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

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

Overview

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

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

Tabs

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.
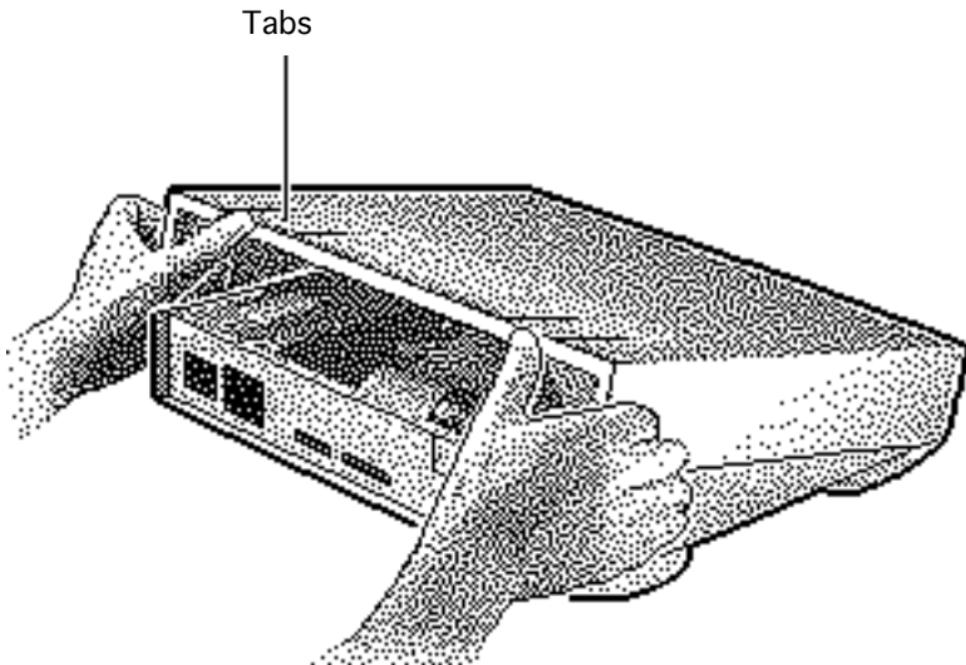
Power Supply

Power Supply

Before you begin, remove the top cover.

Caution: Review the ESD precautions in Bulletins/Safety.
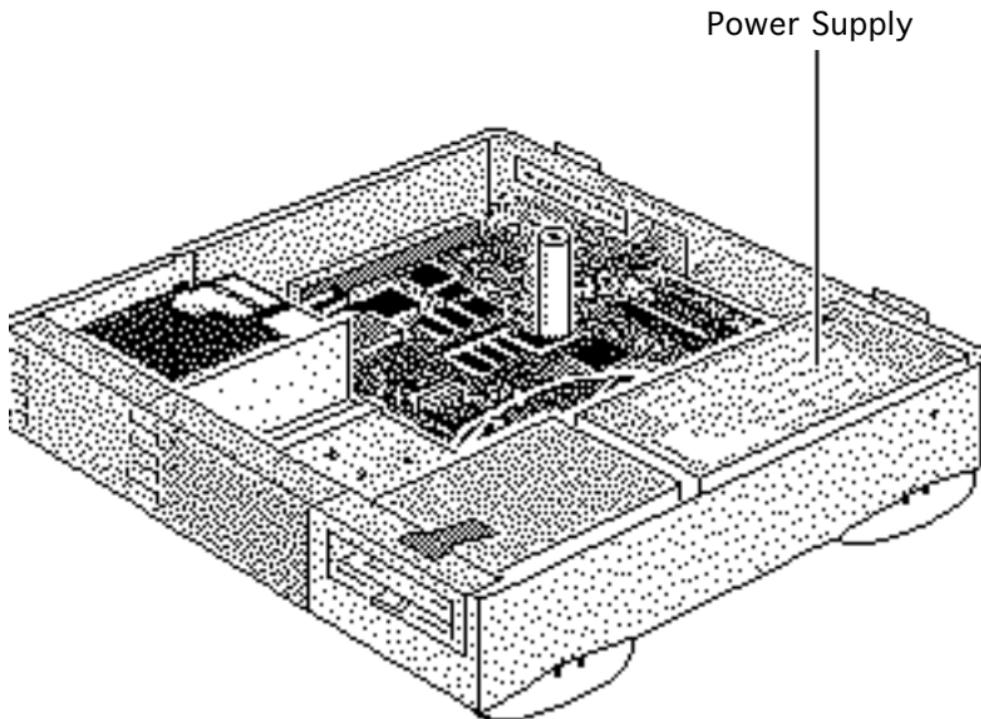
1 Remove the screw that secures the power supply.

Power Supply

Tab
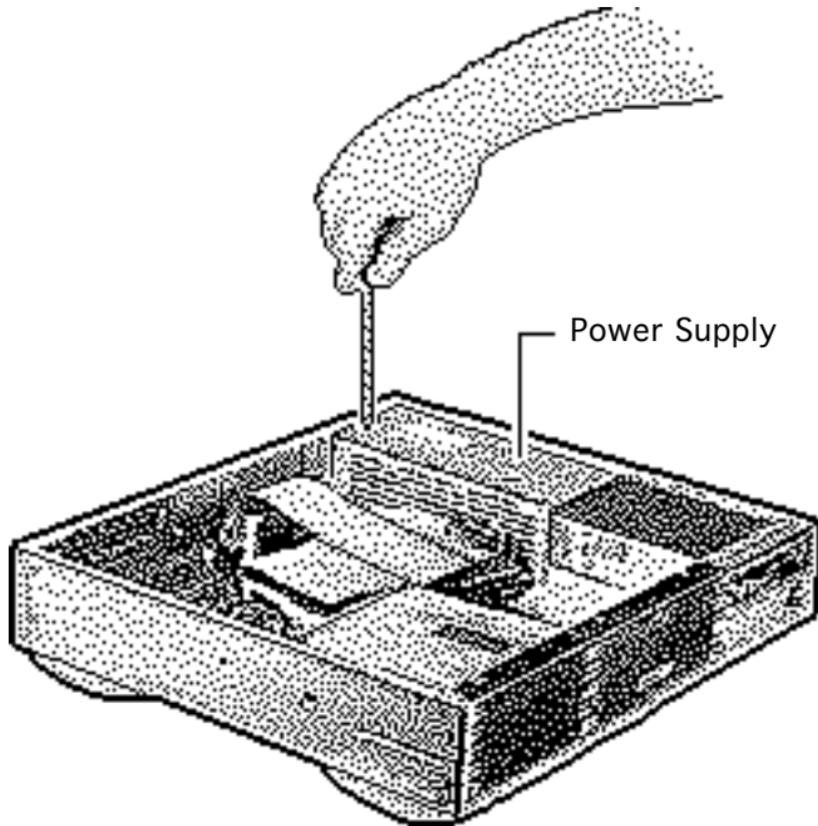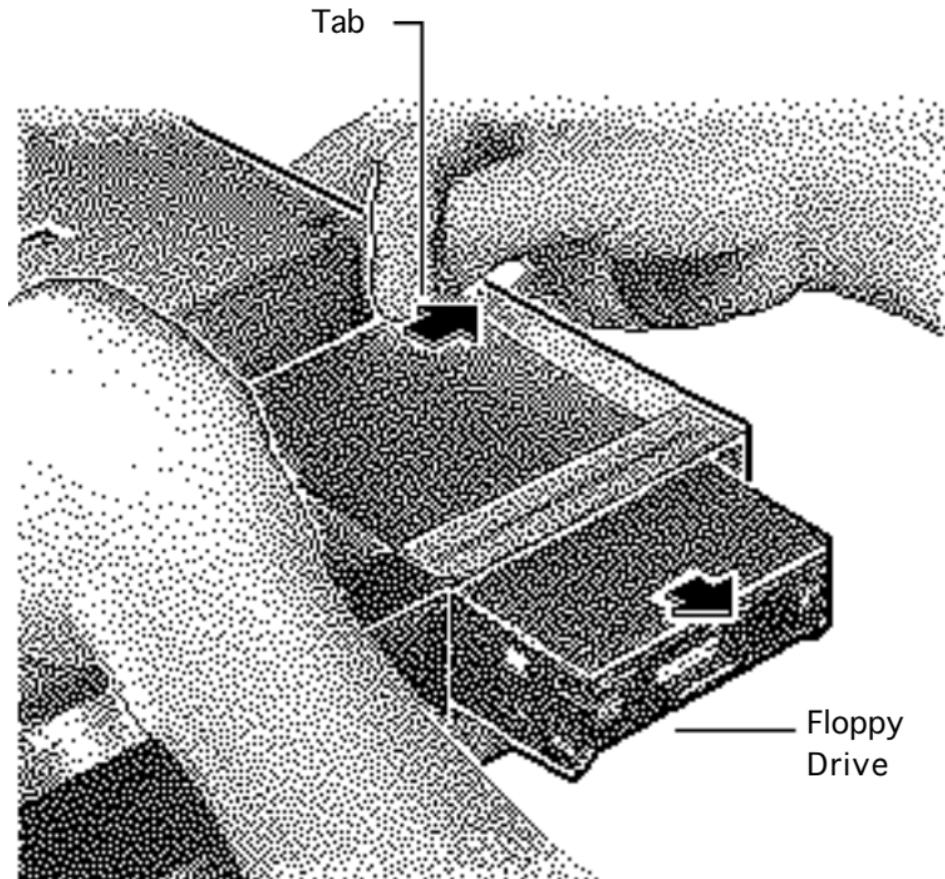
Floppy
Drive

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.

Main Power Cable

CD-ROM Drive Power Cable

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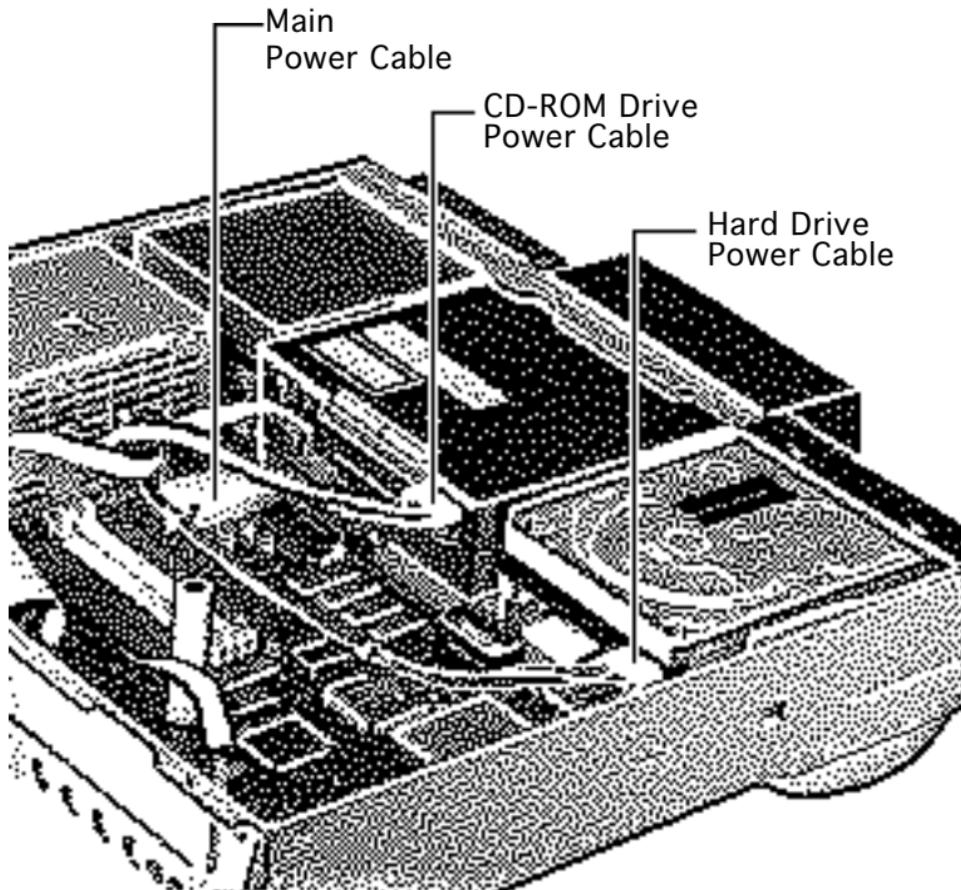
3 Disconnect these power supply cables:
   - Main power cable
   - Hard drive power cable
   - CD-ROM drive power cable (if installed)

4   Slide the power supply
     forward slightly.

Power
Supply
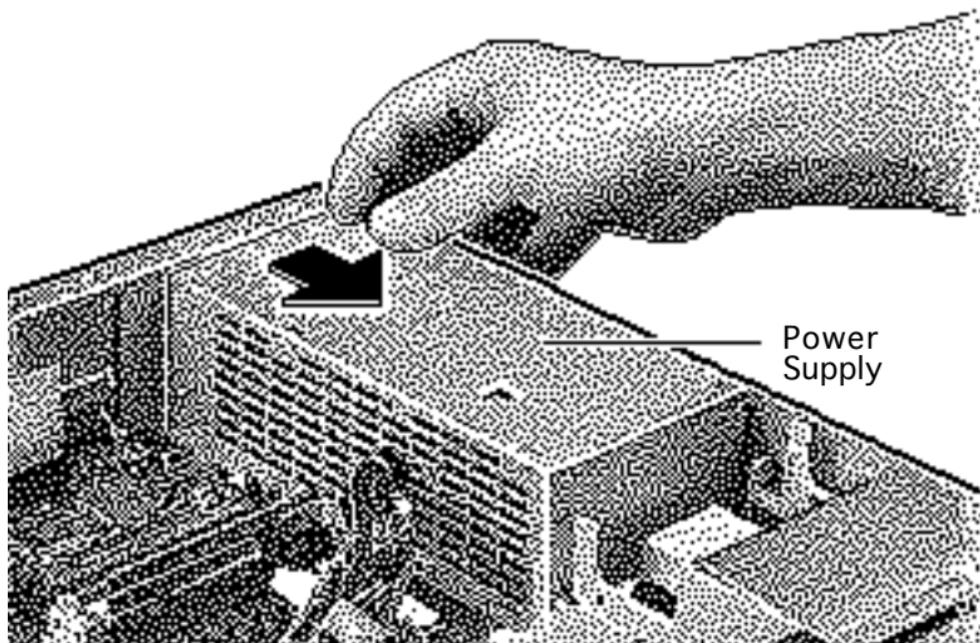
Power Switch

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.
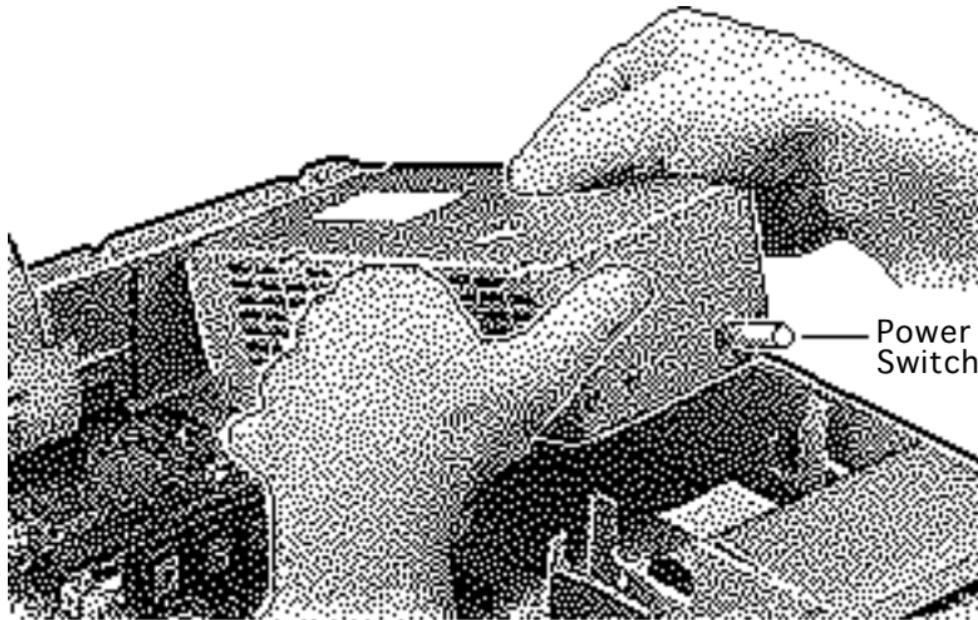
Logic Board

Logic Board

Before you begin, remove the following:

- Top cover
- Power supply

Caution: Review the ESD precautions in Bulletins/ Safety.

