PCI Graphics)

There are seven diagnostic LEDs on the Power Mac G4 (PCI Graphics) logic board. A graphic follows showing their location.

DS1 = ATA drive activity
If a CD and/or Zip are attached to the ATA bus, this LED will illuminate at power/on restart time for a few seconds. After that, it is unlikely it will illuminate again in a trouble-free system. If

this light stays on for a prolonged period, this is a sign of trouble on the ATA bus. If devices are connected to the ATA bus and this LED is dark at boot time, that is also likely a sign of trouble. If a hard disk drive is attached to this bus, the LED flickers regularly indicating drive activity (reads/writes).

DS4 and DS5 = USB power for downstream devices
DS5 = USB port 1- lower
DS4 = USB port 2- upper
(There is no DS2 or DS3 on the board.)

When illuminated, these LEDs indicate that the computer is providing power (+5 V) to downstream USB ports. USB devices do not need to be connected in order for these LEDs to illuminate. However, if one or both of the LEDs is not illuminated and a USB device is/was attached (and the system has completed its boot process), then the logic board has removed downstream power because of a trouble condition.

Since the downstream power is controlled individually for each port, it is possible to have these LEDs in a different state: one off and one on. This way if one port has troubled USB devices, the other port can still be functional. These LEDs are not immediately illuminated at the beginning of a restart or cold power-on. During a successful/normal boot, the sequence will look like:

1. Unit is powered on and other LEDs will illuminate while DS4 and DS5 are off.

2. Then DS4 and DS5 on for a second or two

3. Then off very briefly (1 second)

4. Then back on (confirms secondary PCI bus is initialized and power now available)

These two LEDs are often useful when troubleshooting an unpredictable system. If they stay on (step 4) then the secondary PCI bus has been initialized which happens relatively late in the

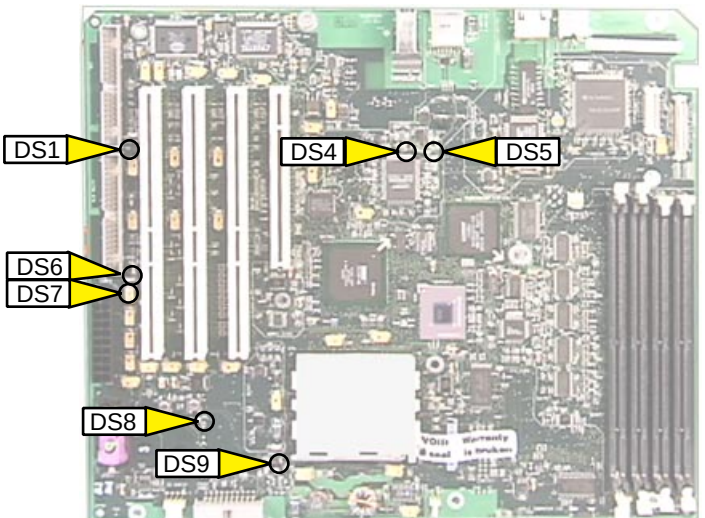
boot/hardware initializing process.

DS6 = Ultra ATA bus activity
DS6 indicates Ultra ATA bus activity.

DS7 & DS8 = Power Indication
In a working unit, these LEDs should be in sync with each other: both on or both off. If one LED is on and the other is off, there is a problem.

DS9 = CPU Bus Request
When illuminated, this LED indicates that the CPU is requesting the bus. This LED will rarely glow as brightly as the others (like the Ultra ATA LED) given that the CPU is not always requesting the bus, and when it does, the period of time is short. As a result, you may need to watch this LED much more carefully than the others to tell if there is activity. If this LED is ever on continuously and bright, then the system is troubled and likely hung.

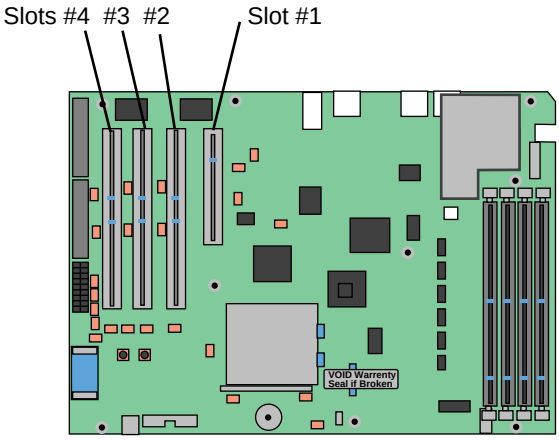
Power Macintosh G4 (PCI Graphics) Logic Board LEDs Locator



Video Card

Power Mac G4 computers require an I/O video card that moves video from the main logic board. The card is installed in slot #1 on the logic board, as illustrated below. Slot #1 on the Power Macintosh G4 (PCI Graphics) is a PCI slot; slot #1 on the Power Mac G4 (AGP Graphics) is an AGP slot. Refer to the Symptom Charts for details on troubleshooting video cards.

Note: The computer will boot up without the video card installed, but it will not operate properly.



SDRAM DIMMs

Power Mac G4 computers use SDRAM DIMMs. Make sure the DIMMs are

- PC-100 SDRAM
- 3.3 volt unbuffered
- 168-pin
- 64-bit wide

PC-100 DIMMs from recent Power Macintosh G3 and Macintosh Server G3 computers are compatible with Power Mac G4 computers; DIMMs in older Macintosh computers are not. Do not use older DIMMs even if they fit into the Power Mac G4 DIMM slots.

The SDRAM DIMMs can be installed one or more at a time. There are no performance gains when two DIMMs of the same size are

installed. Any supported size DIMM can be installed in any DIMM slot, and the combined memory of all of the DIMMs installed will be configured as a contiguous array of memory.

Power Macintosh G4 (PCI Graphics)

Four slots on the Power Macintosh G4 (PCI Graphics) logic board accept 8, 16, 32, 64, 128, and 256 MB DIMMs. Any 128 MB DIMMs must be 64 or 128 Mbit technology; 256 MB DIMMs must be 128 Mbit technology.

Power Mac G4 (AGP Graphics)

Four slots on the Power Mac G4 (AGP Graphics) logic board accept 8, 16, 32, 64, 128, 256, or 512 MB DIMMs. Any 256 MB DIMMs must be 128 or 256 Mbit technology; 512 MB DIMMs must be 256 Mbit technology.

Cleaning Procedure for Card Connectors

It is possible for residue to build up on the gold edge connector pins on some cards, which could cause a variety of symptoms.

If you are having problems with a card, inspect the connector pins with a magnifying glass. If you find residue, use a pencil eraser or the chemical cleaner “stabilant” (see TIL article 10468) to gently clean the pins. Remember, never handle the cards by the gold connectors.

VGA-to-Macintosh Adapters

To avoid “No video” or “Black screen” situations, do not use two VGA-to-Macintosh adapters (one on each end) on the video cable that connects a Power Mac G4 computer to a monitor with a captive VGA connector.

