



Centris 650/Quadra 650

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## Basics

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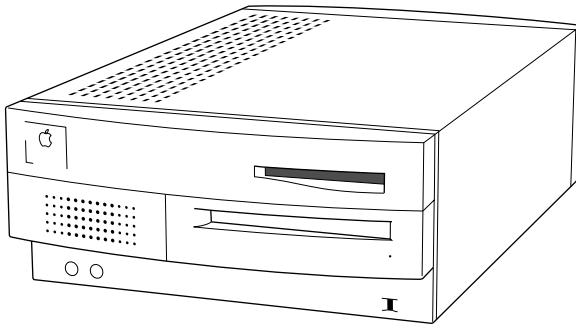
Centris 650/Quadra 650





## Overview

This manual includes complete repair procedures for the Macintosh Centris 650/Quadra 650 shown at left.



**Figure: Macintosh Centris 650/Quadra 650**





## Specifications

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Centris 650/Quadra 650





## Processors

### **Centris 650**

Motorola 68040

25 MHz

Built-in memory management unit (MMU)

### **Quadra 650**

Motorola 68040

33 MHz

Built-in memory management unit (MMU)

### **Coprocessor**

Optional floating-point unit (FPU)

### **Addressing**

32-bit internal registers

32-bit address bus

32-bit data bus





## Memory

<b>RAM</b>	4 or 8 MB RAM, expandable to 132 MB (72-pin SIMM)
<b>ROM</b>	1 MB
<b>PRAM</b>	256 bytes nonvolatile parameter memory
<b>VRAM</b>	512K, expandable to 1 MB
<b>Clock/calendar</b>	CMOS custom chip with long-life lithium battery





## Disk Storage

### **Floppy Drive**

1.4 MB Apple SuperDrive

### **Hard Drive**

Internal Apple SCSI hard drive  
80 MB to 500 MB

### **CD-ROM**

Optional internal 5.25-in. CD-ROM drive





## I/O Interfaces

<b>SCSI</b>	One SCSI port; DB-25 connector Supports a maximum of six external devices (internal SCSI devices include the computer, which is always device 7)
<b>Apple Desktop Bus</b>	Two Apple Desktop Bus (ADB) ports; mini-Din-4 connectors Low-speed synchronous serial interface
<b>Serial</b>	Two RS-232/RS-422 serial ports; mini DIN-8 connectors 230.4 Kbps maximum 0.92 Mbps maximum, clocked externally
<b>NuBus</b>	Three NuBus slots







**Expansion Slot**

One inline processor-direct slot

**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**

On-board Apple Ethernet port





## I/O Devices

### **Keyboard**

Standard, extended, or adjustable keyboard connected through 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)

### **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

Centris 650/Quadra 650 supports these Apple monitors:

- Macintosh 12" Monochrome Display
- Macintosh 12" RGB Display
- AppleColor High-Res RGB 13" Monitor
- Macintosh Color Display
- Macintosh 15" Portrait Display
- Macintosh 16" Color Display
- Apple Two-Page 21" Monochrome Monitor
- Macintosh 21" 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

**Frequency**

50-60 Hz

112 W maximum, not including display power





## Physical

### **Dimensions**

Height: 6.0 in. (152 mm)

Width: 13.0 in. (330 mm)

Depth: 16.5 in. (419 mm)

Weight

25 lb. (11.3 kg)

Weight will vary based on internal devices installed.





## Environmental

**Operating  
Temperature**

50-104°F (10-40°C)

**Storage  
Temperature**

-40F to 116.6°F (-40 to 47°C)

**Relative Humidity**

10-90% RH (noncondensing)

**Altitude**

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





# Troubleshooting

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## Centris 650/Quadra 650







## 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

### Error Chords

One-part error chord sounds during startupsequence

- 1 Disconnect hard drive power cable and hard drive data cable. Reboot system. If startup sequence is normal, run Macintosh Hard Disk test and replace hard drive if necessary.
- 2 Disconnect floppy drive cable and reboot system. If startup sequence is normal, replace floppy drive.
- 3 Replace logic board. Retain customer's SIMMs.





## System

Does not power on;  
screen is black, fan is  
not running and LED  
is not lit

- 1 Check cables.
- 2 Plug monitor directly into wall socket, and verify that monitor has power.
- 3 Replace power cord.
- 4 Replace power supply.
- 5 Replace logic board.

Clicking, Chirping or  
thumping

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





## System (Continued)

System shuts down  
intermittently

- 1 Check that air vents are clear. Thermal protection circuitry may shut down system. After 30 to 40 minutes, system should be OK.
- 2 Replace power cord.
- 3 Check batteries. Refer to “Battery Verification” in Additional Procedures.
- 4 Replace power supply.
- 5 Replace logic board. Retain customer’s SIMMs.

System  
intermittently  
crashes or locks up.

- 1 Verify that system software is correct version.
- 2 Disconnect external SCSI devices.
- 3 Verify that software is known-good.
- 4 Replace SIMMs. (Refer to Hardware/Memory.)
- 5 Replace power supply.
- 6 Replace logic board. Retain customer’s SIMMs





## System (Continued)

Does not start up with  
out a monitor attached

Verify that the Chooser and Control Panels are set correctly.





## Video

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

- 1 Adjust brightness on monitor.
- 2 Clear parameter RAM. Hold down <Command> <Option> <P><R> during startup but before Welcome to Mac appears.
- 3 Check cables.
- 4 Replace monitor. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 5 Replace video card.
- 6 Replace VRAM SIMMs.
- 7 Replace logic board. Retain customer's SIMMs.

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

- 1 Remove peripherals.
- 2 Remove NuBus cards.
- 3 Replace DRAM SIMMs.
- 4 Replace VRAM SIMMs.
- 5 Replace power supply.
- 6 Replace logic board.





## Video (Continued)

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

- 1 Check cables
- 2 Clear parameter RAM. Hold down <Command> <Option> <P><R> during startup but before Welcome to Macintosh appears.
- 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 Remove NuBus cards.
- 4 Replace power supply.
- 5 Replace logic board. Retain customer's SIMMs.





## 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.
- 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 Replace hard drive.
- 4 Replace logic board. Retain customer's SIMMs.





## CD-ROM Drive

CD-ROM drive does not accept a compact disc

- 1 Exchange disk (if disk is dirty or damaged).
- 2 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.





## 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.
- 2 Verify that the hard drive is terminated and the CD-ROM drive is not terminated.
- 3 Replace the terminator on external SCSI device.
- 4 Replace SCSI cable.
- 5 Replace the SCSI select cable on external SCSI device.





## 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.

Cursor does not move

- 1 Reboot computer.
- 2 Verify that mouse is connected properly.
- 3 Clear parameter RAM. Hold down <Command> <Option> <P><R> during startup but before Welcome to Macintosh appears.
- 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.





## Take Apart

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Centris 650/Quadra 650





## Top Cover

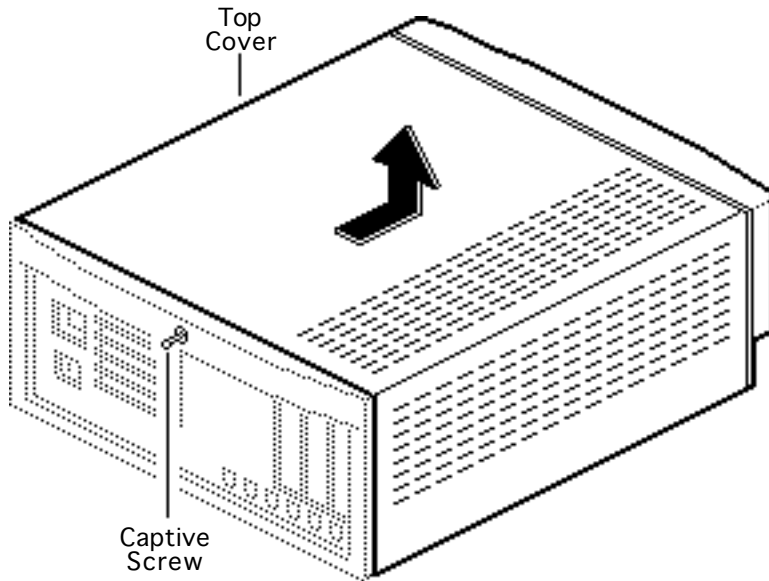
No preliminary steps are required before you begin this procedure.

- 1 Loosen the captive screw.

**Caution:** Excessive force on the captive screw will damage the top cover.

- 2 **Note:** Do not attempt to tilt the top cover when you remove it.

Slide the top cover toward the front 1 inch.







Lift the top cover straight up.

**Replacement Note:** Do not jar the reset/interrupt switch and light pipe out of alignment when you replace the top cover.