Standoff with
Internal Screw
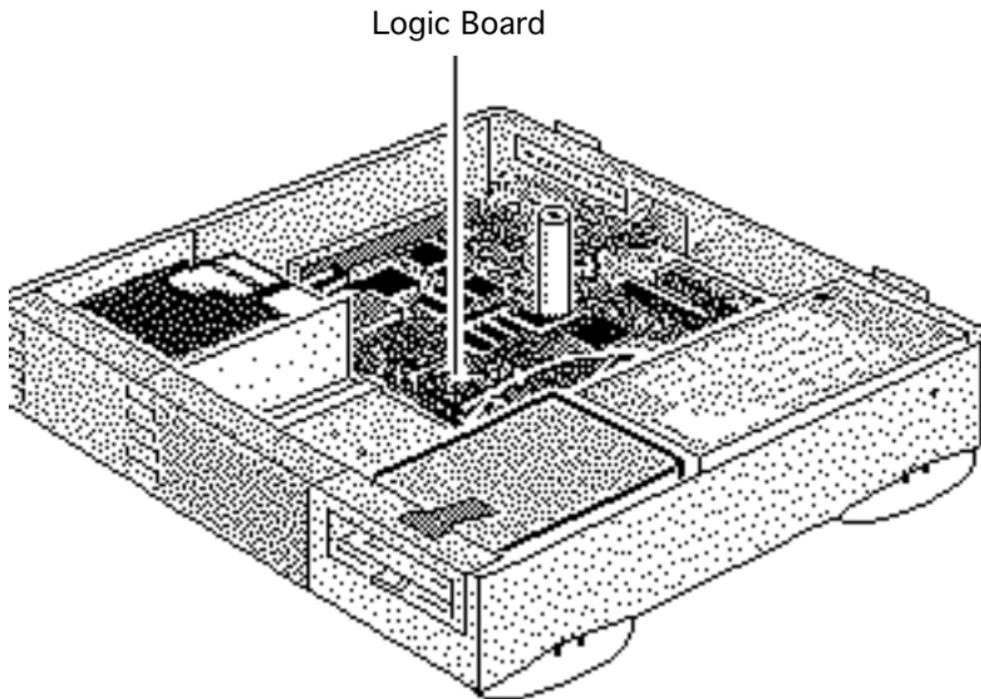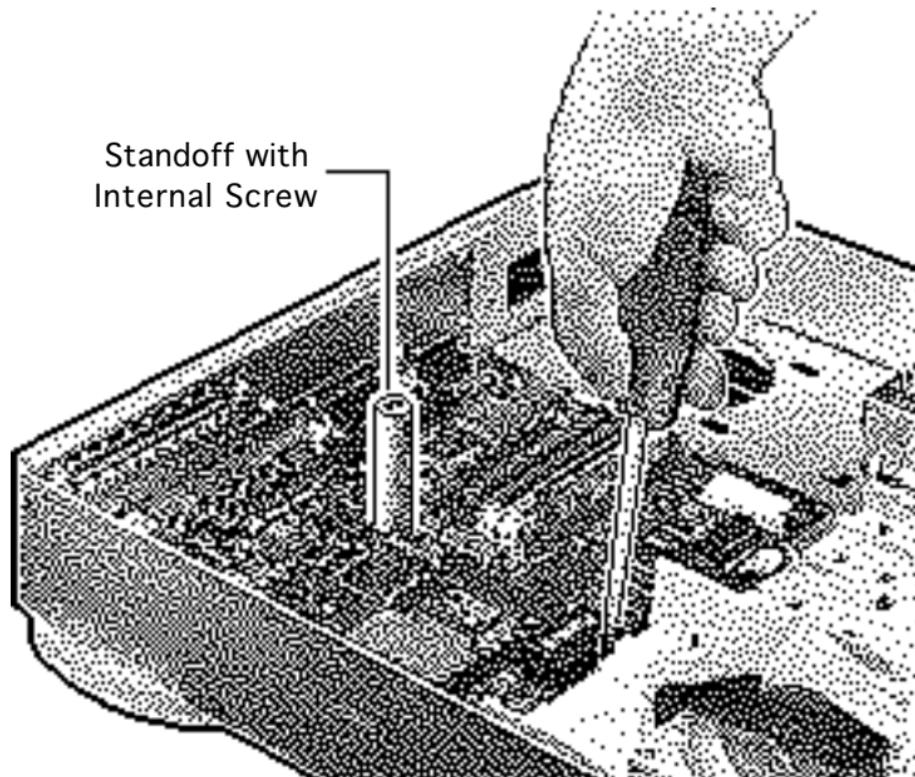
Note: The logic board is secured with two screws.

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.

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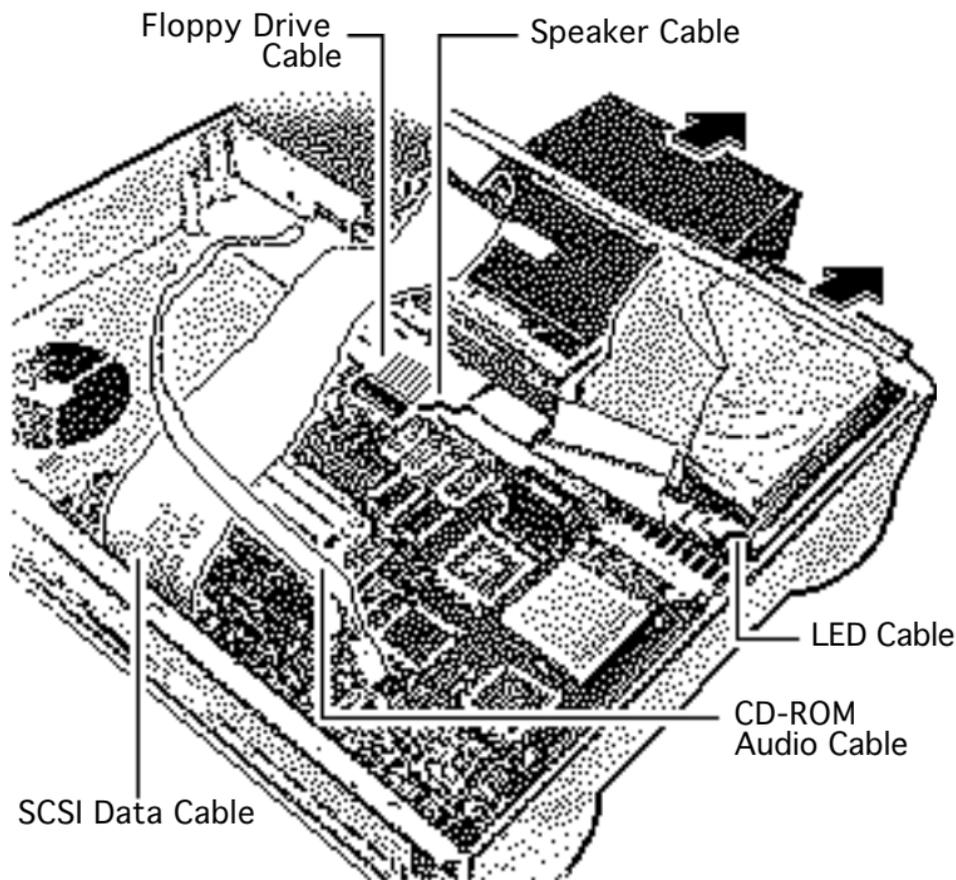
4 Disconnect these cables from the logic board:
- SCSI data cable
- Speaker cable
- LED cable
- CD-ROM audio cable (if present)
- Floppy drive cable

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.
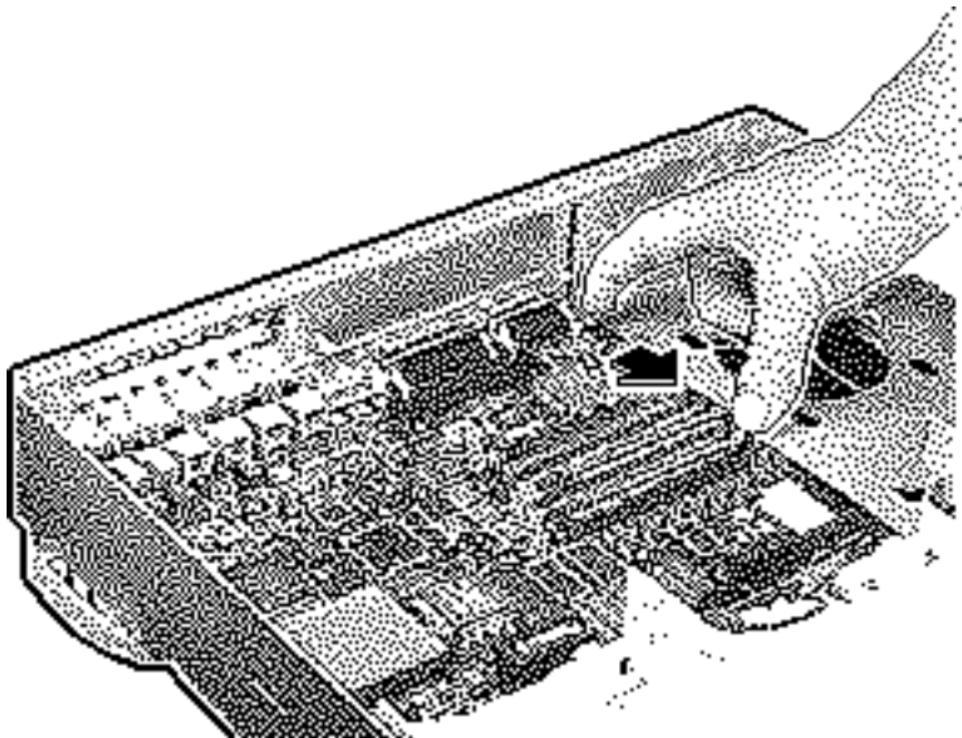
8   Remove the logic board.
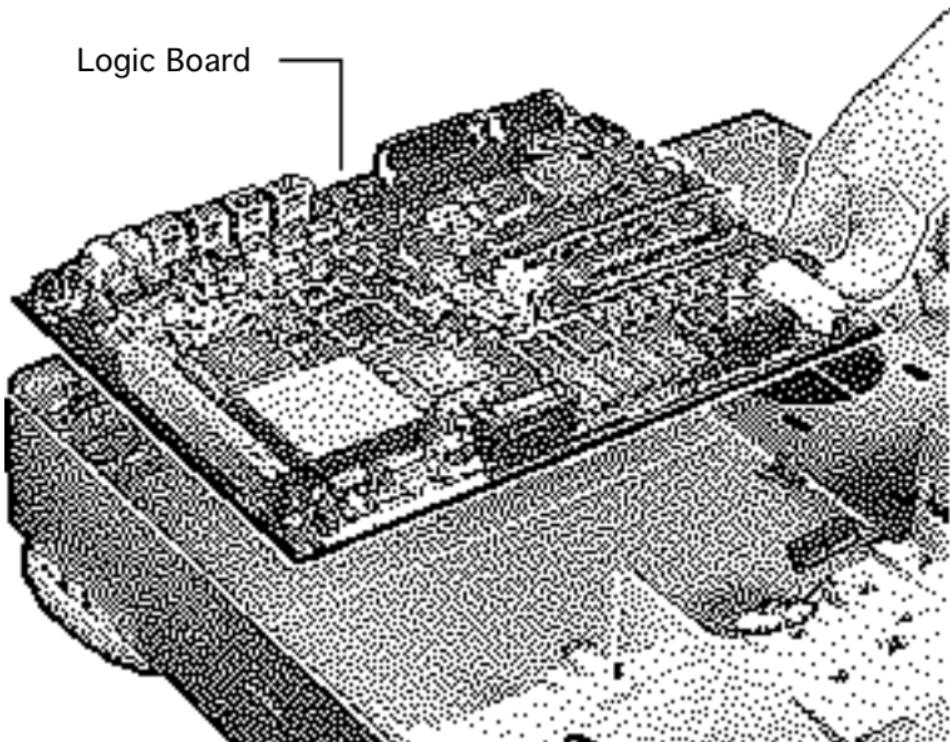
     Replacement Note:
     Slide the hard drive and
     optional CD-ROM drive
     forward. Connect the
     floppy drive cable before
     replacing the logic
     board.

Logic Board

Floppy Drive

Floppy Drive

Before you begin, remove the top cover.

**Caution:** Review the ESD precautions in Bulletins/Safety.

Floppy
Drive

Tab

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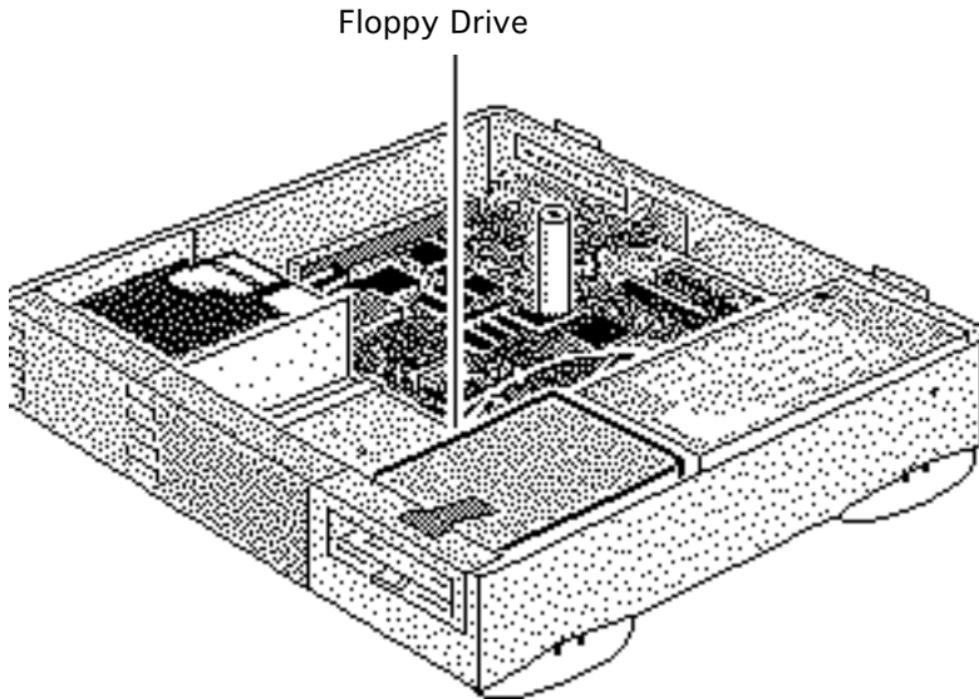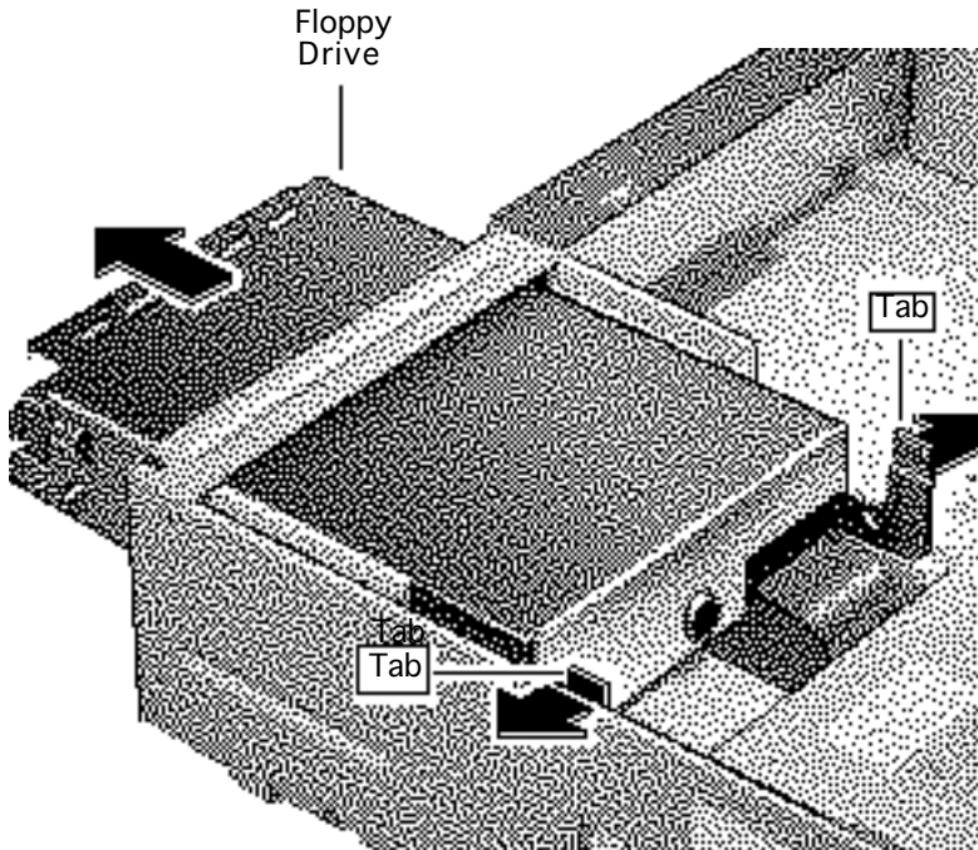
1   Press the tabs outward
    and slide the floppy
    drive forward a few
    inches.

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

Hard Drive

Before you begin remove the top cover.

Caution: Review the ESD precautions in Bulletins/Safety.
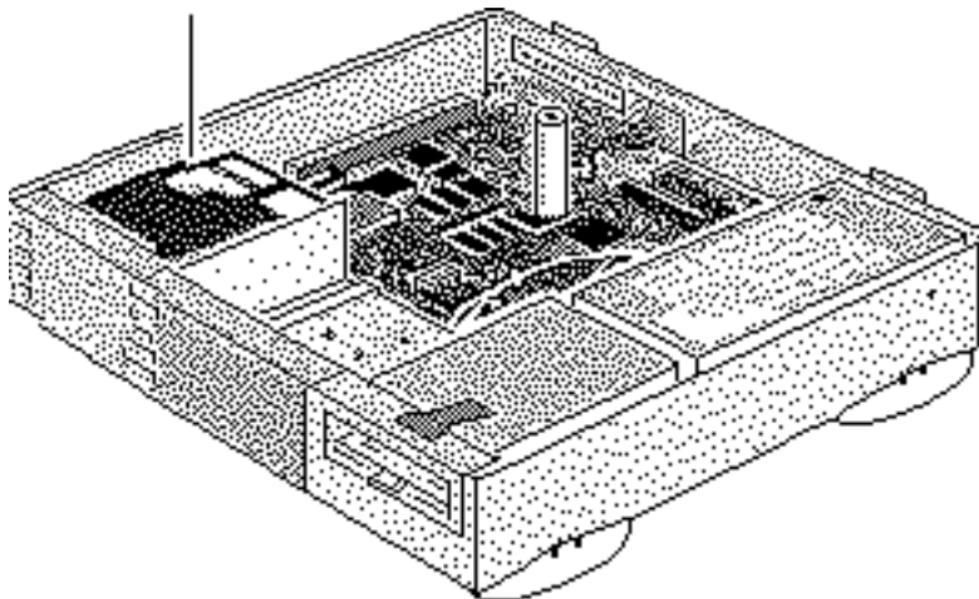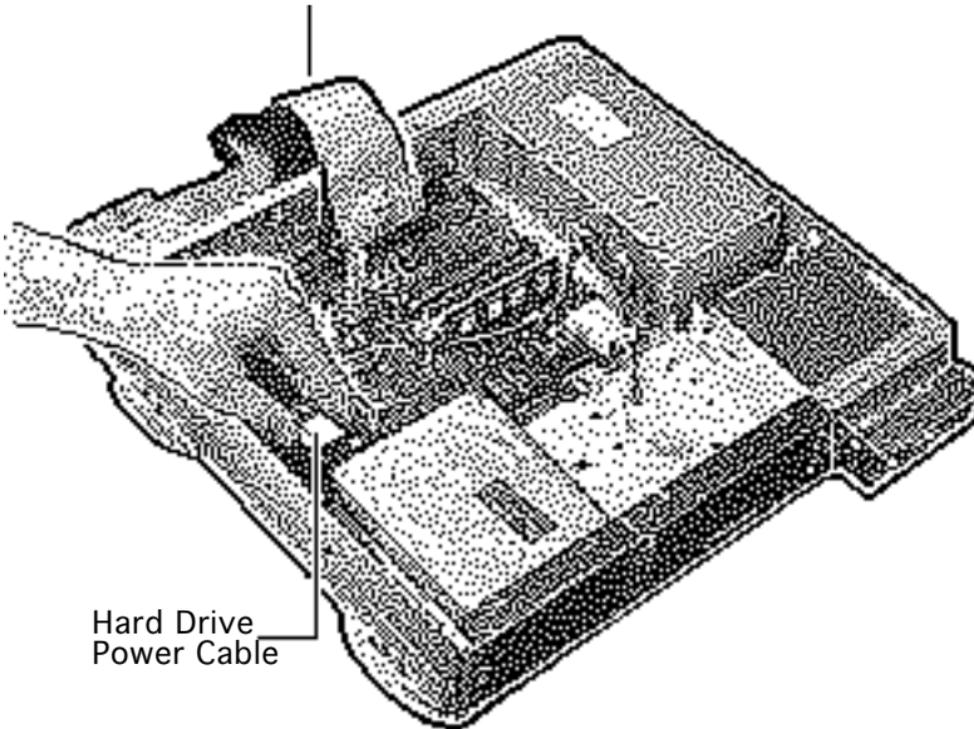
SCSI Data Cable

