



# Workgroup Server 9150

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Workgroup Server 9150  
Workgroup Server 9150/120





## Basics

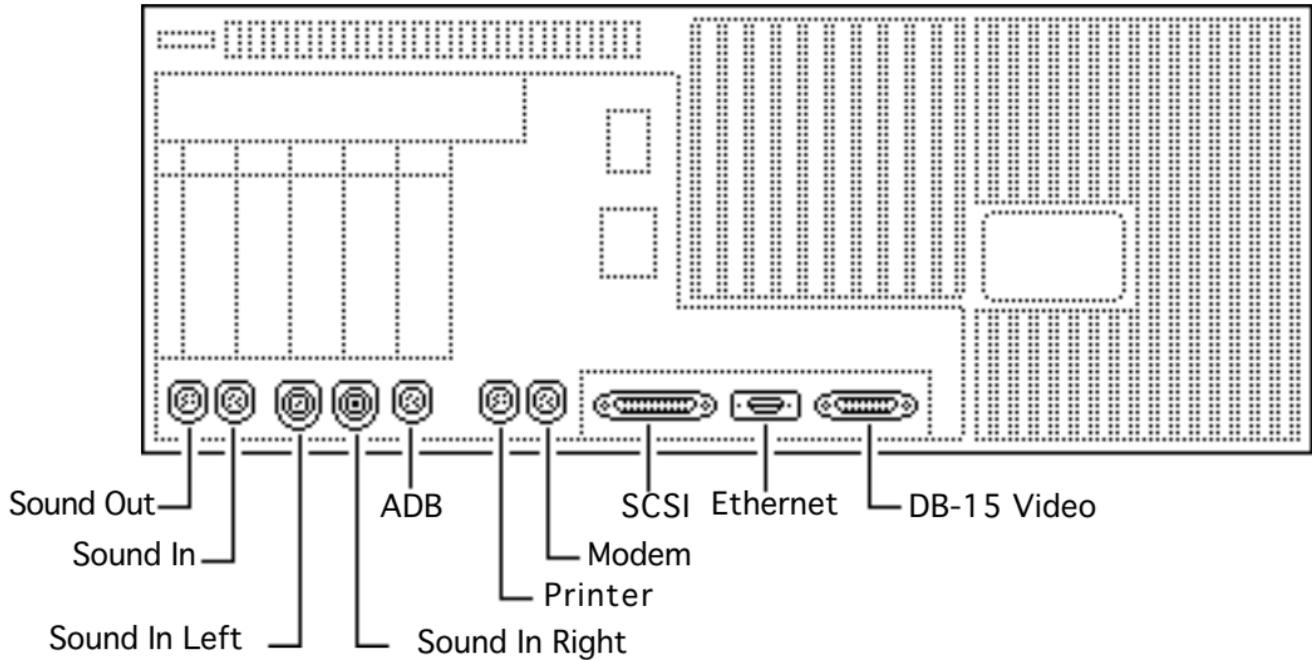
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Workgroup Server 9150





# Rear Panel Connectors

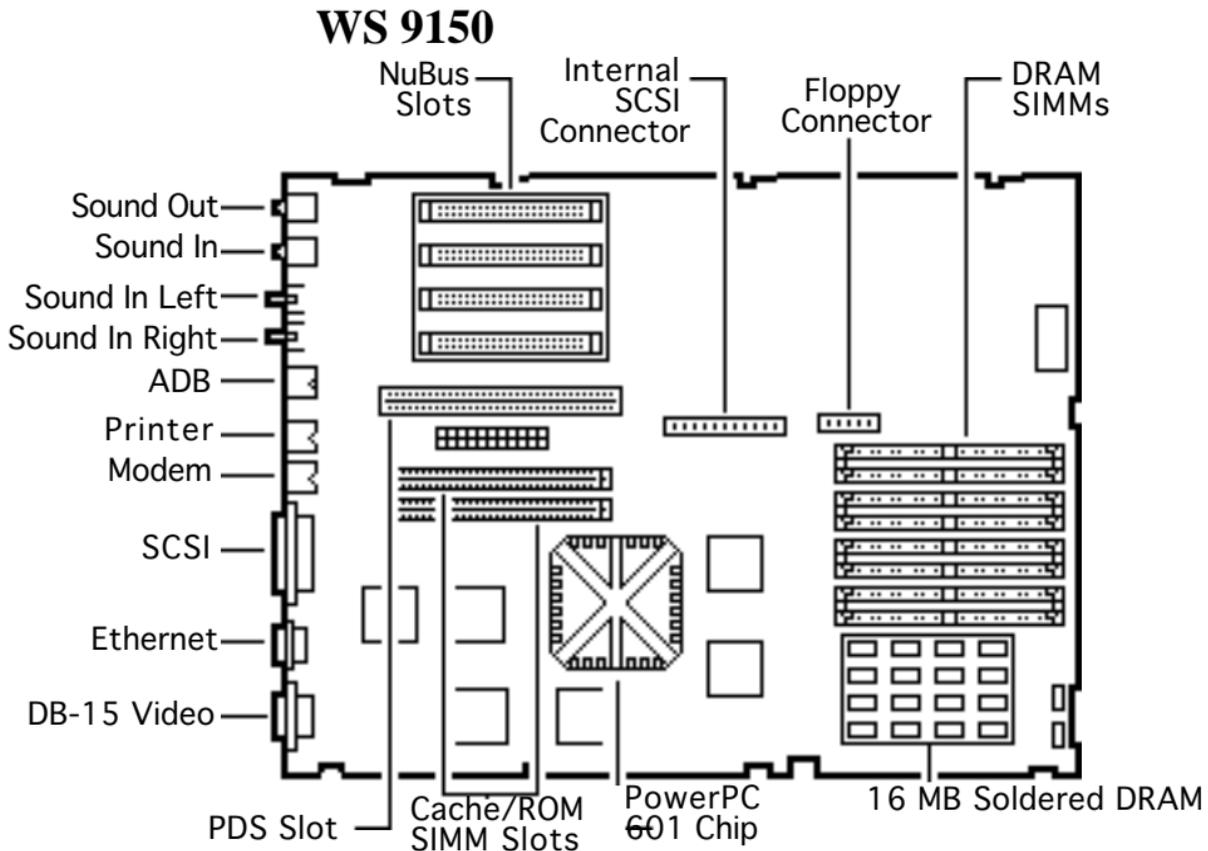




## Logic Board Connectors

**Note:** The order of the cache and ROM SIMMs will vary according to the manufacturing date of the logic board. Be sure to correctly identify the cache SIMM, which has four chips on both sides, and remove it before returning the logic board to Apple for repair. Do NOT remove the ROM SIMM before returning the logic board.