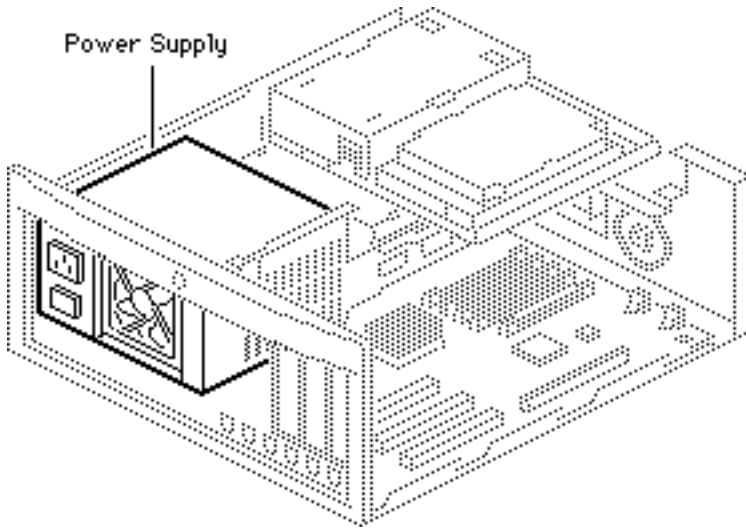


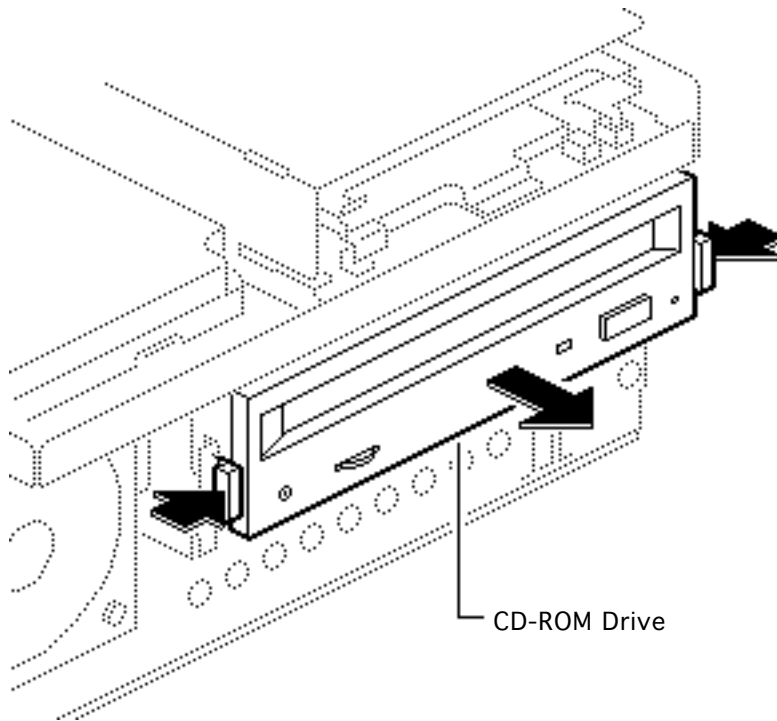


## Power Supply

Before you begin remove the top cover.

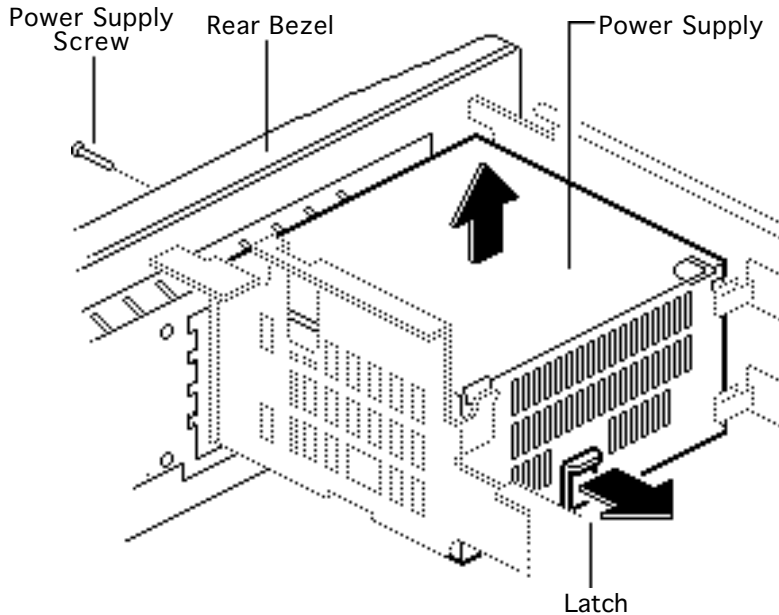
**Caution:** Review the ESD precautions in Bulletins/ Safety.





- 1 If a CD-ROM drive is installed, squeeze its side tabs and pull the drive out an inch or two to more easily reach the power supply.





- 2 Remove the power supply screw from the rear bezel.
- 3 Pry the latch away from the base of the power supply.
- 4 Grasp the power supply and firmly lift it out of the drive mount chassis.

**Note:** The firm lifting motion disconnects the power supply connector from the logic board.

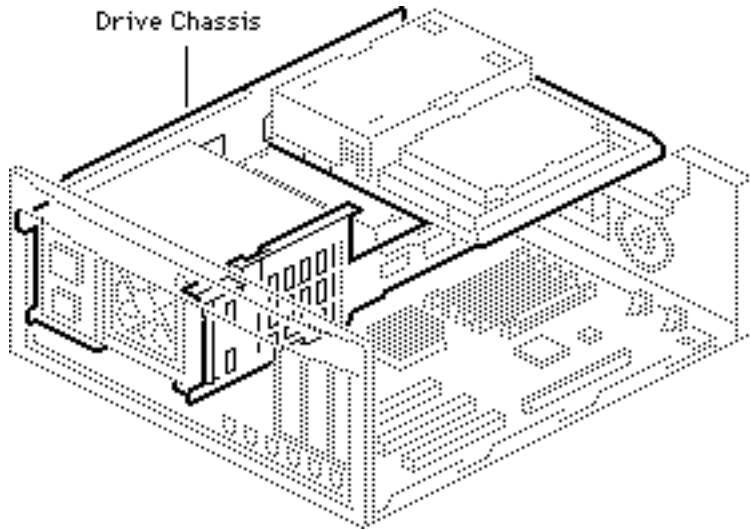


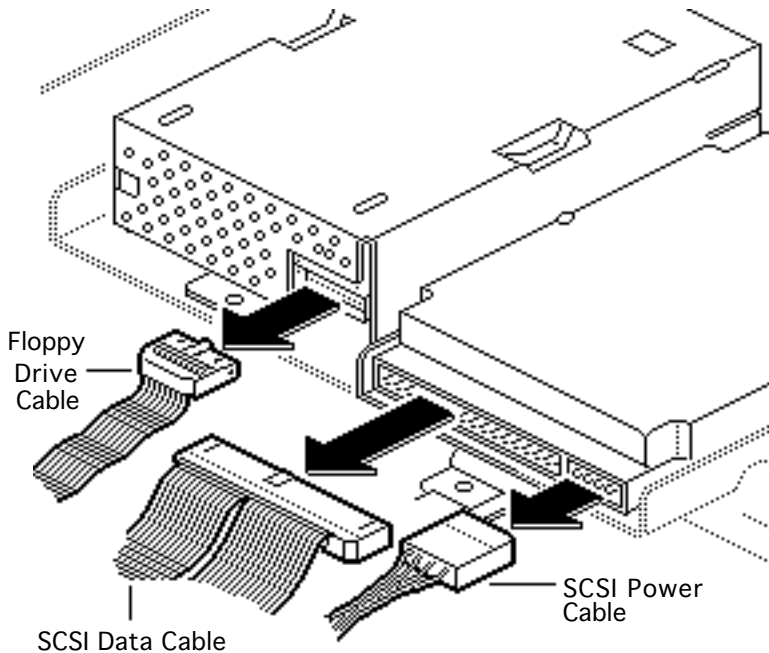


## Drive Chassis

Before you begin, remove the following:

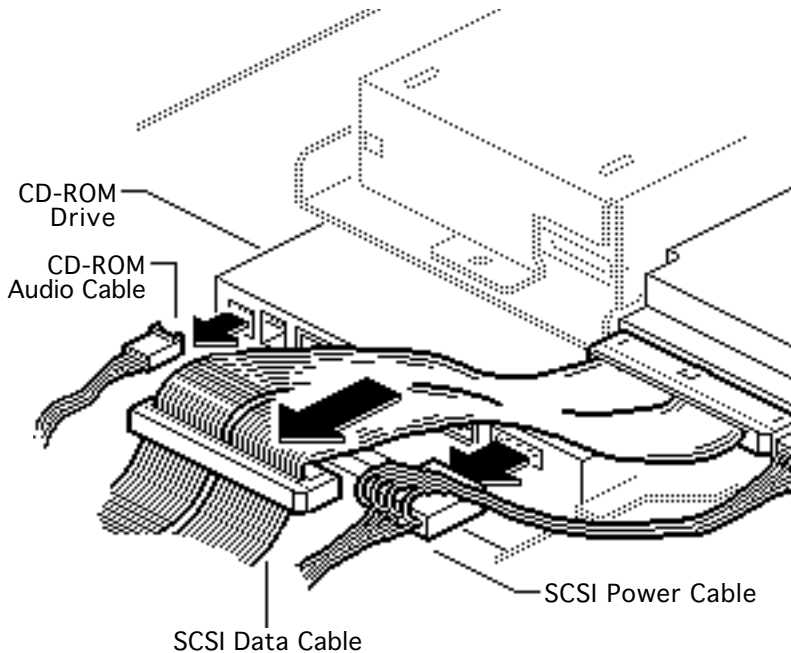
- Top cover
- Power supply





- 1 Disconnect these cables:
- Floppy drive cable
  - SCSI power cable
  - SCSI data cable



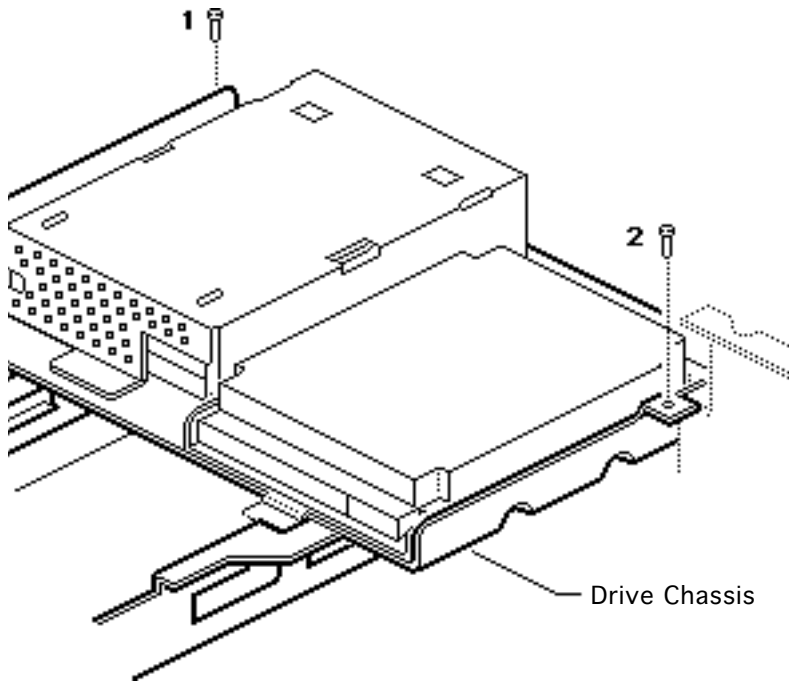


- 2 If a CD-ROM drive is installed, disconnect these cables:
- SCSI power cable
  - SCSI data cable
  - CD-ROM audio cable

