



Macintosh Quadra 610/ Centris 610/WS 60

Macintosh Quadra 610 DOS Compatible
Macintosh Quadra 610
Macintosh Centris 610
Workgroup Server 60





Basics

Macintosh Quadra 610/Centris
610/WS 60





Overview

This manual includes complete repair procedures for the Quadra 610, Centris 610, and WorkGroup Server 60 shown at left.

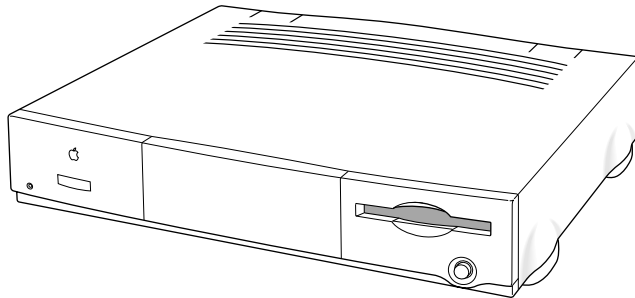


Figure: Macintosh Centris 610, Quadra 610, and WS 60





Specifications

Macintosh Quadra 610/Centris
610/WS 60





Processors

Centris 610/AWS 60

Motorola 68LC040

20 MHz

Built-in memory management unit (MMU)

Note: Apple does not provide a floating point unit (FPU) upgrade for this product.

Quadra 610/AWS 60

Quadra 610: Optional Motorola 68LC040 or 68040

AWS 60: Motorola 68040

25 MHz

Built-in memory management unit (MMU)

Note: A floating point unit (FPU) coprocessor is included with the 68040 processor.



**Quadra 610, DOS
Compatible**

Motorola 68LC040
25 MHz
Built-in memory management unit
DOS compatible card

**DOS Compatible
Card**

486SX microprocessor
25 MHz
32-bit addressing
32-bit data paths
One 72-pin SIMM slot supports up to 64 MB expansion, 80 ns or faster SIMM.
512K, 80 ns video DRAM soldered on board supports standard VGA, many SVGA, and Macintosh monitors.
32-bit DMA channel supports peripheral access to local memory and shared memory through the Macintosh Operating System.





Memory

Centris 610/ Quadra 610

RAM	4 or 8 MB RAM standard, expandable to 68 MB (80 ns or faster 72-pin SIMM)
ROM	1 MB

AWS 60

RAM	8 MB RAM standard, expandable to 68 MB (80 ns or faster 72-pin SIMM)
ROM	1 MB





PRAM	1 MB
VRAM	256 bytes of nonvolatile parameter memory
Clock/Calendar	512K, expandable to 1 MB (80 ns or faster 68-pin SIMM) CMOS custom chip with long-life lithium battery





Disk Storage

Floppy Drive

1.4 MB Apple SuperDrive

Hard Drive

Centris 610/Quadra 610: 80 MB to 500 MB hard drive

CD-ROM

AWS 60: 230 MB or 500 MB hard drive
Optional internal 5.25-in. CD-ROM drive





I/O Interfaces

SCSI

One SCSI port; DB-25 connector

Supports a maximum of six external devices (internal SCSI devices include the computer, which is always device 7)

Apple Desktop Bus

Two Apple Desktop Bus (ADB) ports; mini DIN-4 connectors

Low-speed synchronous serial interface

Two RS-232/RS-422 serial ports; mini DIN-8 connectors

230.4 Kbps maximum

0.92 Mbps maximum, clocked externally

Serial

Internal expansion slot supports either a processor-direct slot card or 7-inch NuBus card (with appropriate adapter)





Sound	One stereo-capable output port One monaural input port
Video	One video port; DB-15 connector Supports Apple monitors (8-bit) VGA and SVGA monitors require a special adapter cable
Ethernet	Centris 610: Optional on-board Ethernet port AWS 60/Quadra 610: On-board Ethernet





I/O Devices

Keyboard

Standard, extended, or adjustable keyboard connected through either of two ADB ports

Maximum power draw for all ADB devices: 500 mA

Keyboard draws 25–80 mA

Mouse

ADB Mouse II; mechanical tracking optical shaft or contact encoding (low power)

Draws up to 80 mA

Microphone

Optional electret, omnidirectional microphone

Microphone output voltage is 4 mV peak to peak at normal value

Mini phone plug connector





Sound and Video

Video Display

Supports Apple monitors, including

- Macintosh 12-in. Monochrome Display
- Macintosh 12-in. RGB Display
- AppleColor High-Res RGB 14-in. Monitor
- Macintosh Color Display
- Macintosh 15-in. Portrait Display
- Macintosh 16-in. Color Display
- Apple Two-Page 21-in. Monochrome Monitor
- Macintosh 21-in. Color Display

Supports NTSC and PAL

Supports VGA monitors (640 pixels by 480 pixels only) and SVGA monitors (800 pixels by 600 pixels only) with appropriate adapter cable





Sound

Custom sound chip supports stereo playback from compact discs and computer-generated stereo sounds through stereo output port

Monaural sound input port





Electrical

Line Voltage

100-240 VAC

Line Frequency

50-60 Hz

Power

112 W (not including monitor)





Physical

Dimensions

Height: 3.4 in. (85 mm)

Width: 16.3 in. (415 mm)

Depth: 4.2 in. (107 mm)

Weight

14.0 lb. (6.4 kg)





Environmental

**Operating
Temperature**

10-40°C (50-104°F)

**Storage
Temperature**

-40 to 47°C (-40 to 116.6°F)

Relative Humidity

10-90% (noncondensing)

Altitude

0-10,000 ft. (0-3,048 m)





Troubleshooting

Macintosh Quadra 610/Centris
610/WS 60





General

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

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

For additional assistance, contact Apple Technical Support.





Symptom Charts

Video

Screen is dark, audio and at least one drive operate, fan is running, and LED is lit

- 1 Reset PRAM.
- 2 Adjust brightness on monitor.
- 3 Check cables.
- 4 Replace monitor. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 5 Replace video cable.
- 6 Replace VRAM SIMMs.
- 7 Replace logic board. Retain customer's SIMMs.





Video (Continued)

Partial or whole screen is bright and audio is present, but no video information is visible

- 1 Reset PRAM.
- 2 Check cables.
- 3 Replace monitor. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 4 Replace video cable.
- 5 Replace VRAM SIMMs.
- 6 Replace logic board. Retain customer's SIMMs.

Screen is completely dark, fan is not running, and LED is not lit

- 1 Verify that external power cables are properly connected.
- 2 Remove peripherals.
- 3 Replace power supply.
- 4 Replace logic board. Retain customer's SIMMs.





Video (Continued)

Screen is dark, audio and drive do not operate, fan is running, and LED is lit

- 1 Remove peripherals and third-party cards.
- 2 Replace VRAM SIMMs.
- 3 Replace DRAM SIMMs.
- 4 Replace power supply.
- 5 Replace logic board.





Floppy Drive

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

- 1 Replace internal floppy drive cable.
- 2 Replace internal floppy drive.
- 3 Replace logic board. Retain customer's SIMMs.

Floppy disk ejects, and display shows Mac icon with blinking "X"

- 1 Replace floppy disk.
- 2 Replace floppy drive cable.
- 3 Replace internal floppy drive.
- 4 Replace logic board. Retain customer's SIMMs.

Floppy disk does not eject

- 1 Switch off system and hold mouse button down while switching on the system
- 2 Eject disk manually.
- 3 Replace floppy drive cable.
- 4 Replace floppy drive.





Floppy Drive (Continued)

Floppy drive
attempts to eject disk
but doesn't

- 1 Push floppy disk completely in.
- 2 Eject floppy disk manually.
- 3 Replace floppy drive.





Hard Drive

Internal hard drive runs continuously

- 1 Replace SCSI data cable.
- 2 Replace internal hard drive.
- 3 Replace logic board. Retain customer's SIMMs.

Internal hard drive does not operate

- 1 Replace SCSI data cable.
- 2 Replace SCSI power cable.
- 3 Check power to the hard drive.
- 4 Replace hard drive.
- 5 Replace logic board. Retain customer's SIMMs.





CD-ROM Drive

CD-ROM drive does not accept a compact disc

- 1 Exchange disc (if disc is dirty or damaged).
- 2 Replace 50-pin ribbon cable.
- 3 Replace CD-ROM drive mechanism.

Macintosh does not display CD-ROM drive icon

- 1 Verify that CD-ROM extension is in System Folder.
- 2 Verify the disc is in the drive correctly.
- 3 Replace CD-ROM drive mechanism.
- 4 Replace power supply.
- 5 Replace SCSI data cable.

Compact disc won't eject from the drive

- 1 Manually eject the compact disc.
- 2 Press the eject button behind the front bezel (if it is accessible).
- 3 Replace CD-ROM drive mechanism.





Peripheral

Works with internal or external SCSI device, but does not work with both

- 1 Verify that SCSI select switch on any external device is set differently from any internal SCSI device setting.
- 2 Verify that hard drive is terminated but optional CD-ROM is not terminated.
- 3 Replace terminator on external hard drive.
- 4 Replace SCSI select cable on external SCSI device.

Cursor does not move

- 1 Reboot computer.
- 2 Verify that mouse is connected properly.
- 3 Reset PRAM.
- 4 If mouse was connected to keyboard, connect mouse to computer ADB port instead. If mouse works, replace keyboard.
- 5 If mouse does not work in any ADB port on computer, replace mouse.
- 6 Replace logic board. Retain customer's SIMMs.





Peripheral (Continued)

Cursor moves, but clicking the mouse button has no effect

- 1 Replace mouse.
- 2 Replace logic board. Retain customer's SIMMs.

Double-click does not open application, disk, or server

- 1 Remove duplicate system files from hard drive.
- 2 Clear parameter RAM. Hold down <Command> <Option> <P> <R> during startup but before "Welcome to Macintosh" appears.
- 3 If mouse was connected to keyboard, connect mouse to computer ADB port instead. If mouse works, replace keyboard.
- 4 If mouse does not work in any ADB port on computer, replace mouse.
- 5 Replace logic board. Retain customer's SIMMs.





Peripheral (Continued)

No response to any key on the keyboard

- 1 Verify that keyboard is connected to ADB port.
- 2 Replace keyboard cable.
- 3 Replace keyboard.
- 4 Replace logic board. Retain customer's SIMMs.





Take Apart

Macintosh Quadra 610/Centris
610/WS 60

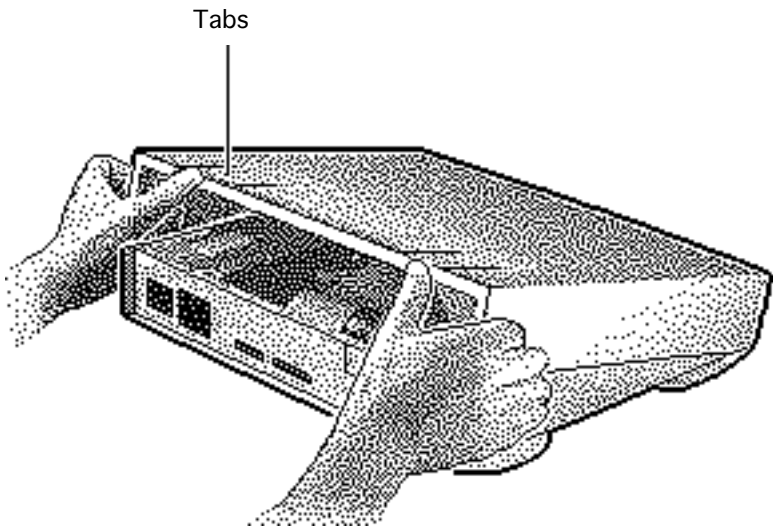




Top Cover

No preliminary steps are required before you begin this procedure.

- 1 Press up on the tabs at the back of the top cover.
- 2 Tilt the back of the top cover and remove the top cover.

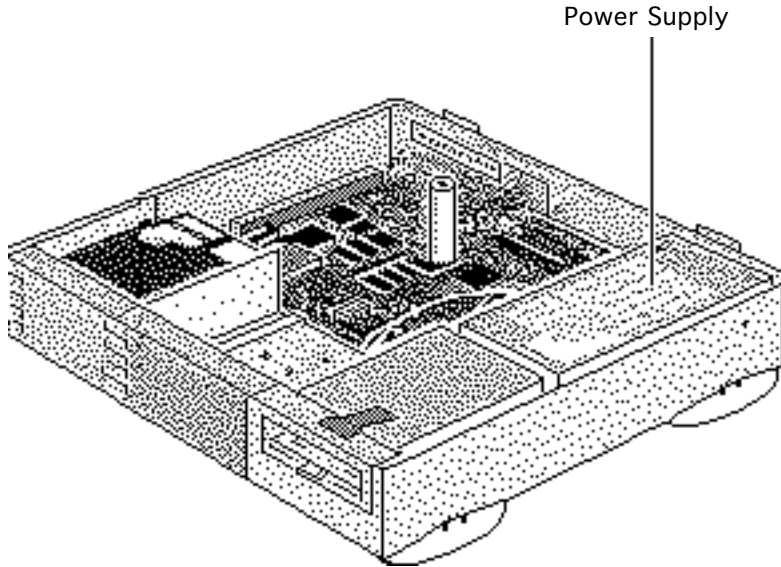




Power Supply

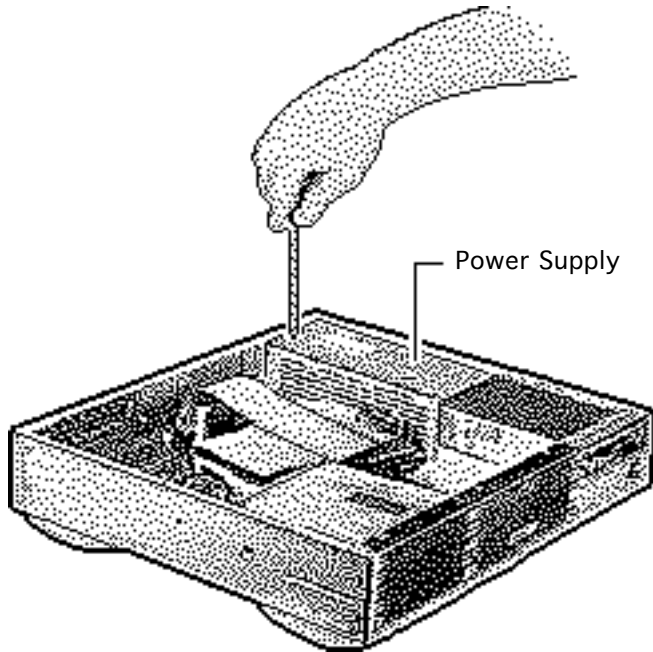
Before you begin, remove the top cover.