If you need to connect a VGA monitor, connect it in one of the following ways:

- VGA monitor --> to a VGA cable with VGA connectors on both ends --> to the video card on the Power Mac G4
- VGA monitor --> to a mixed cable, a cable that has a VGA connector on one end and a Macintosh connector on the other end --> to the video card on the Power Mac G4

Symptom Charts

System

Fan is running, LED is on, drive is accessed at startup, no startup chime, and screen is black	1 Reseat SDRAM DIMMs. 2 Check cable connections to the monitor and to the speaker/ microphone ports on the rear of the unit. Are the cables connected to the correct ports? 3 Power Mac G4 (PCI Graphics): Check jumper block at J25. Make sure jumper is correct color for processor type, includes all required inner metal clips, and is installed in correct direction. See “Processor Module” in Take Apart for more information. 4 Reseat video card and PCI cards.

Memory error dialog box message appears on the screen	1 Reseat SDRAM DIMMs. (**Note:** The computer does not ship with any on-board memory. You must have an SDRAM DIMM installed for the computer to boot properly.) 2 Verify that only PC-100 SDRAM DIMMs are installed and not EDO memory. 3 Run MacTest Pro to locate the bad SDRAM. Replace the SDRAM with a known-good DIMM.
Computer begins to power up, the fan and hard drive are spinning, the power LED is lit, but there is no video.	1 Check all cable connections. 2 Power Mac G4 (PCI Graphics): Check jumper block at J25. Make sure jumper is correct color for processor type, includes all required inner metal clips, and is installed in correct direction. See “Processor Module” in Take Apart for more information. 3 Reseat SDRAM DIMMs. Refer to the “Power-On Self Test” section mentioned earlier in this chapter. 4 Test for a bad SDRAM DIMM by removing the DIMMs one at a time (replacing each one afterwards). Replace any faulty

	SDRAM DIMMs. 5 Reseat the processor card. 6 Verify internal SCSI cabling is secure. 7 Verify all cards are seated properly. 8 Remove all cards (except video card) and disconnect hard drives from the logic board. Do you have video? 9 Replace the video card. 10 Replace the logic board. 11 Replace the processor.
Clicking, chirping, thumping, or rubbing	1 Remove all PCI cards and test unit. If problem does not occur with cards removed, begin replacing cards one at a time to determine which card is causing problem. Replace problem card with known-good card. 2 Remove media from drives and verify noise is gone. Replace media. 3 Verify no cables are caught in fan. 4 Disconnect fan and verify noise is gone. Replace fan.

5 Reseat the CD-ROM/Zip drive carrier.
6 Disconnect power cable to all drives. Reconnect drives one at a time. Replace problem drive.
7 Replace power supply.
8 Replace video card.
9 Replace logic board.
10 Replace processor module.

System shuts down intermittently

1 Check that the fan cable is connected and the fan is operational.
2 Make sure air vents are clear. Do not operate the computer with the access panel open, the heatsink could overheat.
3 Make sure power cord is plugged in firmly.
4 Check that power source is turned on and correct voltage is present.
5 Replace power cord.
6 Check battery.
7 Power Macintosh G4 (PCI Graphics): Reset Cuda chip. See

	"The Cuda Chip" in this chapter. 8 Reset logic board. (Refer to "Resetting the Logic Board" in this chapter.) 9 Replace power supply. 10 Replace logic board. 11 Replace processor module.
System intermittently crashes or hangs	1 Verify system software is Mac OS 8.6 or higher. 2 If crash or hang is occurring in a specific application, replace the application. 3 Perform a clean install of system software with the system restore CD that came with the computer. 4 Verify software is compatible with this model of Power Macintosh (contact developer). 5 Start up with extensions off to determine if there are system extension or control panel problems. 6 Run Disk First Aid. 7 Test for bad memory. Run MacTest Pro in loop mode

overnight to test the memory. If MacTest Pro finds a bad memory module, or other hardware, replace the hardware in question with a known-good module.

8 Clear parameter RAM. Hold down Command-Option-P-R during startup but before “Welcome to Macintosh” appears.

9 Remove all SDRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.

10 Reset the logic board. Refer to “Resetting the Logic Board.”

11 Replace logic board.

12 Replace processor module.

During startup, following message is displayed, “This startup disk will not work on this Macintosh model....”

1 Start up with the system restore CD that came with the computer and run Disk First Aid.

2 Verify system software is Mac OS 8.6 or higher.

3 Perform a clean install of system software with the system restore CD that came with the computer.

System freezes during normal operation	1 Boot with extensions off by holding down the Shift key during startup. To isolate the problem, use the Extension Manager to add the system extensions and control panels back one at a time, starting up the system after each addition. 2 Perform a clean install of system software with the system restore CD that came with the computer. 3 Reset the logic board. See “Resetting the Logic Board” in this chapter. 4 Remove all third-party hardware from the computer, including RAM, PCI cards, hard drives, external USB devices, and FireWire devices. Also remove any third-party drivers. Reinstall one at a time, starting up after each addition. 5 Run MacTest Pro in loop mode to verify the remaining Apple hardware. 6 Replace the logic board. 7 Replace the processor module.

No Power

System is completely dead (no fan movement)

1. Power Mac G4 (PCI Graphics): Check LEDS DS7 and DS8 on the logic board. In a working unit, these LEDs should be in sync with each other: both on or both off. If one LED is on and the other is off, there is a problem.
2. Verify the power outlet is good. Try a known-good power cord.
3. Make sure the voltage switch on the back of the power supply is set to the correct voltage.
4. Check for +5 V trickle voltage on pin 20 at the power supply connector. (Pin 20 is the pin closest to the edge of the logic board and the front of the computer.) If there is a +5 V reading, you know the power supply is likely OK. However, if there's no +5 V trickle power, replace the power supply.
5. Disconnect the keyboard and power-on the system via the power button on the front of the computer. If the unit powers on, replace the USB keyboard. If not, go to next step.

6 Power Macintosh G4 (PCI Graphics): Reset the Cuda chip and try again. See “The Cuda Chip” in this chapter.
7 Reset the logic board. See “Resetting the Logic Board” in this chapter.
8 Replace the logic board.

Error Beeps

Computer beeps once at startup	1 One beep means that no RAM is installed or detected. 2 Reseat the SDRAM and try again. 3 If no SDRAM is present, install a known-good PC-100 SDRAM DIMM in the top slot and try again. 4 If DRAM is present, replace it (one DIMM at a time, starting with the top DIMM slot) with a known-good PC-100 SDRAM DIMMs. 5 Reseat processor module and try again. 6 Replace processor module and try again. 7 Replace logic board.
Computer beeps twice at startup	1 Two beeps means that incompatible RAM types may be installed. Verify that only PC-100 SDRAM DIMMs are installed and not EDO memory. 2 Replace the existing SDRAM one DIMM at a time with known-good PC-100 SDRAM DIMMs.

	3	Reseat processor module and try again.
	4	Replace processor module and try again.
	5	Replace logic board.
Computer beeps three times at startup	1	Three beeps means that no RAM banks passed memory testing.
	2	Replace the existing SDRAM one DIMM at a time with known-good PC-100 SDRAM DIMMs.
	3	Reseat processor module and try again.
	4	Replace processor module and try again.
	5	Replace logic board.
Computer beeps four or five times at startup	1	Four or five beeps means that the ROM is probably bad and cannot be fixed.
	2	Remove all third-party hardware from the computer, including RAM, PCI cards, hard drives, external USB devices, and FireWire devices. Reinstall one at a time, starting up after each addition.
	3	Replace logic board.