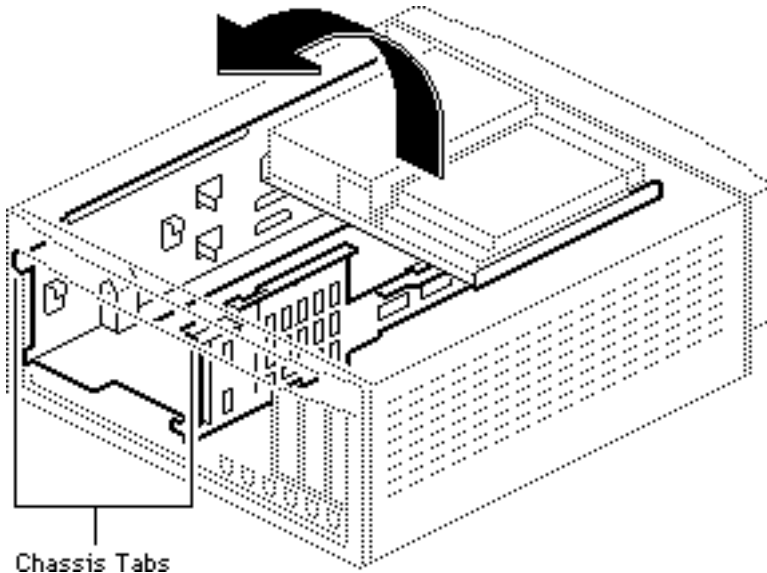




- 3 Remove the two drive chassis screws.



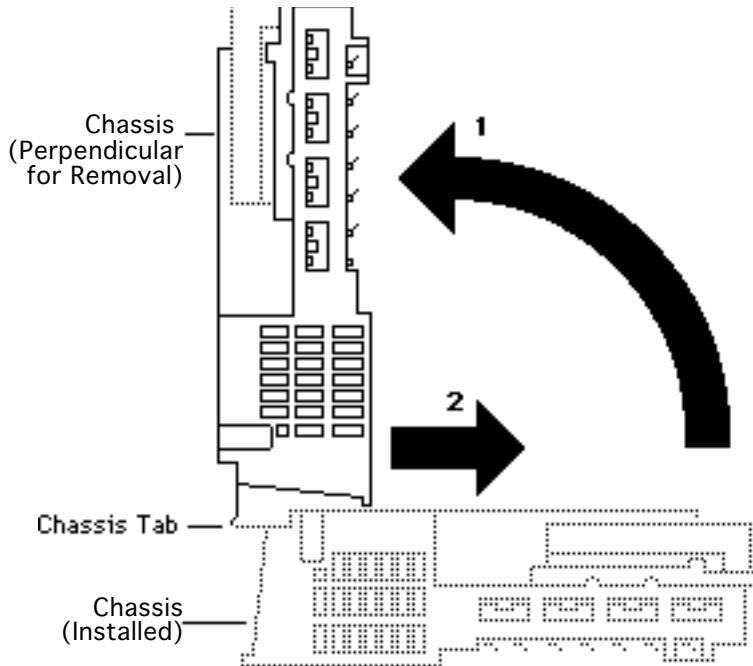




- 4 Lift the front of the drive chassis until the chassis is perpendicular to the bottom case.

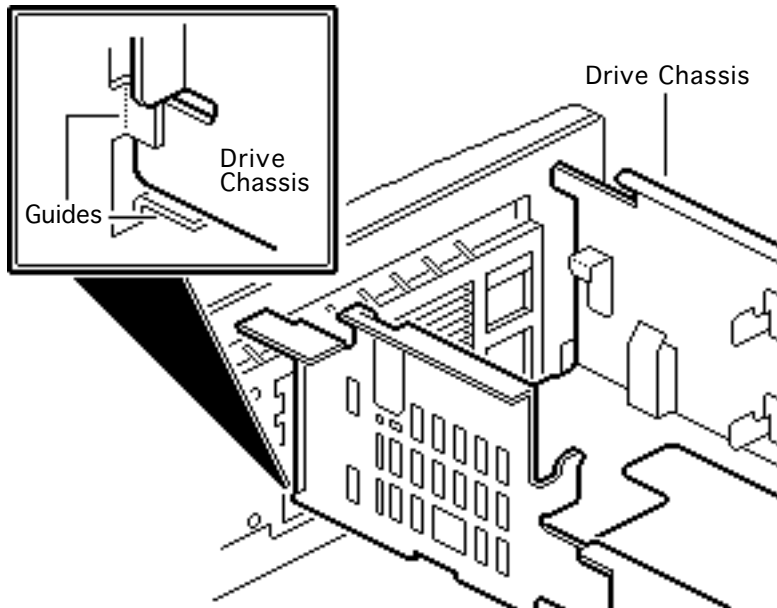
**Note:** The chassis swivels where the chassis tabs meet the bottom cover.





- 5 Pull the chassis forward and gently guide the chassis tabs from the slots in the bottom case.
- 6 Remove the chassis.





- 7 **Replacement Note:**  
Carefully seat the bottom corners of the drive chassis into the guides in the case bottom.

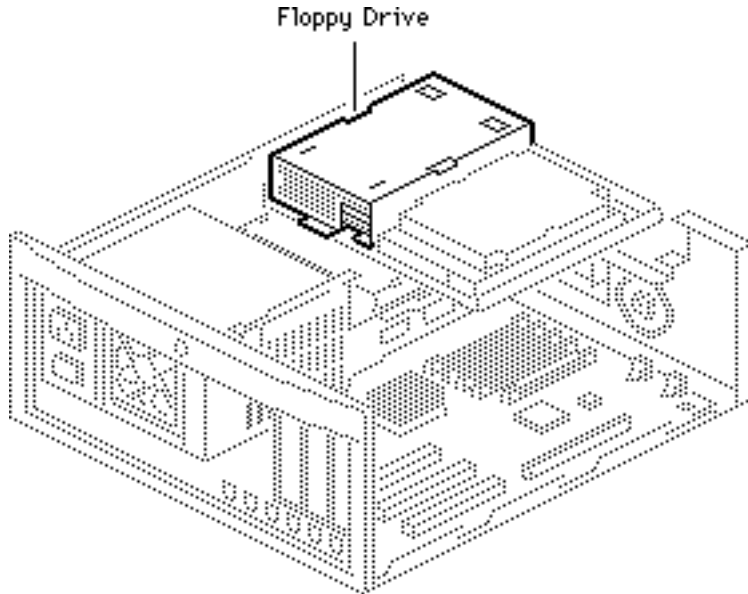


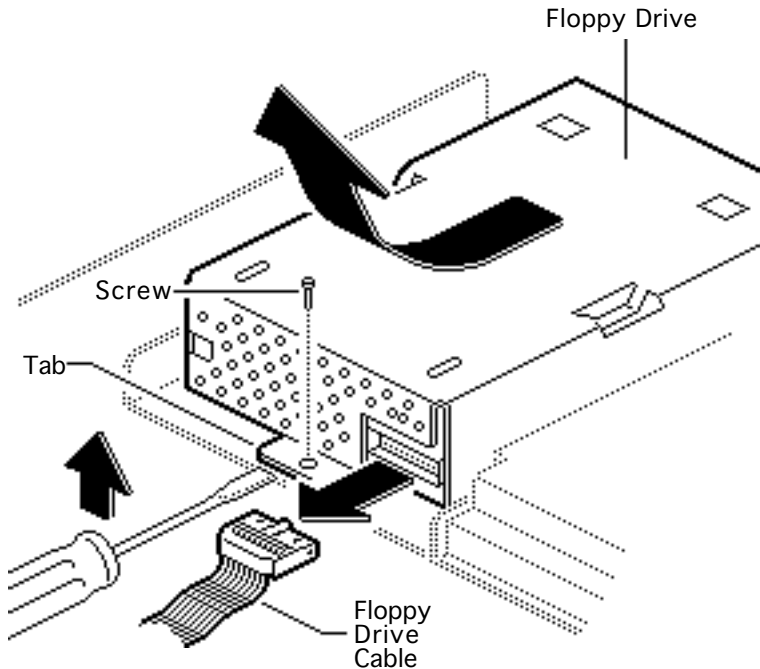


## Floppy Drive

Before you begin, remove the top cover.

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





- 1 Disconnect the floppy drive cable from the floppy drive.
- 2 Remove the floppy drive mounting screw.
- 3 Pry up the mounting tab and slide out the floppy drive.

**Replacement Note:** You may encounter either an auto-inject or manual-inject 1.4 MB floppy drive. Replace floppy drives like for like.