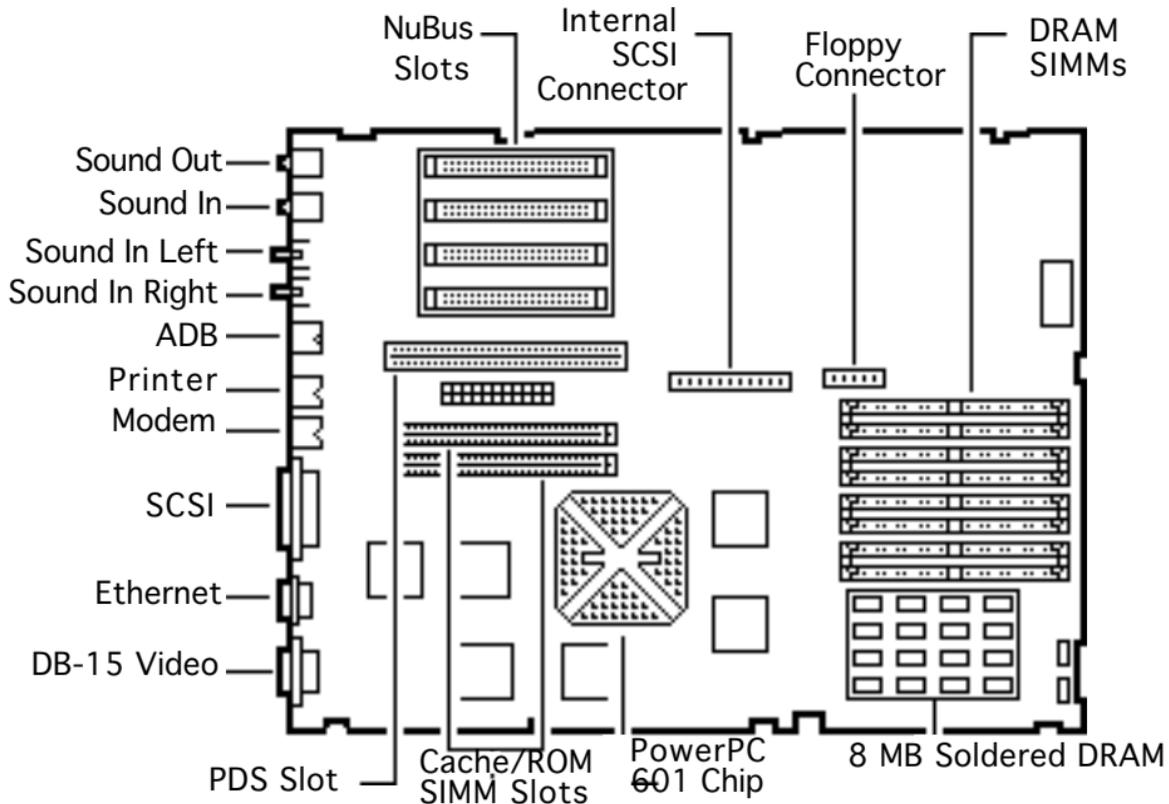


**Note:** The order of the cache and ROM SIMMs will vary according to the manufacturing date of the logic board. Be sure to correctly identify the cache SIMM, which has four chips on both sides, and remove it before returning the logic board to Apple for repair. Do NOT remove the ROM SIMM before returning the logic board.





# WS 9150/120





**Important:** The WS 9150/120 logic board has a thermoelectric cooling device that attaches directly to the microprocessor's heatsink. You can identify this cooling device by the black and red wires that run to the right of the heatsink and plug into the logic board via a keyed connector. This device is not a serviceable item. Do not unplug this device or you may damage the logic board. Also note that the order of the cache and ROM SIMMs may vary. Be sure to correctly identify the cache SIMM and remove it before returning the logic board to Apple for repair. Do NOT remove the ROM SIMM before returning the logic board.





# RAID Information

## Apple RAID Software

Apple RAID (Redundant Array of Independent Disks) software protects data from loss during a disk failure and enhances the speed of data storage and retrieval. It is available for all Power Macintosh Workgroup servers.

Data protection is achieved through disk mirroring, a data storage scheme in which identical data is stored on two different disks. Apple RAID can also be configured for disk striping, a data storage scheme in which successive units of data are transferred to several disks at one time.





If you plan to install the Apple RAID software on an existing Power Macintosh Workgroup Server, or if you are reinitializing an existing Apple RAID drive, keep in the mind the following:

- If you wish to use your server's startup disk for Apple RAID, do not install the Apple RAID program on your startup disk until you have initialized and set up new volumes on that disk. Before you initialize the startup disk, backup all valuable data.
- You must reinitialize all disks on which you will use Apple RAID volumes. Initializing with Apple RAID removes all data, so be sure to backup your disks first.





- The Apple RAID CD contains the facilities to reinstall your system software. However, if you have made any customizations to your system files, such as adding extension files, control panels, or preference files, then back up your system files now. Back them up in such a way that you can restore your system files separately from the non-system files on your disk. You will later restore your system files using the backup copy rather than the System Installer on the RAID CD, so that you preserve your system customizations.
- Apple HD SC Setup does not recognize Apple RAID volumes. If you want to remove or resize volumes on Apple RAID disks, use the Apple RAID program.





## Specifications

Workgroup Server 9150





## Processor

### CPU

- 9150:** 80 MHz PowerPC 601 RISC microprocessor  
Built-in MMU and FPU  
32K of on-chip cache memory  
Requires system software version 7.1.2 or later
- 9150/120:** 120 MHz PowerPC 601 RISC microprocessor  
Built-in MMU and FPU  
32K of on-chip cache memory  
Requires system software version 7.5 or later





## Memory

### RAM

- 9150:** 8 MB RAM soldered on logic board, expandable to 264 MB via 8 SIMM sockets on logic board\*
- 9150/120:** 16 MB RAM soldered on logic board, expandable to 264 MB via 8 SIMM sockets on logic board\*
- \*SIMMs must be installed in pairs of the same size and speed. The SIMMs must be 80 ns or faster, 72-pin noncomposite SIMMs.