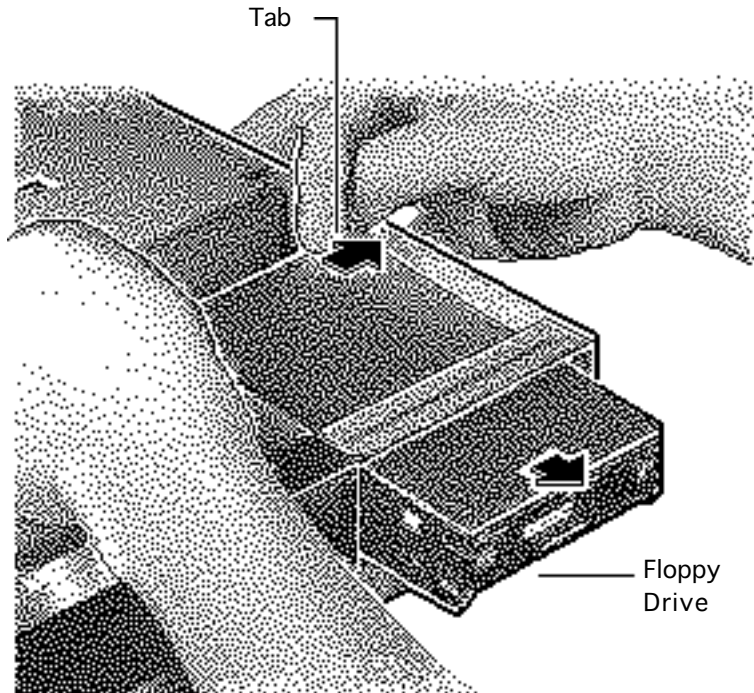
Caution: Review the ESD precautions in Bulletins/Safety.





- 1 Remove the screw that secures the power supply.

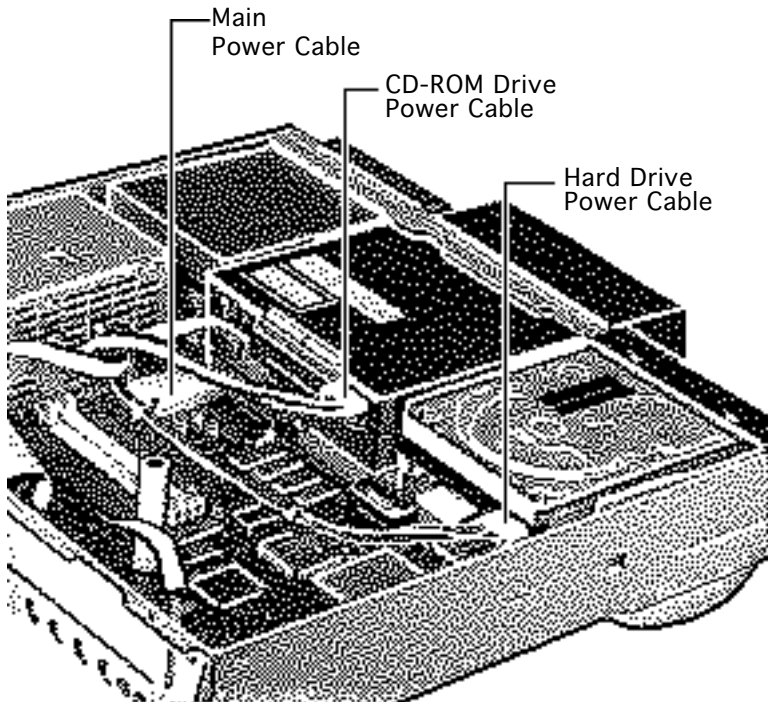




- 2 For easier access to the power supply, release the tabs of the floppy drive and slide the floppy drive forward a few inches.

Note: If a CD-ROM drive is present, remove the SCSI data cable and move the CD-ROM drive forward. Refer to the “CD-ROM Drive” topic.



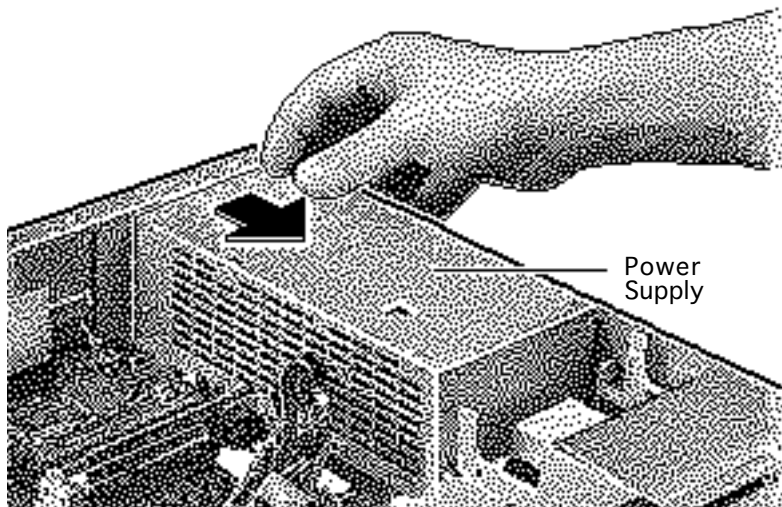


- 3 Disconnect these power supply cables:
- Main power cable
 - Hard drive power cable
 - CD-ROM drive power cable (if installed)





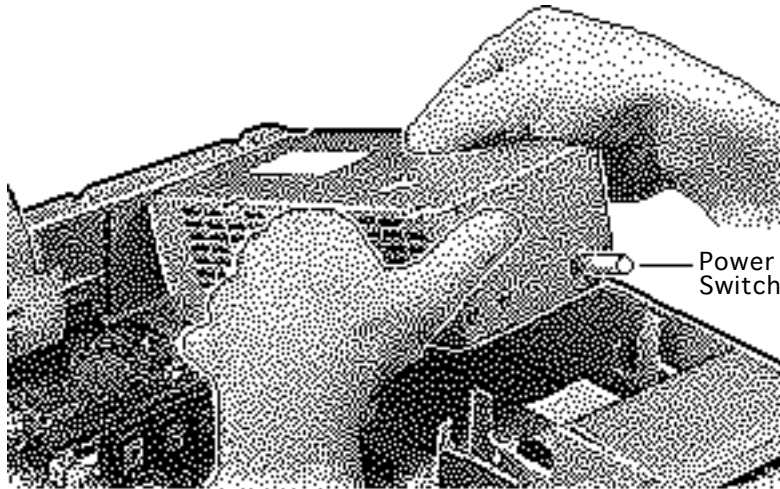
- 4 Slide the power supply forward slightly.





- 5 Tilt the front of the power supply and lift it out of the computer.

Replacement Note: Move the floppy drive forward. Press the actuator toward the back of the computer to properly seat the power switch in the actuator.



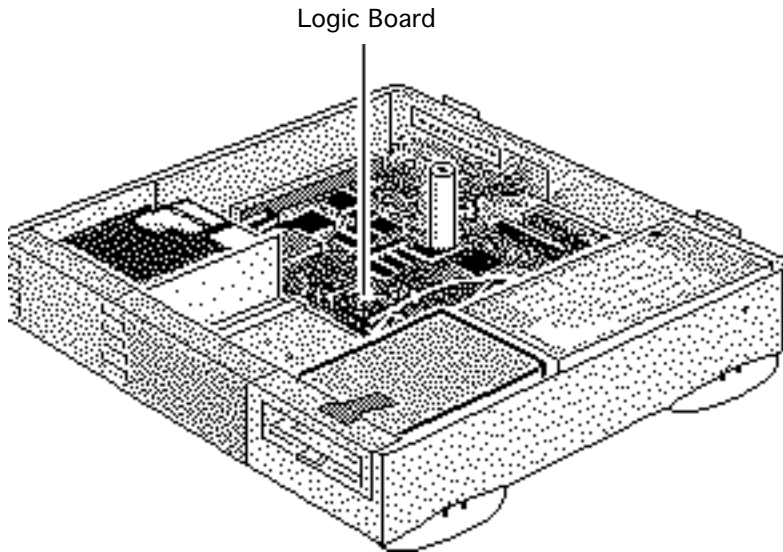


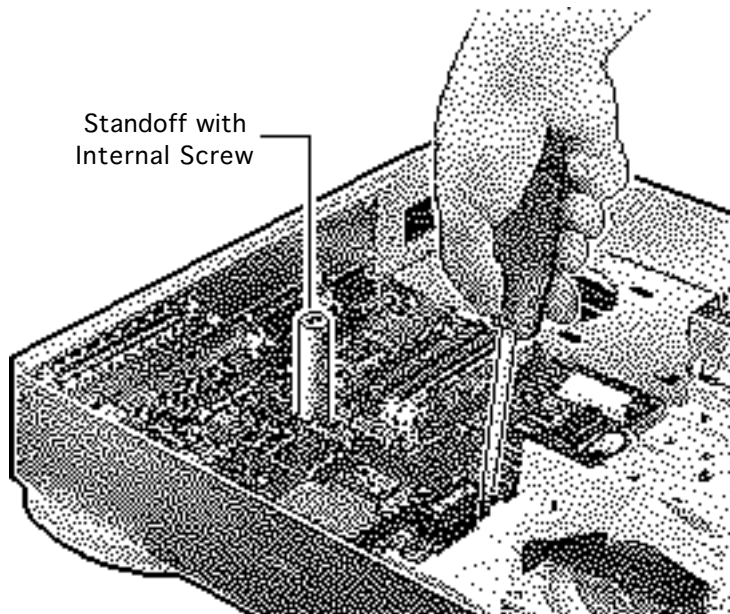
Logic Board

Before you begin, remove the following:

- Top cover
- Power supply

Caution: Review the ESD precautions in Bulletins/Safety.

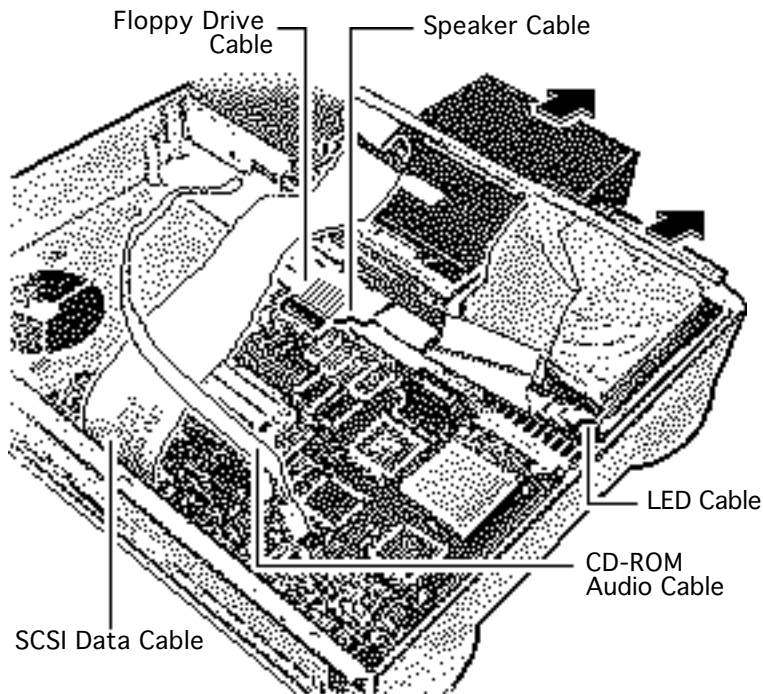




Note: The logic board is secured with two screws.

- 1 Using a long Phillips screwdriver, remove the screw from the center of the standoff.
- 2 Remove the standoff.
- 3 Remove the Phillips screw from the front edge of the logic board.



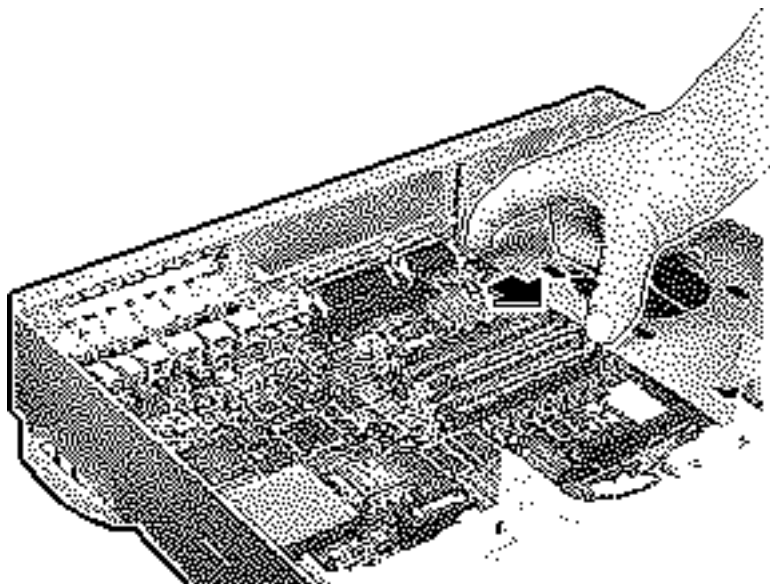


- 4 Disconnect these cables from the logic board:
 - SCSI data cable
 - Speaker cable
 - LED cable
 - CD-ROM audio cable (if present)
 - Floppy drive cable
- 5 **Note:** Lift the front edge of the logic board to make removing the floppy drive easier.
- 6 Slide forward the hard drive and CD-ROM drive (if installed).





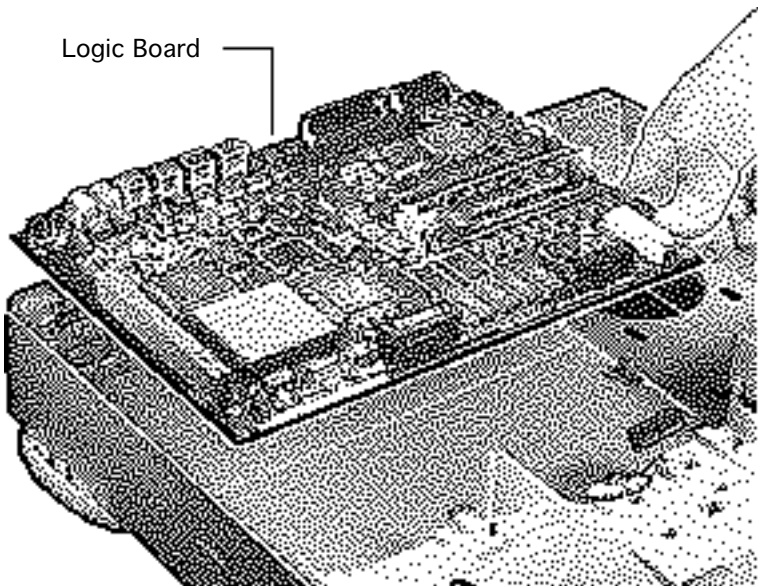
- 7 Slide the logic board toward the front of the computer.