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

Tab
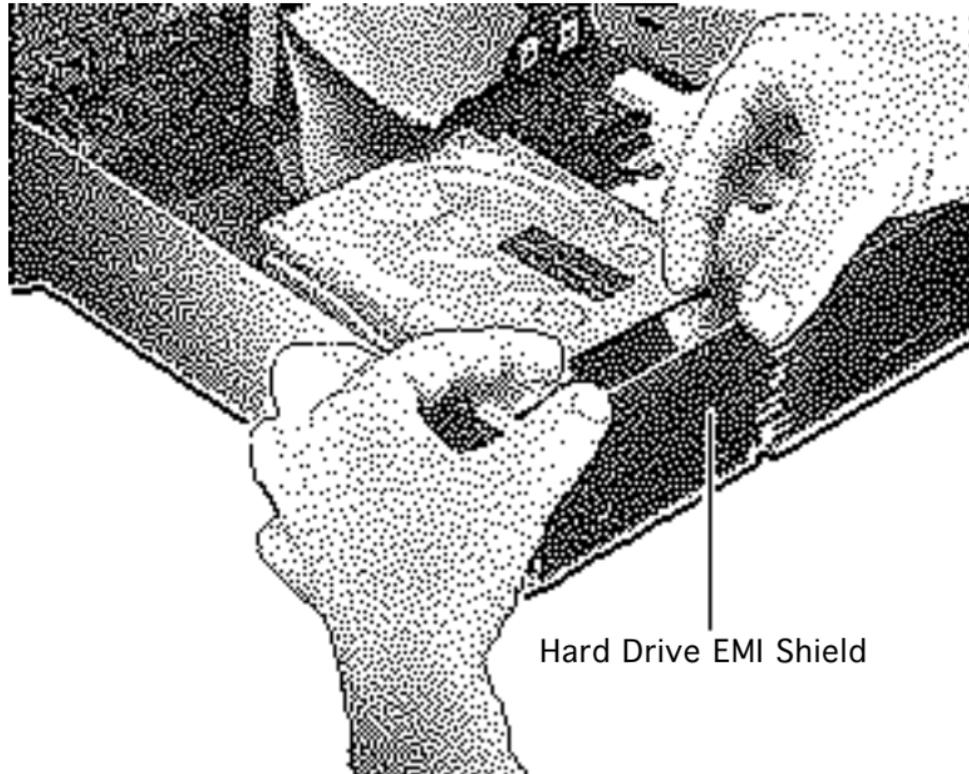
3 Press down on the tab and slide out the hard drive.
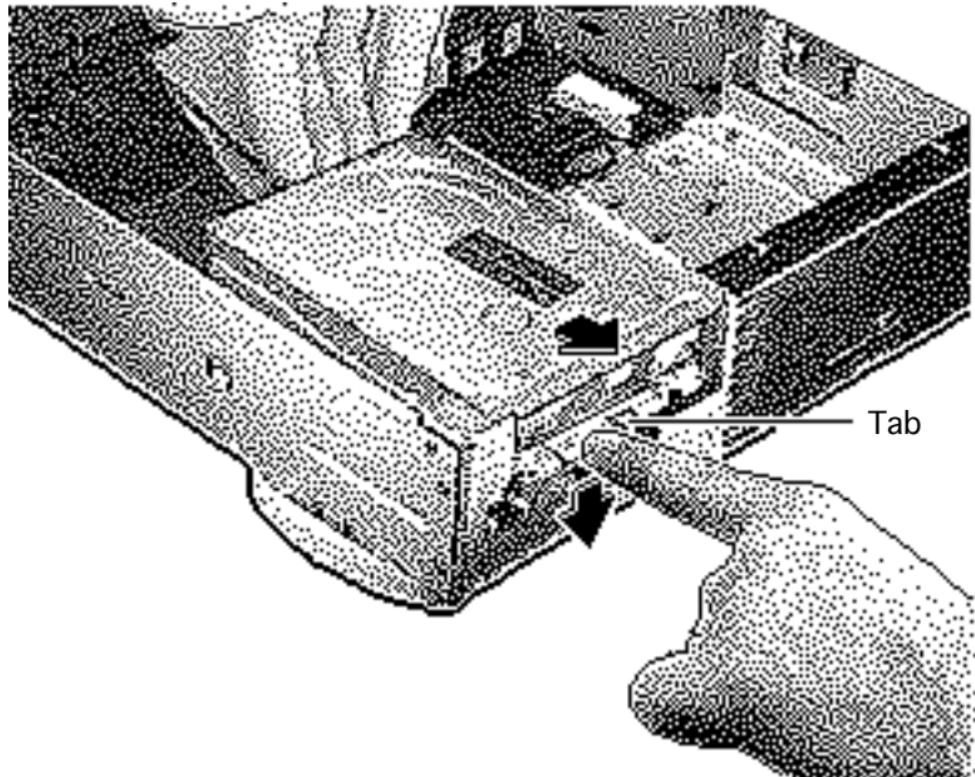
CD-ROM Drive

CD-ROM Drive

Before you begin, remove the top cover.

Caution: Review the ESD precautions in Bulletins/Safety.
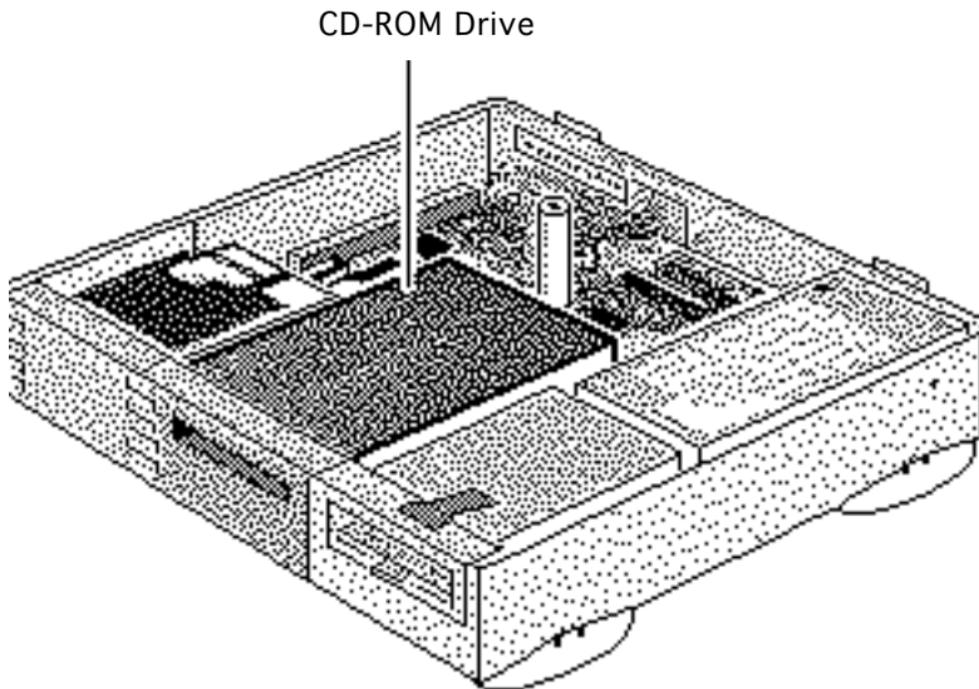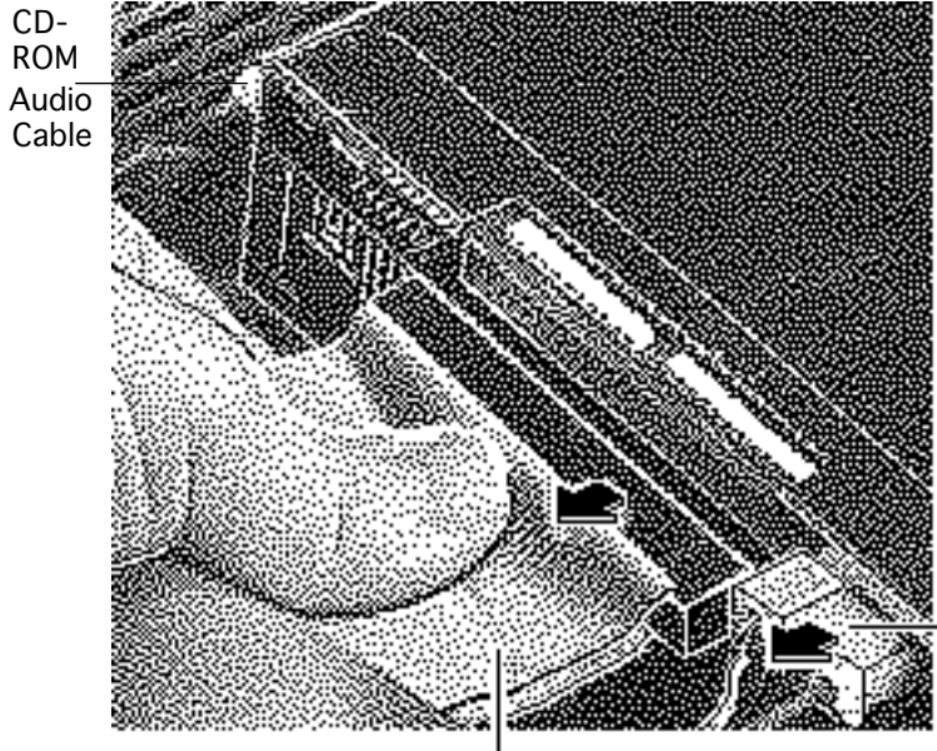
CD-
ROM
Audio
Cable

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.

CD-ROM EMI Shield

3 Remove the CD-ROM drive EMI shield.

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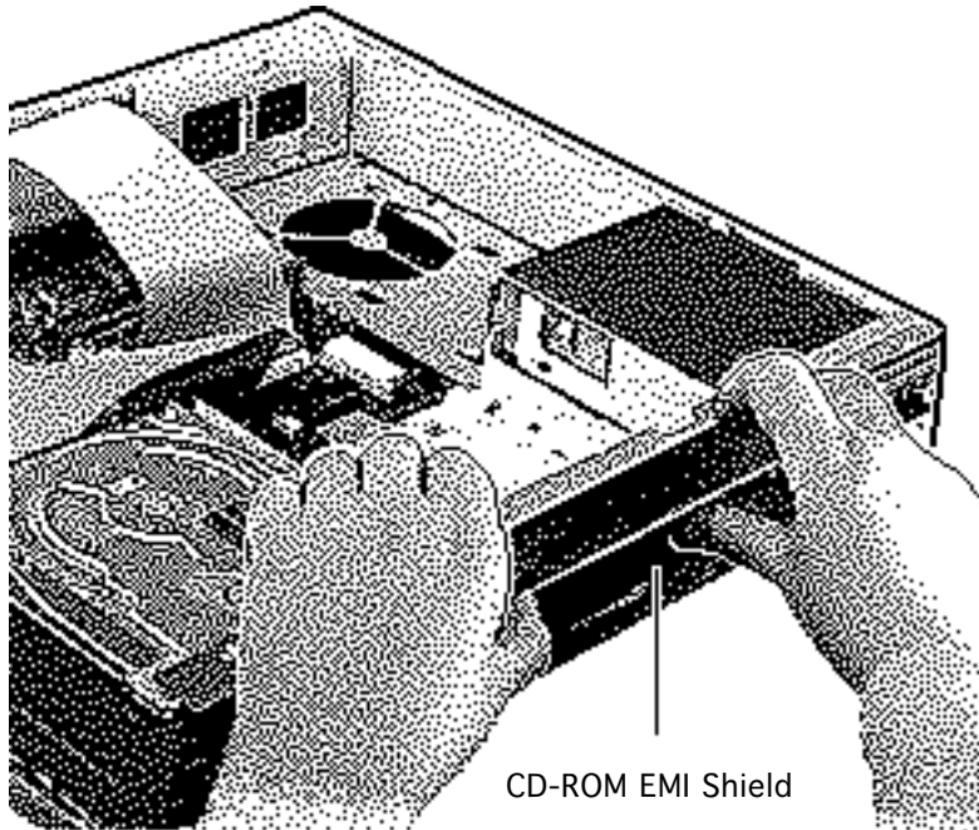
4 Press up on the tab and slide out the CD-ROM drive.

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

Internal Chassis
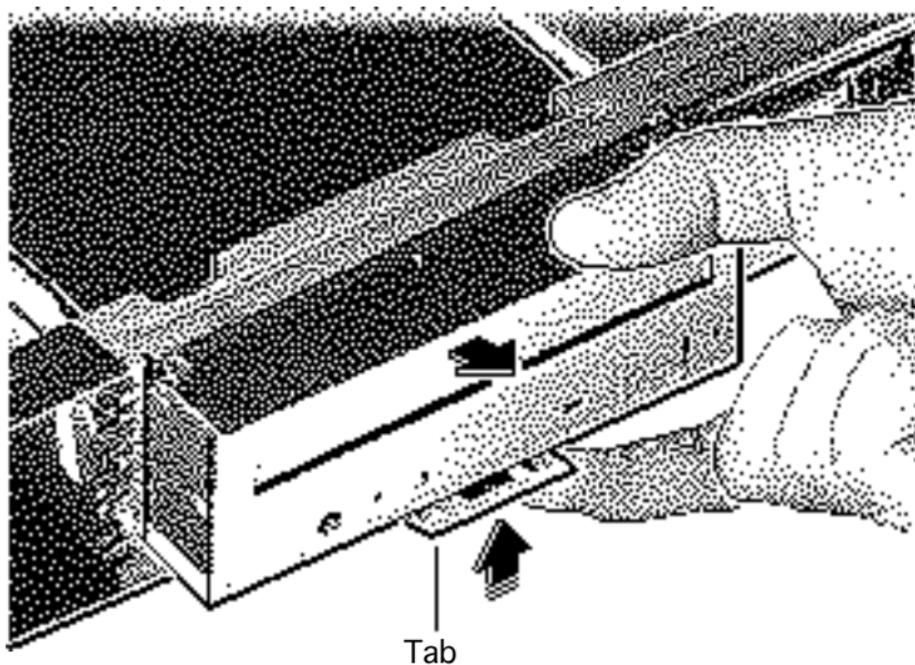
Internal Chassis

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.

Internal Chassis

Support Post

Rail and
Metal Tab

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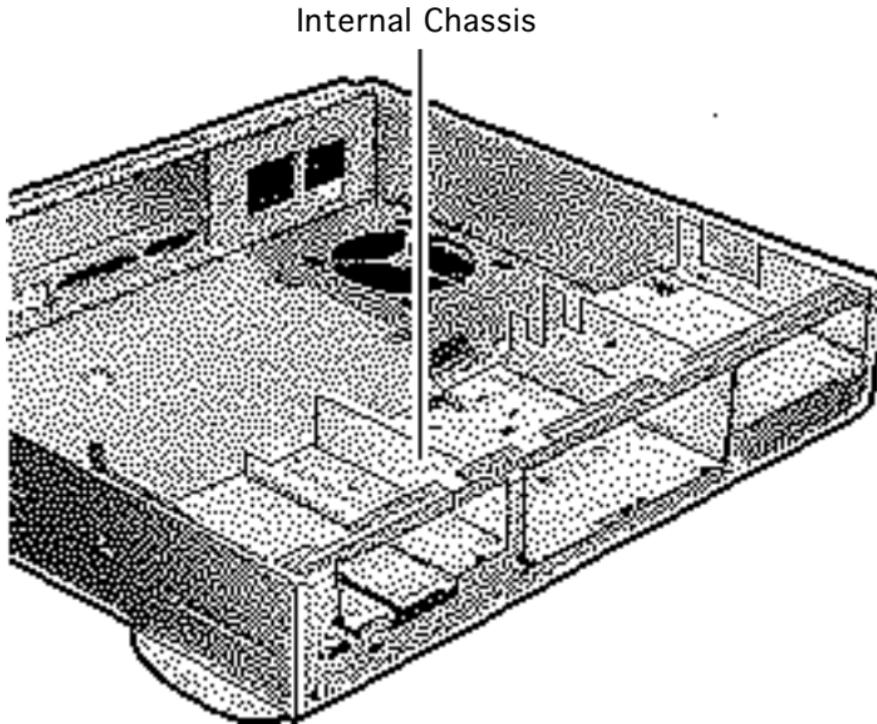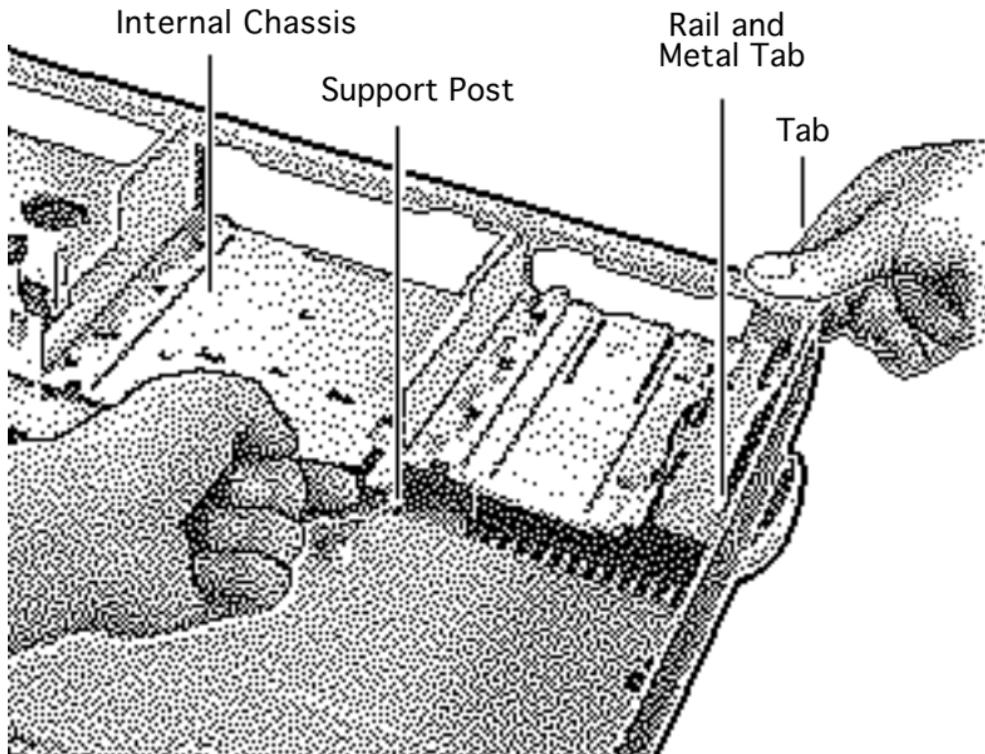
Note: The chassis is
secured to the bottom cover
by two tabs at the front of
the unit, two rail and tab
sets at the sides of the unit,
support posts at the back of
the chassis, and hidden
brackets that slide into the
bottom cover.