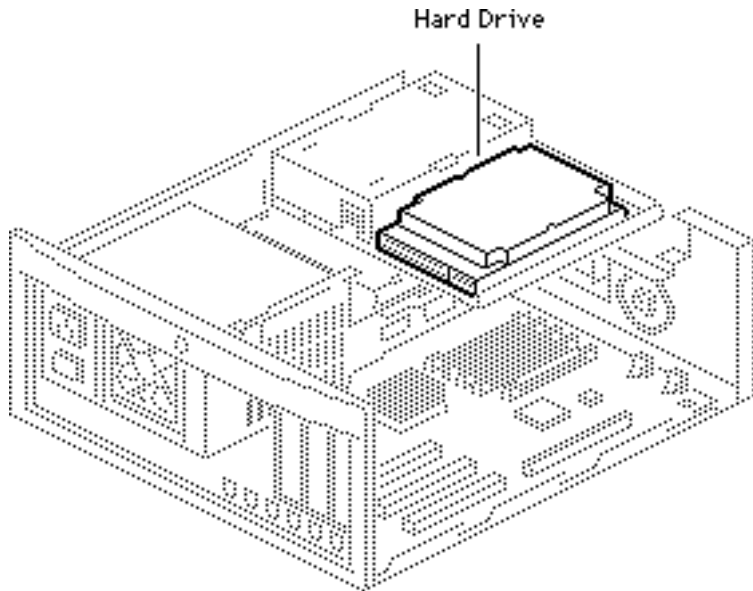


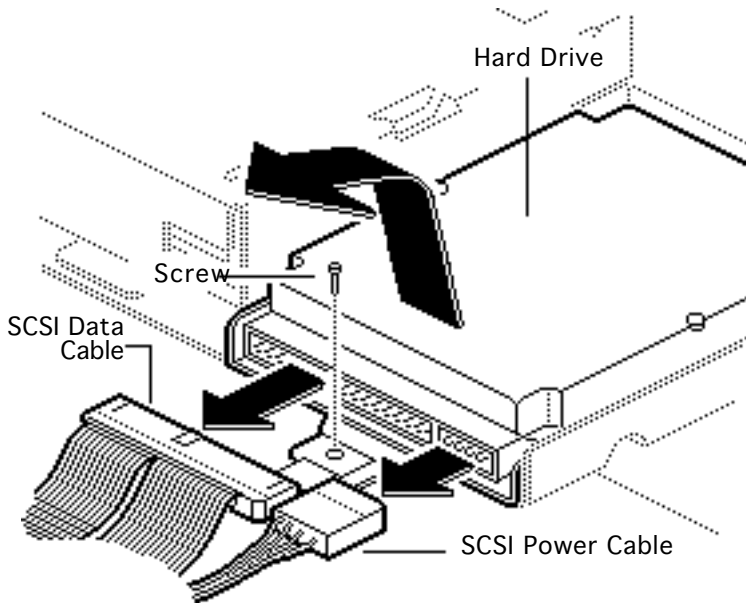


## Hard Drive

Before you begin, remove the top cover.

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





- 1 Disconnect the SCSI data cable and the SCSI power cable from the hard drive.
- 2 Remove the hard drive mounting screw from the carrier.
- 3 Lift the back of the hard drive and slide the hard drive carrier out of the drive chassis.

**Replacement Note:** For information on removing the hard drive from the carrier and returning drives, cables, and carriers to Apple, refer





to the Hard Drives  
manual (Hardware/  
Service Manual/Drives/  
Hard Drives).





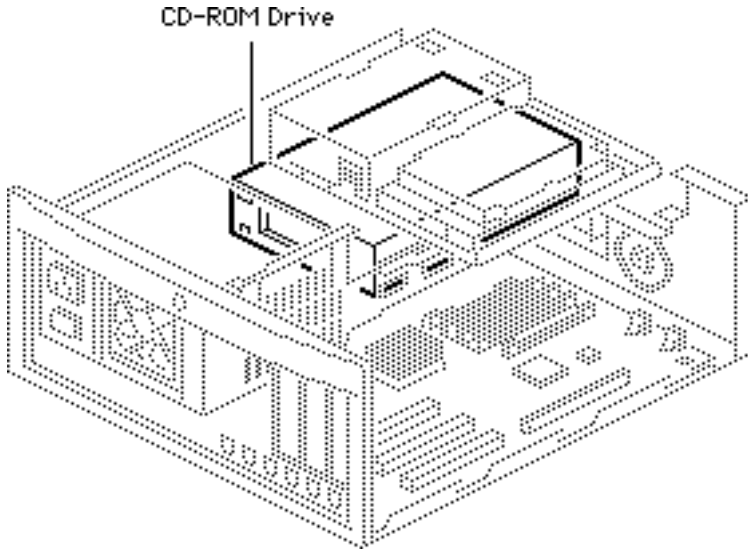


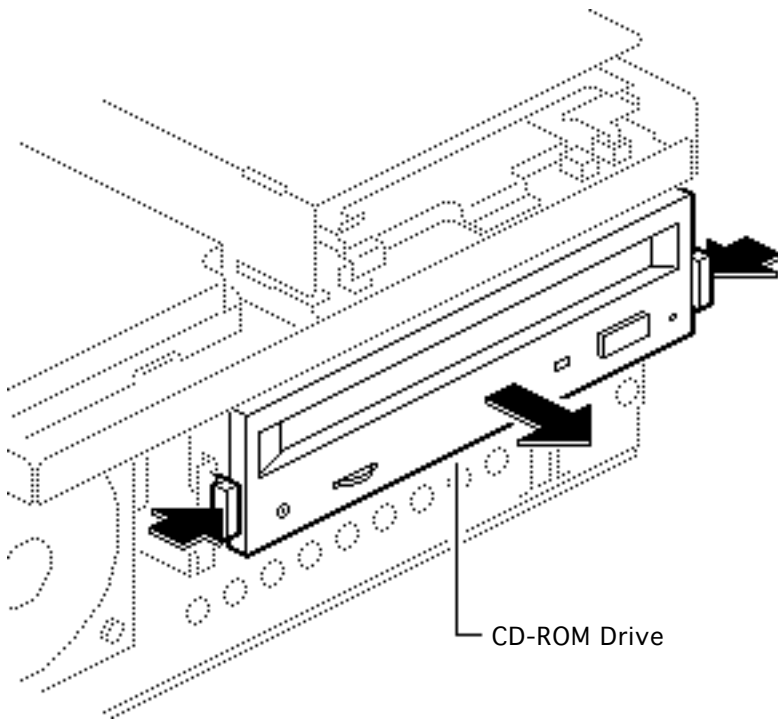
## CD-ROM Drive

Before you begin, remove the top cover.

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

**Note:** A CD-ROM Drive is optional.



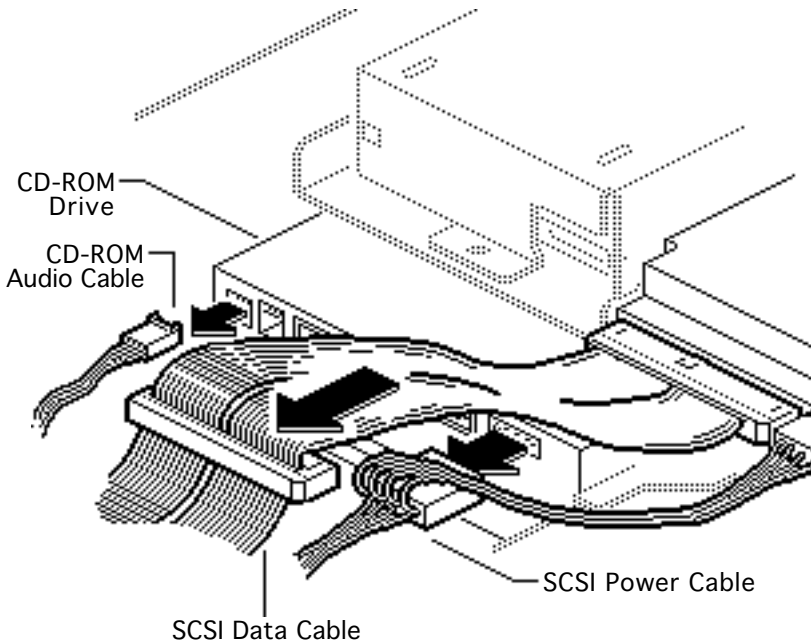


- 1 Squeeze the side tabs and pull the drive out a few inches to more easily perform the next step.