### ROM

4 MB installed on a SIMM socket





**VRAM** None; DRAM video support provided on logic board

## Cache

**9150:** 32K on-chip cache; 512K level 2 cache SIMM

**9150/120:** 32K on-chip cache; 1 MB level 2 cache SIMM

**Clock/Calendar** CMOS custom chip with long-life lithium battery





## Disk Storage

### **Floppy Drive**

1.4 MB Apple SuperDrive Manual Insert

### **Hard Drive**

**9150:** 500 MB, 1 GB, or 2 GB hard drive standard; room for a total of five internal hard drives

**9150/120:** Two 1 GB hard drives or one 2 GB hard drive standard; room for a total of five internal hard drives

### **Tape Drive**

Optional DDS-2 DAT tape drive, 120 M tape supported





## CD-ROM Drive

**9150:** Internal AppleCD 300 Plus CD-ROM drive standard

**9150/120:** Internal AppleCD 600 CD-ROM drive standard





## I/O Interfaces

### **SCSI**

One SCSI port; DB-25 connector

Supports maximum of seven internal and seven external SCSI devices

### **Serial**

Two RS-232/RS-422 LocalTalk/GeoPort serial ports; mini DIN-9 connectors (backward compatible with mini DIN-8 connectors)

### **Apple Desktop Bus**

One Apple Desktop Bus (ADB) port; mini-Din-4 connector  
Maximum power draw 500 mA; maximum of three devices total

### **Ethernet**

One Ethernet port; AAUI-15 connector





**Expansion Slot**

One Power Macintosh video slot; 182-pin connector  
(Terminator card **must** be installed)

**NuBus**

Four slots support long or short expansion cards; 96-pin Euro-DIN connectors

**Video**

One DB-15 DRAM-based video port on logic board



**Sound**

8-bit stereo input; 16-bit stereo output

Sample rates of 48, 44.1, 24, and 22.05 kHz

Input/output line level: 1 V peak-to-peak

Input/output signal-to-noise ratio (SNR): 82 dB with no audible discrete tones

Bandwidth: 20 Hz–20 kHz  $\pm$  2 dB) at 44.100 kHz sample rate

THD+N (total harmonic distortion plus noise): less than 0.05%, measured 20Hz–20 kHz with a 1-V<sub>rms</sub> sine wave input





## I/O Devices

### **Keyboard**

Standard, extended, or adjustable keyboard

Keyboard draws 25–80 mA, depending on model of keyboard

### **Mouse**

ADB Mouse II; Draws up to 10 mA

### **Microphone**

Electret, omnidirectional; output voltage is 4 mV, peak to peak, at normal value; does not use Apple PlainTalk microphone





## Video Display

### Video Support

Supports monochrome, color, VGA, and SVGA formats, including

- Macintosh 12" Monochrome Display (640 x 480)
- Macintosh 12" RGB Display (512 x 384)
- AppleColor High-Resolution RGB 14" Monitor (640 x 480)
- Apple AudioVision 14 Display (640 x 480)
- Macintosh Color Display (640 x 480)
- Macintosh 15" Portrait Display (640 x 870)
- Macintosh 16" Color Display (832 x 624)





## Electrical

<b>A/C Line Input Voltage</b>	100–240 VAC; RMS single phase, automatically configured
<b>Input Line Frequency</b>	50–60 Hz, single phase
<b>Input Power</b>	600 W maximum, not including monitor power
<b>Power Supply DC Output</b>	303 W maximum





## Physical

### **Dimensions**

Height: 16.8 in. (473 mm)

Width: 8.9 in. (224 mm)

Depth: 20.6 in. (523 mm)

### **Weight**

36 lb., 12 oz. (16.7 kg) without hard drive





## Environmental

<b>Operating Temp</b>	50-104° F (10-35° C)
<b>Storage Temp</b>	-40 to 116.6° F (-40 to 47° C)
<b>Relative Humidity</b>	20-80% noncondensing
<b>Altitude</b>	0-10,000 ft. (0-3048 m)





# Troubleshooting

Workgroup Server 9150





## 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.





## Cleaning Procedure for Card Connectors

A small number of cards for the Workgroup Server 9150 may contain residue on the gold edge connector pins, which may cause a variety of intermittent symptoms.

To correct the problem, inspect the connector pins with a magnifying glass. If you find residue, use a pencil eraser to gently clean the pins.





# Symptom Charts

## Power Supply

System does not  
power up

- 1 Reset logic board. (Refer to Additional Procedures.)
- 2 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 3 Replace power supply.
- 4 Replace logic board.





## Error Chords

One-part error  
chord sounds during  
startup sequence

- 1 Disconnect SCSI data cable from hard drive and reboot system. If startup sequence is normal, initialize hard drive. If error chord still sounds, replace hard drive.
- 2 Disconnect floppy drive cable from floppy drive and reboot system. If startup sequence is normal, replace floppy drive.
- 3 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 4 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 power cables.
- 2 Plug monitor directly into wall socket, and verify that monitor has power.
- 3 Reset logic board. (Refer to Additional Procedures.)
- 4 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 5 Replace power cord.
- 6 Replace power supply.
- 7 Replace logic board. Retain customer's SIMMs.





## System (Continued)

Clicking, chirping,  
or thumping

- 1 Replace power supply.
- 2 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 3 Replace logic board. Retain customer's SIMMs.
- 4 Replace floppy drive cable.
- 5 Replace floppy drive.





## System (Continued)

System shuts down intermittently

- 1 Make sure 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 battery. Refer to “Battery Verification” in Additional Procedures.
- 4 Replace power supply.
- 5 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 6 Replace logic board. Retain customer’s SIMMs.





## System (Continued)

System  
intermittently  
crashes or hangs

- 1 Verify that system software is version 7.1.2 or later (9150) or 7.5 or later (9150/120).
- 2 Verify SIMMs are noncomposite and installed in like pairs (same size/speed).
- 3 Verify software is known-good and Power Mac compatible.
- 4 Verify a terminator or video card is installed in the PDS slot.
- 5 Clear parameter RAM. Hold down <Command> <Option> <P> <R> during startup but before “Welcome to Macintosh” appears.
- 6 Replace DRAM SIMMs. Refer to Memory manual.
- 7 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 8 Replace cache SIMM or DIMM.
- 9 Replace logic board. Retain SIMMs.
- 10 Replace power supply.





## System (Continued)

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

- 1 Verify that startup disk is good.
- 2 Attach LED cable to logic board.
- 3 Replace LED cable.
- 4 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 5 Replace logic board. Retain customer’s SIMMs.