Video

Screen is black, but boot tone is present, drive operates, fan is running, and LED is lit	1 Check video cable/card connections and connector pins. 2 Remove all third-party devices. 3 Reseat video card. 4 Power Mac G4 (PCI Graphics): Check jumper block at J25. Make sure jumper is correct color for processor type, includes all required inner metal clips, and is installed in correct direction. See “Processor Module” in Take Apart for more information. 5 Reseat SDRAM DIMMS. Make sure DIMMS are PC-100 DIMMS. 6 Remove all SDRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs. 7 Clear parameter RAM. Hold down Command-Option-P-R during startup but before “Welcome to Macintosh” appears. 8 Power Macintosh G4 (PCI Graphics): Reset Cuda chip. See “The Cuda Chip” in this chapter.

9 Reset logic board. See “Resetting the Logic Board” in this chapter.
10 Test with known-good monitor. Replace monitor if necessary. Refer to appropriate monitor manual to troubleshoot defective monitor.
11 Replace video card.
12 Replace processor module.
13 Replace logic board.

Screen is black, there is no boot tone, and drive does not operate, but fan is running and LED is lit

1 Power Mac G4 (PCI Graphics): Check jumper block at J25. Make sure jumper is correct color for processor type, includes all required inner metal clips, and is installed in correct direction. See “Processor Module” in Take Apart for more information.
2 Check video cable/card connections.
3 Reset Cuda chip. See “The Cuda Chip” in this chapter.
4 Reset logic board. See “Resetting the Logic Board” in this chapter.

5 Reseat the video card.
6 Reseat the SDRAM DIMMs.
7 Reseat processor module.
8 Remove all SDRAM DIMMs and try replacing them one at a time to test. Replace any bad DIMMs.
9 Replace the video card.
10 Replace processor module.
11 Replace logic board.
12 Replace power supply.

Boot tone is present and screen lights up, but nothing is displayed on screen

1 Check video cable/card connections.
2 Reset Cuda chip. See “The Cuda Chip” in this chapter.
3 Reset logic board. See “Resetting the Logic Board” in this chapter.
4 Reseat all PCI cards and SDRAM.
5 Reseat processor module.
6 Test with known-good monitor. Replace monitor if necessary. Refer to appropriate monitor manual to troubleshoot

	defective monitor. 7 Replace processor module. 8 Replace logic board.
Distorted Video	1 Apple monitors: Adjust the focus using the Display Adjustment Utility on the MacTest Pro CD. 2 Third-party monitors: Try a known-good monitor. 3 Check and reseat the video cable. 4 Check the video adapter if using one. Refer to “VGA-to-Macintosh Adapter” earlier in this chapter. 5 Adjust the screen geometry using the Display Adjustment Utility on the MacTest Pro CD. 6 Adjust the cutoff or white balance using the Display Adjustment and Display Service Utilities on the MacTest Pro CD. Refer to the monitor’s owner’s manual for additional information.

Erroneous text or characters appear on the screen	1 Check the keyboard and the keyboard connection. 2 Start up from the system restore CD that came with the computer. If problem is resolved, perform a clean install of the system software.
Flashing question mark	1 Boot from the system restore CD to verify the hard drive can be seen on the desktop. If booting from a SCSI chain, make sure the hard drive's SCSI ID is set to a unique number. 2 Check for OS software on the boot drive. 3 Run Disk First Aid. Update the driver with Drive Setup. 4 If the symptom is on the external SCSI drive, disconnect the external SCSI devices. Troubleshoot the SCSI chain if necessary. 5 Reinstall system software using the system restore CD that came with the computer. 6 Replace the hard drive data cable. 7 Replace the hard drive.

Screen jitter	1 Verify there are no environmental factors causing monitor to jitter. 2 Check all cable connections. 3 Test with known-good monitor. Replace monitor if necessary. Refer to appropriate monitor manual to troubleshoot defective monitor. 4 Reseat the video card. 5 Replace the video card.

Zip Drive

Zip drive does not show up on desktop	1 Replace Zip disk with known-good disk. 2 Does drive have power? Check that light blinks on front of Zip drive when disk is inserted. 3 Reseat cables on back of Zip drive. 4 Make sure driver is turned on in Extension Manager. 5 Reinstall Zip software. 6 Verify that Zip drive shows up in Apple System Profiler as ID = 1 (slave). If not, check the connector. There should be no jumper on the 6-pin device setting's connector. 7 Replace IDE/ATA drive cable. 8 Replace Zip drive. 9 Replace logic board.
During system startup, Zip disk ejects	1 Replace Zip disk with known-good disk. 2 Reseat cables on back of Zip drive. 3 Reinstall Zip software.

	4	Verify that Zip drive shows up in Apple System Profiler as ID = 1 (slave). If not, check the connector. There should be no jumper on the 6-pin device setting's connector.
	5	Replace IDE/ATA cable.
	6	Replace Zip drive.
	7	Replace logic board.
Zip disk does not eject	1	Use the manual eject hole on the Zip drive to eject the stuck disk. Examine the disk for damage. Restart the computer, and hold down the manual eject button throughout the entire boot process. Once the system is booted, insert a known-good Zip disk and try ejecting it by dragging the disk icon to the trash can.
	2	Reinstall Zip software.
	3	Replace Zip drive.
	4	Replace IDE/ATA drive cable.
	5	Replace logic board.

Zip drive attempts to eject disk, but doesn't	1 Reseat Zip drive bezel so bezel slot aligns correctly with drive. 2 Use the manual eject hole on the Zip drive to eject the stuck disk. Examine the disk for damage. Restart the computer, and hold down the manual eject button throughout the entire boot process. Once the system is booted, insert a known-good Zip disk and try ejecting it by dragging the disk icon to the trash can. 3 Replace Zip drive.
Zip drive runs continuously	1 Replace Zip disk with known-good disk. 2 Reinstall Zip software. 3 Replace Zip drive. 4 Replace IDE/ATA drive cable. 5 Replace logic board.

Hard Drive

Single internal ATA hard drive does not operate; drive doesn't spin	1 Check if you can see the drive using Drive Setup from MacTest Pro. Reinstall the software drivers for the hard drive. 2 Check all cable connections to the hard drive. 3 Replace hard drive data cable. 4 Verify hard drive power cable is OK. Try another power connector. If power cable defective, replace power supply. 5 Replace hard drive. If problem resolved, reinstall IDE device driver and system software.
No internal SCSI drives operate	1 Verify hard drives are getting power. 2 Verify there are no duplicate SCSI device addresses on a single SCSI bus. 3 Disconnect external SCSI devices and check for proper termination. 4 Reseat SCSI PCI card and verify data cable is seated firmly in

	card and drives. 5 Check internal SCSI termination. Internal drives should not be terminated; SCSI cable should have termination at end. 6 If more than one SCSI device is on the SCSI chain, remove one device at a time and retest. Replace the bad drive. 7 Replace internal SCSI data cable. 8 Replace SCSI PCI card. 9 Replace power supply.
No external SCSI drive shows up	1 Verify there are no duplicate SCSI device addresses. 2 Verify total cable length does not exceed maximum total cable length for SCSI card. See TIL article 58204. 3 Reseat SCSI cable connections going to the SCSI card. 4 Replace terminator on external SCSI device. 5 Reseat the SCSI card, then try a known-good SCSI card. 6 Replace SCSI drive cables one at a time. 7 Disconnect external SCSI chain. Using known-good cables, reattach devices one at a time.