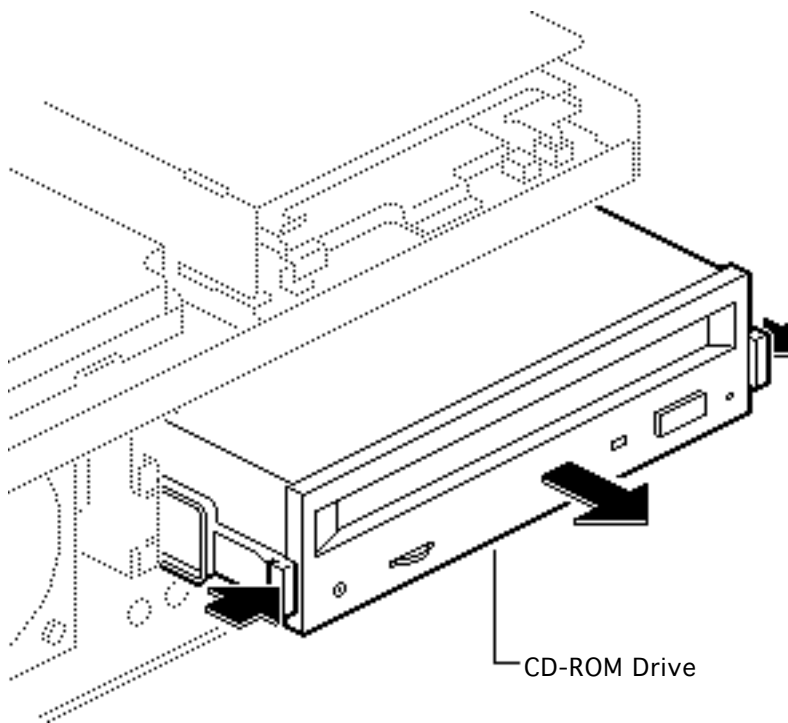


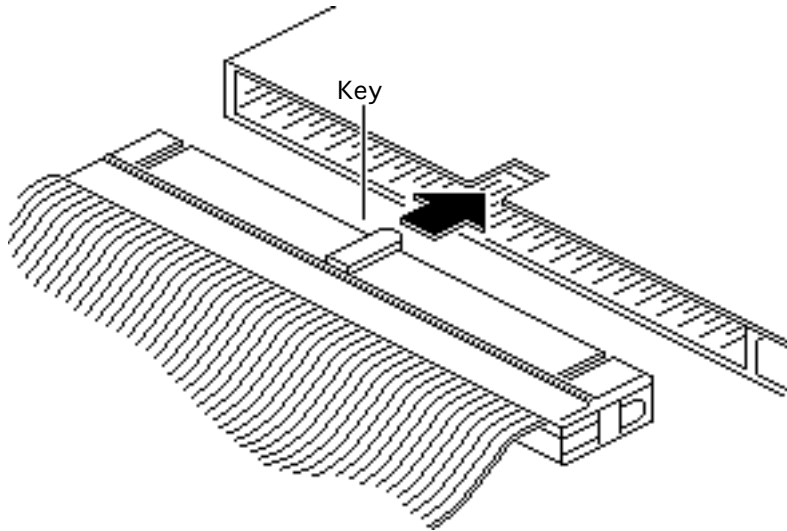
- 2 Disconnect these cables from the CD-ROM drive:
- Audio cable
  - SCSI power cable
  - SCSI data cable





- 3 Slide out the CD-ROM drive.





**Replacement Note:** The connectors on the SCSI data cable are keyed. You may need to twist the cable to insert the connector properly.

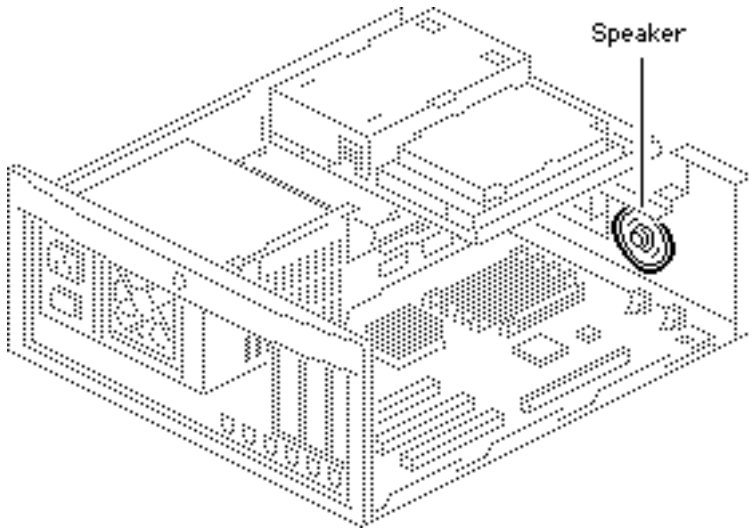


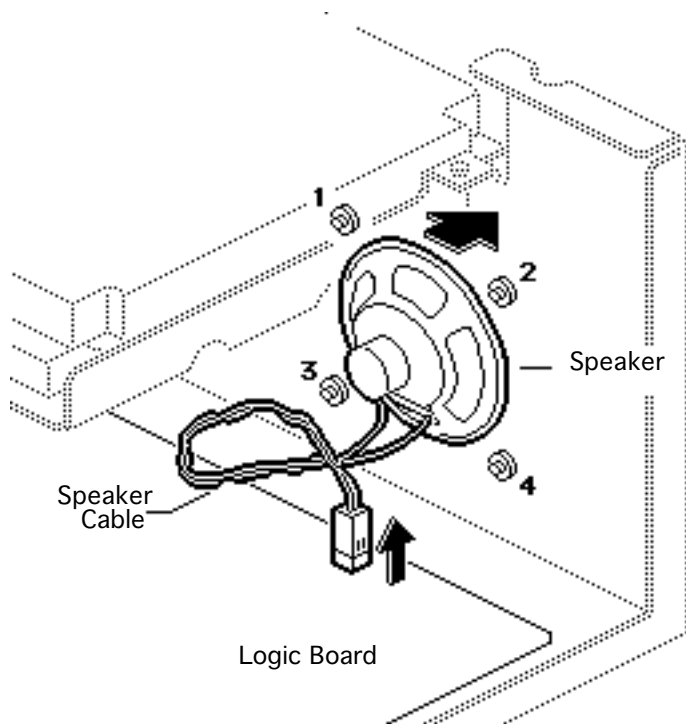


## Speaker

Before you begin, remove the top cover.

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





- 1 Disconnect the speaker cable from the logic board.
- 2 Remove the speaker mounting screws and pull out the speaker.

**Note:** There is more than one version of speaker for the computer. Speakers install with four or two screws, depending on the version.

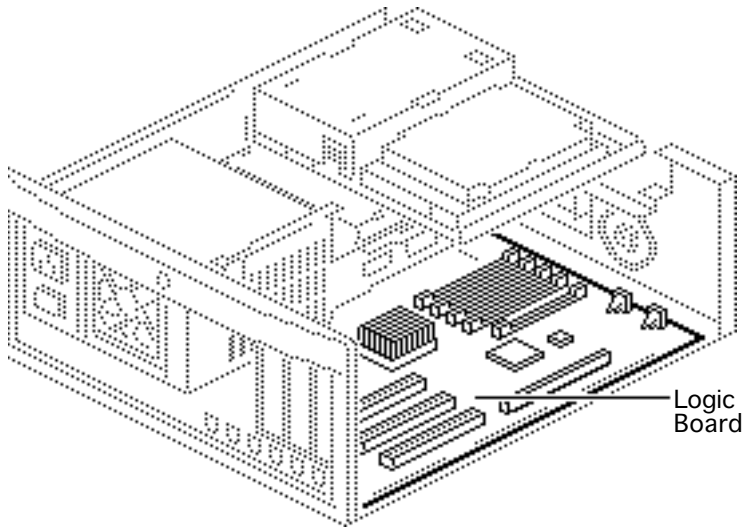




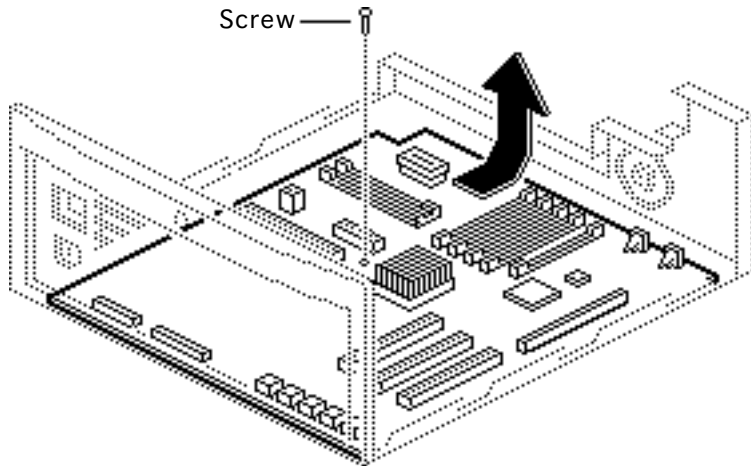
## Logic Board

Before you begin, remove the following:

- Top cover
- Power supply
- Drive chassis
- Reset/Interrupt switch
- Speaker

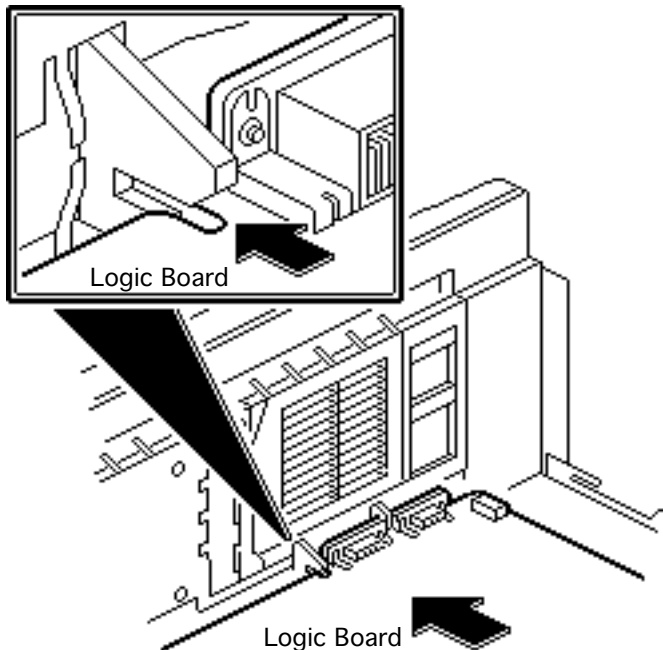






- 1 Remove the screw in the center of the logic board.
- 2 Slide the logic board toward the front about 1/2 inch and lift the board out of the case.





**Replacement Note:** Remove the customer's SIMMs from the defective logic board and install them on the replacement logic board. (See Hardware/Memory.)

**Replacement Note:** The logic boards of the various models of the computer are similar. Be sure to install the correct board.

**Replacement Note:** Position the center rear edge of the logic board in the plastic bracket and slide the board straight back.