- 8 Remove the logic board.

Logic Board



Replacement Note:

Slide the hard drive and optional CD-ROM drive forward. Connect the floppy drive cable before replacing the logic board.

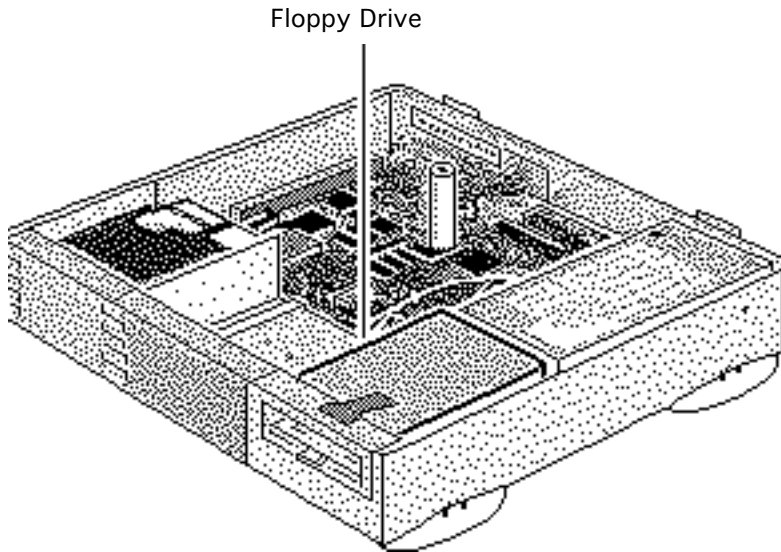


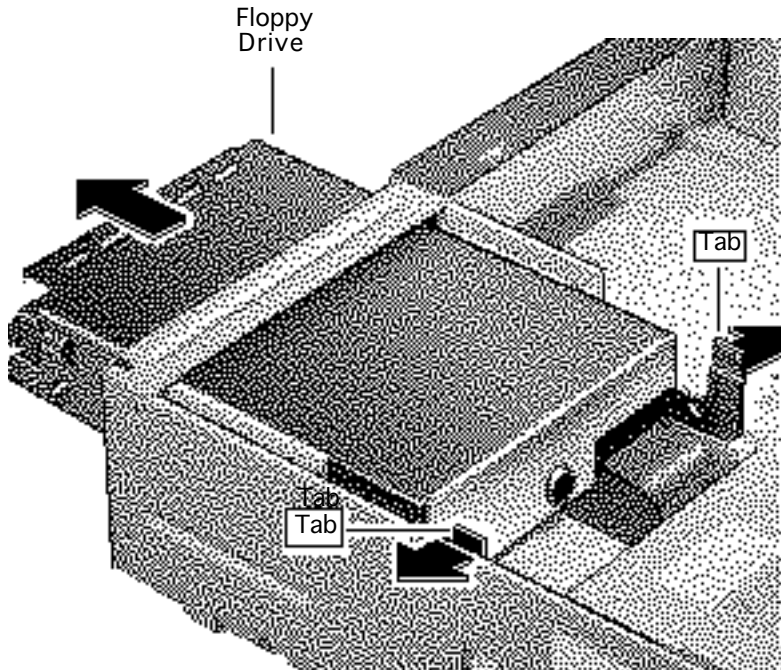


Floppy Drive

Before you begin, remove the top cover.

Caution: Review the ESD precautions in Bulletins/Safety.





1 Press the tabs outward and slide the floppy drive forward a few inches.

2 Disconnect the floppy drive cable.

Note: You can easily reach the floppy drive cable connector when the floppy drive is forward.

3 Slide out the floppy drive.



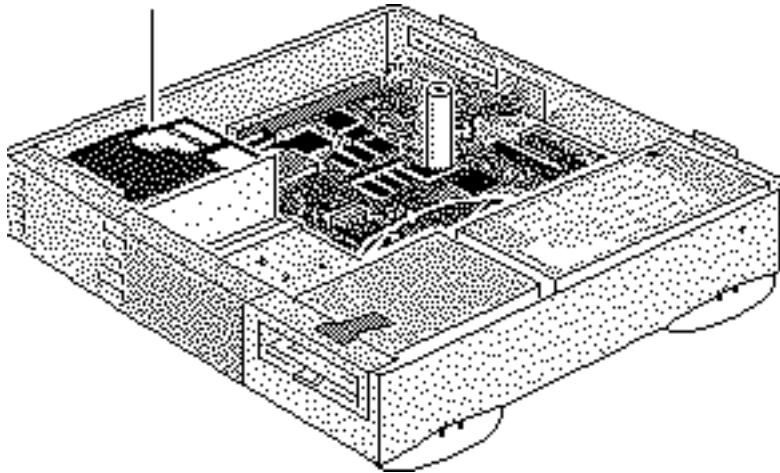


Hard Drive

Before you begin remove the top cover.

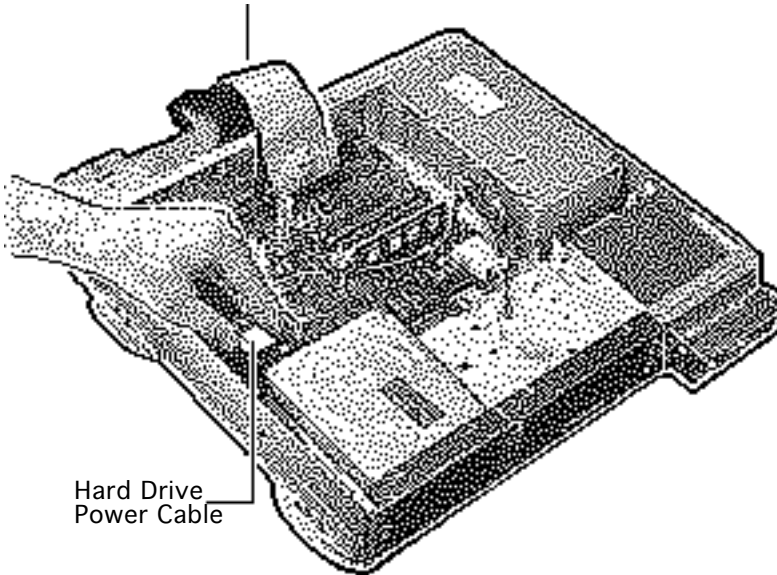
Caution: Review the ESD precautions in Bulletins/Safety.

Hard Drive





SCSI Data Cable



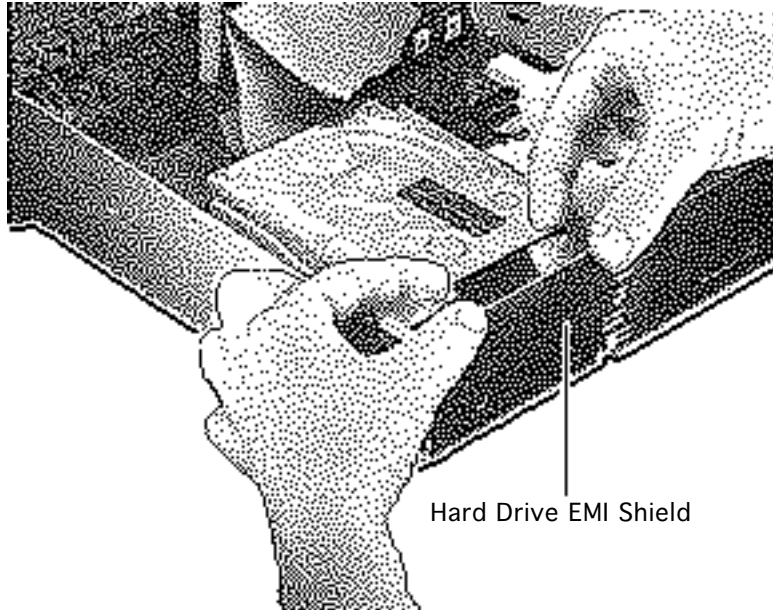
Hard Drive
Power Cable

- 1 Disconnect the SCSI data and hard drive power cables from the hard drive.





- 2 Remove the hard drive EMI shield.

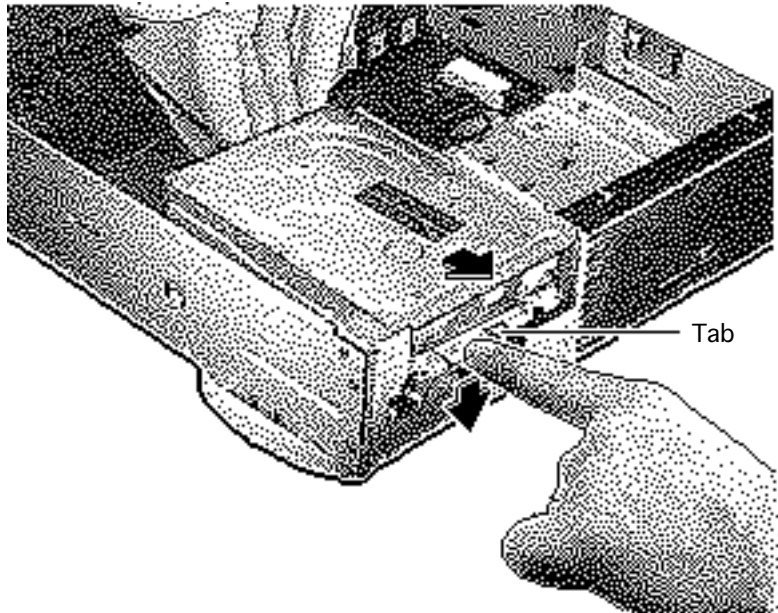


Hard Drive EMI Shield





- 3 Press down on the tab and slide out the hard drive.

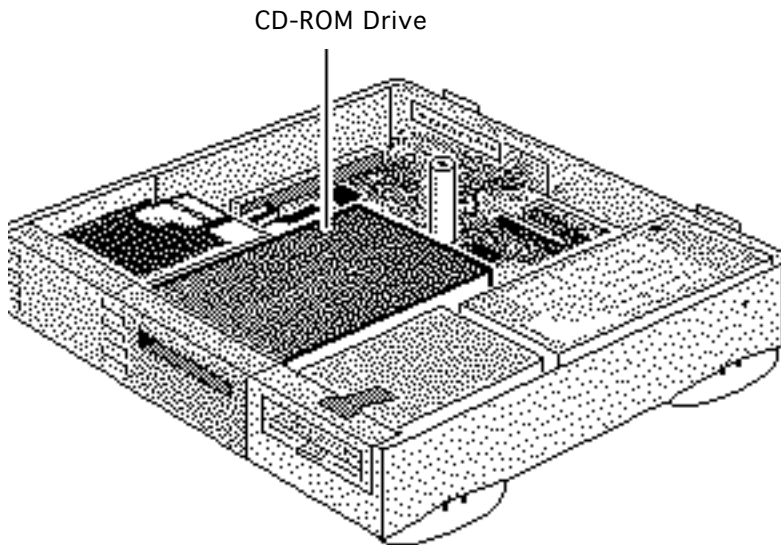


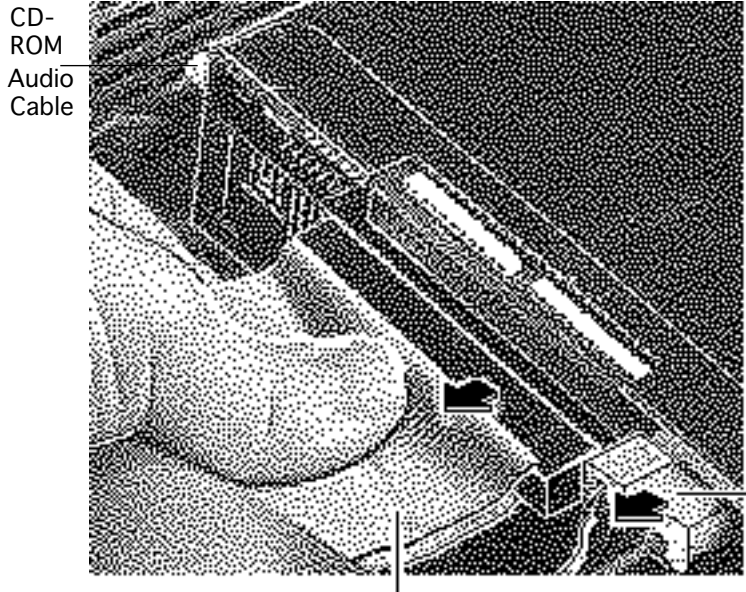


CD-ROM Drive

Before you begin, remove the top cover.

Caution: Review the ESD precautions in Bulletins/Safety.





CD-ROM
Audio
Cable

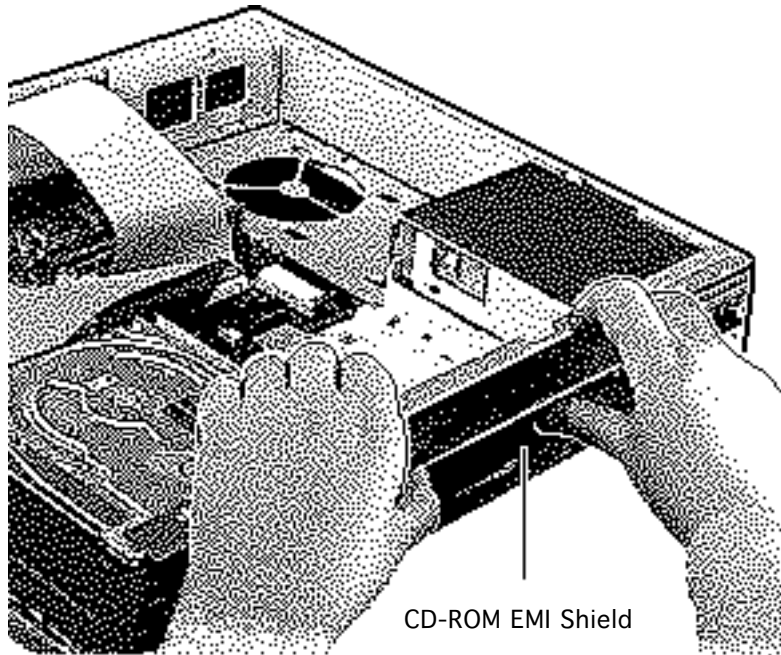
SCSI Data Cable

- 1 Disconnect the SCSI data cable and CD-ROM drive power cable from the CD-ROM drive.
- 2 Disconnect the CD-ROM audio cable.