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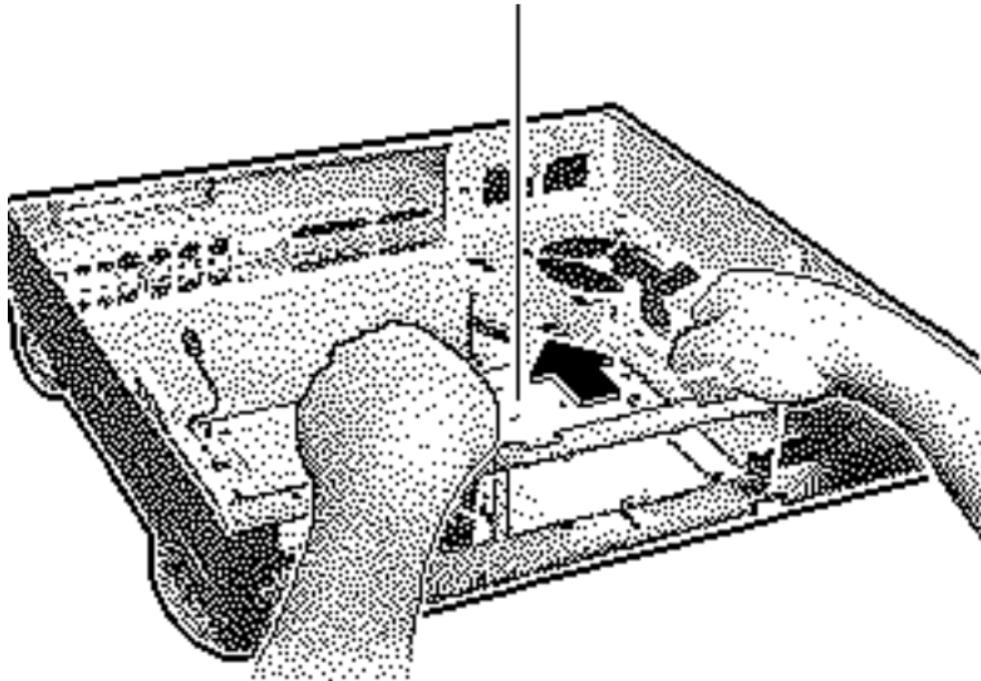
3 Press down and slide the chassis toward the back of the computer.

4 Remove the chassis.

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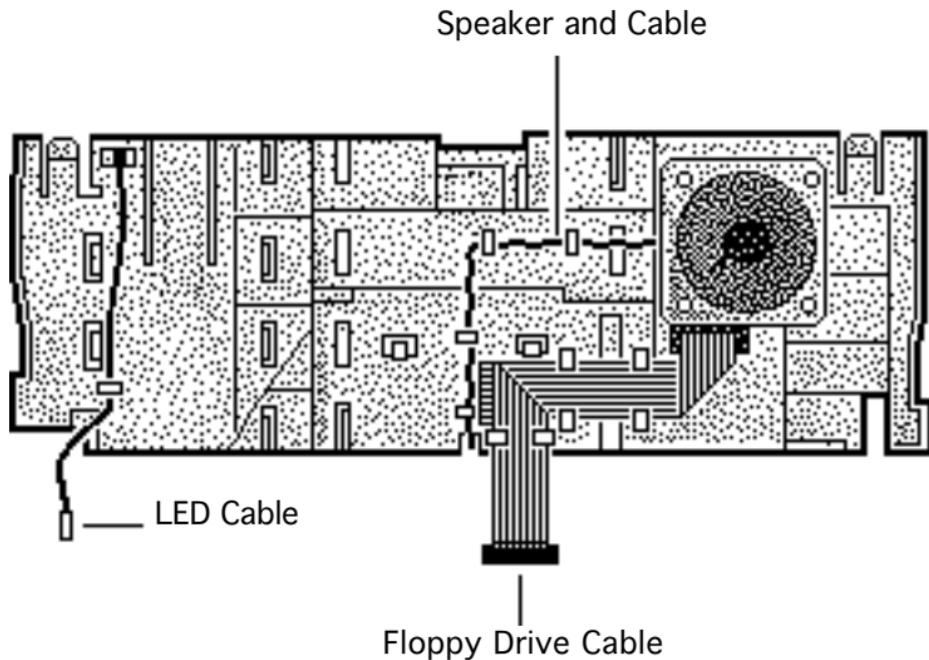
5 Turn the chassis over.

6 Remove the floppy drive cable and the LED cable.

7 Remove the speaker cable from its routing guides.

Speaker and Cable

LED Cable

Floppy Drive Cable
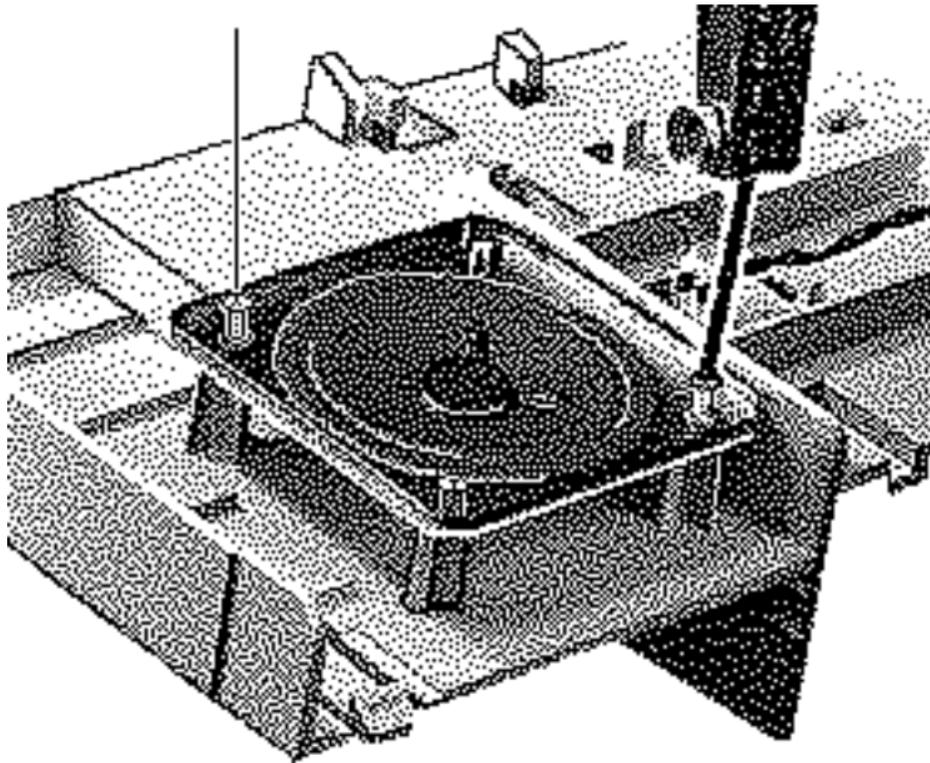
Torx Screws

8 Remove the two torx screws from the speaker.

9 Lift out the speaker.

Bottom Cover

Internal Chassis
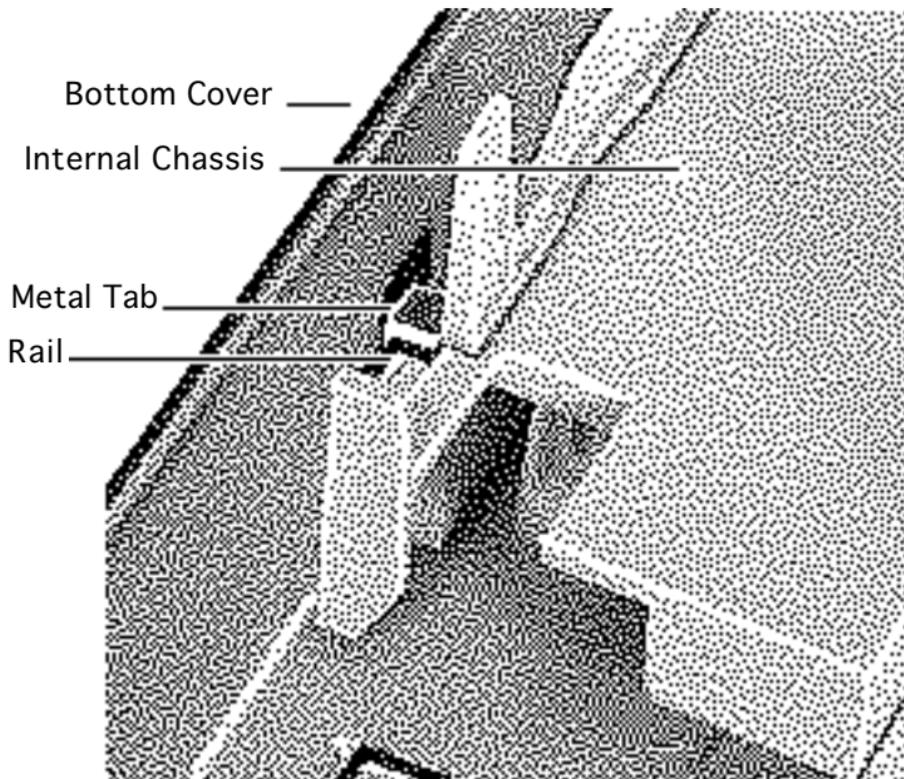
Metal Tab

Rail

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

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

Actuator

Tab

Tab
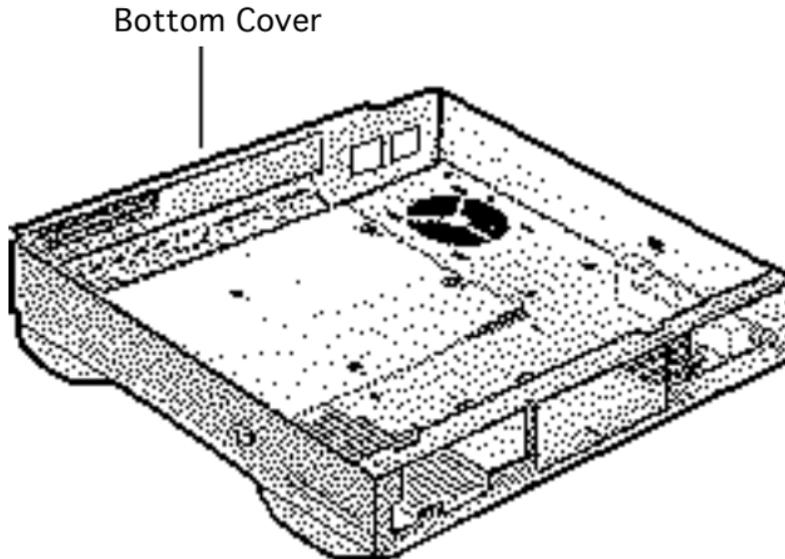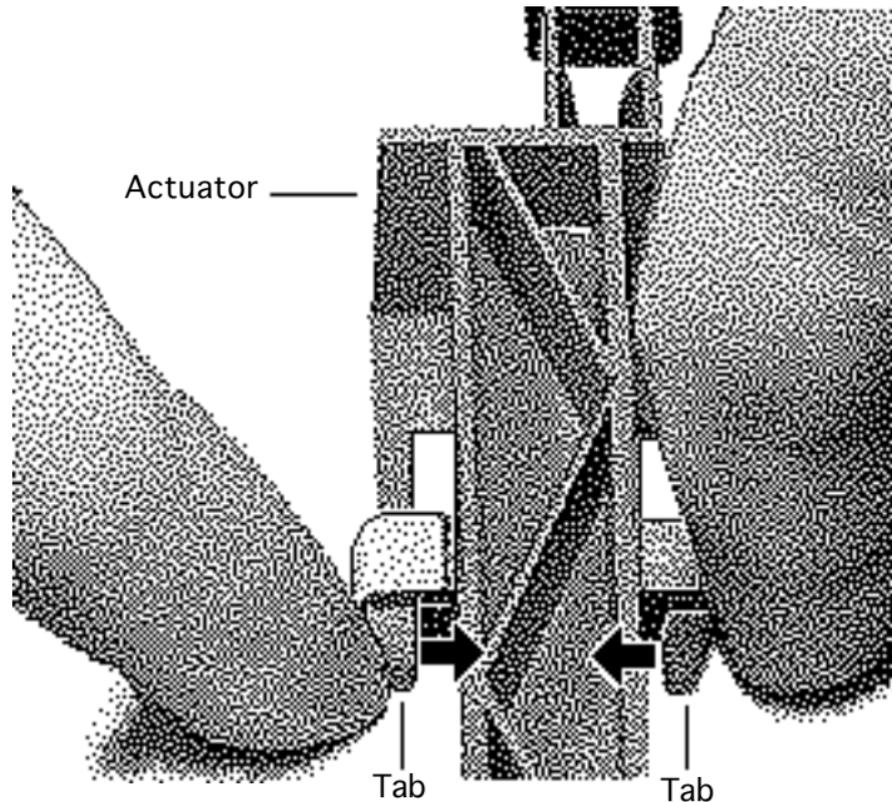
1 Shift the actuator toward the back of the unit.

2 Squeeze together the tabs on the shaft of the actuator.

3 Remove the actuator.
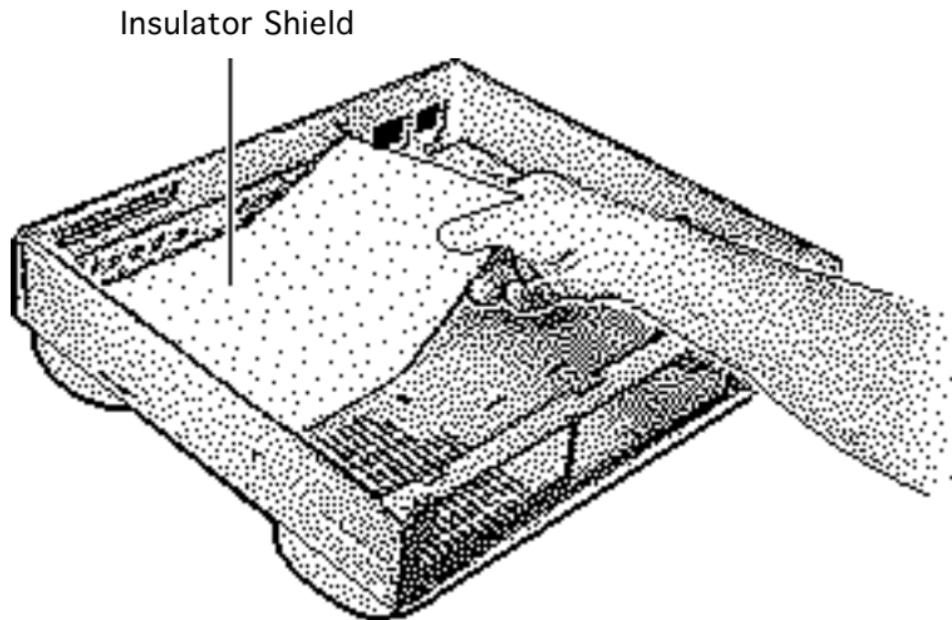
4 Lift out the insulator
   shield.

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.

Insulator Shield

Tab

Tab
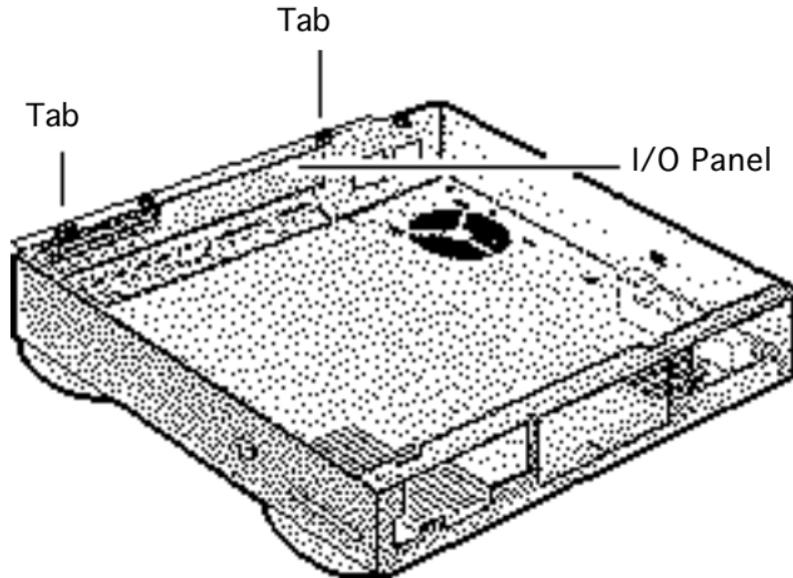
I/O Panel

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 Card Slot

Expansion Cards

Before you begin, remove the cover.