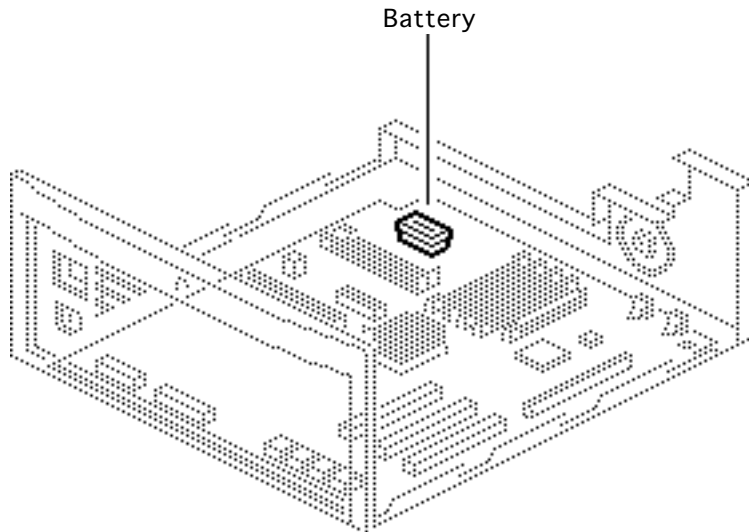


## Additional Procedures

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Centris 650/Quadra 650





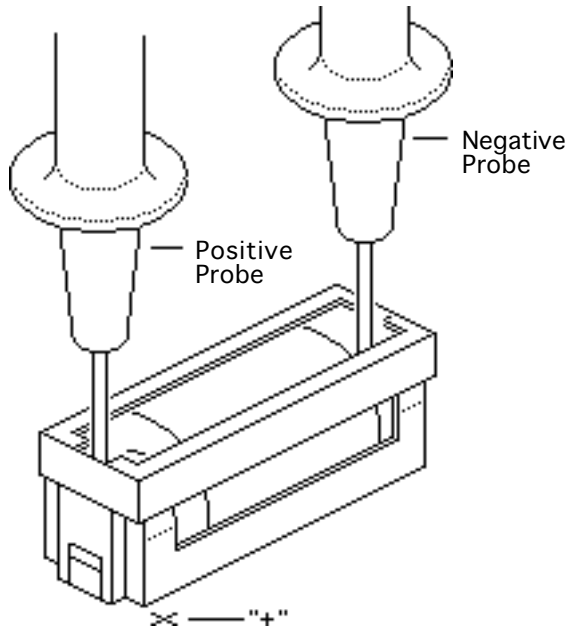
## Battery Verification

Before you begin, remove the top cover.

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

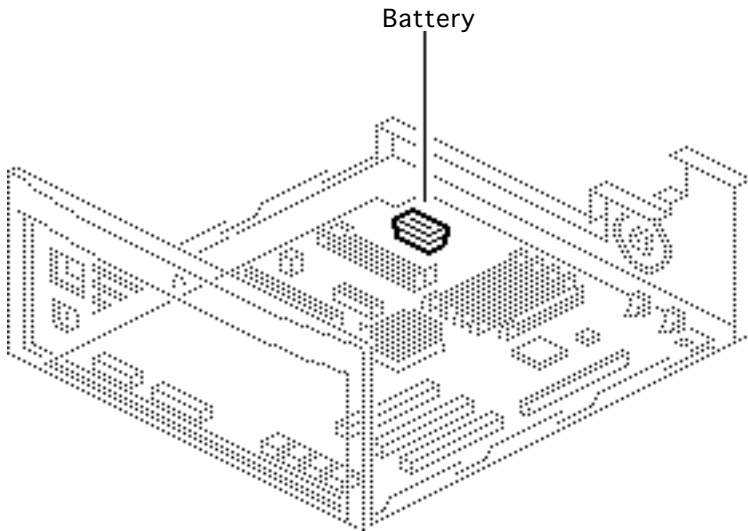
**Caution:** Review the ESD precautions in Bulletins/Safety.





- 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 top cover.

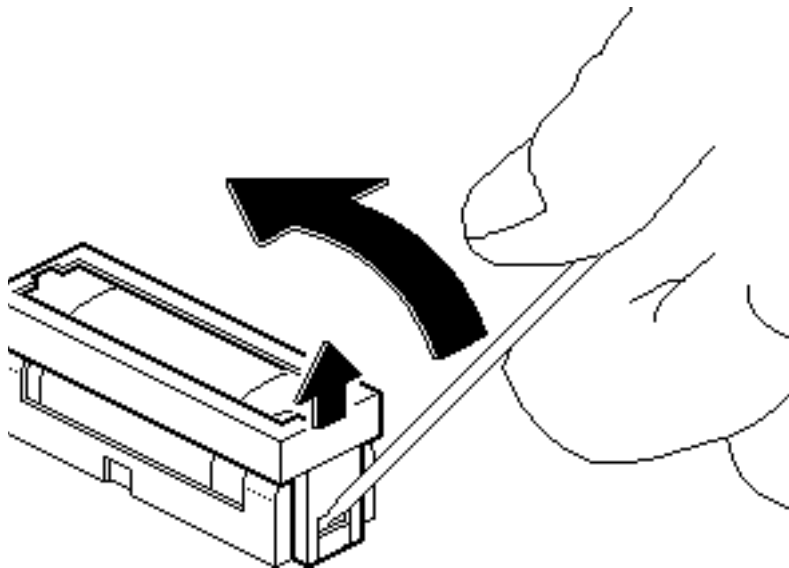
**Warning:** If handled or discarded improperly, the lithium battery could explode. Review battery handling and disposal instructions in Bulletins/ Safety.

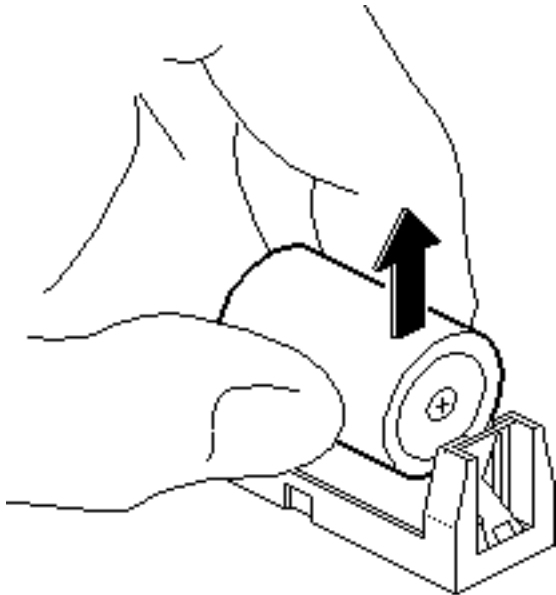
**Caution:** Review the ESD precautions in Bulletins/ Safety.





- 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.



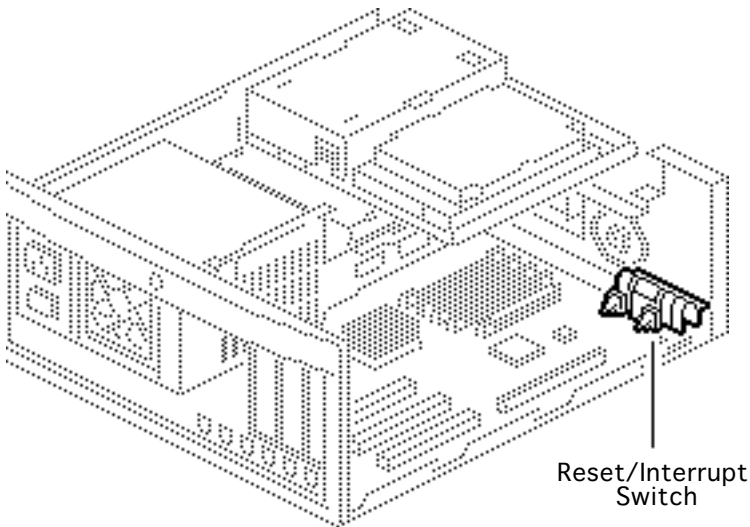


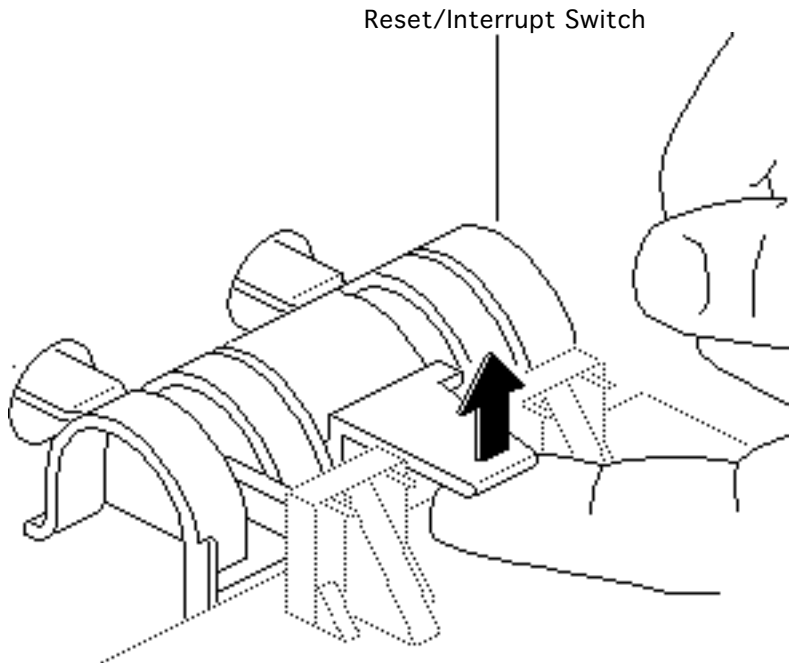


## Reset/Interrupt

Before you begin, remove the cover.

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





- 1 With one finger, lift the center tab of the switch.
- 2 Gently lift the rear of the switch up and away from the front of the case.