## Video

Screen is black, audio and drive operate, fan is running, and LED is lit

- 1 Adjust brightness on monitor.
- 2 Replace video cable.
- 3 Try using known-good RAM SIMMs.
- 4 Replace video card (if present).
- 5 Clear parameter RAM. Hold down <Command> <Option> <P> <R> during startup but before “Welcome to Macintosh” appears.
- 6 Replace SIMMs.
- 7 Replace monitor. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 8 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 9 Replace logic board. Retain customer’s SIMMs.
- 10 Replace power supply.





## Video (Continued)

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

- 1 Replace video cable.
- 2 Replace video card (if present).
- 3 Replace SIMMs.
- 4 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 5 Replace logic board. Retain customer's SIMMs.
- 6 Replace power supply.





## Video (Continued)

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

- 1 Replace video cable.
- 2 Replace video card (if present).
- 3 Clear parameter RAM. Hold down <Command> <Option> <P> <R> during startup but before “Welcome to Macintosh” appears.
- 4 Replace monitor. Refer to appropriate monitor manual to troubleshoot defective monitor.
- 5 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 6 Replace logic board. Retain customer’s SIMMs.





## Floppy Drive

Internal floppy drive  
does not operate

- 1 Replace disk with known-good floppy disk.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 5 Replace logic board. Retain customer's SIMMs.
- 6 Replace power supply.





## Floppy Drive (Continued)

During system startup, disk ejects; display shows icon with blinking “X”

- 1 Replace disk with known-good system disk.
- 2 Clear parameter RAM. Hold down <Command> <Option> <P> <R> during startup but before “Welcome to Macintosh” appears.
- 3 Replace floppy drive cable.
- 4 Replace floppy drive.
- 5 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 6 Replace logic board. Retain customer’s SIMMs.





## Floppy Drive (Continued)

Does not eject disk

- 1 Switch off computer. Hold mouse button down while you switch computer on.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 5 Replace logic board. Retain customer's SIMMs.

Attempts to eject disk, but doesn't

- 1 Push disk completely in.
- 2 Reseat floppy drive bezel and drive so bezel slot aligns correctly with drive.
- 3 Eject disk manually.
- 4 Replace floppy drive.





## Floppy Drive (Continued)

Internal floppy drive runs continuously

- 1 Replace disk with known-good floppy disk.
- 2 Replace floppy drive cable.
- 3 Replace floppy drive.
- 4 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 5 Replace logic board. Retain customer's SIMMs.

MS-DOS drive does not recognize a disk formatted on a 1.4 MB drive

To read and write files with either MS-DOS or 1.4 MB drive, format all disks with MS-DOS drive first.





## Hard Drive

Single internal hard drive does not operate; drive doesn't spin

- 1 Update driver software of hard drive using HD-SC Setup. (Note: Use Apple RAID to update driver on RAID WS 9150 drives.)
- 2 Reinstall system software.
- 3 Replace hard drive power cable.
- 4 Replace SCSI cable.
- 5 Replace hard drive. (Note: If replacing an Apple WS 9150 RAID drive, you must reinstall the RAID software on the drive. See “RAID Information” in Basics.)
- 6 Replace power supply.





## Hard drive (Continued)

No internal SCSI drives operate

- 1 Verify there are no duplicate SCSI device addresses.
- 2 Replace SCSI data cable.
- 3 Replace power supply.
- 4 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 5 Replace logic board. Retain customer's SIMMs.

Drive does not appear on the desktop

- 1 Verify there are no duplicate SCSI device addresses.
- 2 If drive is not initialized, use HD SC Setup to initialize. (Note: Use Apple RAID to initialize RAID drives for the WS 9150 drives.)
- 3 Replace SCSI cable.
- 4 Replace hard drive. (Note: If replacing an Apple WS 9150 RAID drive, you must reinstall the RAID software on the drive. See "RAID Information" in Basics.)





## Hard Drive (Continued)

Works with internal or external SCSI devices but not with both

- 1 Verify there are no duplicate SCSI device addresses.
- 2 Replace terminator on external SCSI device.
- 3 Verify that SCSI device at end of internal SCSI data cable is only device terminated.
- 4 Refer to appropriate manual to troubleshoot defective external device.





## Peripherals

Cursor does not move

- 1 Inspect inside of mouse for buildup of dirt or other contaminants. Clean mouse if necessary.
- 2 Reinstall the system software.
- 3 Replace external SCSI cables.
- 4 Verify that there is only one terminator on external devices.
- 5 Check mouse connection.
- 6 If mouse was connected to keyboard, connect mouse to computer ADB port. If mouse works, replace keyboard.
- 7 If mouse does not work in any ADB port on computer, replace mouse.
- 8 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 9 Replace logic board. Retain customer's SIMMs.





## Peripherals (Continued)

Cursor moves, but clicking mouse button has no effect

- 1 Replace mouse.
- 2 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 3 Replace logic board. Retain customer's SIMMs.





## Peripherals (Continued)

Double-click doesn't open application, disk, or server

- 1 Remove duplicate system folders.
- 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 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 6 Replace logic board. Retain customer's SIMMs.





## Peripherals (Continued)

No response to any key on keyboard

- 1 Check keyboard connection to ADB port.
- 2 Replace keyboard cable.
- 3 Replace keyboard.
- 4 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 5 Replace logic board. Retain customer's SIMMs.

Known-good serial printer does not work

- 1 Verify that system software is version 7.1.2 or later (9150) or 7.5 or later (9150/120).
- 2 Verify that Chooser is set correctly.
- 3 Replace printer interface cable.
- 4 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 5 Replace logic board. Retain customer's SIMMs.





## Peripherals (Continued)

Known-good network printer does not print

- 1 Verify that system software is version 7.1.2 or later (9150) or 7.5 or later (9150/120).
- 2 Verify that Chooser is set correctly.
- 3 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 4 Replace logic board. Retain customer's SIMMs.





## Miscellaneous

No sound from speaker

- 1 Verify that volume setting in Control Panel is 1 or above.
- 2 Replace speaker.
- 3 Reseat ROM, RAM, and cache SIMMs, and reseat terminator card.
- 4 Replace logic board. Retain customer's SIMMs.

About This Macintosh reports more memory than is installed

- 1 Check to see if virtual memory is turned on (which will cause the system to report more memory).
- 2 Verify that RAM SIMMs are installed in matching pairs (same size and speed).
- 3 Replace RAM SIMMs.





## Miscellaneous (Continued)

About This Macintosh reports less memory than is installed

- 1 Verify that RAM SIMMs are installed in matching pairs (same size and speed).
- 2 Replace RAM SIMMs.