Caution: Review the ESD precautions in Bulletins/Safety.
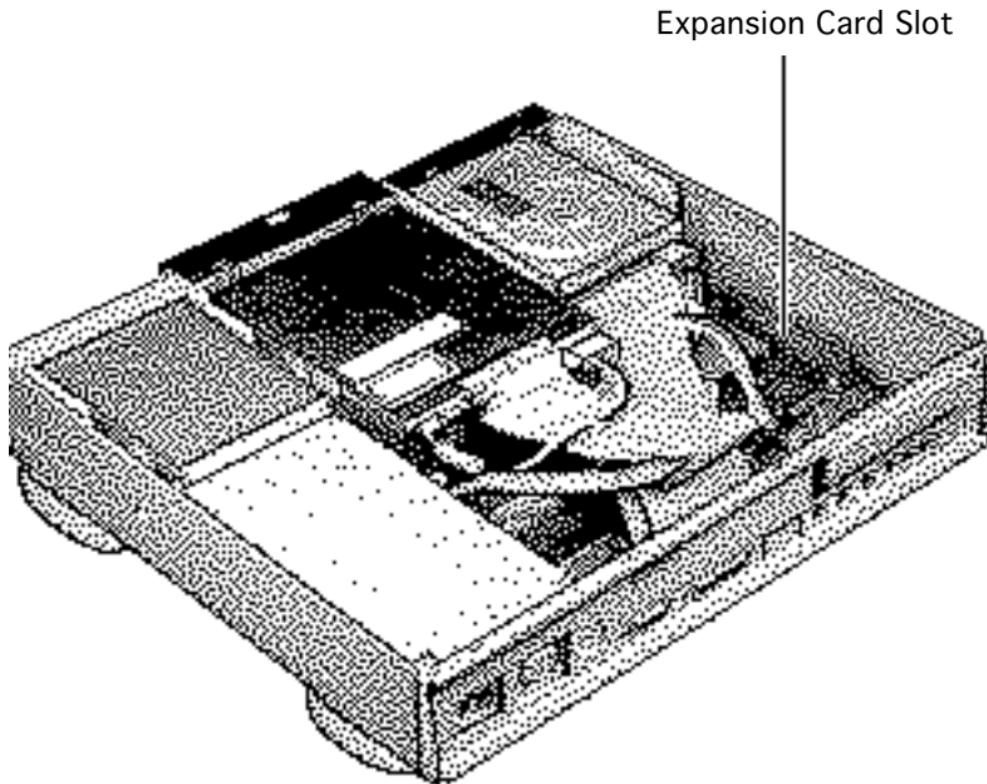
Expansion Port Cover
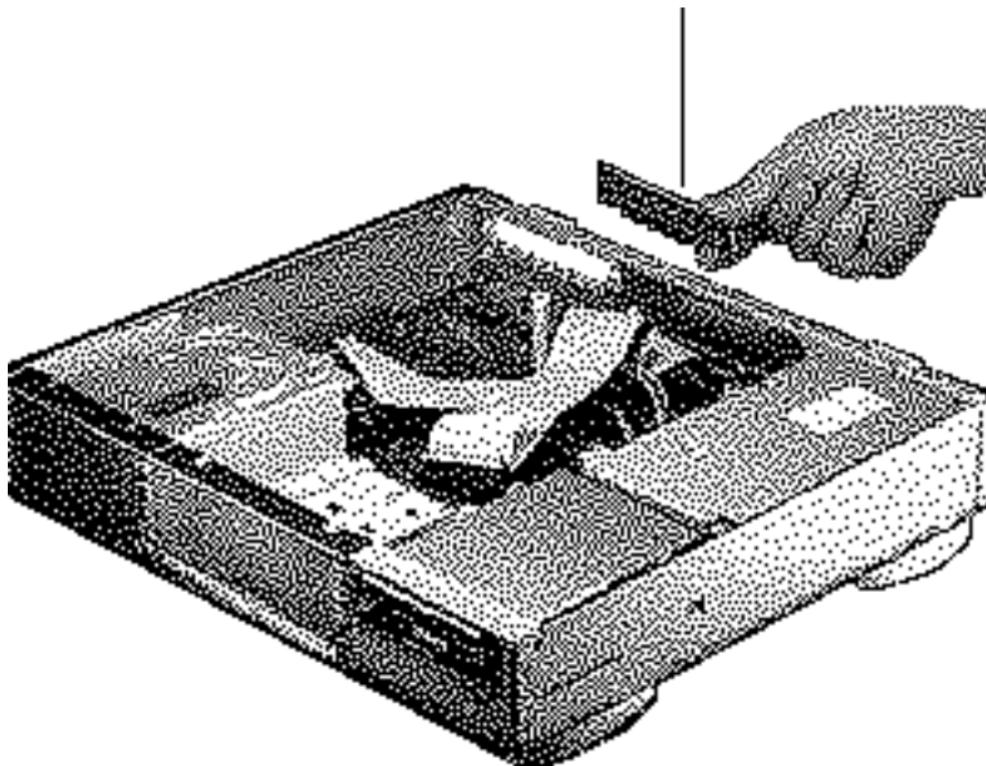
1 Remove the expansion port cover from the back panel.

Expansion Card
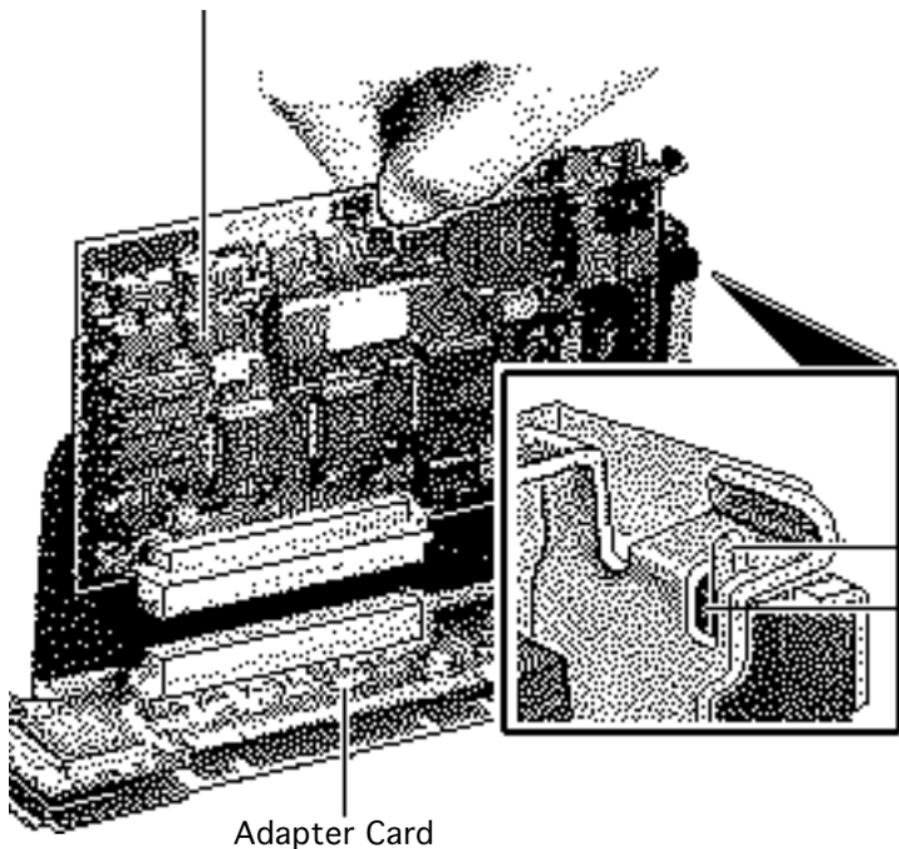
2 Loosely connect the expansion card connector to the adapter card connector.

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

3 Gently press the connectors together.

Adapter Card Pin

Expansion Card Hole

Adapter Card

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.

Adapter Card Tab

Adapter Card Connector

Bottom Case Slot

Expansion Slot
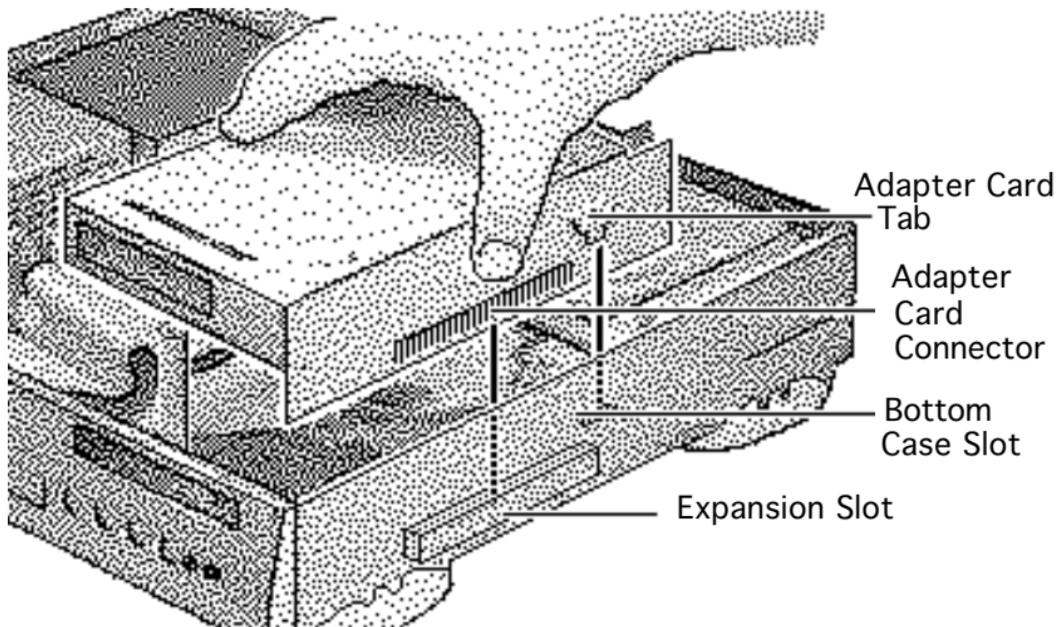
5 Attach the thumbscrews.
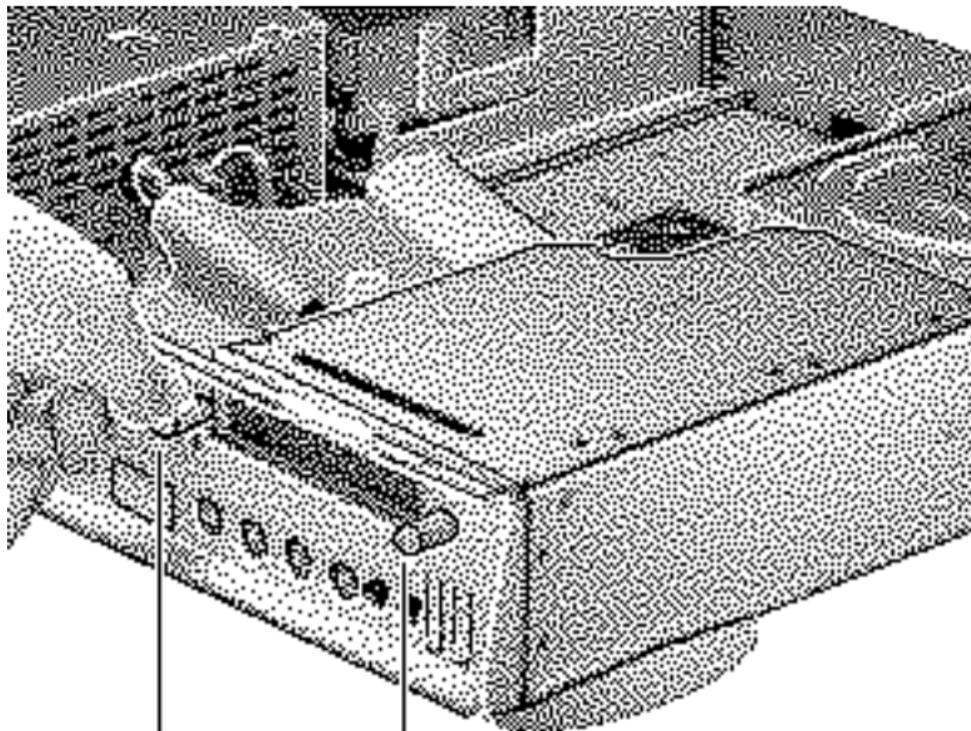
Thumbscrews

CD-ROM Drive Bay

CD-ROM Drive Upgrade

Before you begin, remove the top cover.

**Caution:** Review the ESD precautions in Bulletins/Safety.
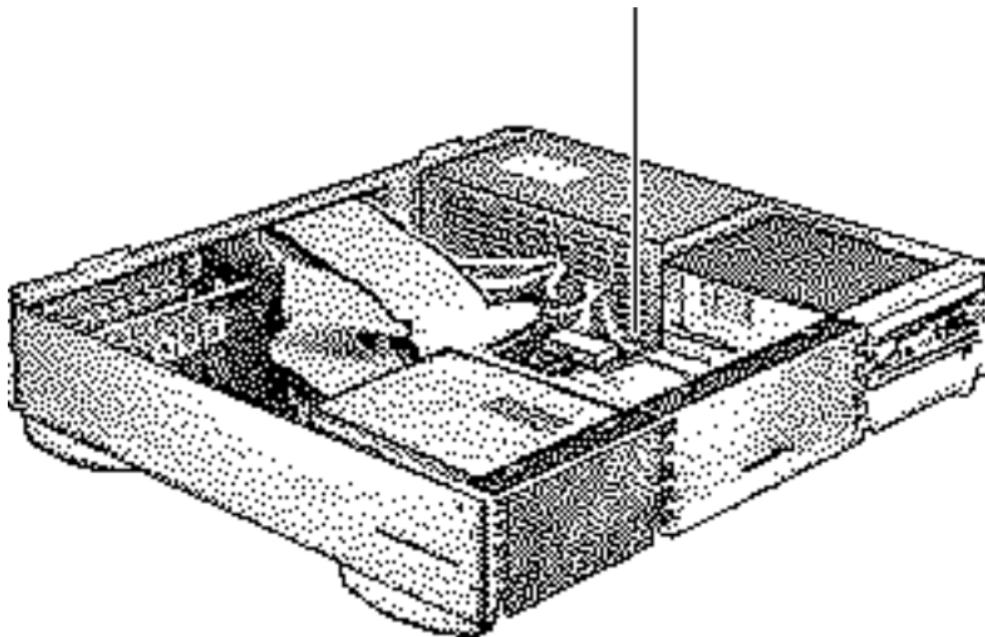
1 Remove the blank CD-ROM drive bezel from the top cover.

2 Install the slotted CD-ROM drive bezel in the top cover.

Slotted CD-ROM
Drive Bezel
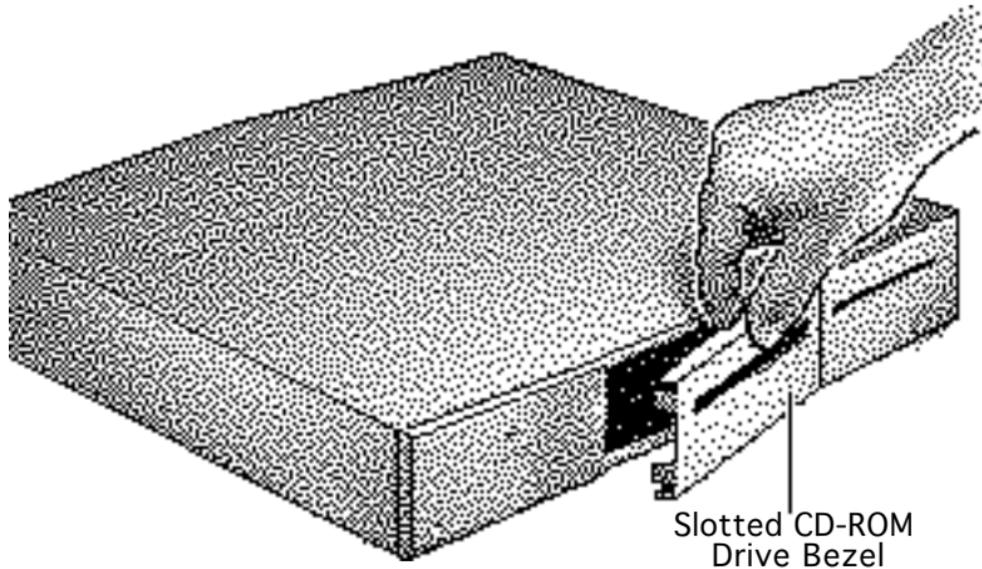
3 Pry off the metal 5.25"
drive bay shield.
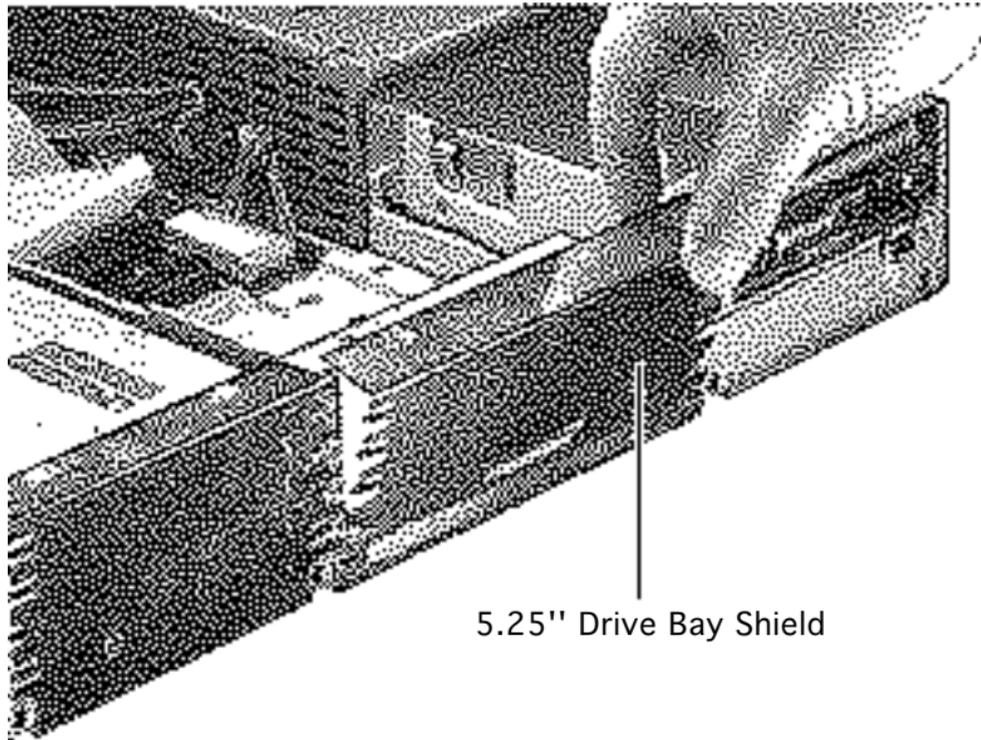
5.25'' Drive Bay Shield

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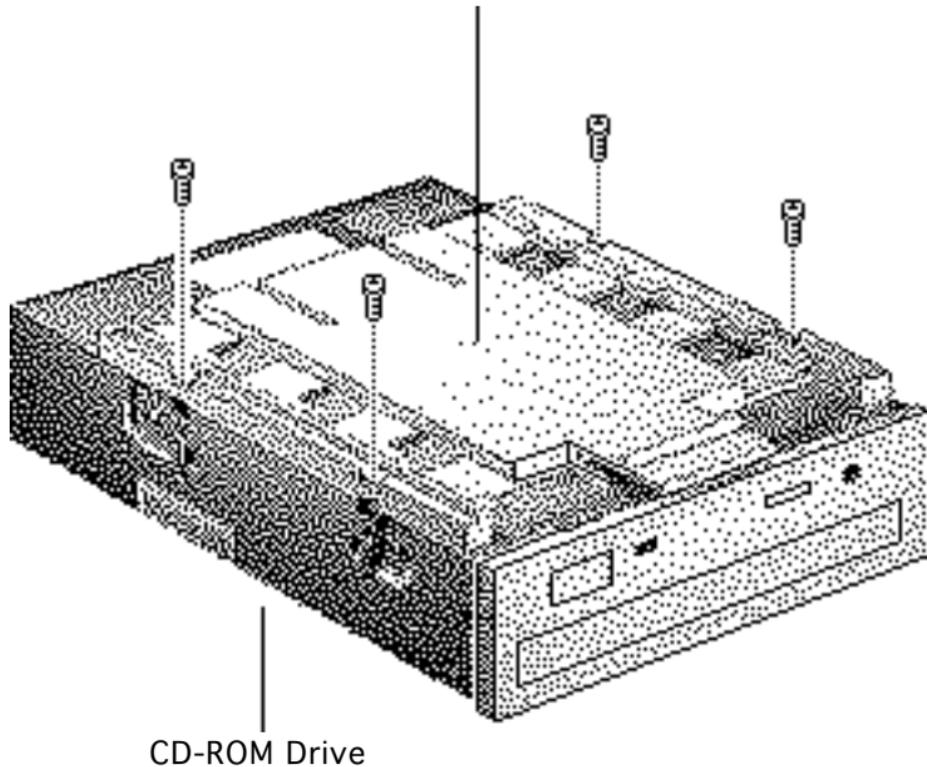
4 Attach the CD-ROM drive carrier to the CD-ROM drive with four Phillips screws.