Input Device Problems

At startup, cursor does not move with the USB mouse	1 Disconnect and reconnect the mouse securely to the USB keyboard. 2 Inspect inside of mouse for buildup of dirt or other contaminants. Clean mouse if necessary. 3 If mouse is connected to keyboard, connect the mouse to one of the USB ports on the I/O panel instead. If the mouse works, replace keyboard. 4 If the cursor doesn't move, replace the USB mouse. 5 If the mouse is connected to one of the USB ports on the I/O panel, switch to the other USB port. 6 If the cursor moves, replace logic board.
Cursor moves, but clicking USB mouse button has no effect	1 Boot from system restore CD that came with the computer. 2 Troubleshoot extensions or reinstall system software. 3 If mouse is connected to keyboard, connect the mouse to one of the USB ports on the I/O panel instead. If mouse works,

	replace keyboard. 4 If the mouse is connected to one of the USB ports on the I/O panel, switch to the other USB port. If mouse works, replace logic board. 5 Clear parameter RAM. Hold down Command-Option-P-R during startup but before “Welcome to Macintosh” appears. 6 Replace mouse.
No response to any key on keyboard	1 Boot with extensions off. If problem resolved, troubleshoot extensions. 2 Check keyboard connection to USB port. 3 Remove all USB devices, except keyboard and mouse. 4 Boot from system restore CD that came with the computer and test. Reinstall system software. 5 Replace keyboard. 6 Replace logic board.

USB printer does not work	1 Verify you have correct version of system software and printer driver installed. 2 Open the Chooser and verify that you have the correct printer selected. 3 If the printer is connected to a third-party USB hub, switch it to one of the USB ports on the I/O panel. If the printer works now, you have a bad third-party USB hub. 4 Turn off unnecessary extensions and try again. 5 Perform clean install of system software and print driver. 6 Replace printer interface cable. 7 Replace the printer. 8 Replace logic board.

Known-good network printer does not print	1 Check network connections. 2 Verify you have correct version of system software and printer driver installed. 3 Open the Chooser and verify that you have the correct printer selected. 4 Does printer show up in Chooser? If so, perform clean install of system software and/or network and printer software.

CD-ROM Drive

CD-ROM tray won't open	1 Reseat cables on the back of the CD-ROM drive. 2 Verify CD-ROM software is good. Reinstall CD-ROM software. 3 Verify CD-ROM bezel is properly seated. 4 Reseat CD-ROM data cable on logic board. 5 Try using known-good compact disc. 6 Replace CD-ROM drive mechanism.
CD-ROM icon does not appear on the desktop	1 Try using known-good compact disc. 2 Reinstall CD-ROM software. 3 Reseat CD-ROM data cable back of CD-ROM drive and at logic board. 4 Replace CD-ROM data cable. 5 Replace CD-ROM drive mechanism. 6 Replace the logic board only if other devices on the bus do not work.

DVD-ROM Drive

“Cannot open” error message appears when Apple DVD Player launched	1 Make sure DVD-ROM drive is installed. If CD-ROM rather than DVD-ROM drive is installed, Apple DVD Player cannot launch. 2 Quit all open applications and relaunch Apple DVD Player. 3 Restart computer and relaunch Apple DVD Player. 4 Power Mac G4 (PCI Graphics): Verify DVD decoder card is installed. 5 Turn off Chooser setting for automatically mounting servers at startup. For more information, see TIL article 30970. 6 Refer to TIL article 30887 for further instructions.

Sound

No sound from computer's speaker

1. Boot with extensions off and try again. Troubleshoot extensions
2. Boot from system restore CD that came with the computer and test. Reinstall system software.
3. Disconnect any microphones or external speakers.
4. Verify that volume setting in Control Panel is adequate and mute is not checked.
5. Clear parameter RAM. Hold down Command-Option-P-R during startup, until the Macintosh restarts.
6. Verify speaker cable is plugged into logic board.
7. Plug headphones or external speakers into the external jack. If the external jack works, replace the internal speaker. If the external jack doesn't work, replace the logic board.

Network Problems

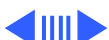
Ethernet connection drops off line by itself	1 Try another Ethernet cable. 2 Reinstall the Ethernet driver. 3 Possible network problem. Troubleshoot the network.
Unable to switch to the Ethernet network option in the control panel	1 Use a known-good Ethernet cable and connect properly to an known-good network. 2 Reset parameter RAM. Hold down Command-Option-P-R during startup but before “Welcome to Macintosh” appears. 3 Boot from the system restore CD that came with the computer. Open the TCP/IP control panel and switch to Ethernet. Are you able to switch to Ethernet and see Ethernet devices on the network now? If so, troubleshoot software extensions or reinstall system software.

Unable to see any network devices	1 Open the AppleTalk or TCP/IP control panel and select the Ethernet option. Verify that you can now see devices on the network. 2 Reset parameter RAM. Hold down Command-Option-P-R during startup but before “Welcome to Macintosh” appears. 3 Boot from the system restore CD that came with the computer. Open the AppleTalk or TCP/IP control panel and switch to Ethernet. Are you able to switch to Ethernet and see Ethernet devices on the network now? If so, troubleshoot software extensions or reinstall system software. 4 Try connecting to a known-good Ethernet port at the wall or external hub. 5 Verify that other users are experiencing the same problem. If so, contact the network administrator. If not, go on to the next step 6 Replace the logic board.

Modem

The internal modem is not recognized.	1 Make sure the correct CCL and extension files installed. 2 Reseat the modem and modem cable. 3 Reinstall the CCL and modem extension. If the problem persists, reinstall the system software and try again. 4 Reset parameter RAM. Hold down Command-Option-P-R during startup but before “Welcome to Macintosh” appears. 5 Replace the modem.
Modem reports an error when dialing out	1 Make sure the correct driver is installed and the correct CCL is selected and that they are not corrupted. If necessary, reinstall the driver and/or CCL. 2 Try another cable and phone jack. 3 If the problem persists, reinstall the system and modem software.

Computer freezes when modem dials	Extensions are in conflict or the Mac OS is corrupted. Enable only the Mac OS files in the Extensions Manager and any modem drivers needed. If the problem persists, reinstall the system software
Modem is having trouble connecting to Online site	1 The phone line may have too much noise. If the user has a second line, try that one. The user should contact their local phone company and request their line be checked. 2 Check to make sure the TCP/IP control panel is correctly configured for the user's Internet Service Provider. If the TCP/IP control panel is not configured correctly, it may connect but won't be able to access any sites. 3 Sometimes online services use different servers for dial-up/ authentication and for services. If one server is down, users may be able to login but not access any services. Contact the online service for help.



The system returns an error message when launching an Internet browser	Browser software is not installed correctly. If necessary, reinstall the browser software. **Note**: Internet Explorer 4 and greater needs to be installed and not just drag copied.
The dialup software will not initiate a connection	Dialup software is installed incorrectly. Make sure the software is fully installed and all required extensions are enabled. If necessary, reinstall the dialup software and provide the necessary information for setup.
Modem is dropping its connection	1 Try another cable and phone jack. 2 The phone line may be too noisy to handle the higher modem speeds. Try connecting at a slower speed or use a generic CCL file. (If you are familiar with the CCL script language, you can edit the modem script to force a connection at a lower speed.) If the problem continues, contact the phone company to report the bad phone line.