System hangs, I/O errors, or “mirrors out of sync” errors resulting from SCSI Bus-intensive activity

- 1 Verify that system software is version 7.1.2 or later (9150) or 7.5 or later (9150/120).
- 2 Clear parameter RAM. Hold down <Command> <Option> <P> <R> during startup but before “Welcome to Macintosh” appears.
- 3 Replace the logic board with part number 661-0993 and retain customer’s SIMMs. (Note: This problem occurs only on the 80 MHz version of the WS 9150 and only during periods of heavy SCSI Bus activity (for example, when using backup programs or disk arrays).





## CD-ROM Drive

CD-ROM drive does not accept compact disc

- 1 Exchange disc.
- 2 Replace CD-ROM drive mechanism.

Macintosh does not display CD-ROM drive icon

- 1 Verify that CD-ROM software is installed.
- 2 Replace SCSI data cable.
- 3 Replace CD-ROM drive mechanism.

Computer with 600i CD-ROM drive makes stuttering sounds when playing CD+ or CD-R formatted discs or CD-ROM disc won't mount

Replace CD-ROM drive.





Take Apart

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Workgroup Server 9150



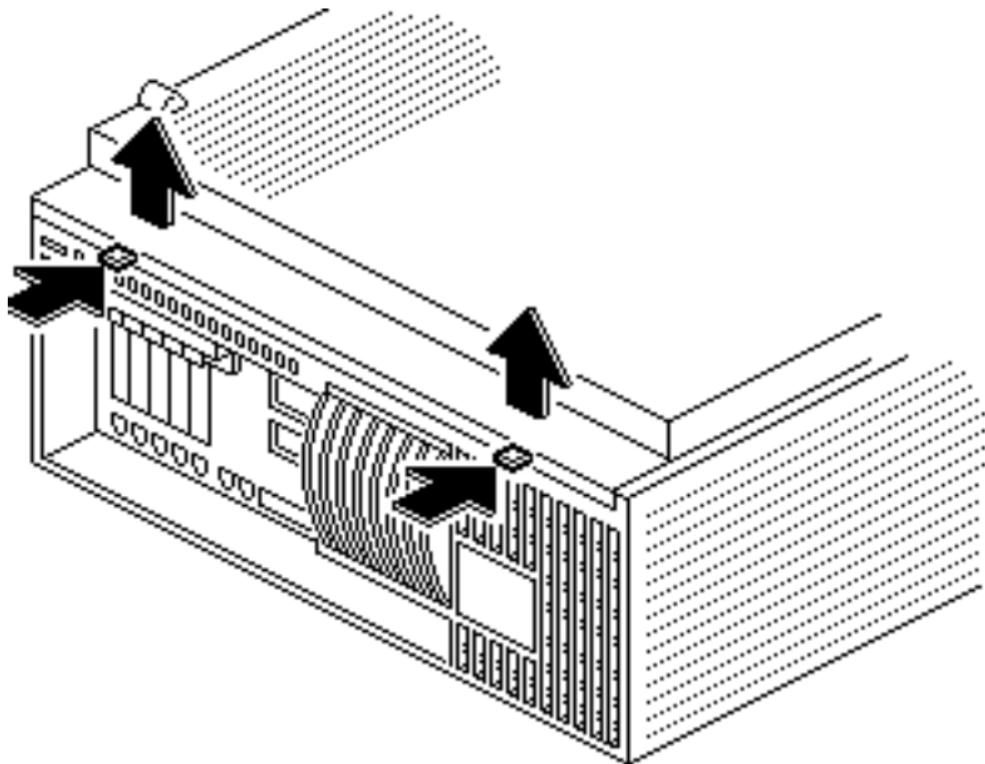


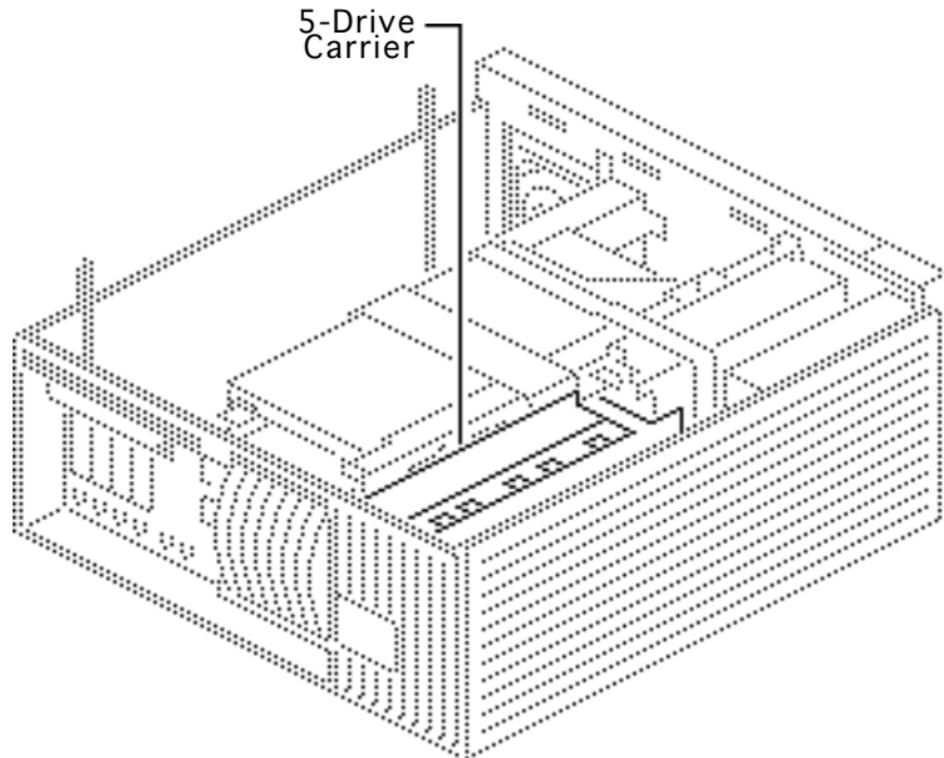
## Cover

No preliminary steps are required before you begin this procedure.

**Note:** You must place the system on its side. Attempting to remove the cover with the system standing may cause damage to the cover.

Press the two latches, lift the cover, and remove it from the computer.