## Upgrades

Centris 650/Quadra 650





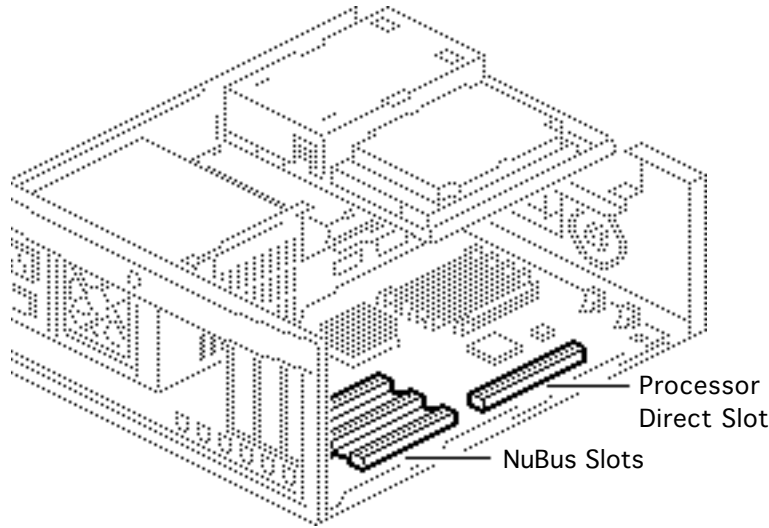
## Expansion Cards

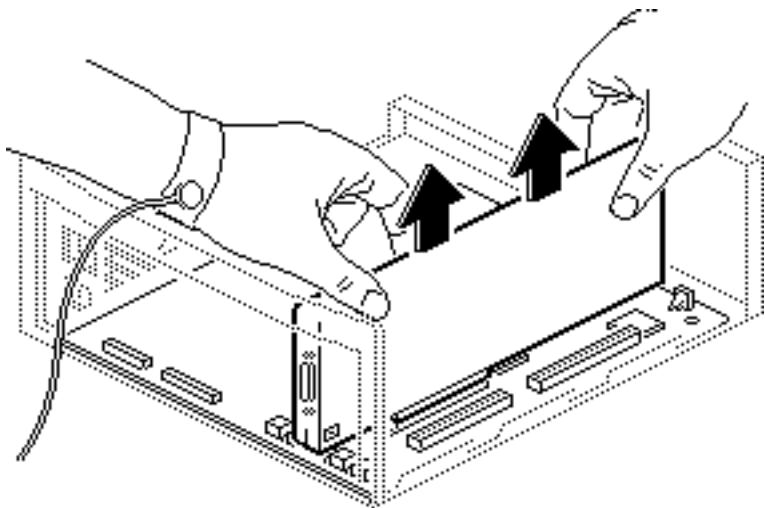
Before you begin, remove the cover.

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

**Note:** The Centris 650/ Quadra 650 has two types of expansion slots: three NuBus slots and one processor direct slot.

Pull up evenly on both sides of an expansion card to avoid





bending the connector pins.

Carefully grasp each end of the card and pull straight up to remove the card from the expansion slot.

**Replacement Caution:** When replacing the card, do not force it into the expansion slot. If the card does not seat properly, remove it and try again.

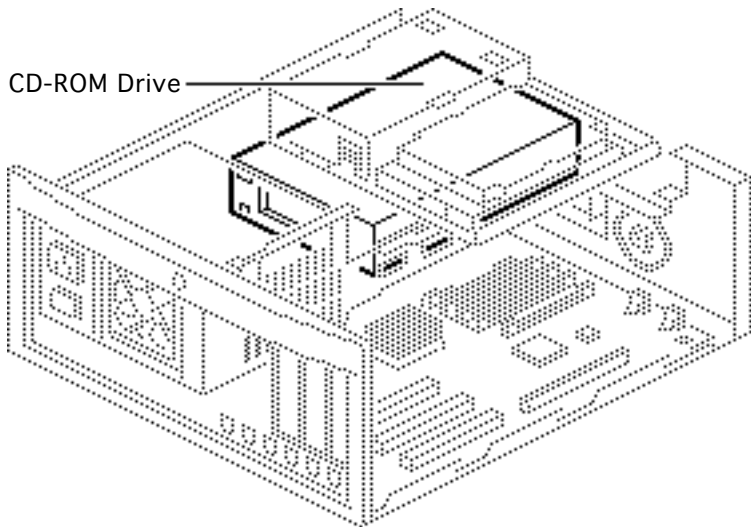


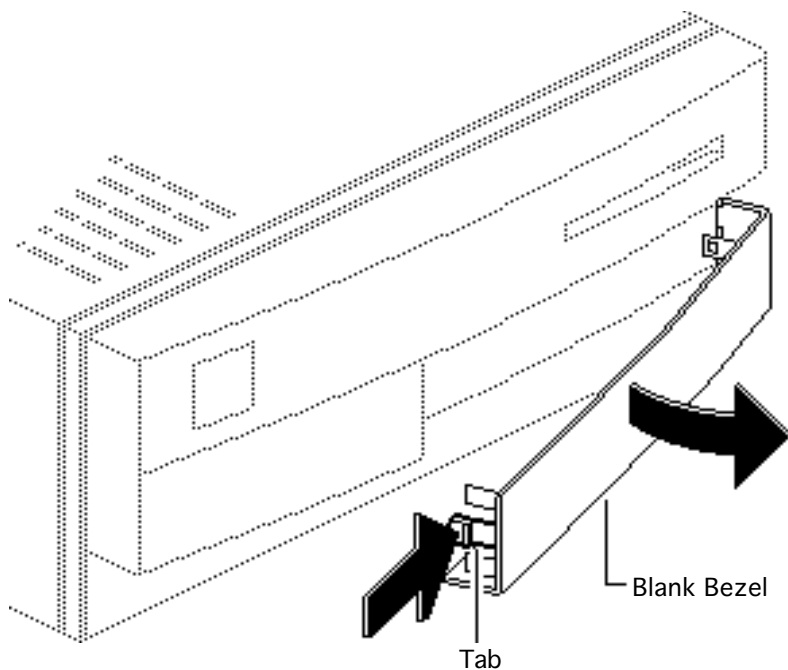


## CD-ROM Drive Upgrade

Before you begin, remove the top cover.

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



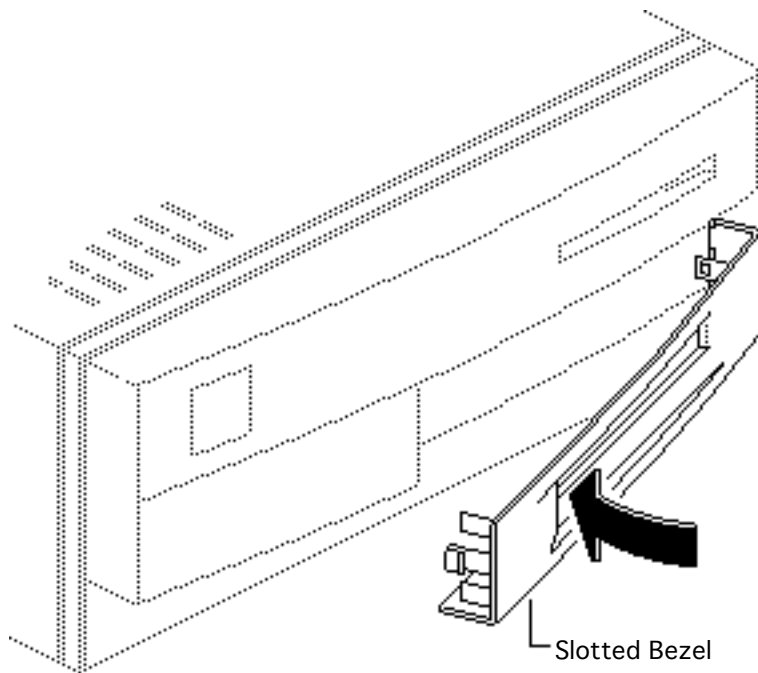


- 1 From the inside of the top cover, squeeze in the tabs of the blank bezel and push out the bezel.

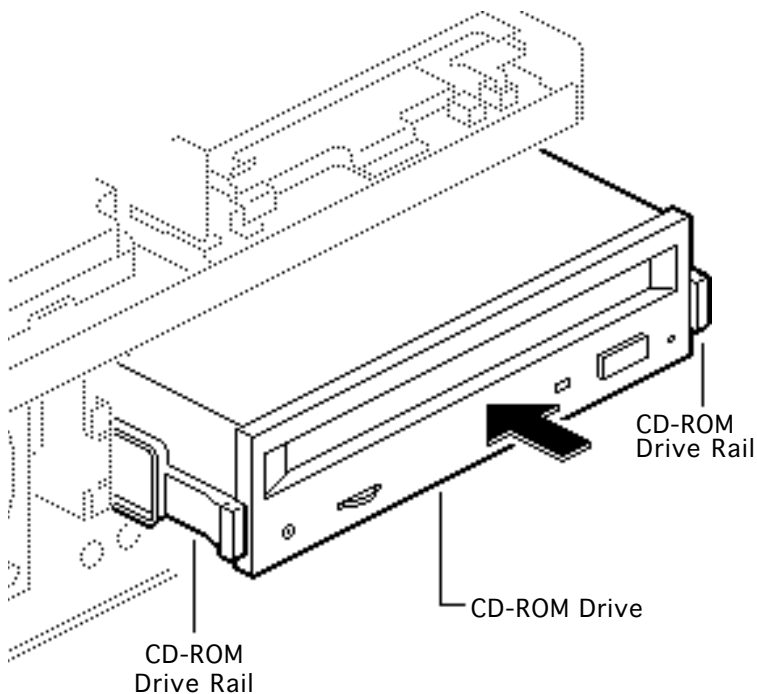




- 2 Push in the slotted bezel.