- 3 Remove the CD-ROM drive EMI shield.



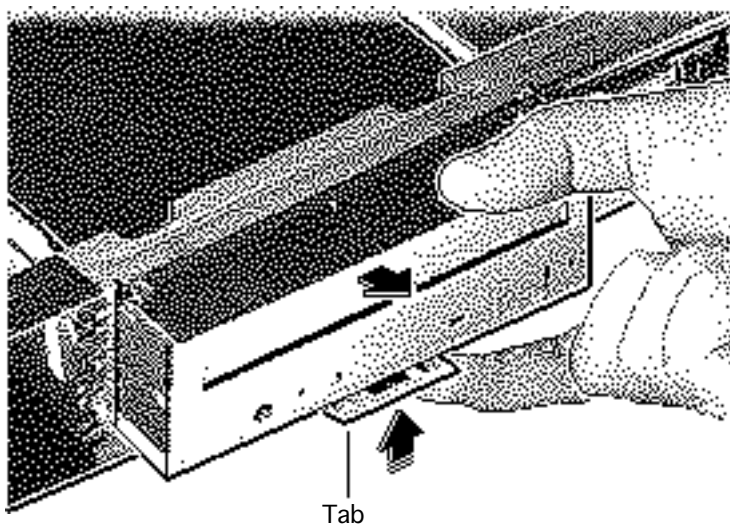
CD-ROM EMI Shield





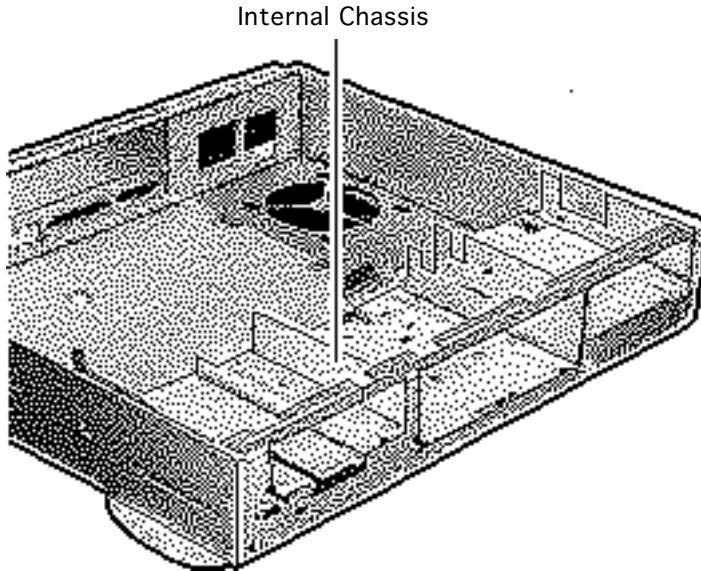
- 4 Press up on the tab and slide out the CD-ROM drive.

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





Internal Chassis

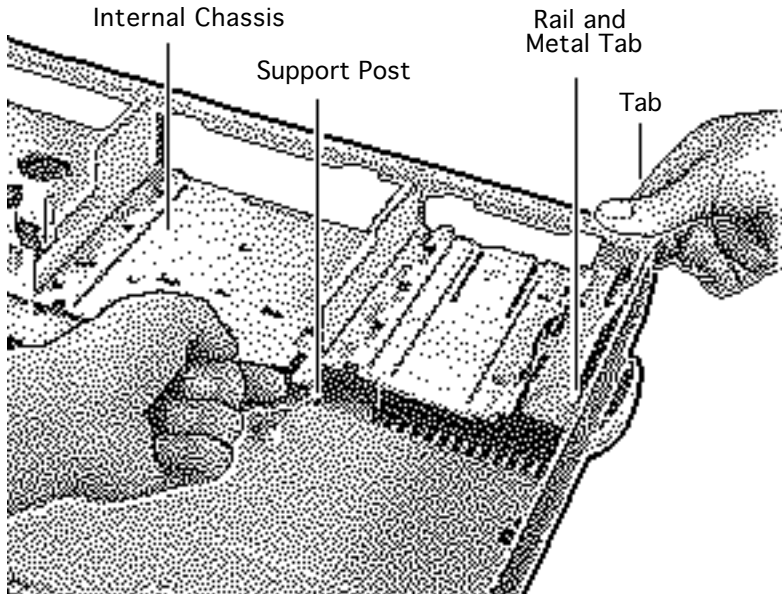


Before you begin, remove the following:

- Top cover
- Power supply
- Floppy drive
- Hard drive
- CD-ROM drive (if installed)
- Logic board

Caution: Review the ESD precautions in Bulletins/ Safety.





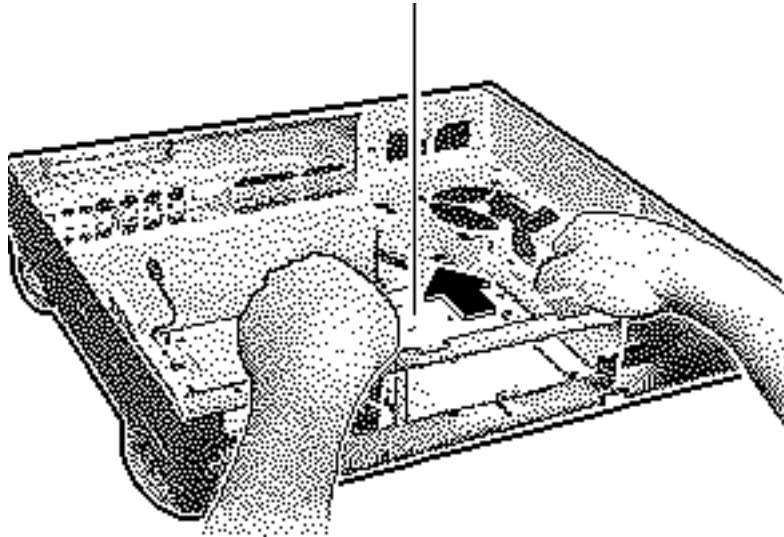
Note: The chassis is secured to the bottom cover by two tabs at the front of the unit, two rail and tab sets at the sides of the unit, support posts at the back of the chassis, and hidden brackets that slide into the bottom cover.

- 1 Press up on one of the front tabs while lifting the support post.
- 2 Repeat this step on the other side until the internal chassis slides easily toward the back of the computer.





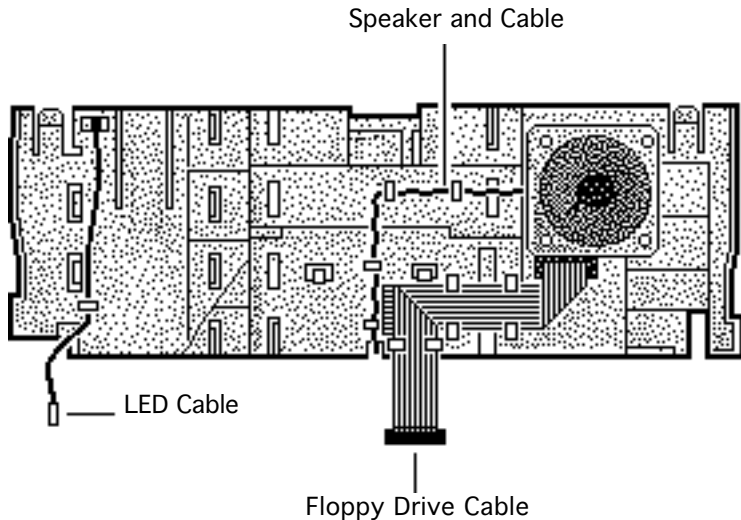
Internal Chassis



- 3 Press down and slide the chassis toward the back of the computer.
- 4 Remove the chassis.

Note: The LED cable, floppy drive cable and speaker are not part of the internal chassis assembly.



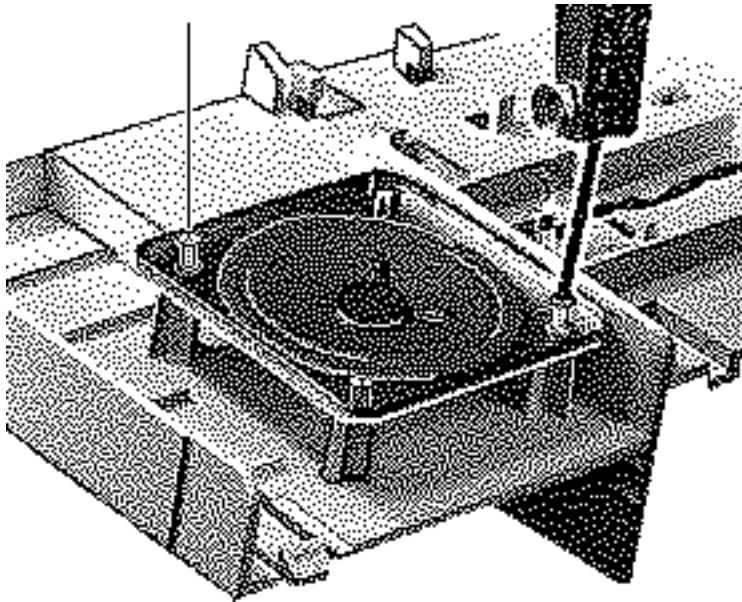


- 5 Turn the chassis over.
- 6 Remove the floppy drive cable and the LED cable.
- 7 Remove the speaker cable from its routing guides.



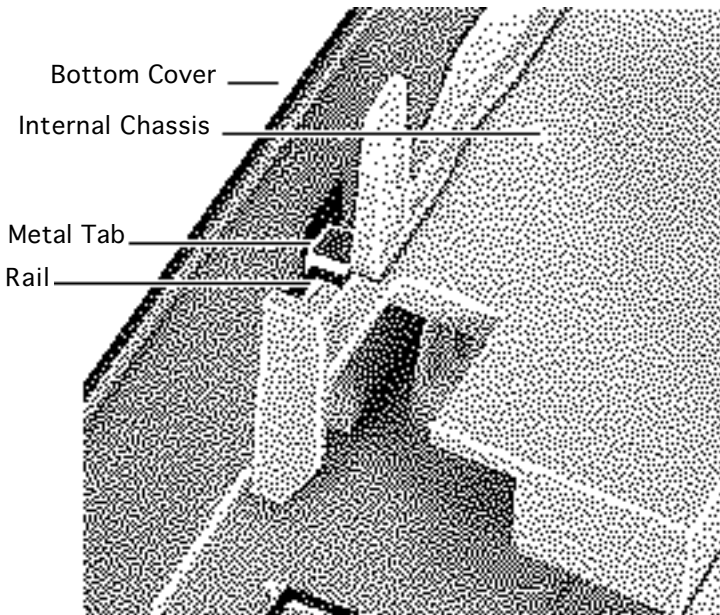


Torx Screws



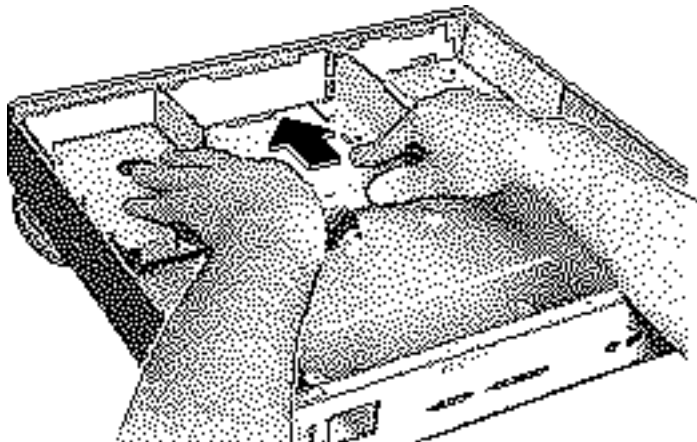
- 8 Remove the two torx screws from the speaker.
- 9 Lift out the speaker.





Replacement Note: To replace the chassis, carefully slide the rails at the side of the chassis under the metal tabs.





Replacement Note: After carefully aligning the side rails, push down firmly on the chassis and slide it toward the front of the unit. The tabs will snap in place.



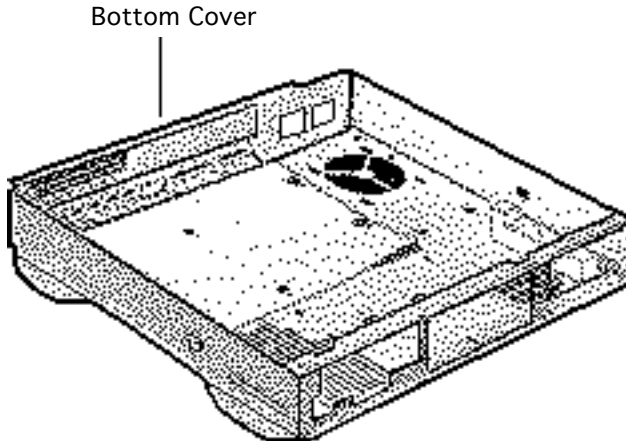


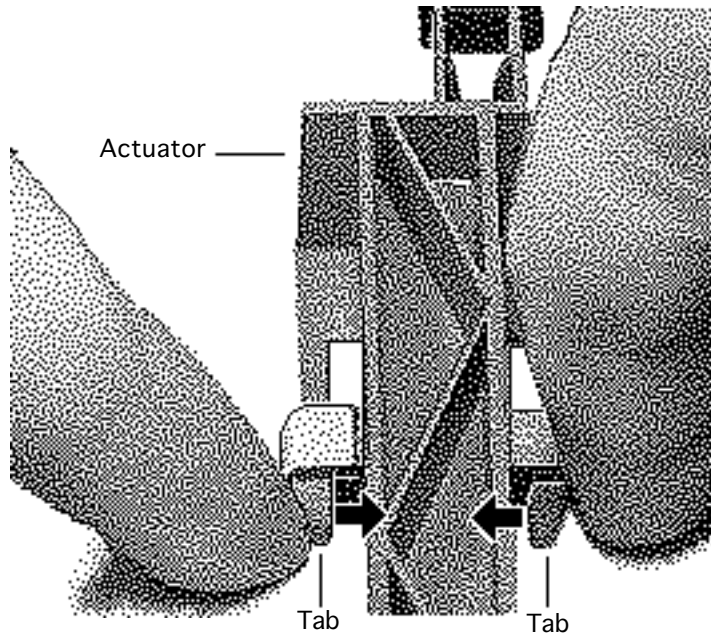
Bottom Cover

Before you begin, remove the following:

- Top cover
- Power supply
- Floppy drive
- Hard drive
- CD-ROM drive (if installed)
- Logic board
- Internal chassis

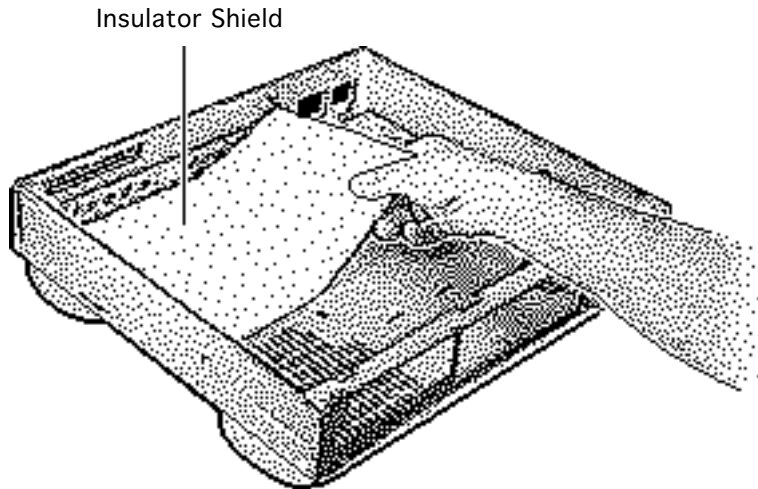
Caution: Review the ESD precautions in Bulletins/ Safety





- 1 Shift the actuator toward the back of the unit.
- 2 Squeeze together the tabs on the shaft of the actuator.
- 3 Remove the actuator.