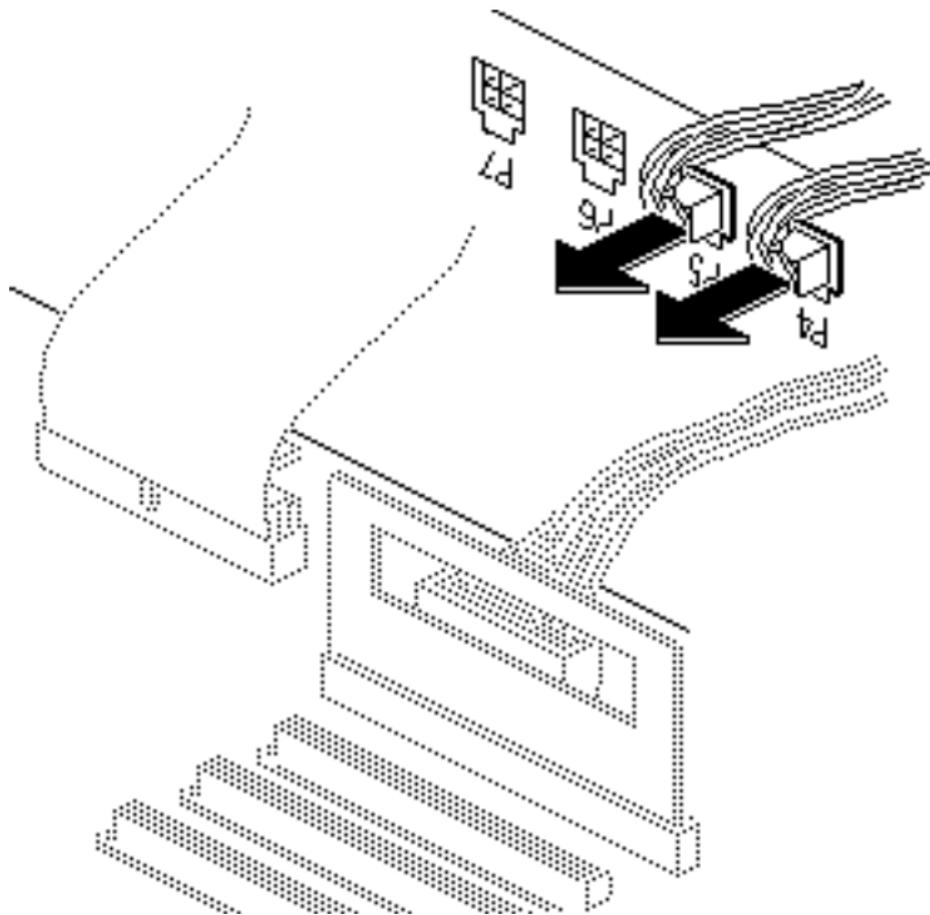
## 5-Drive Carrier

Before you begin, remove the cover.