CD-ROM Drive
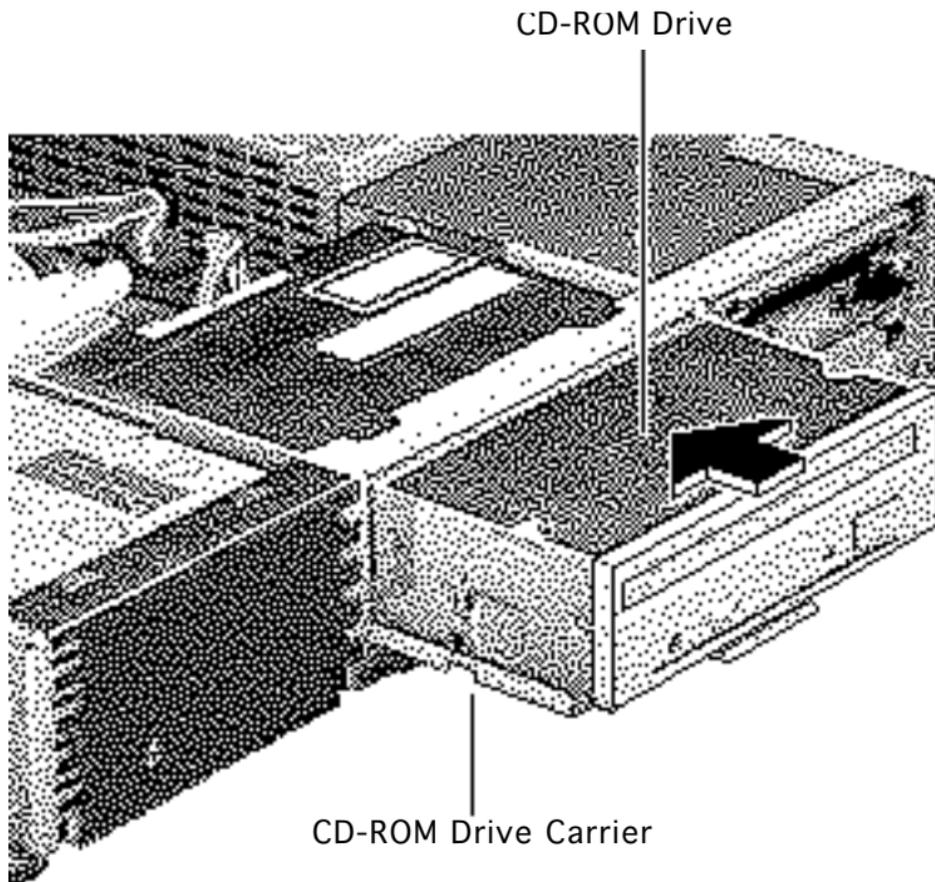
CD-ROM Drive

5 Push in the CD-ROM drive and carrier.

CD-ROM Drive Carrier

Bottom Cover
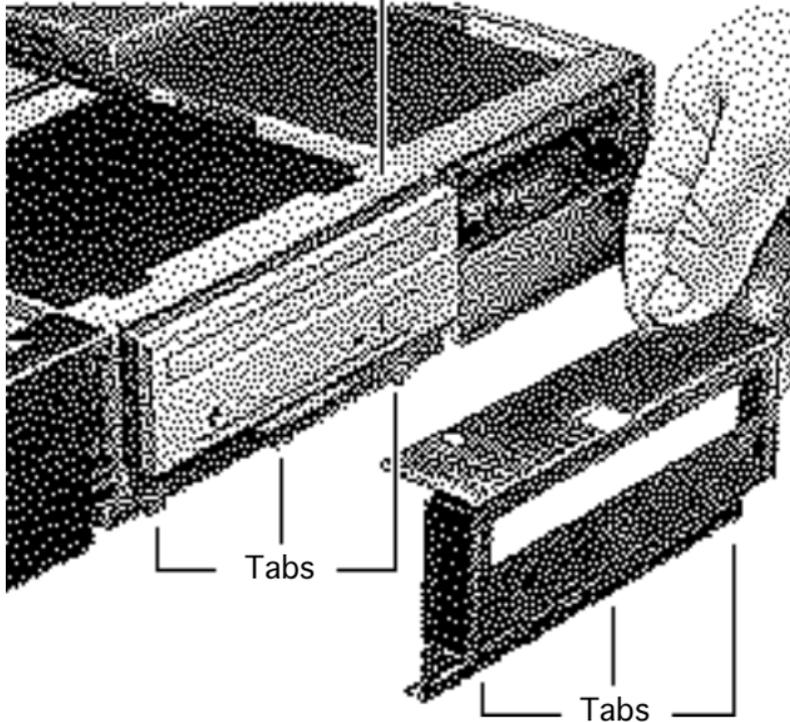
6 Align the slots at the lower edge of the CD-ROM shield with the tabs on the bottom cover.

7 Swing up the CD-ROM shield until it snaps securely onto the bottom cover.

CD-ROM Shield

Tabs

Tabs

CD-ROM Audio Cable

SCSI Data Cable

CD-ROM Drive Power Cable
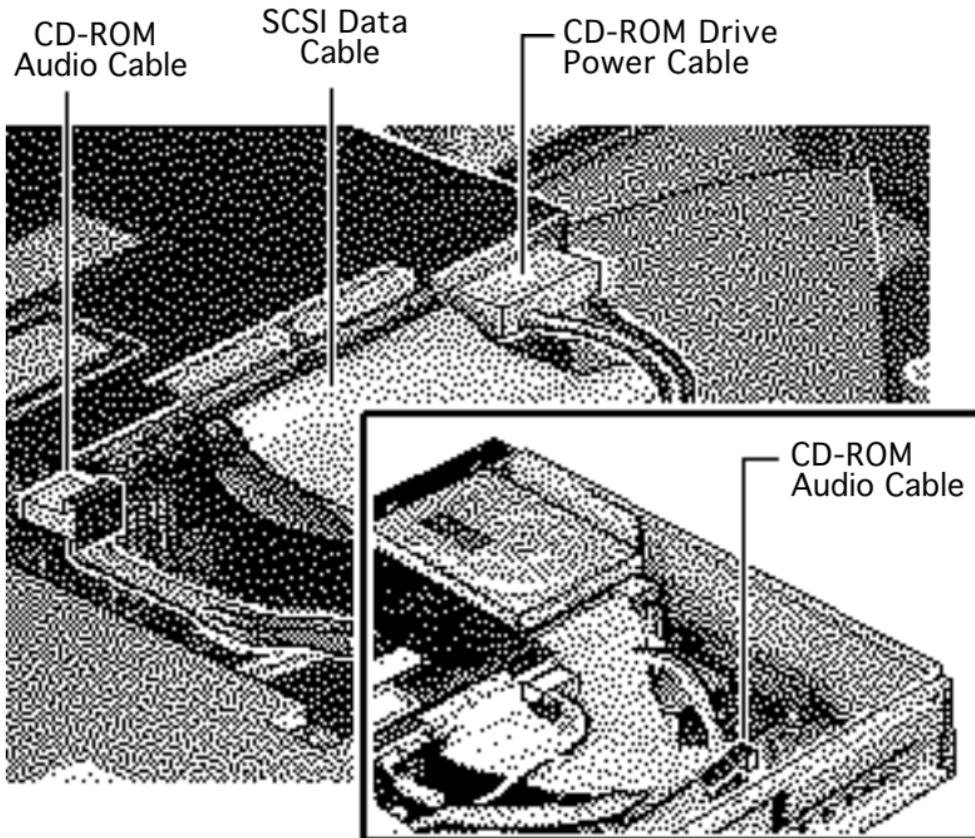
CD-ROM Audio Cable

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
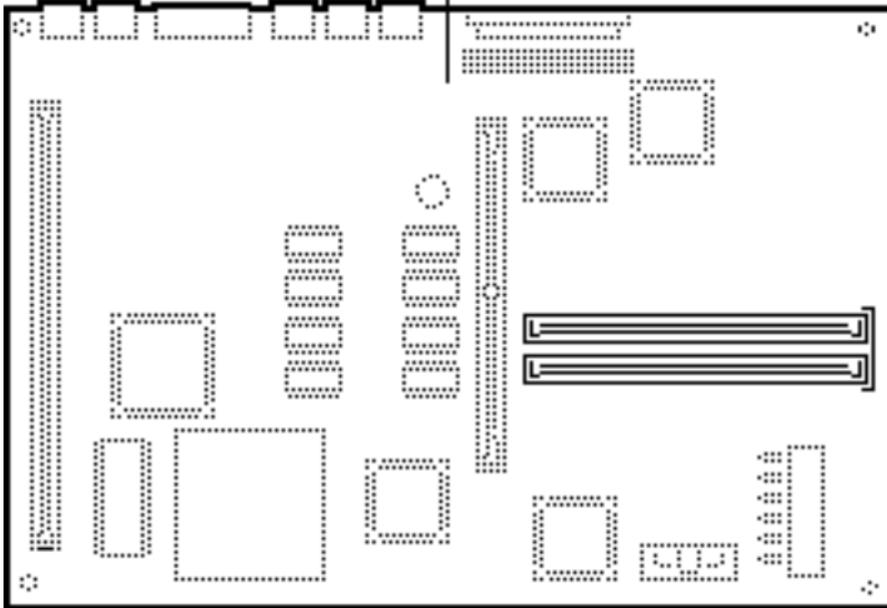
660AV Upgrade

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 1/O panel.

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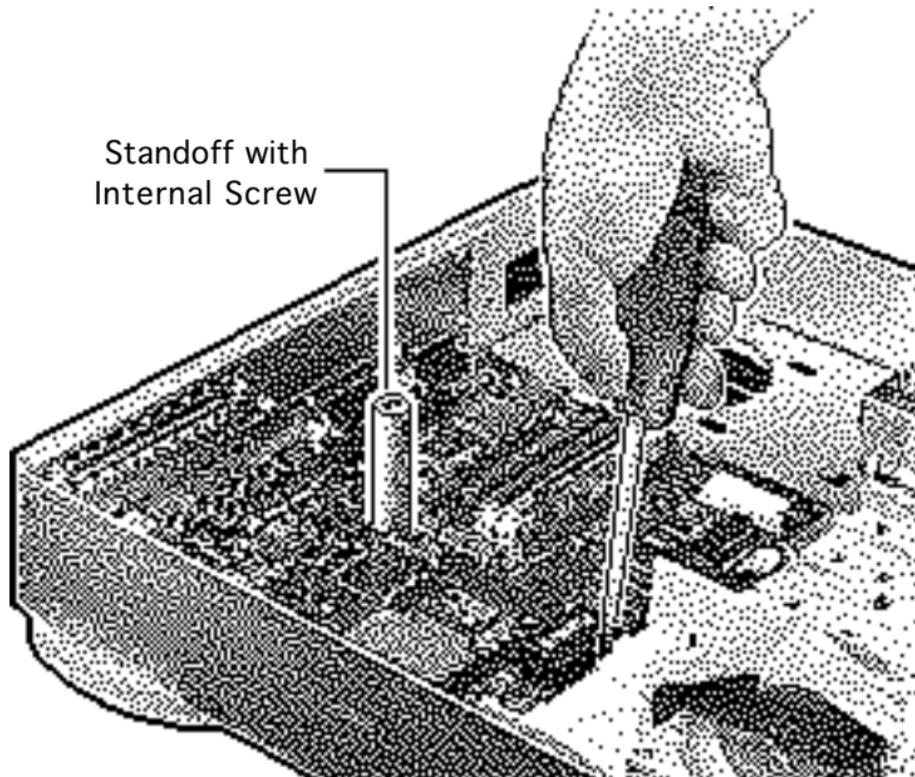
Note: The Centris 610 logic board is secured with two screws.

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.

Floppy Drive Cable — Speaker Cable

LED Cable

CD-ROM Audio Cable
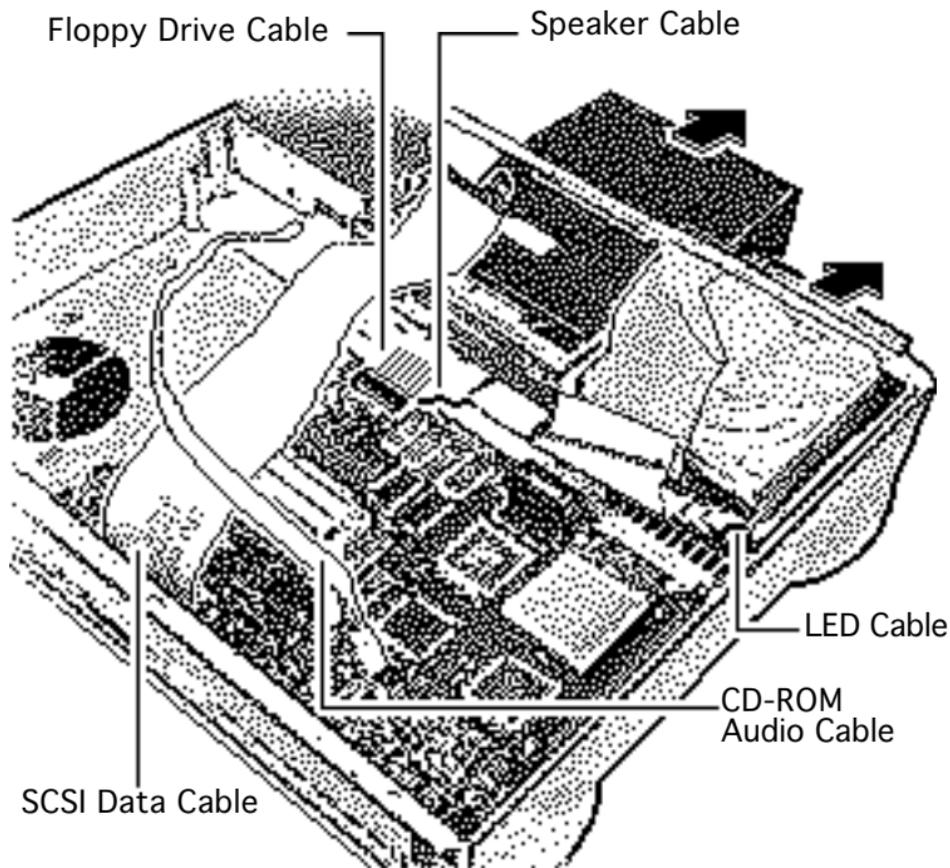
SCSI Data Cable

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.

Tab

Tab

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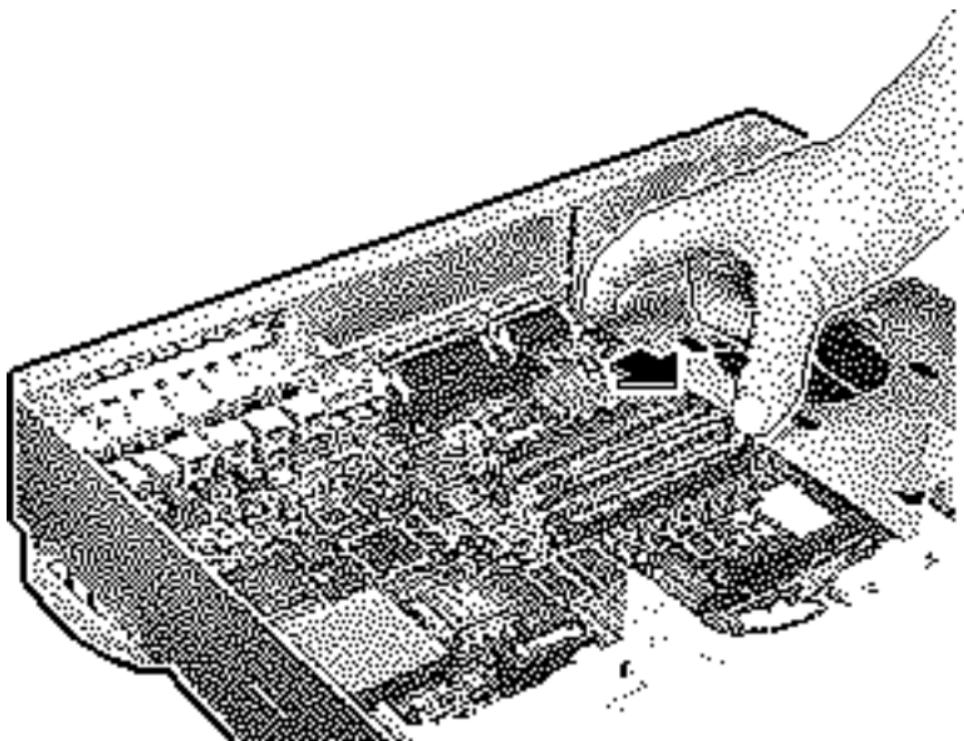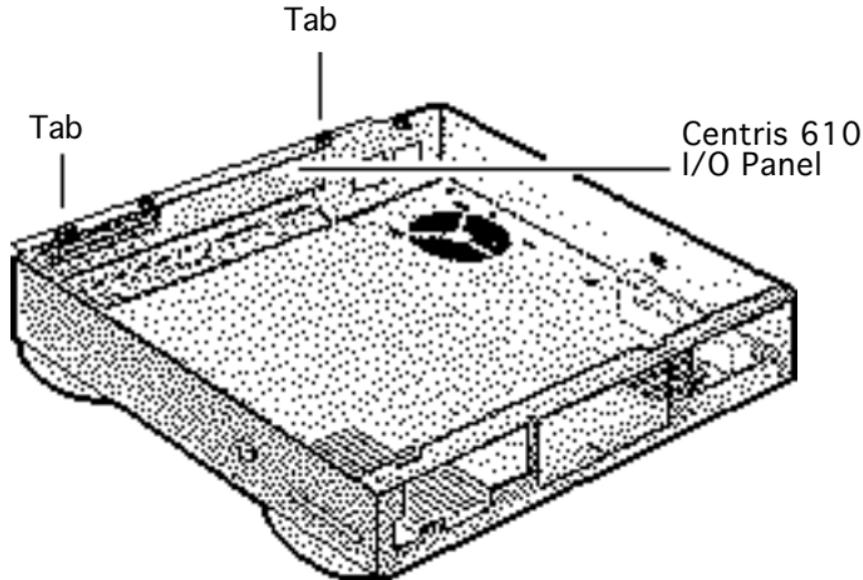
8   Using a screwdriver, release the tabs on the upper-rear edge of the bottom cover.