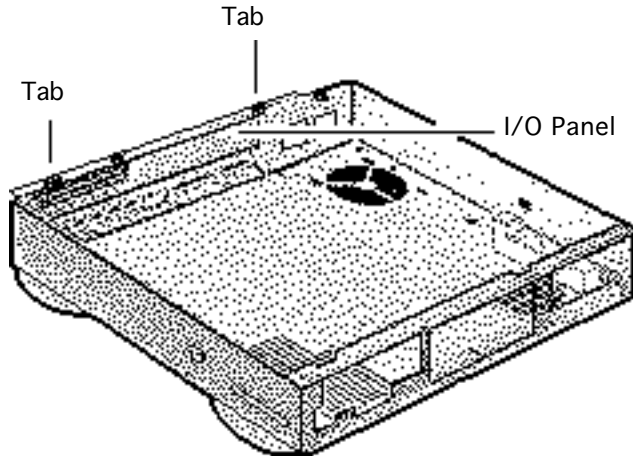


- 4 Lift out the insulator shield.

Replacement Note:

There is only one correct position for the insulator shield. Match the notches on the sides of the insulator sheet with the corresponding metal stops.





- 5 Using a screwdriver, release the tabs on the upper-rear edge of the bottom cover.
- 6 Push out the I/O panel.





Upgrades

Macintosh Quadra 610/Centris
610/WS 60



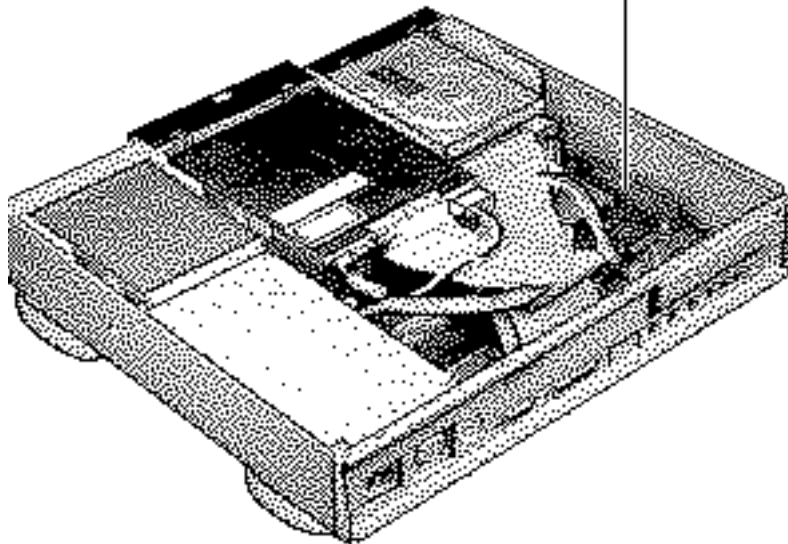


Expansion Cards

Before you begin, remove the cover.

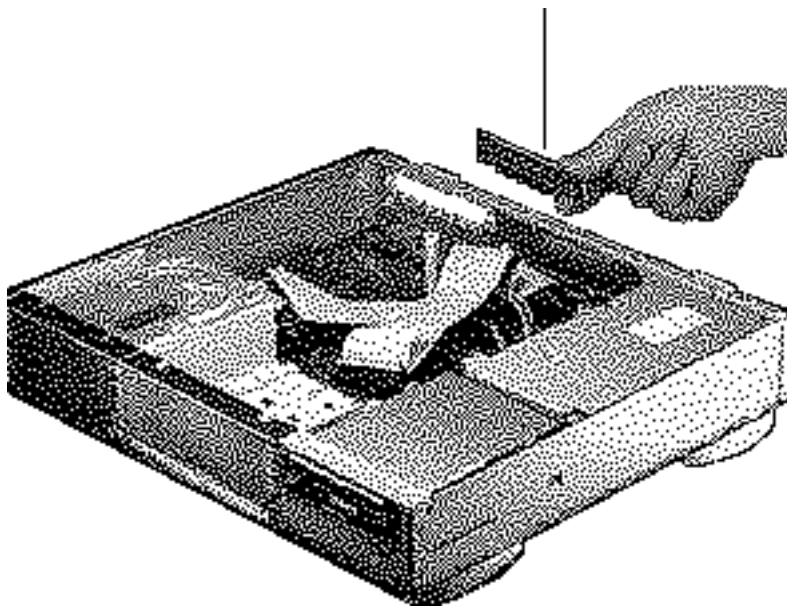
Caution: Review the ESD precautions in Bulletins/Safety.

Expansion Card Slot





Expansion Port Cover

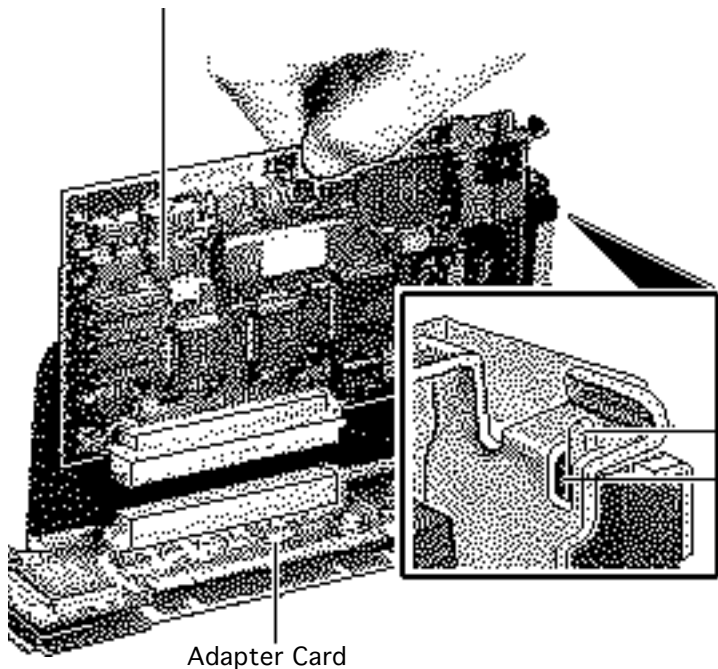


- 1 Remove the expansion port cover from the back panel.





Expansion Card



- 2 Loosely connect the expansion card connector to the adapter card connector.

Note: Be sure to fit the adapter card pin into the expansion card hole.

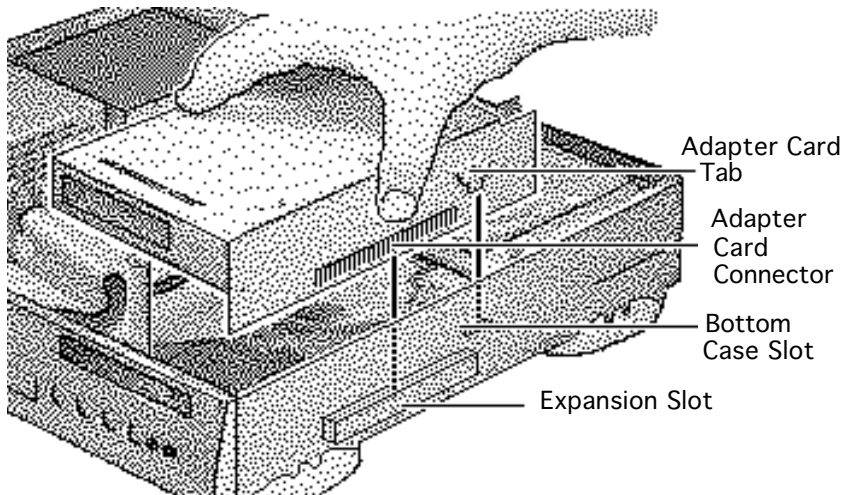
- 3 Gently press the connectors together.





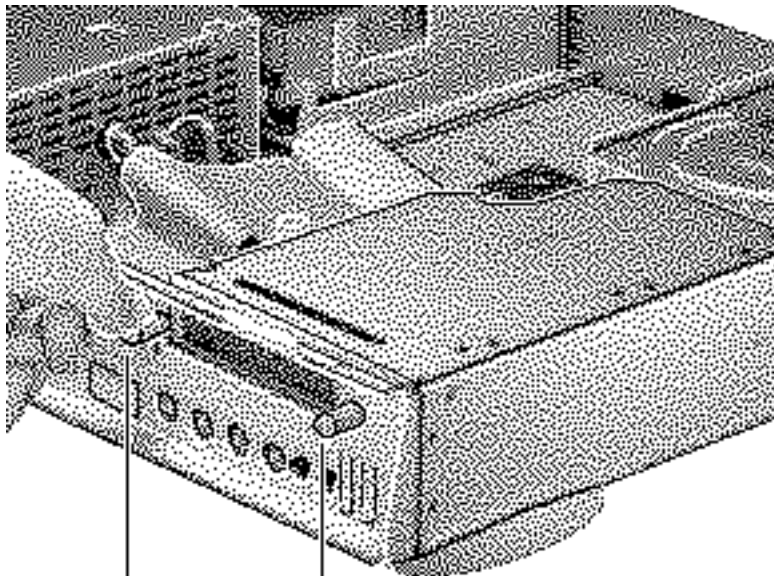
- 4 Insert the connector on the bottom of the adapter card into the expansion slot.

Note: Make sure that the tab on the side of the adapter card slides into the slot on the side of the bottom case.





- 5 Attach the thumbscrews.



Thumbscrews



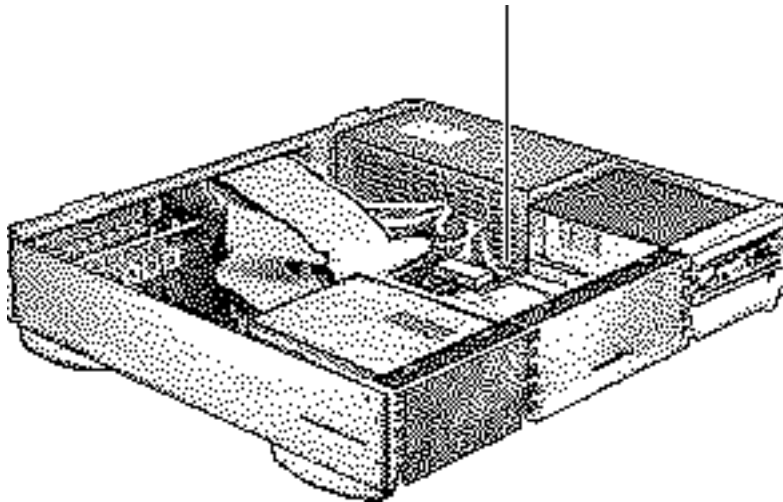


CD-ROM Drive Upgrade

Before you begin, remove the top cover.

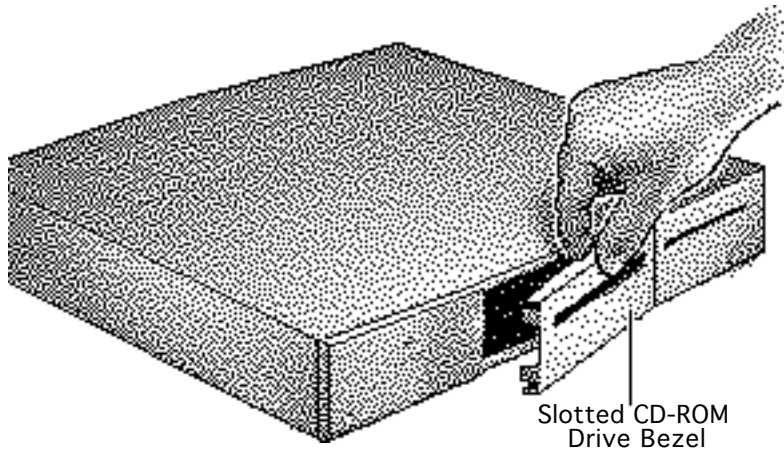
Caution: Review the ESD precautions in Bulletins/Safety.

CD-ROM Drive Bay



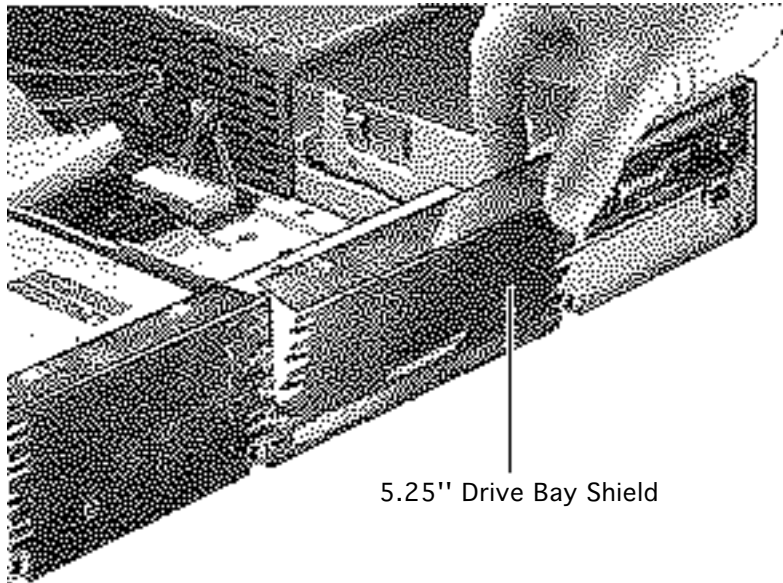


- 1 Remove the blank CD-ROM drive bezel from the top cover.
- 2 Install the slotted CD-ROM drive bezel in the top cover.