3 Verify that the user has call waiting on that phone line. With call waiting active, an incoming call can interrupt the connection. Disable call waiting using AT commands placed in the init string of the dialup application. Usually the string is *70.
4 There may be a problem with the server to which you are connecting. Servers sometimes develop problems that disconnect users without explanation. Try calling back later or use an alternate number if one is available.
5 Check with the Internet Service Provider.
6 Reseat the modem. If the problem persists, replace the modem.

Modem disconnects after a period of time

Timed disconnect setting is causing the modem to disconnect. Some services or software packages have a feature that will disconnect the user after a set period of time. Either increase this time setting or disable the feature if possible. Contact the ISP or network administrator for more information.

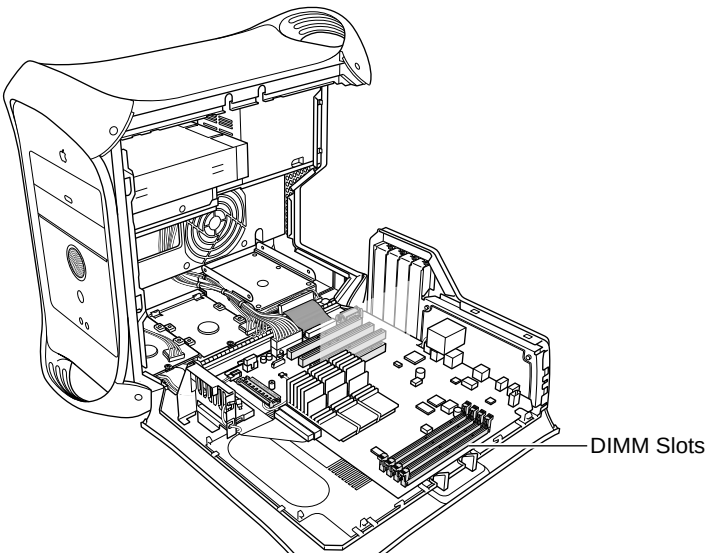
Modem is slow responding	1 Too many people are using the ISP's Internet services. When using an ISP, users need to remember that the ISP only has a limited amount of bandwidth to the Internet. If a large amount of people are dialing in, individual's speeds will be affected 2 Check the phone line. The quality of the phone line can limit modem performance.

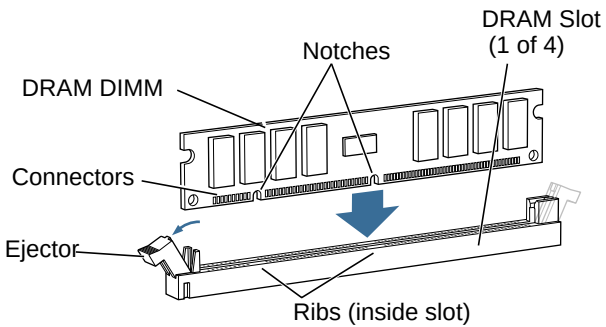
Upgrades

Power Mac G4 / Macintosh Server G4

SDRAM DIMM Installation

Before you begin, open the side access panel.





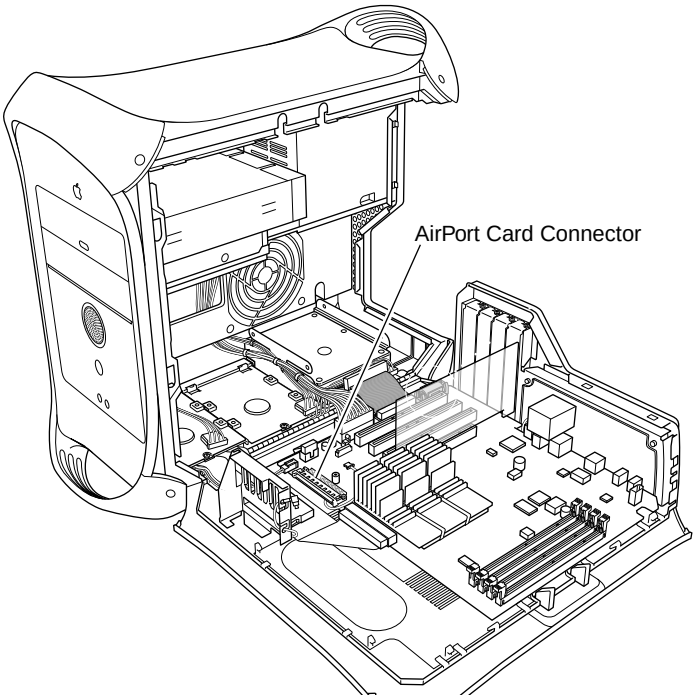
1 Align a DRAM DIMM in the DRAM slot so the notches line up with the ribs inside the slot.

2 Push the DIMM down evenly until the ejectors snap into place.

Note: To remove a DIMM, push down on the slot's ejectors until they open and release the DIMM. Some DRAM slots may have only one ejector.

Important: After upgrading memory on a new, out-of-the-box Power Mac G4

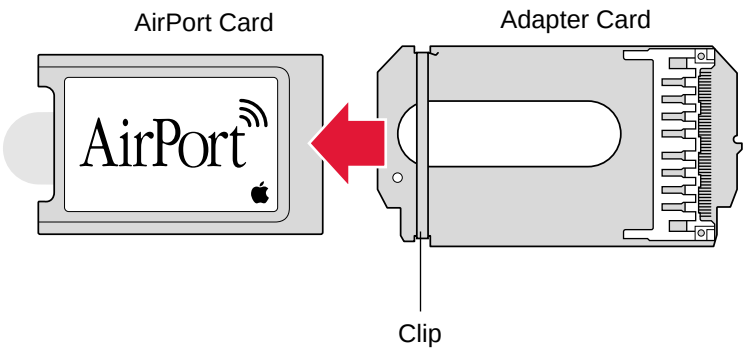
running Mac OS 9, you must press Option-S when restarting the computer. This ensures the customer will see the Setup Assistant (a movie and setup instructions). If these keys are not pressed down each time a technician restarts the system after an upgrade, the Setup Assistant file will execute, disable itself, and the customer will never see it.



AirPort Card Installation

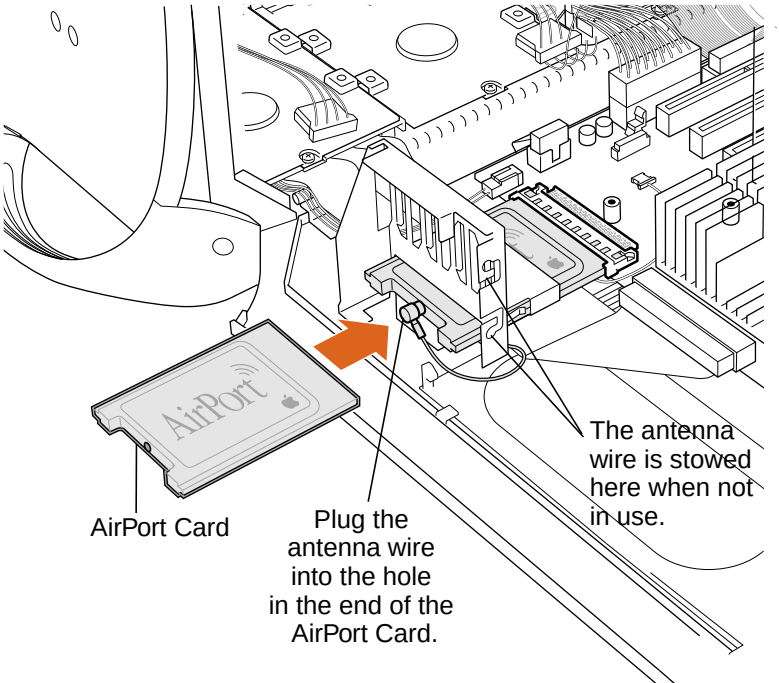
Before you begin, open the side access panel.