9   Push out the Centris 610 I/O panel.

Centris 660AV
I/O Panel
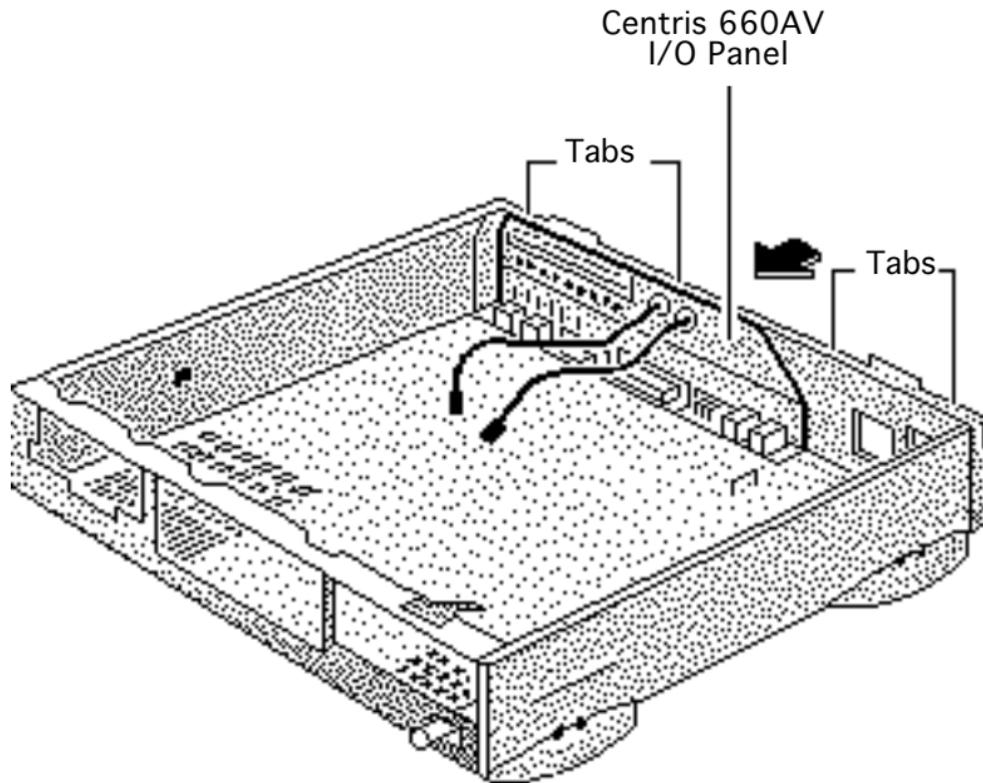
Tabs

Tabs

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.

SCSI Data Cable

Video-Out Cable
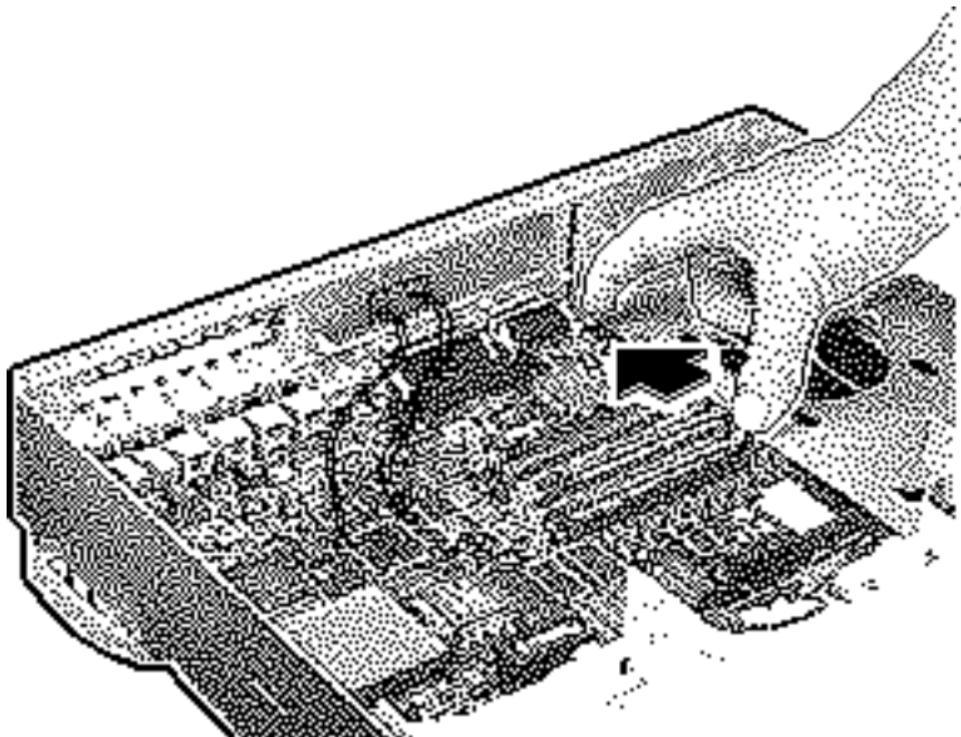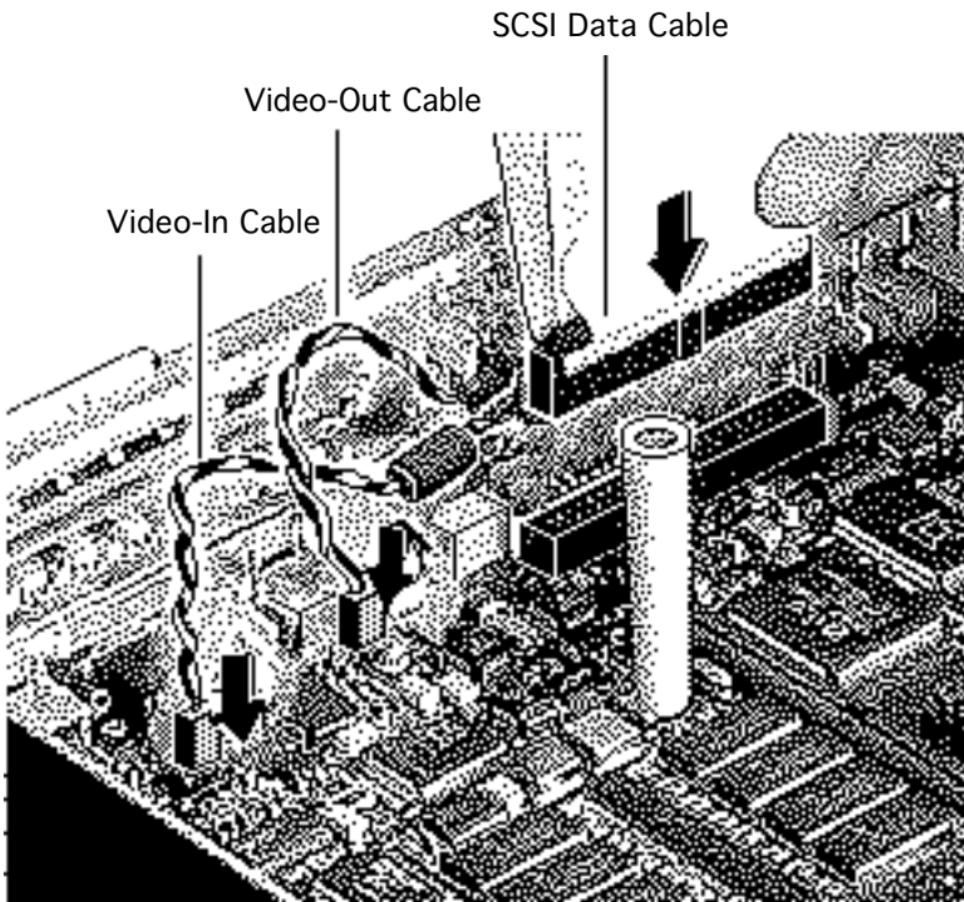
Video-In Cable

13 Connect these cables to the back edge of the logic board:
  • Video-out cable
  • Video-in cable
  • SCSI data cable

LED Cable

Speaker Cable
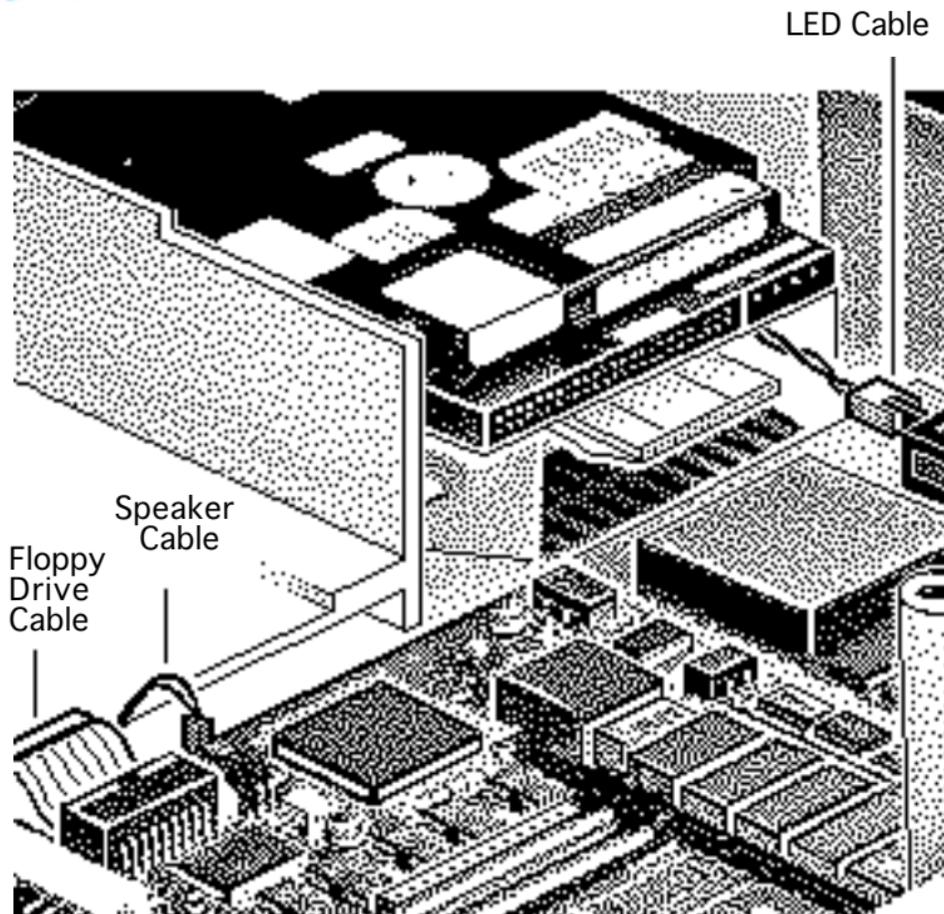
Floppy Drive Cable

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)
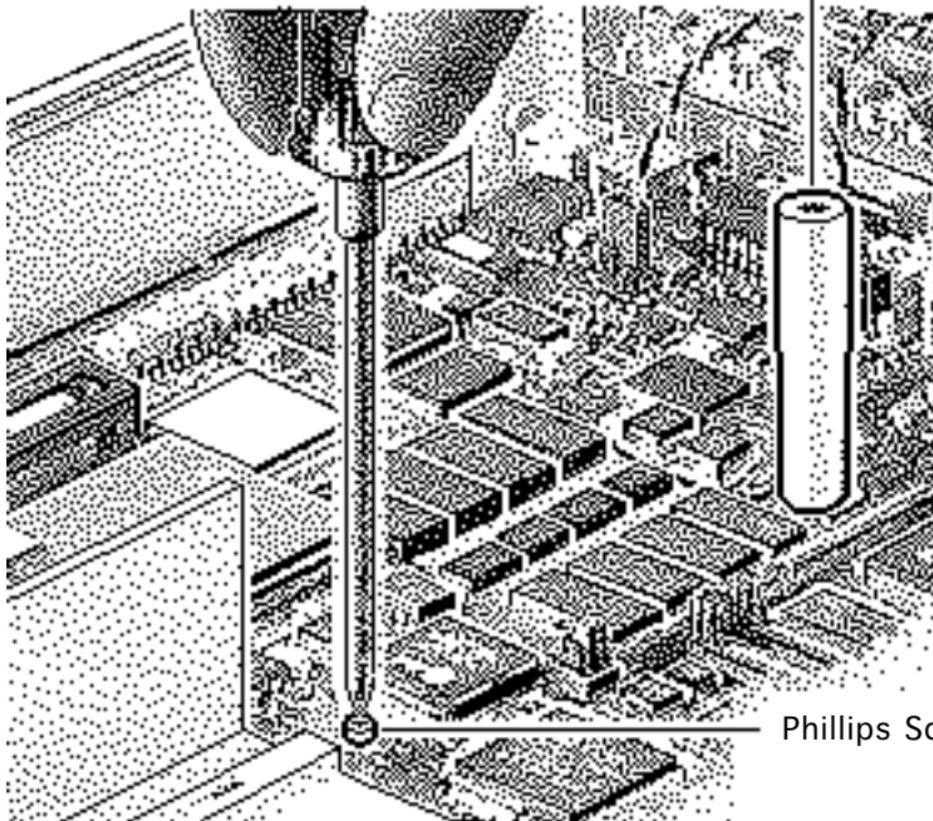
Standoff with Internal Screw

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

Phillips Screw

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.
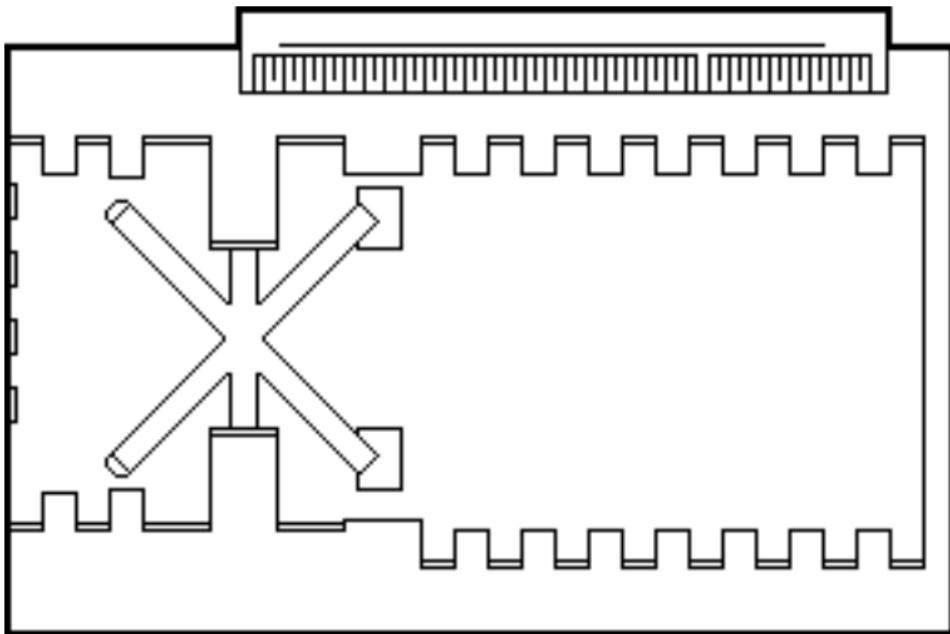
Refer to "Expansion Cards"
in this chapter for
installation procedures.

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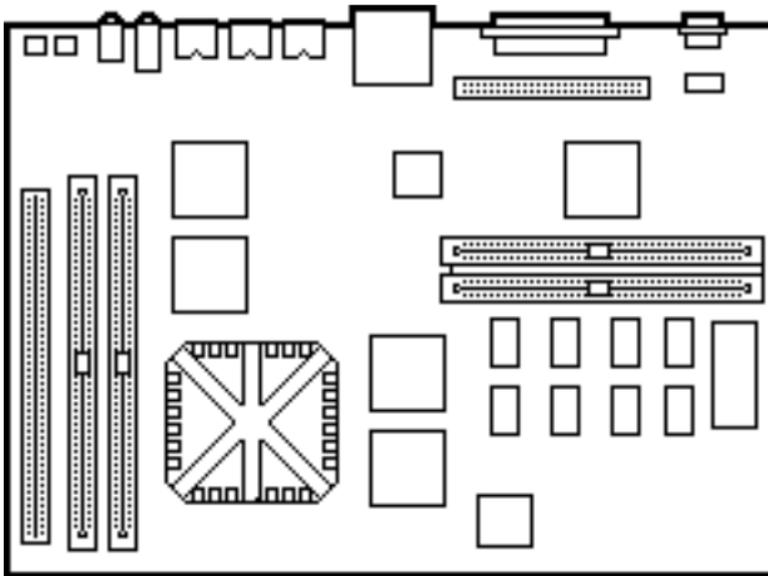
For upgrade instructions, refer to the Upgrades chapter in the Power Macintosh 6100/WS 6150 manual.