- 3 Pry off the metal 5.25" drive bay shield.

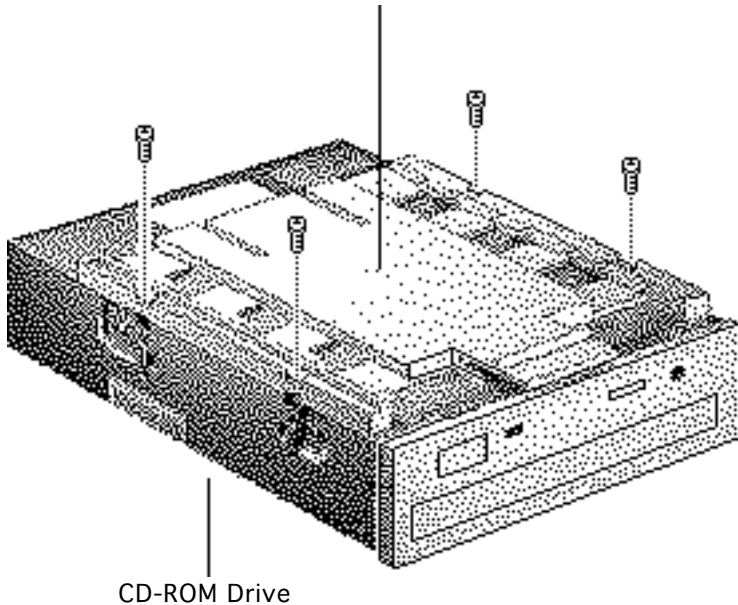


5.25" Drive Bay Shield



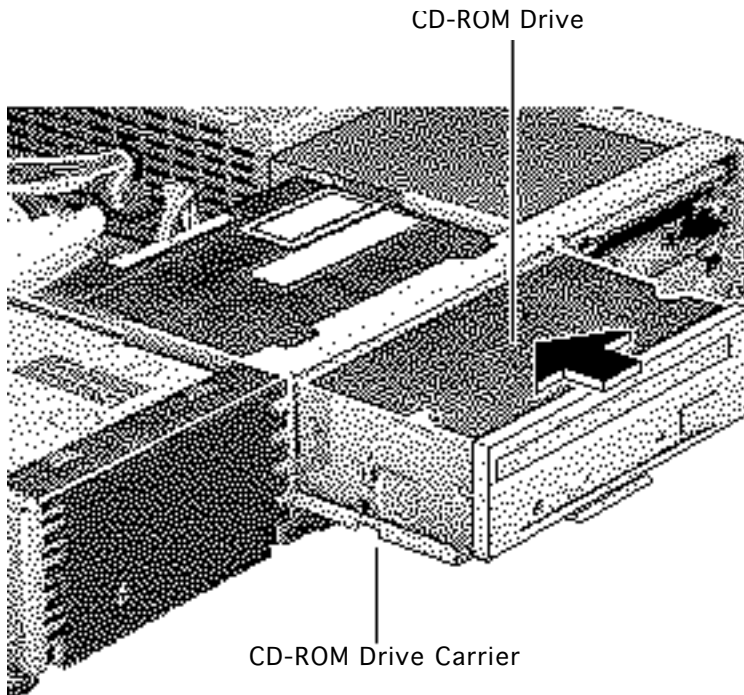


CD-ROM Drive Carrier



- 4 Attach the CD-ROM drive carrier to the CD-ROM drive with four Phillips screws.



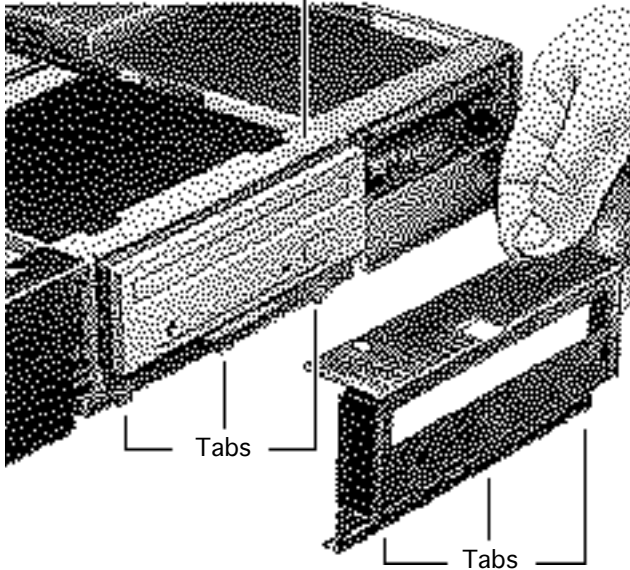


- 5 Push in the CD-ROM drive and carrier.





Bottom Cover



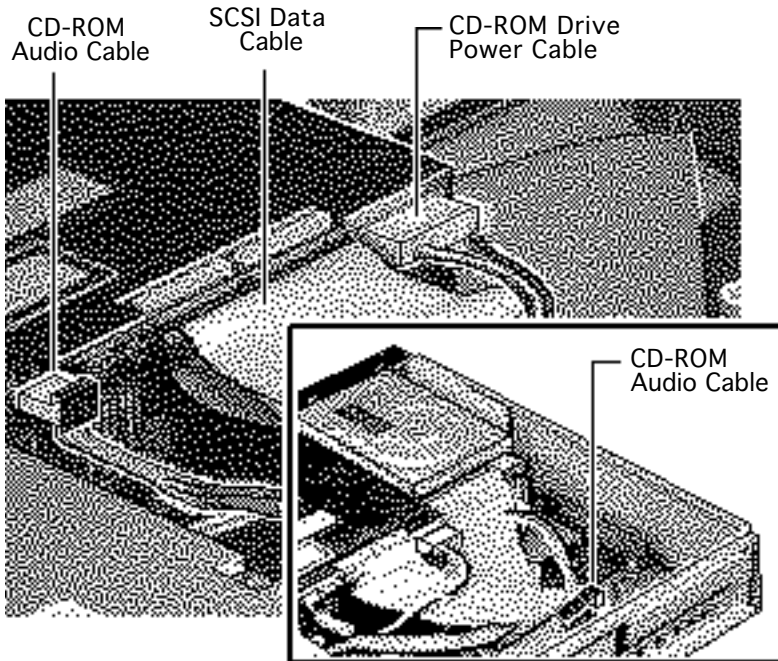
CD-ROM Shield

Tabs

Tabs

- 6 Align the slots at the lower edge of the CD-ROM shield with the tabs on the bottom cover.
- 7 Swing up the CD-ROM shield until it snaps securely onto the bottom cover.





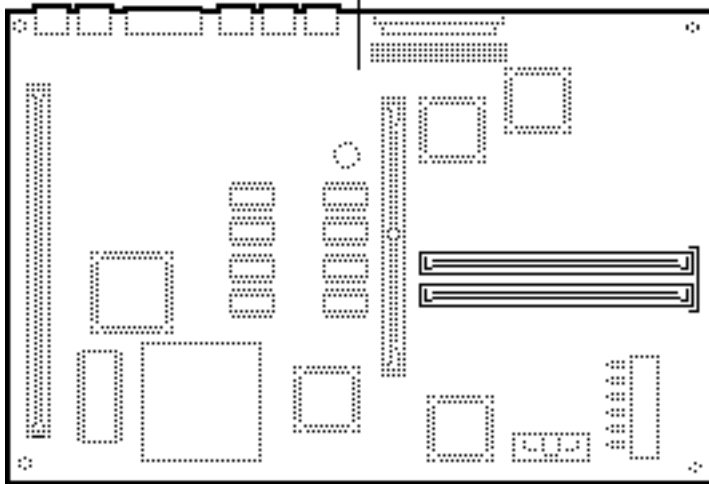
- 8 Connect these cables from the power supply to the CD-ROM drive:
 - SCSI data cable
 - CD-ROM drive power cable

- 9 Connect one end of the audio cable to the CD-ROM drive and the other end of the audio cable to the logic board.





Centris 660AV Logic Board



660AV Upgrade

Before you begin, remove the following:

- Top cover
- Power supply
- Logic board

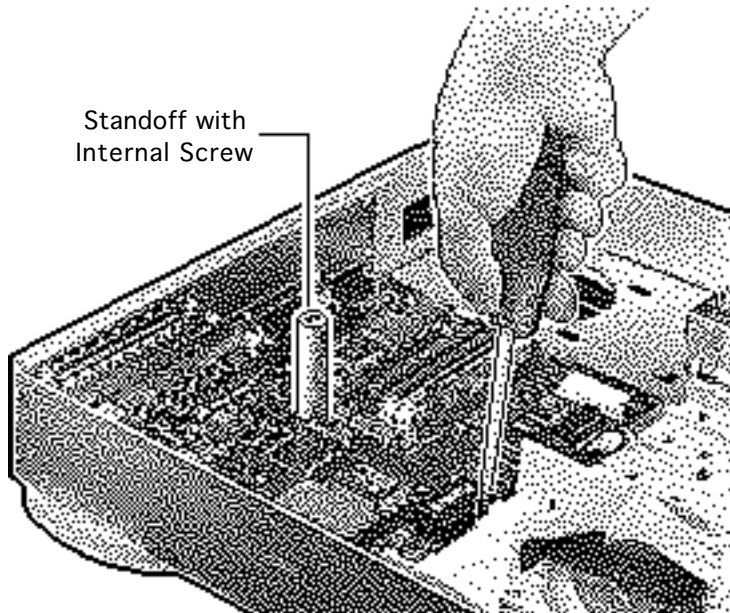
Caution: To prevent ESD damage to components, wear a grounding wriststrap. Review the ESD precautions in Bulletins/Safety.





Note: The Centris 610AV Upgrade Kit for the Centris 610 includes a Centris 610AV Logic Board, product labels, and I/O panel.

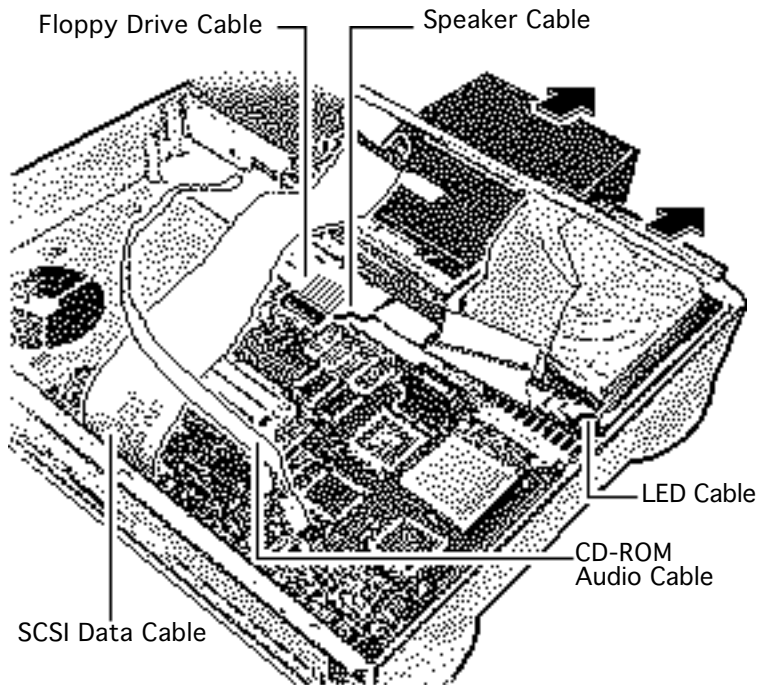




Note: The Centris 610 logic board is secured with two screws.

- 1 Using a long Phillips screwdriver, remove the screw from the center of the standoff.
- 2 Remove the standoff.
- 3 Remove the Phillips screw from the front edge of the Centris 610 logic board.





- 4 Disconnect these cables from the Centris 610 logic board:
 - SCSI data cable
 - Speaker cable
 - LED cable
 - CD-ROM audio cable (if present)
 - Floppy drive cable

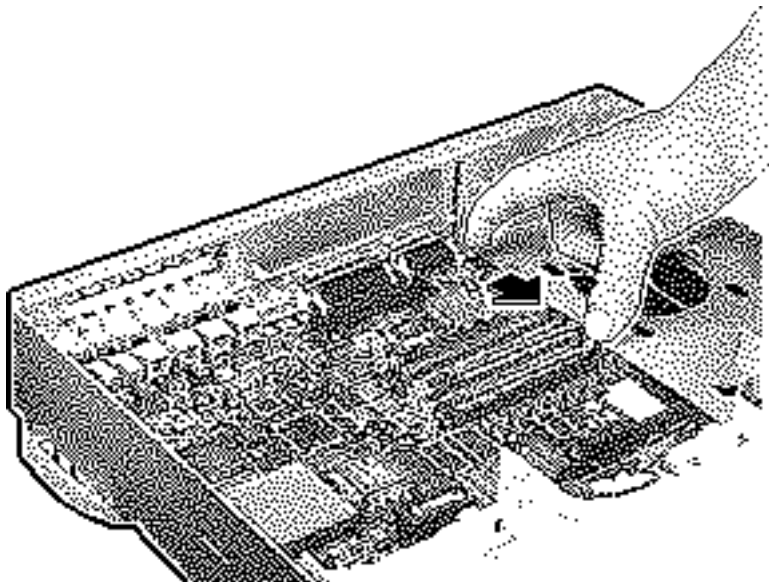
Note: Lift the front edge of the logic board to make removing the floppy drive easier.