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

**Note:** For information on the Five-Drive configuration, refer to “Hard Drive Upgrades” in the Upgrades chapter.



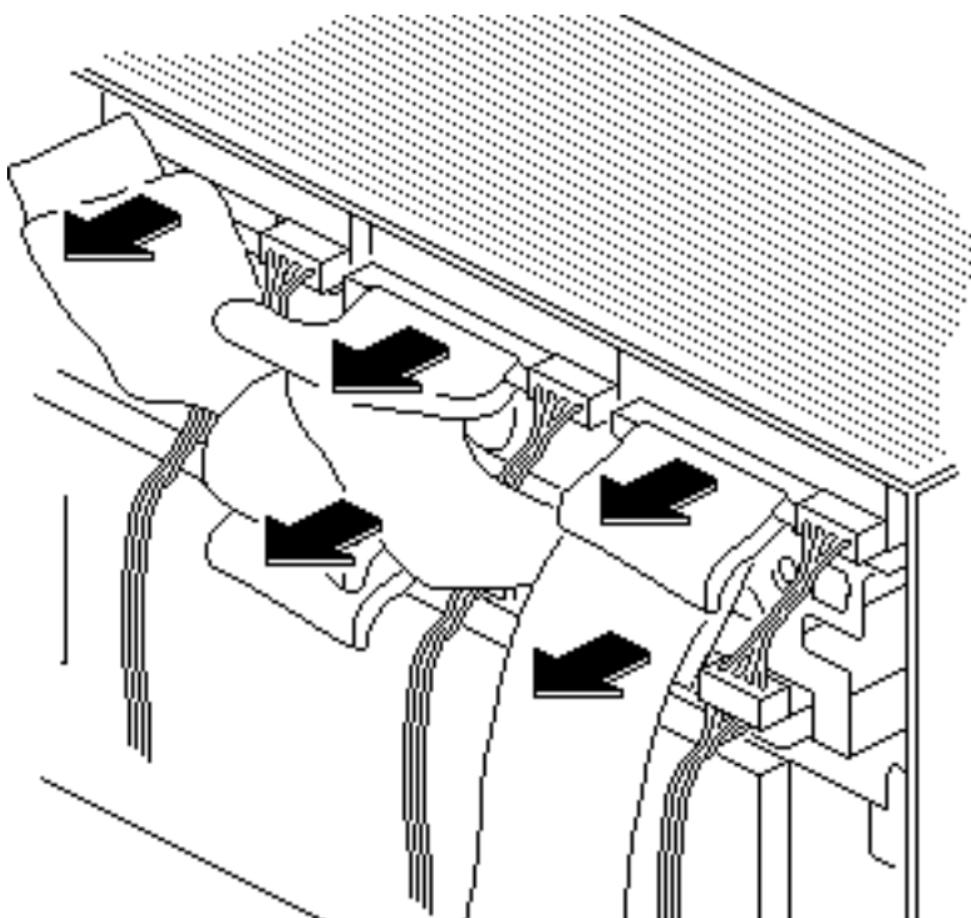


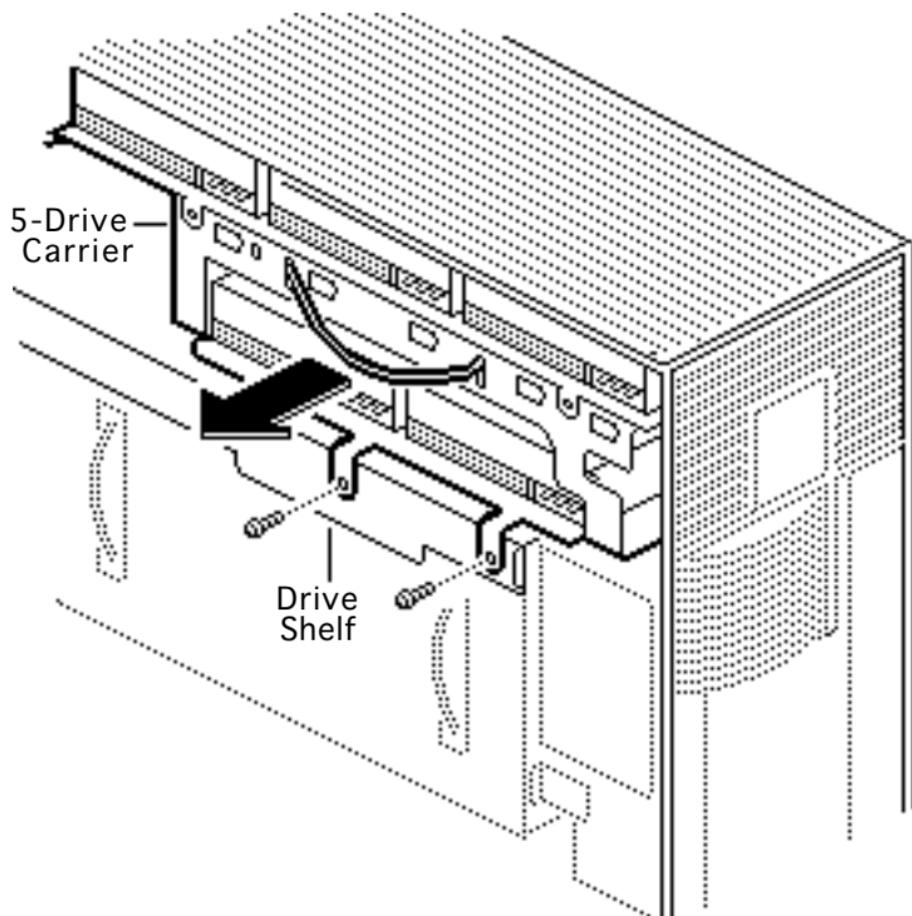
- 1 Disconnect the SCSI power cable(s) from the power supply.





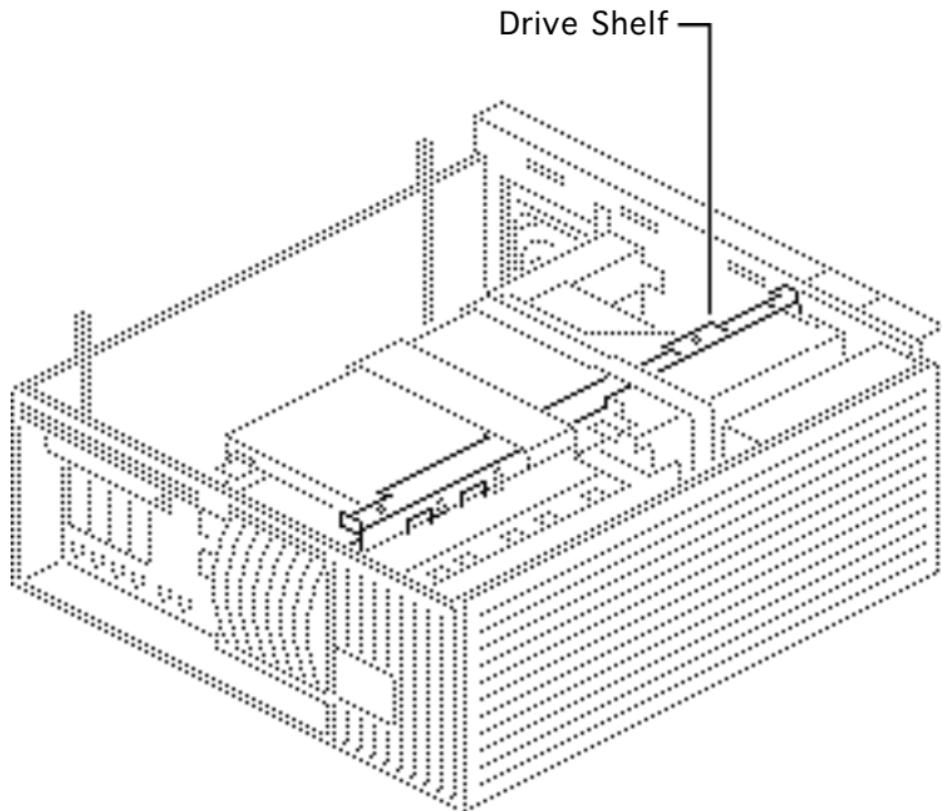
- 2 Disconnect the SCSI cable from the hard drives.





- 3 Remove the two screws that secure the 5-drive carrier to the drive shelf.
- 4 Grasp the cable tie and the edge of the carrier and lift the 5-drive carrier out of the computer.





## Drive Shelf

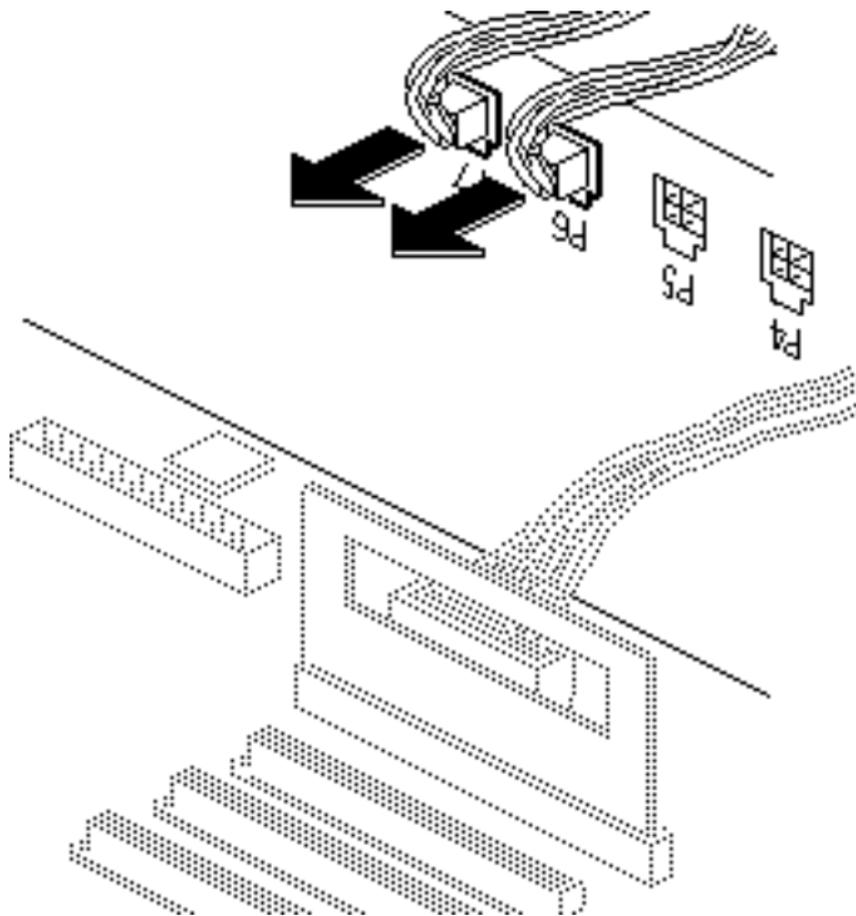
Before you begin, remove the following:

- Cover
- 5-drive carrier

Review the ESD precautions in Bulletins/Safety.