# 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.

Battery

Positive Probe

Negative Probe

× — "+"
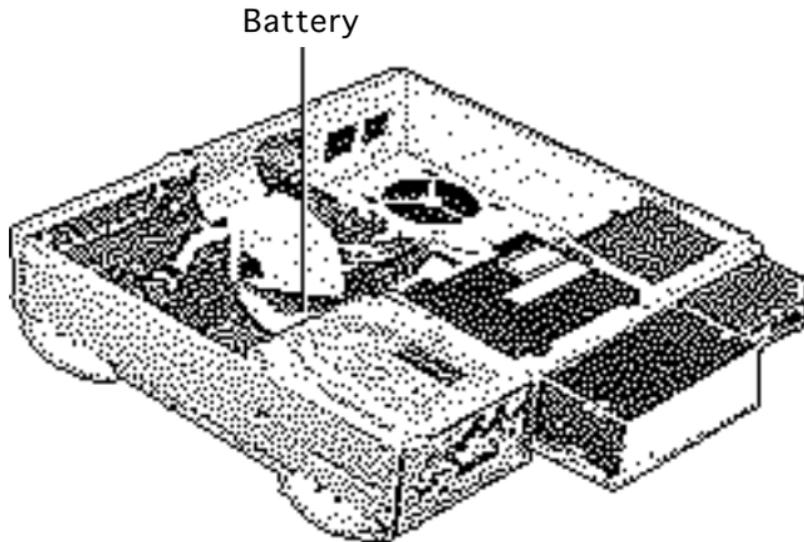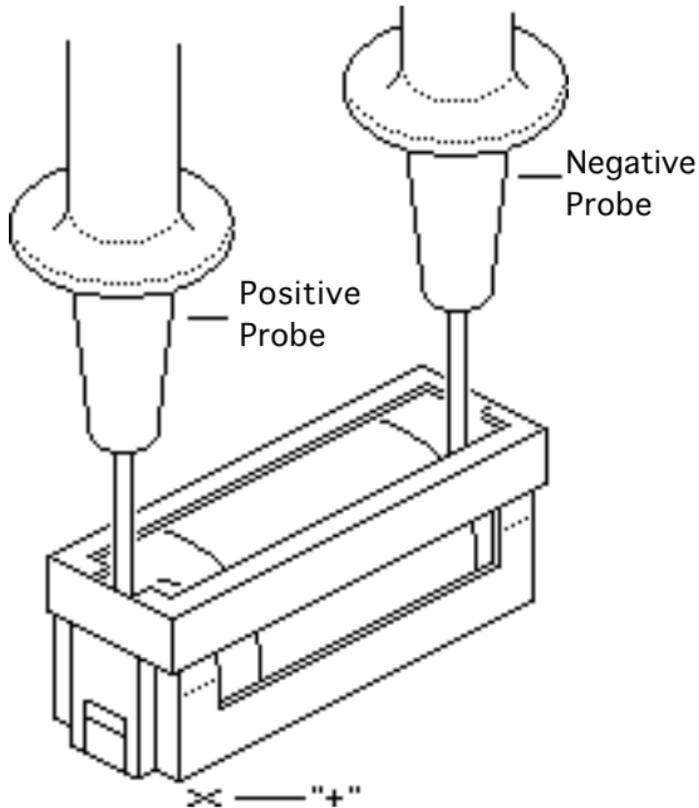
1. Set the voltmeter to the 10 volts DC scale.

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

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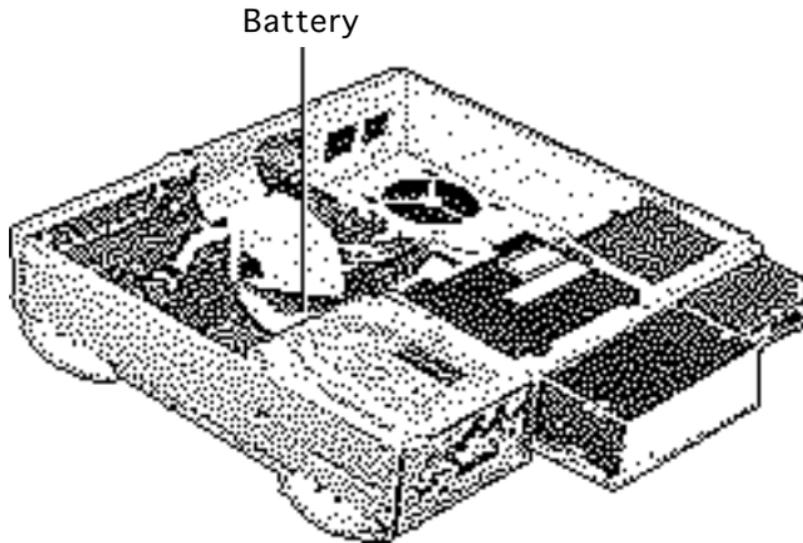
1   Using a small flat-blade
    screwdriver, pry open
    the latch at the end of the
    battery holder and lift
    off the cover.
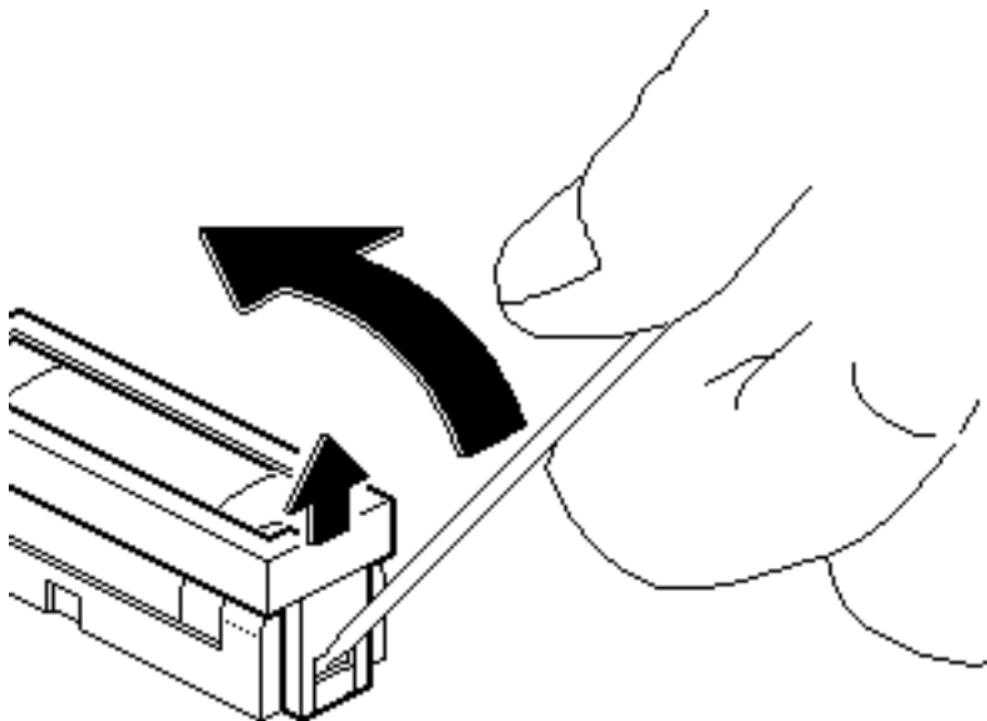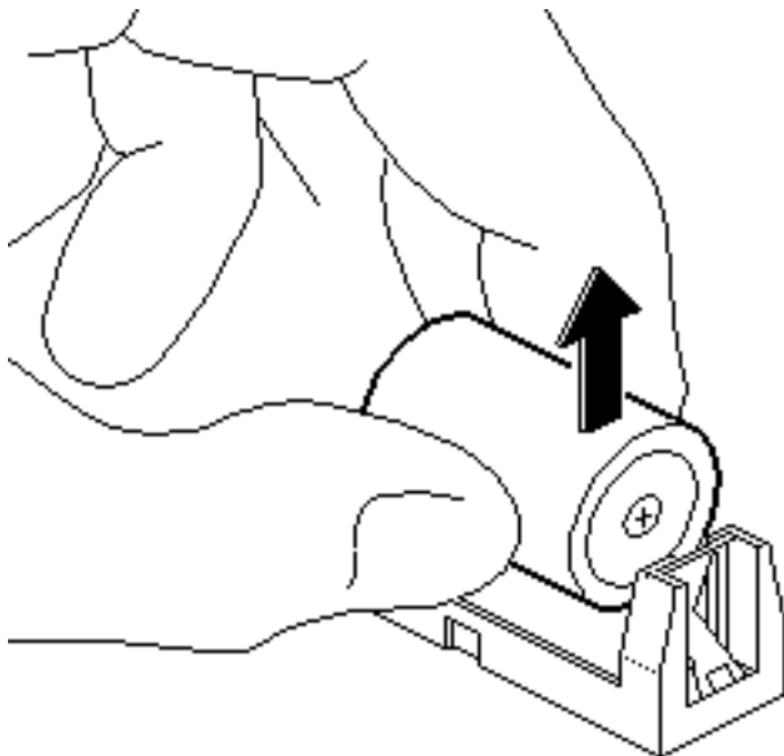
2 Grasp the battery and remove it from the holder.

3 Return the battery to Apple for proper disposal. For battery packaging and labeling instructions, refer to the safety information in Bulletins/Safety.

Processor Chip

CPU Replacement

Before you begin, remove the following:

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

Caution: Review the ESD precautions in Bulletins/ Safety.

Processor Chip

PGA Processor
Chip Removal Tool
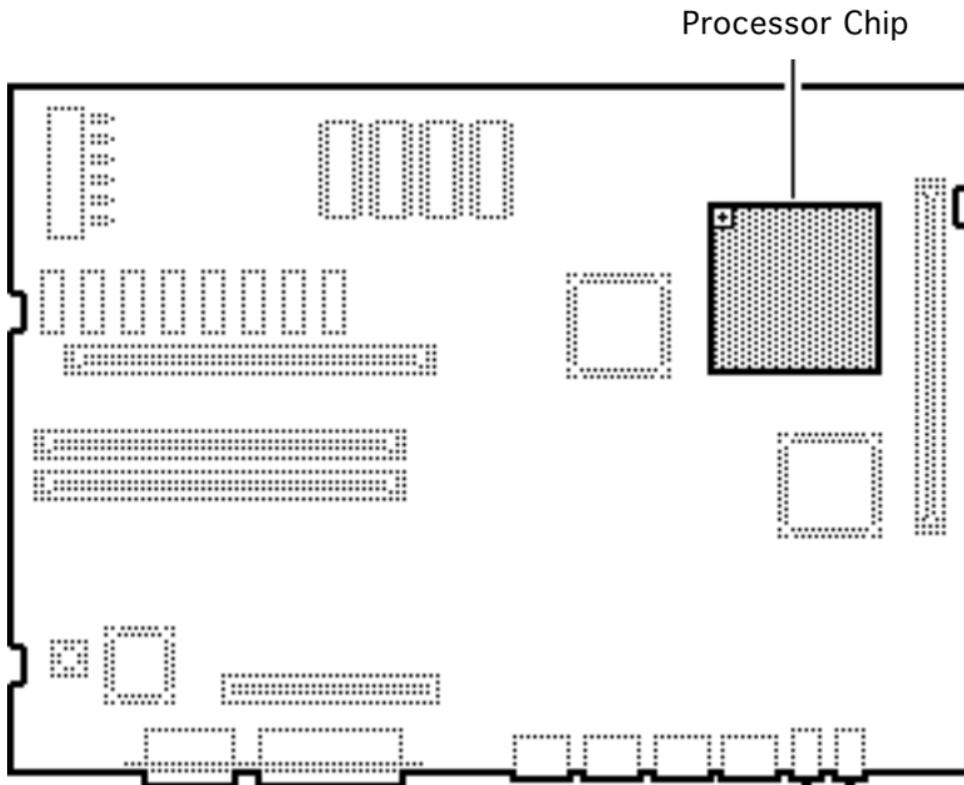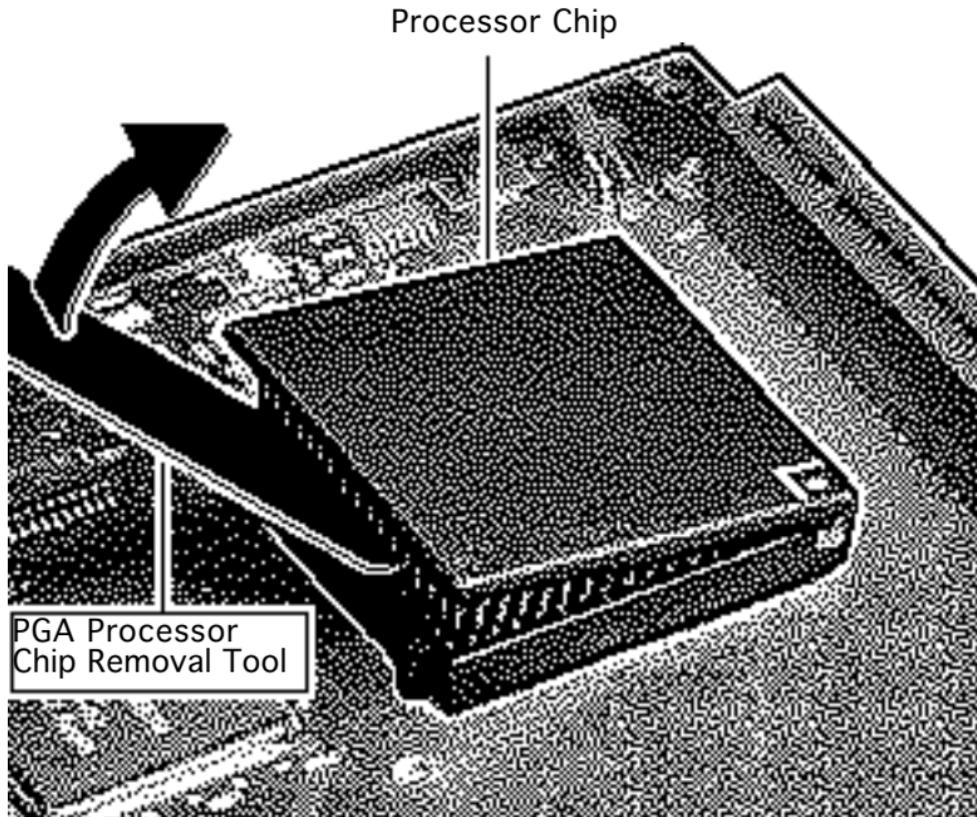
1 Position the teeth of the PGA processor chip removal tool in the groove between the chip and the socket.

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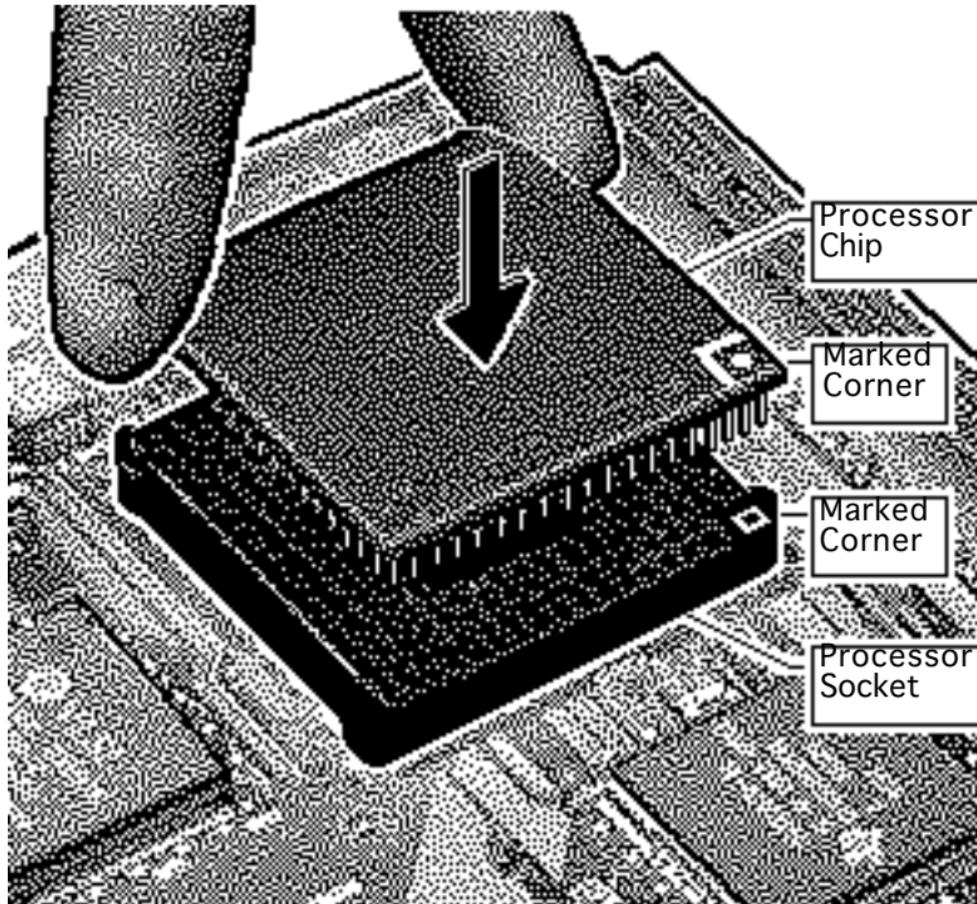
4   Position the marked corner of the processor chip over the marked corner of the processor socket.

    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

Top Cover
922-0545 (for Manual Insert Floppy)
922-0368

Blank Bezel
922-0358

Slotted CD Bezel
with Caddy
922-0355

Slotted CD Bezel
Caddiless

SCSI Cable
922-0804

Support
Column
922-0356

Power Supply
661-1688

Logic Board
661-0042
(No FPU)
661-0043
(FPU)
661-1681
661-1682
(with E-Net)

Internal Chassis
922-0359

Floppy
Drive
Cable
922-0351

Insulator Sheet
(plastic)
922-0361

Speaker
922-0353

LED Cable
922-0354

On/Off Actuator
922-0357

AV Adapter Cables

CD Audio Cable
922-0842

Floppy Drive
661-0121
661-0474

Expansion
Port Cover
922-0902

Floppy Drive
Carrier
922-0445
805-0961

Floppy
Shield

Rear
Housing
922-0365

*CD-ROM
Drive

CD-ROM
Shield
922-0826

Feet (4)
922-0862

Bottom Cover
922-0806

Hard Drive*

Hard Drive Carrier
922-0621
922-1806

PDS Adapter or
NuBus Adapter
661-1718

CD-ROM Carrier
922-0850

Hard Drive
Shield
922-0367

Blank
Shield

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