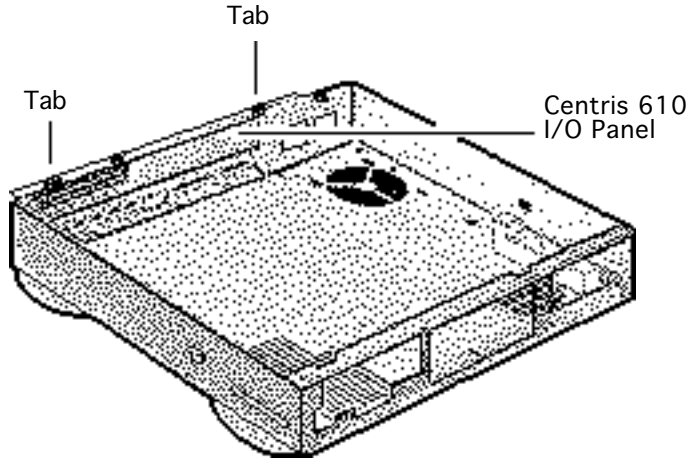
- 5 Slide forward the hard drive and CD-ROM drive (if installed).





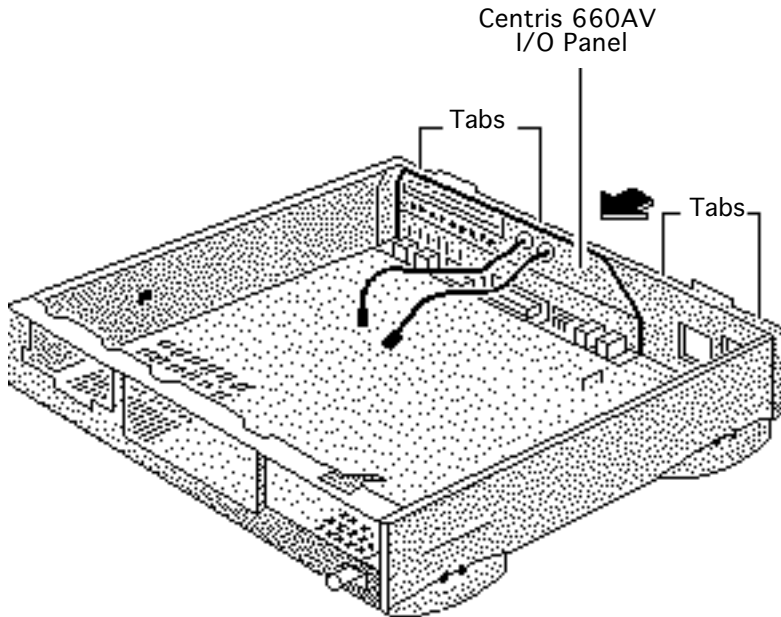
- 6 Slide the Centris 610 logic board toward the front of the computer.
- 7 Remove the Centris 610 logic board.





- 8 Using a screwdriver, release the tabs on the upper-rear edge of the bottom cover.
- 9 Push out the Centris 610 I/O panel.



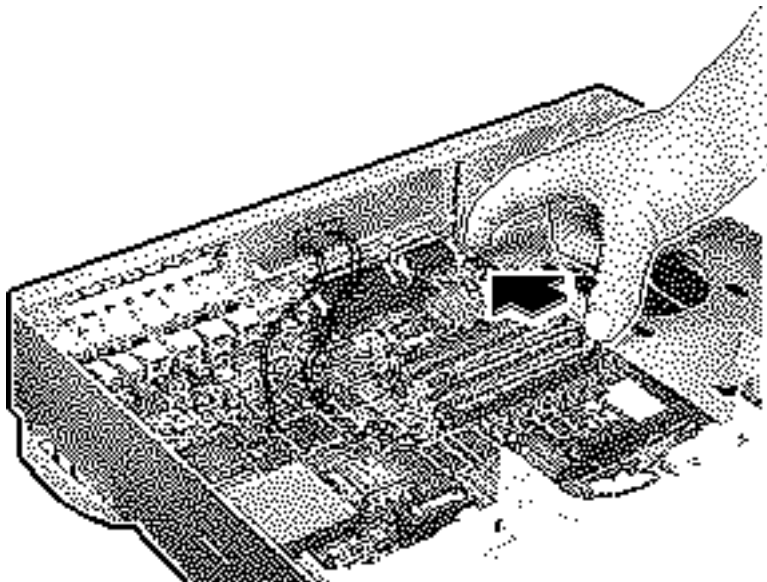


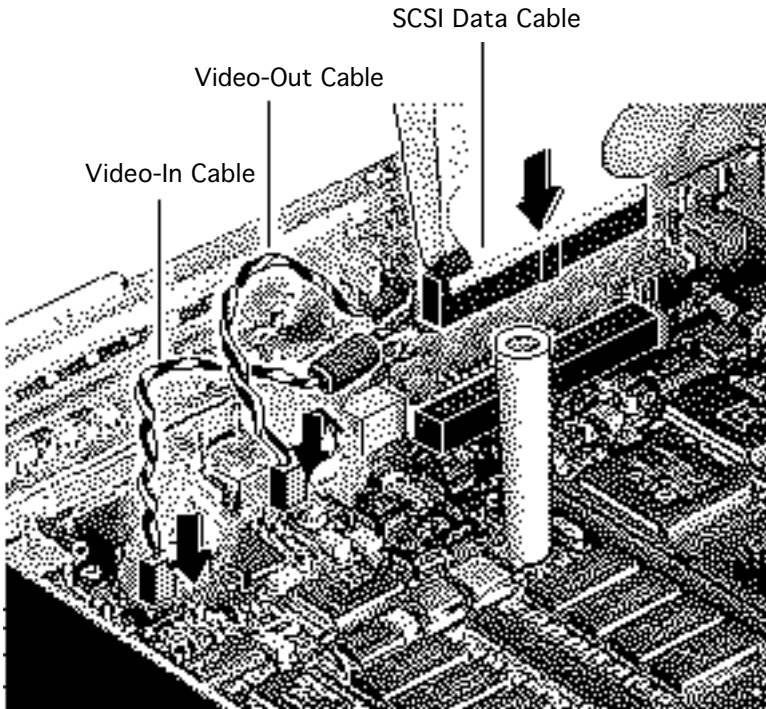
- 10 Position the Centris 660AV I/O panel in the bottom cover.
- 11 Press the I/O panel to snap the tabs in place.





- 12 Place the Centris 660AV logic board in the bottom cover just forward of the I/O panel and slide the logic board into place.

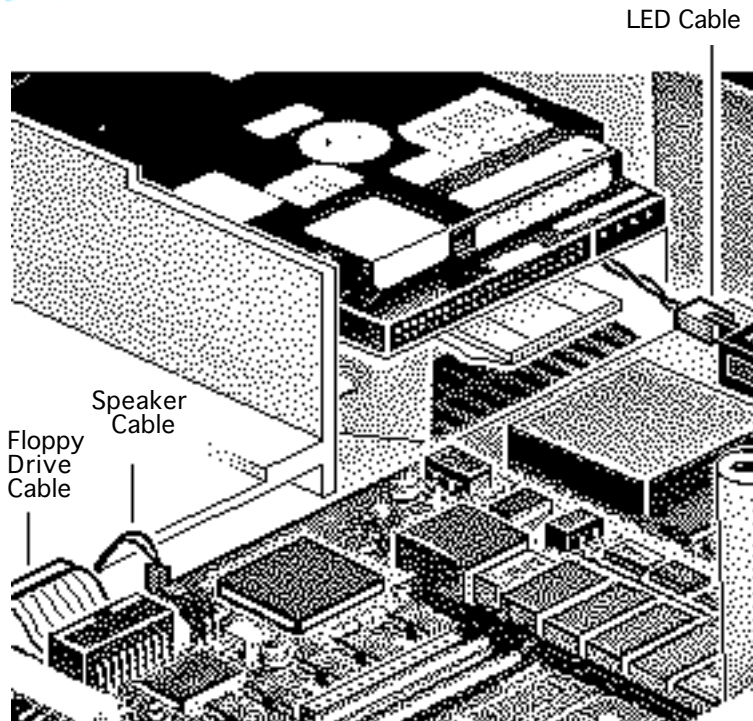




13 Connect these cables to the back edge of the logic board:

- Video-out cable
- Video-in cable
- SCSI data cable





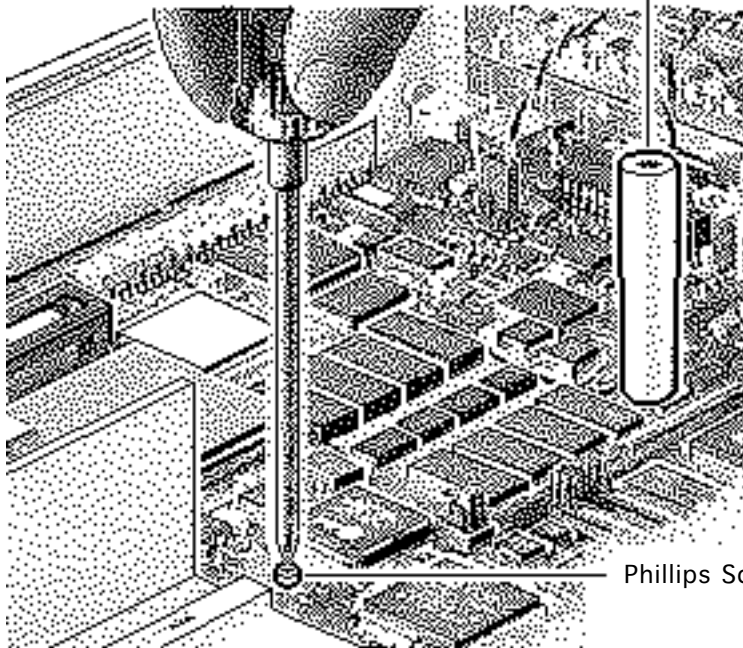
14 Connect these cables to the front edge of the Centris 660AV logic board:

- Floppy drive cable
- Speaker cable
- LED cable
- CD-ROM audio cable (if present)





Standoff with Internal Screw



Phillips Screw

Replacement Note: Replace the standoff with the internal Phillips screw. Replace the Phillips screw on the front edge of the logic board.



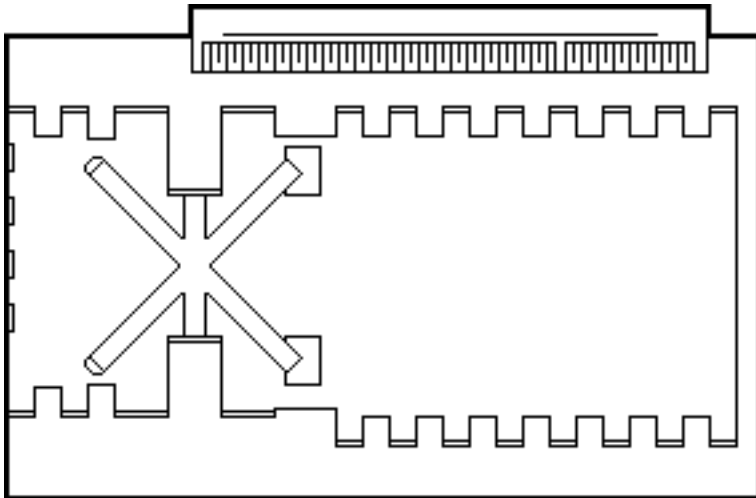


Power Macintosh Card

Before you begin, remove the cover.

Caution: Review the ESD precautions in Bulletins/ Safety.

Installing this card in the computer's Processor-Direct Slot (PDS) upgrades this 68040-based computer to a PowerPC-based computer.





Refer to “Expansion Cards” in this chapter for installation procedures.

Refer to Power Macintosh Card manual for more information.

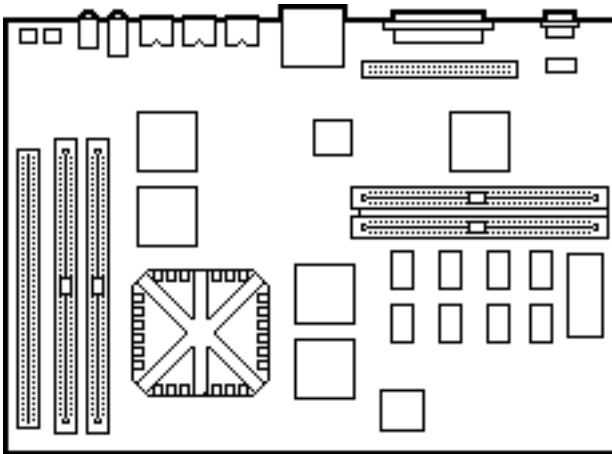




Power Mac Upgrade

No preliminary steps are required before you begin this procedure.

The Centris 610 and Quadra 610 can be upgraded to a Power Macintosh 6100/60 or Power Macintosh 6100/60AV. The AWS 60 can be upgraded to a Workgroup Server 6150.





For upgrade instructions, refer to the Upgrades chapter in the Power Macintosh 6100/WS 6150 manual.





Additional Procedures

Macintosh Quadra 610/Centris
610/WS 60



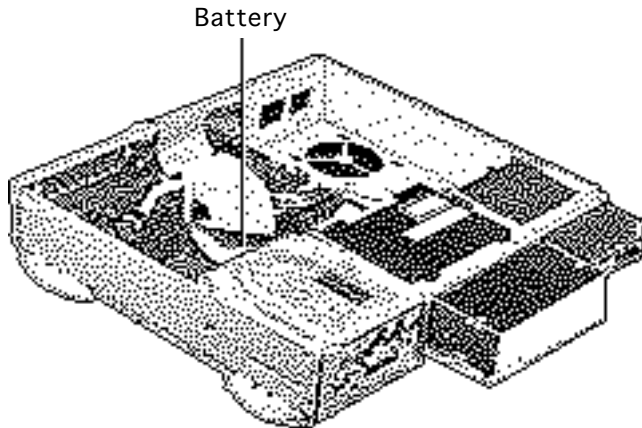


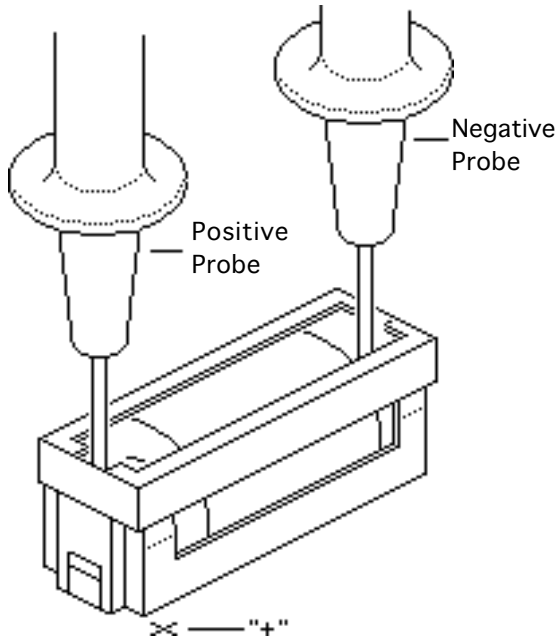
Battery Verification

Before you begin, remove the cover.