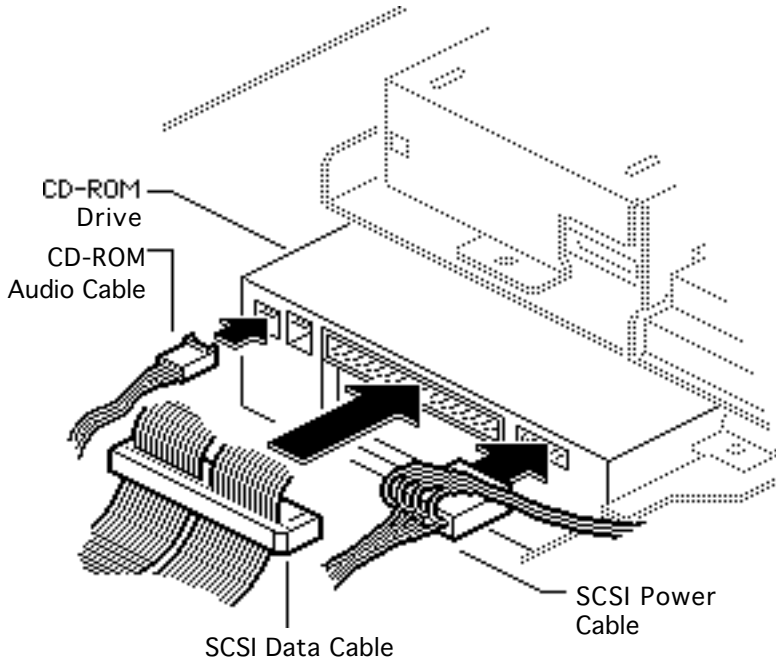






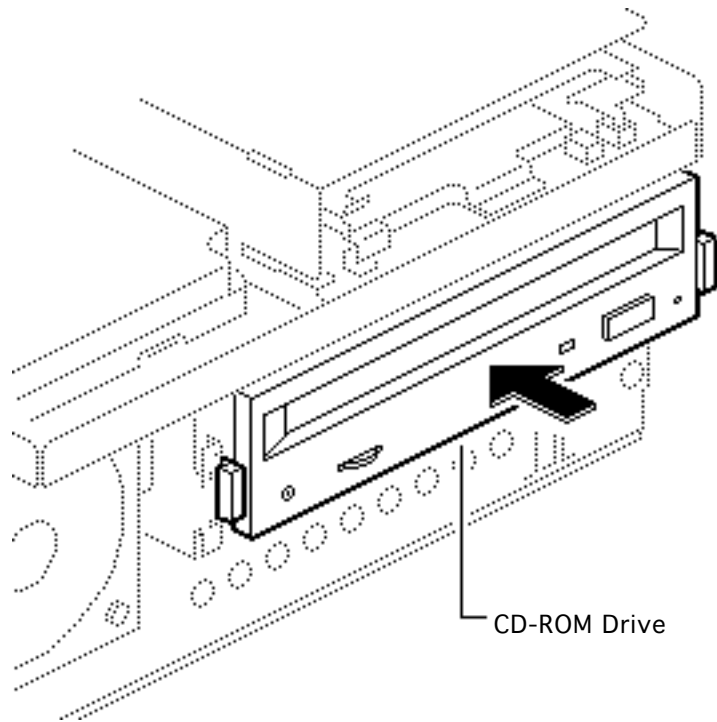
- 3 Attach the CD-ROM drive rails to the CD-ROM drive.
- 4 Slide the CD-ROM drive about three quarters of the way into the drive mount chassis.





- 5 Connect these cables to the CD-ROM drive:
- CD-ROM audio cable
  - SCSI data cable
  - SCSI power cable





- 6 Push the CD-ROM drive completely into the CD-ROM slot until you hear a click.



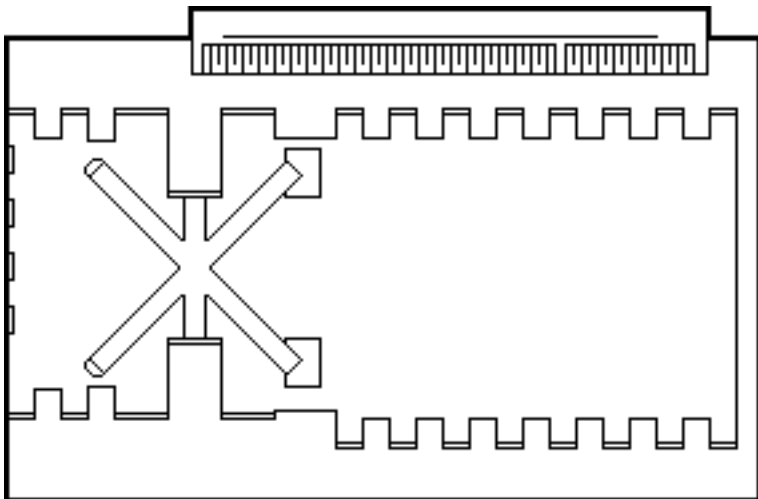


## Power Macintosh Card

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 computer to a PowerPC microprocessor-based computer.





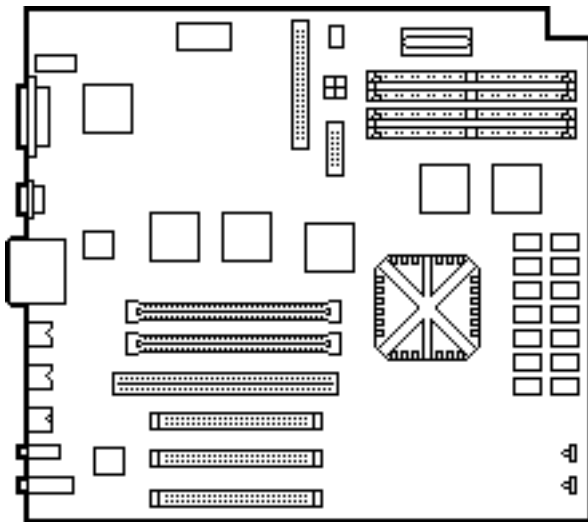
For more information, including installation instructions, refer to the Basics chapter in the Power Macintosh Card manual.





# Power Macintosh Upgrade

No preliminary steps are required before you begin this procedure.





The Centris 650 and Quadra 650 computers can be upgraded to a Power Macintosh 7100/66 or Power Macintosh 7100/66AV. For upgrade instructions, refer to the Upgrades chapter in the Power Macintosh 7100 manual.





Exploded View

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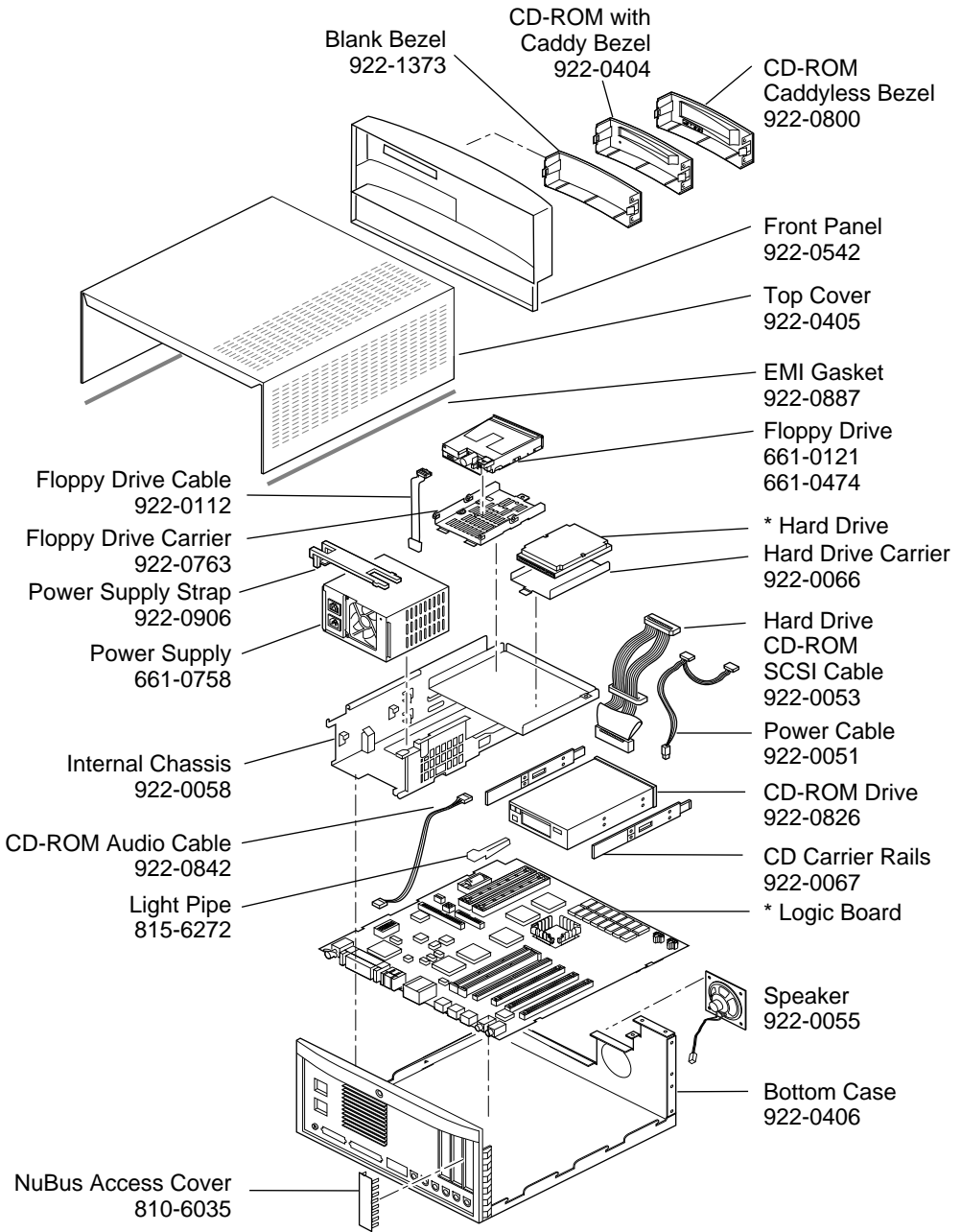
Centris 650/Quadra 650







# Exploded View



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