Note: The following procedure applies to the Power Mac G4 (AGP Graphics) only. You cannot install an AirPort card in the Power Mac G4 (PCI Graphics).



1 If an adapter card is installed on the AirPort card, release the metal clip and remove the AirPort card from the adapter.

Note: The adapter and clip are not used with the Power Mac G4.



2 Insert the AirPort card through the opening in the PCI card guide and into the connector on the logic board.

3 Connect the antenna cable to the conector on the end of the AirPort card.

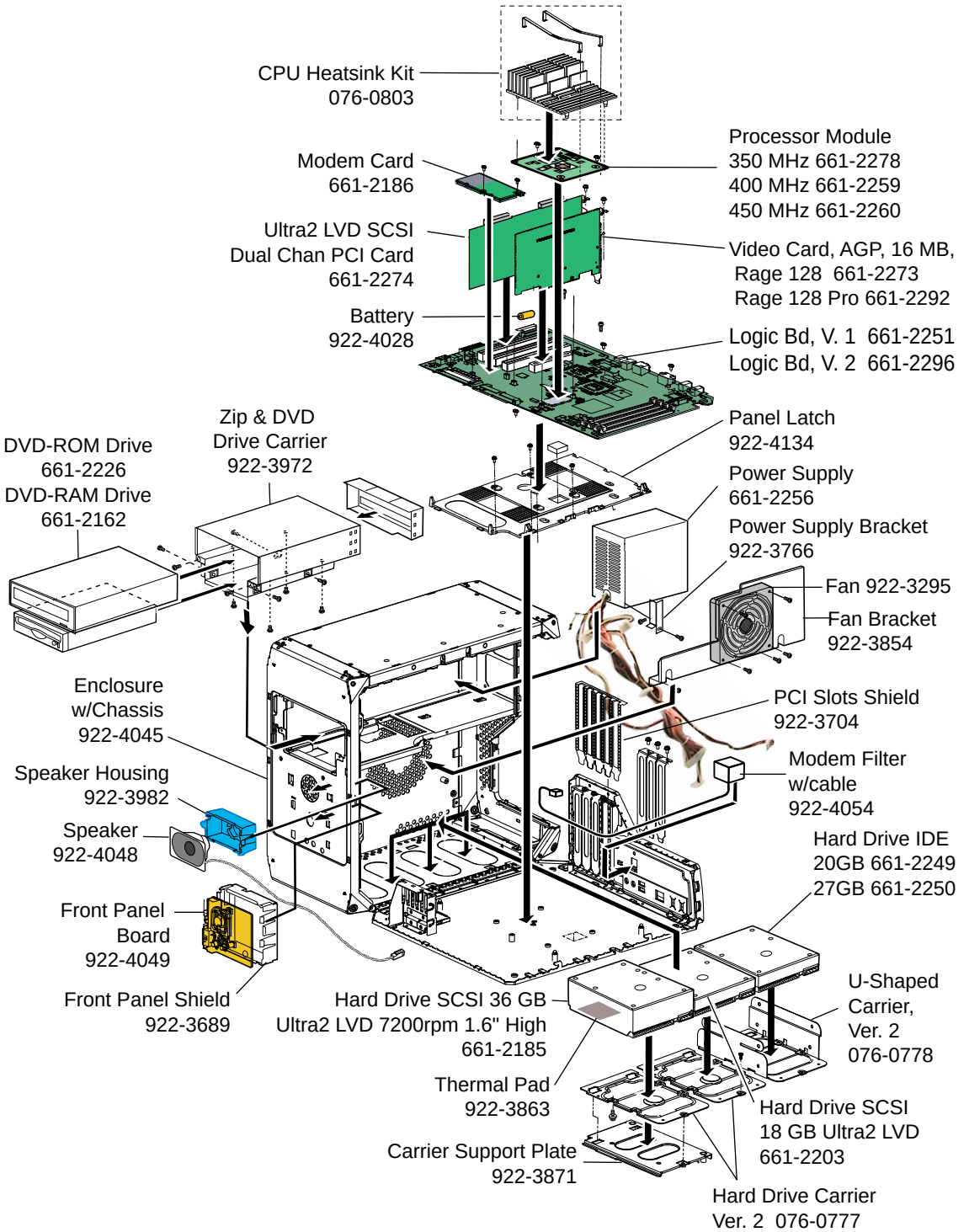
Important: After installing an AirPort card on a new, out-of-the-box Power Mac G4 running Mac OS 9, you must press Option-S when restarting the computer. This ensures the customer will see the Setup Assistant

(a movie and setup instructions). If these keys are not pressed down each time a technician restarts the system after an upgrade, the Setup Assistant file will execute, disable itself, and the customer will never see it.

Exploded View

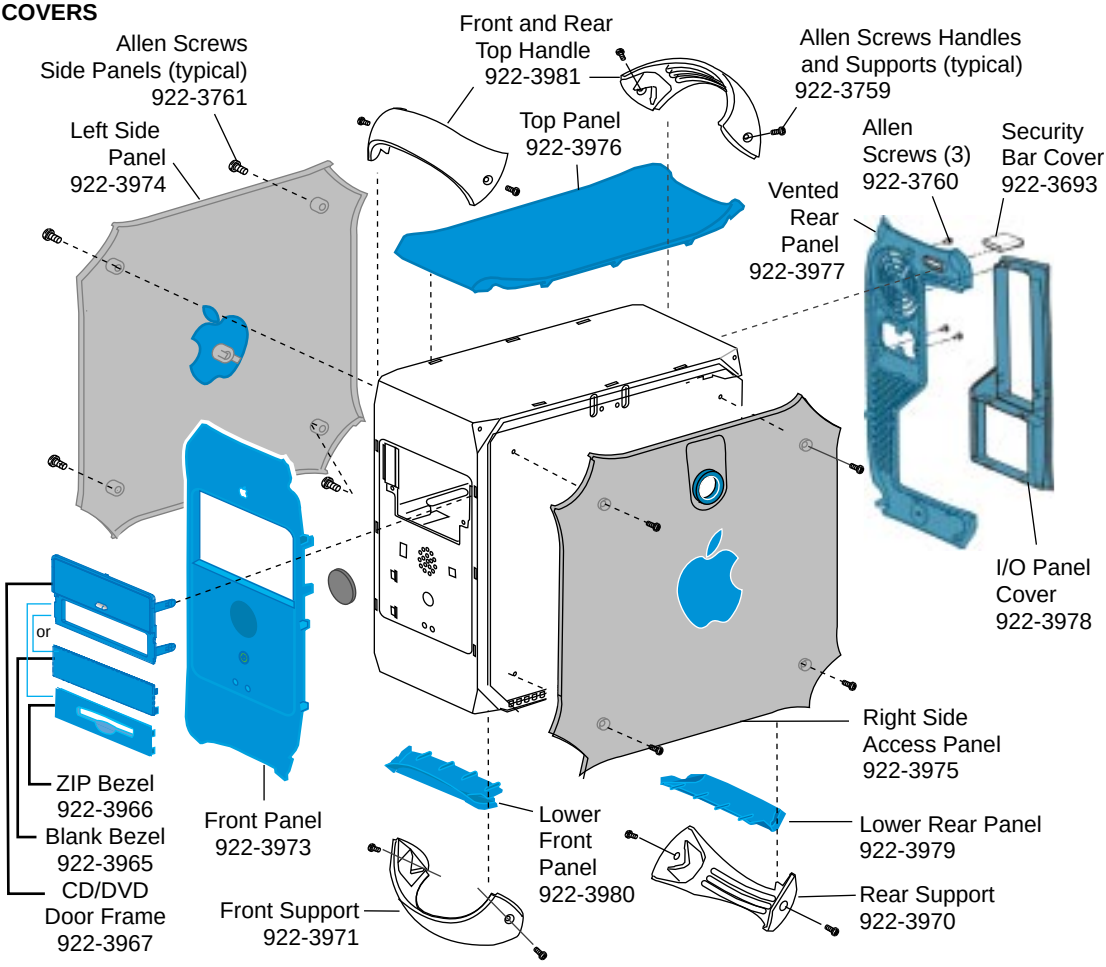
Power Mac G4 (AGP Graphics)/ Macintosh Server G4