⚠ Warning: If handled or discarded improperly, the lithium battery in the computer could explode. Review battery-handling and disposal instructions in Bulletins/Safety.

Caution: Review the ESD precautions in Bulletins/Safety.





- 1 Set the voltmeter to the 10 volts DC scale.
- 2 Hold the positive probe of the voltmeter to the positive end of the battery (marked “+” on the logic board) and the negative probe to the negative end of the battery.
- 3 If the battery voltage is below 3.2 volts, replace the battery. Refer to “Battery Replacement” in this chapter.



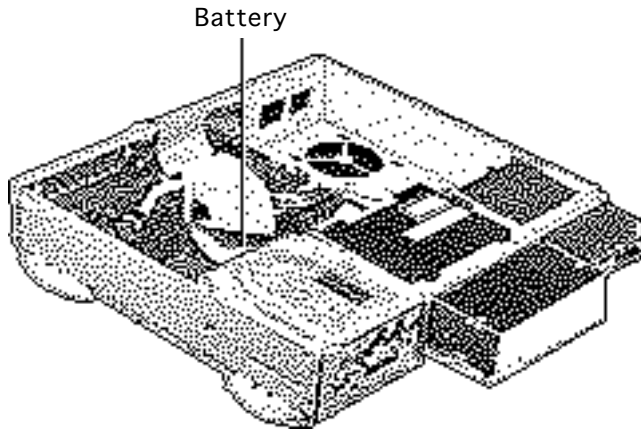


Battery Replacement

Before you begin, remove the cover.

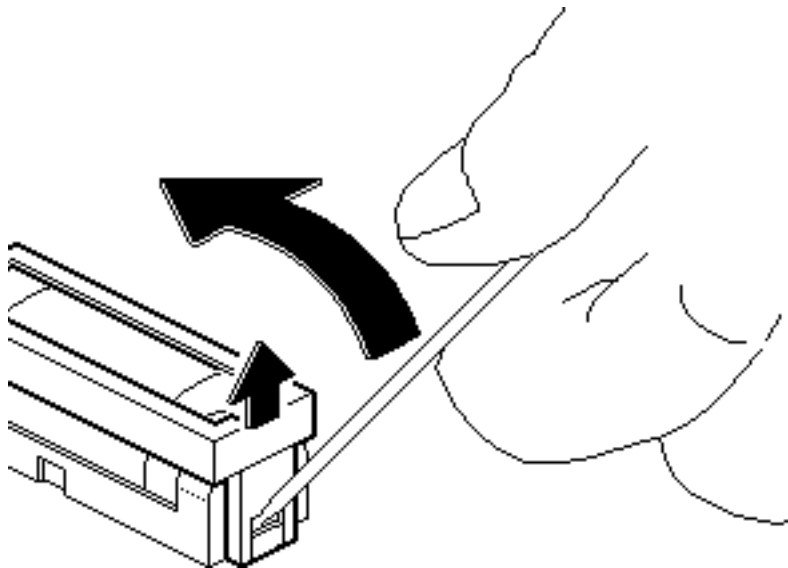
⚠ Warning: If handled or discarded improperly, the lithium battery in the computer could explode. Review battery-handling and disposal instructions in Bulletins/Safety.

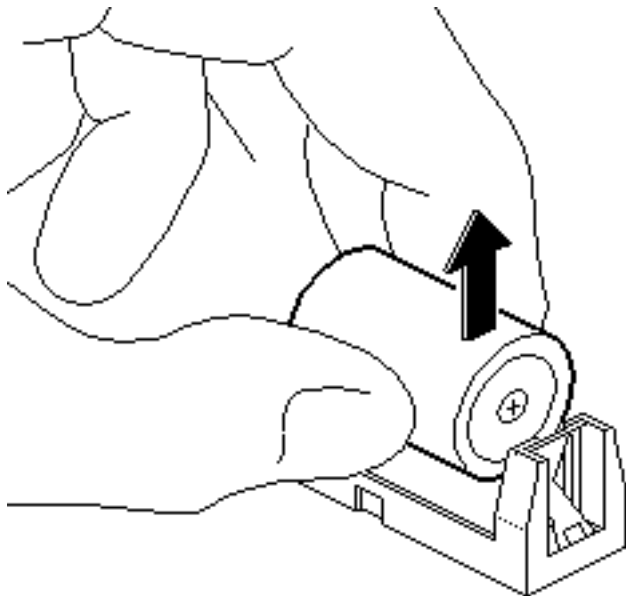
Caution: Review the ESD precautions in Bulletins/Safety.





- 1 Using a small flat-blade screwdriver, pry open the latch at the end of the battery holder and lift off the cover.





- 2 Grasp the battery and remove it from the holder.
- 3 Return the battery to Apple for proper disposal. For battery packaging and labeling instructions, refer to the safety information in Bulletins/Safety.



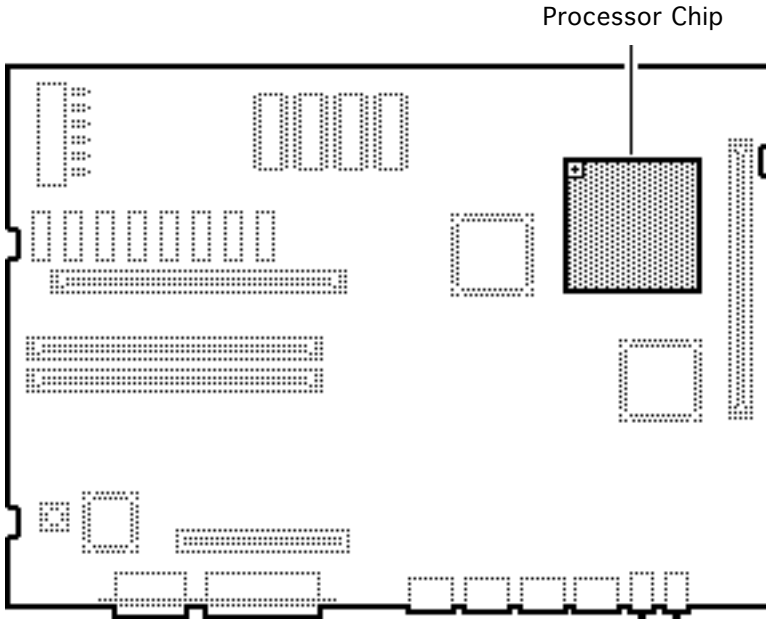


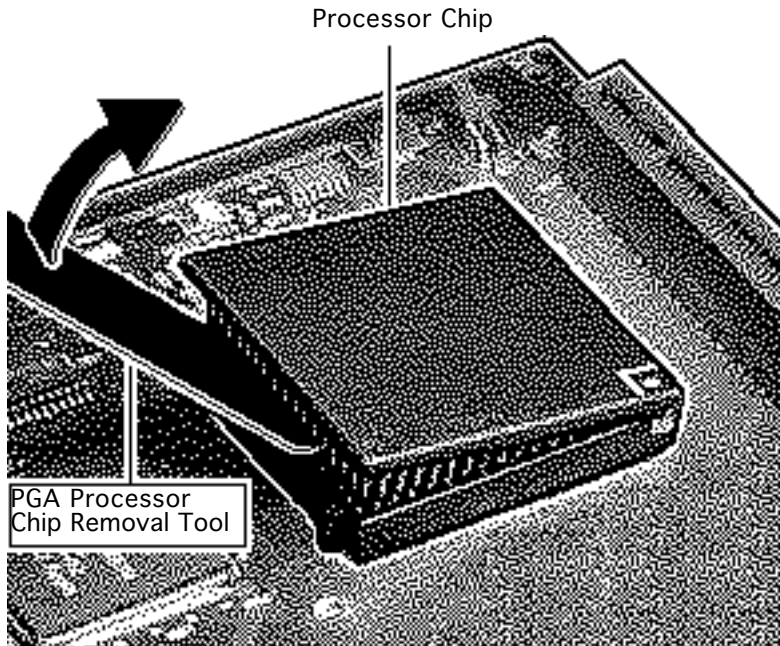
CPU Replacement

Before you begin, remove the following:

- Top cover
- Power supply
- Expansion card
- Logic board

Caution: Review the ESD precautions in Bulletins/ Safety.



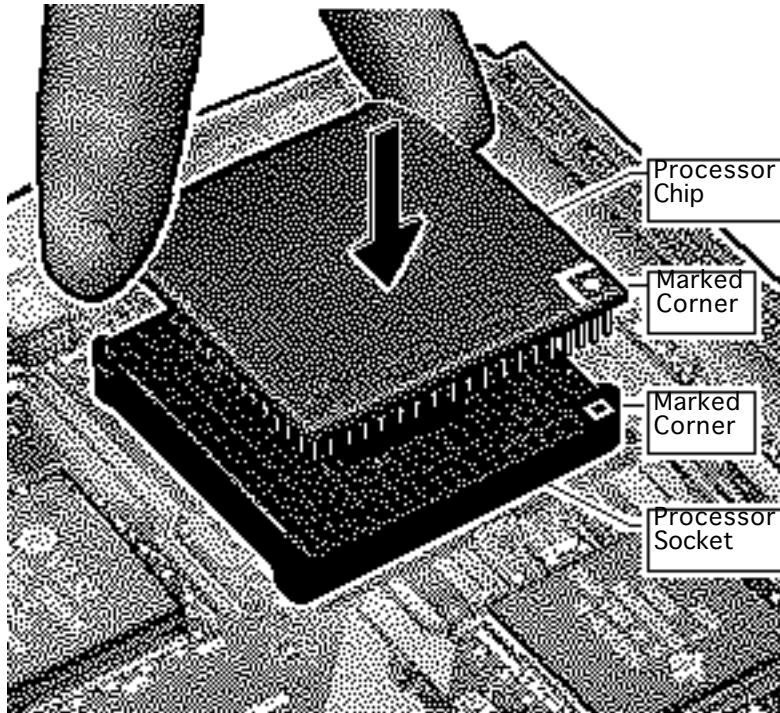


- 1 Position the teeth of the PGA processor chip removal tool in the groove between the chip and the socket.

Caution: Be sure to lift up on the handle of the chip removal tool. Pressing down could damage components on the board.

- 2 Gently lift up the handle to loosen each side of the processor chip from the socket.
- 3 Remove the processor chip.





- 4 Position the marked corner of the processor chip over the marked corner of the processor socket.

Replacement Caution:

Forcing the processor into the socket could damage processor pins. If the processor resists installation, check pin alignment.

- 5 Carefully align the pins of the processor chip with the corresponding holes in the socket.





- 6 Press down firmly on each edge of the processor chip.





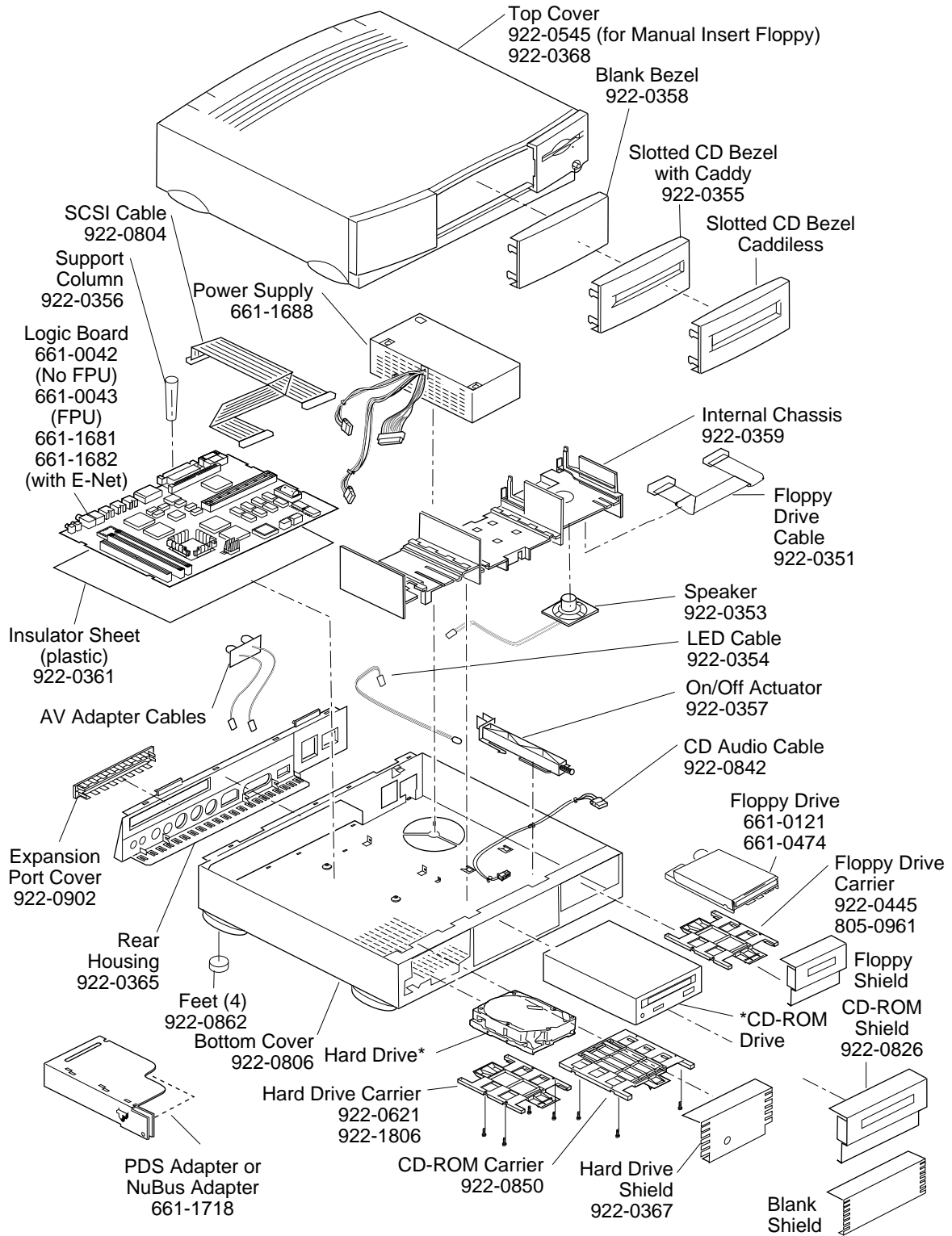
Exploded View

Macintosh Quadra 610/Centris
610/WS 60





Exploded View



***This is a generic representation of a product family. Configurations may vary.
For number of part with asterisk, see parts list.***