Power Mac G4 (AGP Graphics)



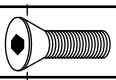
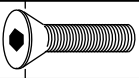
*Covers and Enclosure: See page 2. Cables and Screw Matrix: See page 3.

COVERS

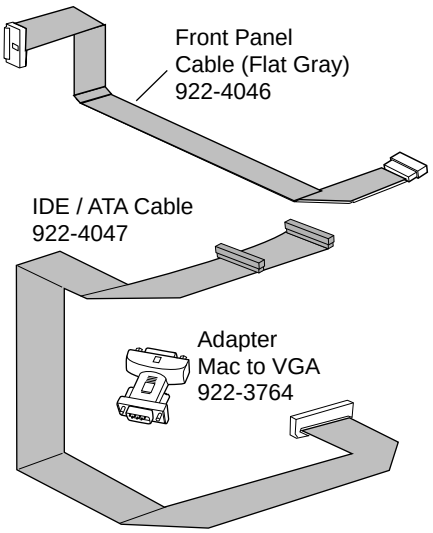


Enclosure with Chassis 922-4045

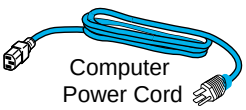
Note:
Logic Board, CD drive, Zip drive, power supply and hard drives are not part of the enclosure.

Power Mac G4 (AGP Graphics) Screw Matrix		
076-0777		Hard drive carrier, Ver. 2, and (5) screws (same as 922-3874) (4) Hard drive carrier to hard drive, (1) Hard drive carrier to chassis
922-3874		(4) Hard drive carrier to hard drive, (1) Hard drive carrier to chassis
922-1203 (34 total)		(1) Modem, (1) Modem plug, (2) Carrier support plate, (1) Power supply bracket, (4) Latch panel, (12) Logic board, (2) Firewire board, (2) Fan guard, (3) Chassis, (1) Hard drive carrier retainer, (4) PCI slot covers (same screw can be used when cards installed)
922-2739		(4) CD/DVD drive to carrier, (4) Zip drive to carrier, (1) Bracket to power supply
922-3669		(4) Fan to fan bracket
922-3759		(4) Handles and (4) supports
922-3760		(3) Vented rear panel
922-3761		(8) Right and left side panels
922-3762		(2) Latch to right side panel
922-3873		(2) CD/DVD/ZIP drive carrier to chassis
922-4051		(3) Processor to logic board
922-4050		(2) Modem to logic board
922-4052		(2) Antenna

Cables



Firewire Cable (External)
922-3884

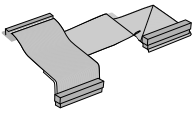


Cable Modem, Phone Ice
922-3963

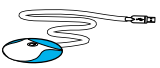
SCSI Adapter
922-3770

Ultra ATA Cable, Dual Drive
922-3862

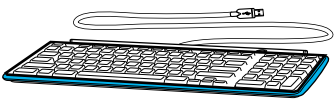
Ultra2 LVD SCSI
Cable 922-3861



Apple USB Mouse
922-3969



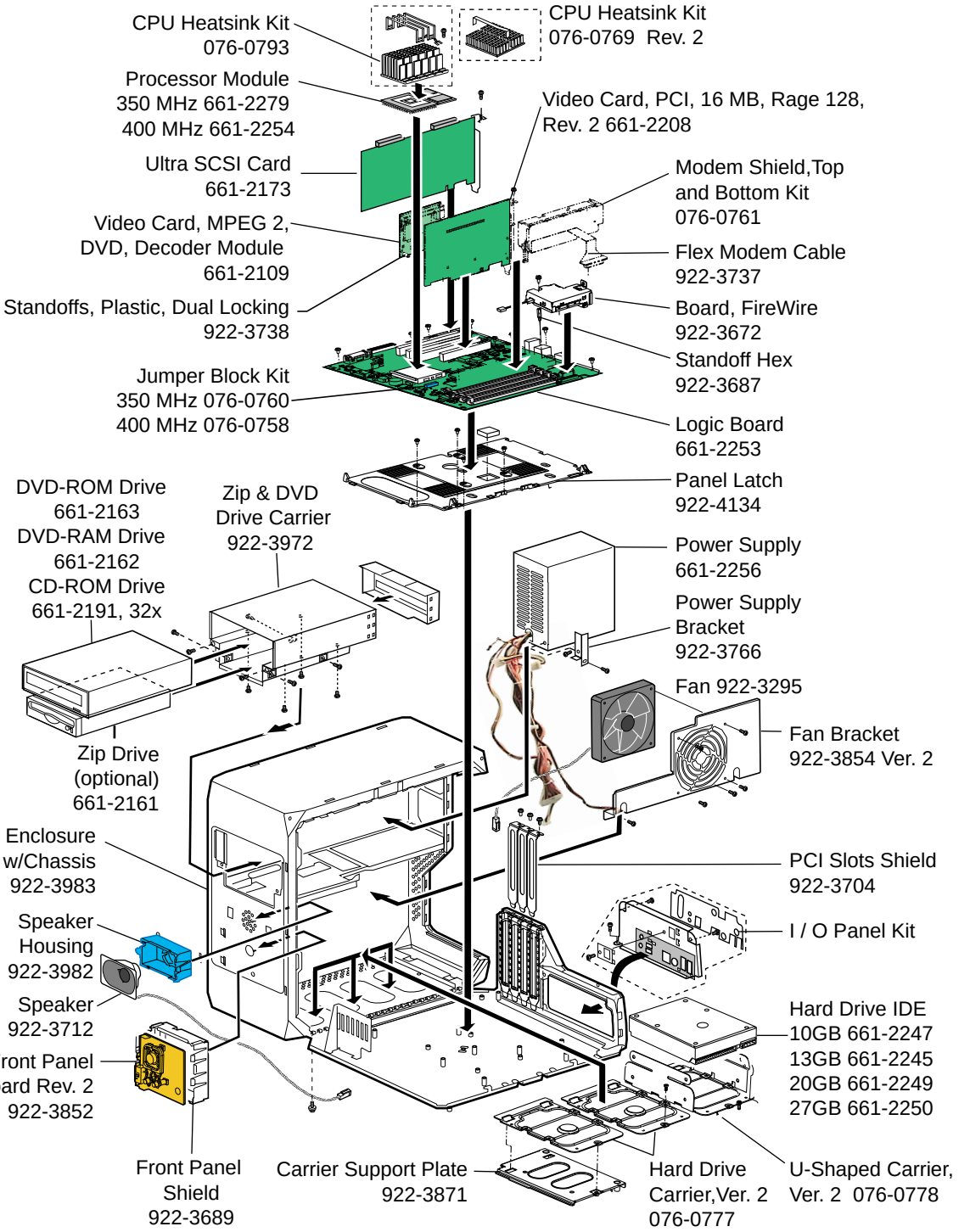
Apple USB Keyboard
922-4161



Exploded View

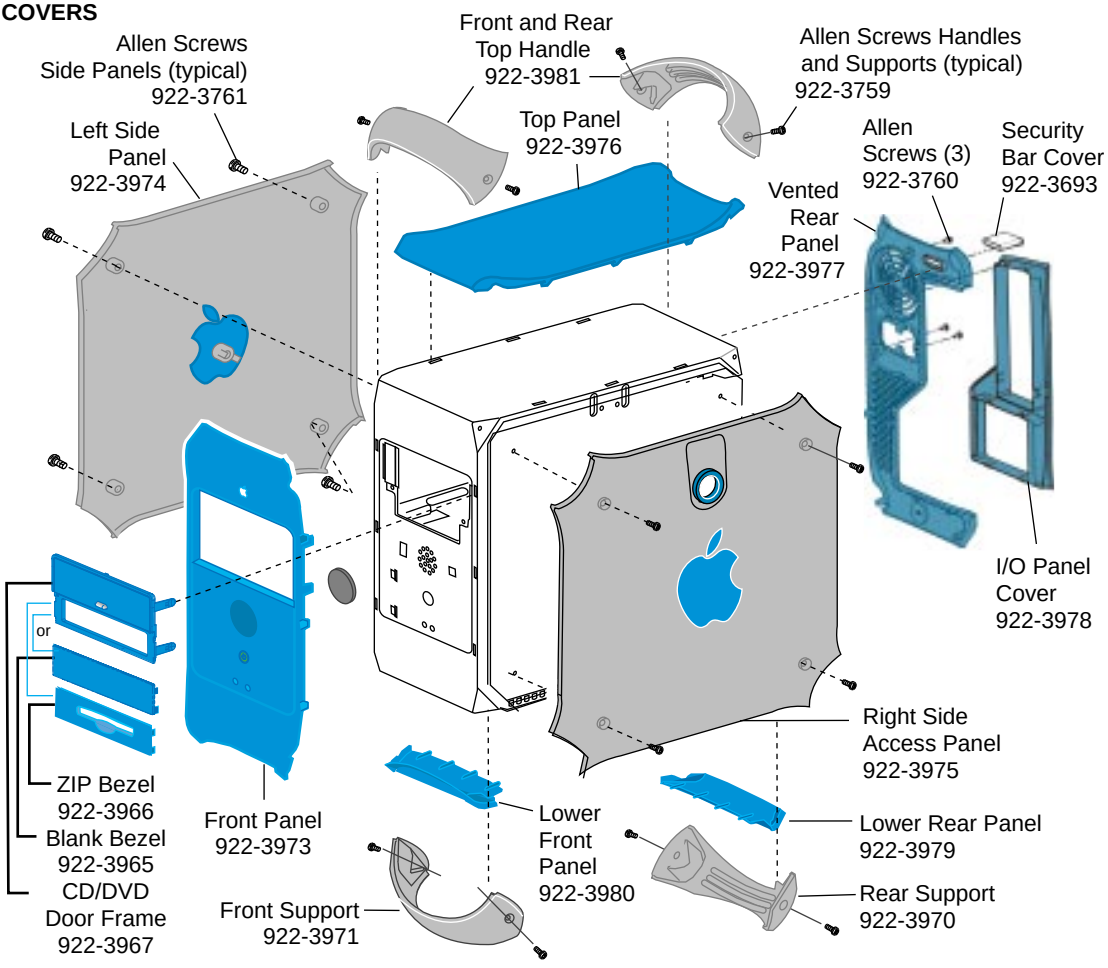
Power Mac G4 (PCI Graphics)

Power MacG4 (PCI Graphics)

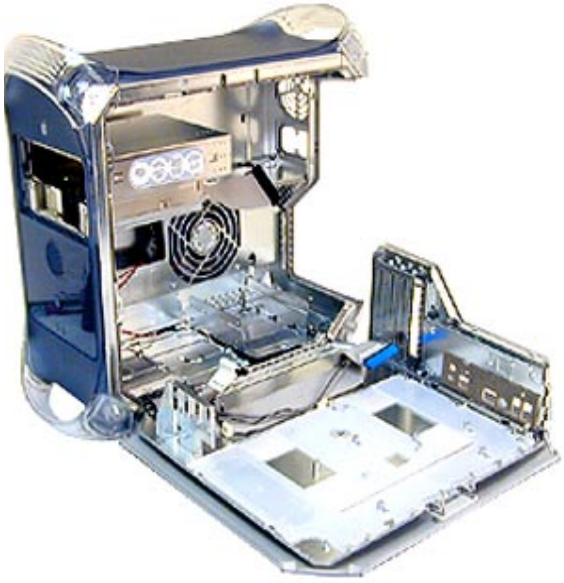


*Covers and Enclosure: See page 2. Cables and Screw Matrix: See page 3.

COVERS



Enclosure with Chassis 922-3983



Note:
Logic Board, CD drive, Zip drive, power supply, and hard drives are not part of the enclosure.

Power Mac G4 (PCI Graphics) Screw Matrix

076-0777 Ver. 2 only				Hard drive carrier, Ver. 2, and (5) screws (same as 922-3874) (4) Hard drive carrier to hard drive, (1) Hard drive carrier to chassis
922-3874				(4) Hard drive carrier to hard drive, (1) Hard drive carrier to chassis
922-1203 (34 total)				(1) Modem, (1) Modem plug, (2) Carrier support plate, (1) Power supply bracket, (4) Latch panel, (12) Logic board, (2) Firewire board, (2) Fan guard, (3) Chassis, (1) Hard drive carrier retainer, (4) PCI slot covers (same screw can be used when cards installed)
922-2739				(4) CD/DVD drive to carrier, (4) Zip drive to carrier, (1) Bracket to power supply
922-3013				(1) FireWire board into hex standoff on logic board
922-3669				(4) Fan to fan bracket
922-3687				(1) Hex standoff (under FireWire board) to logic board
922-3759				(4) Handles and (4) supports
922-3760				(3) Vented rear panel
922-3761				(8) Right and left side panels
922-3762				(2) Latch to right side panel
922-3873				(2) CD/DVD/ZIP drive carrier to chassis

Scale = 1 inch 0 1/8 1/4 3/8 1/2 5/8 3/4 1

Cables