**Note:** For information on the Five-Drive configuration, refer to Additional Procedures.



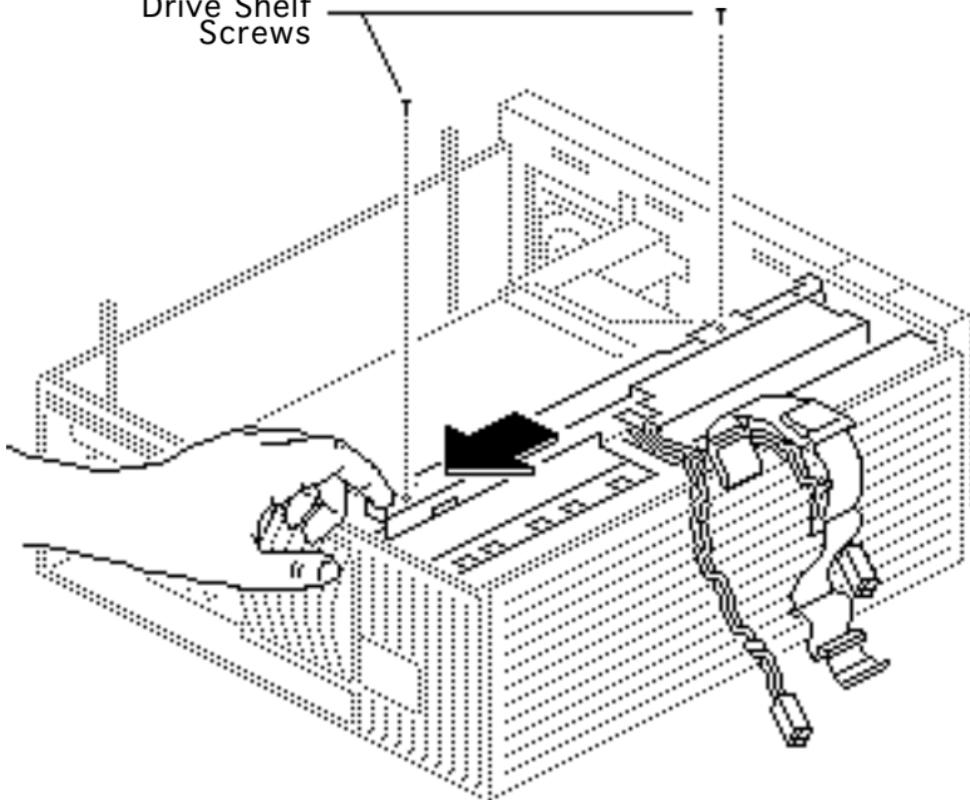


- 1 Disconnect the tape drive and CD-ROM drive power cables from the power supply.



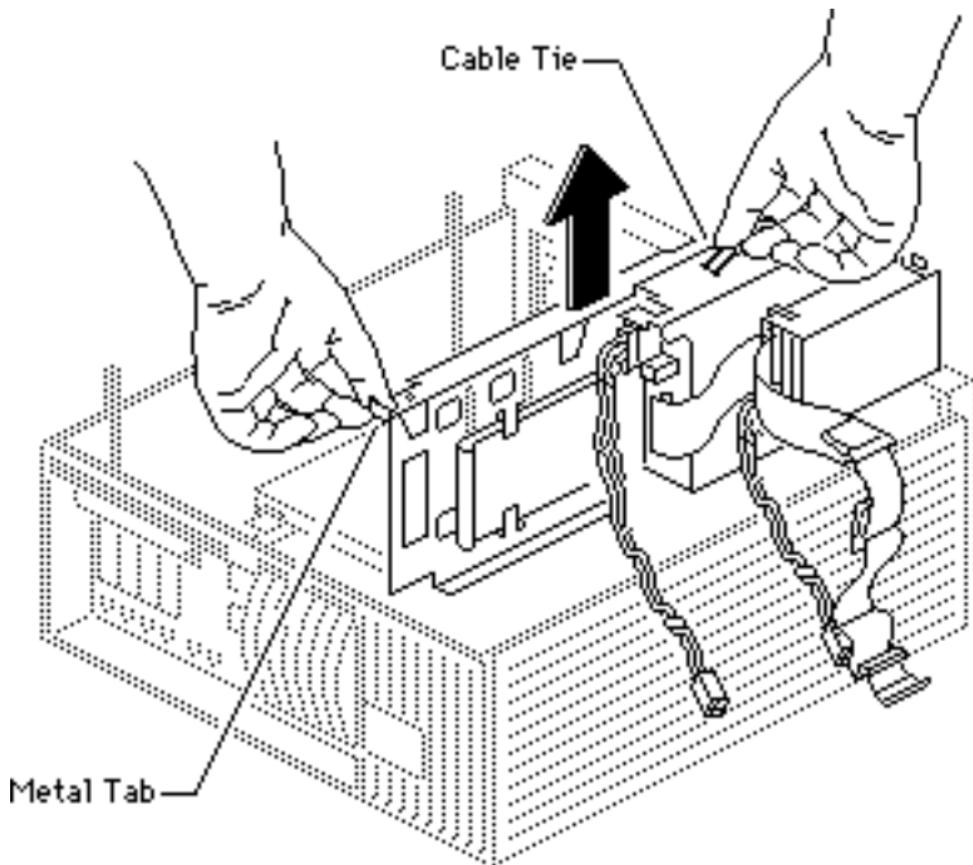


Drive Shelf  
Screws



- 2 Remove the two screws securing the drive shelf to the inside frame.
- 3 Slide the drive shelf toward the rear of the computer.

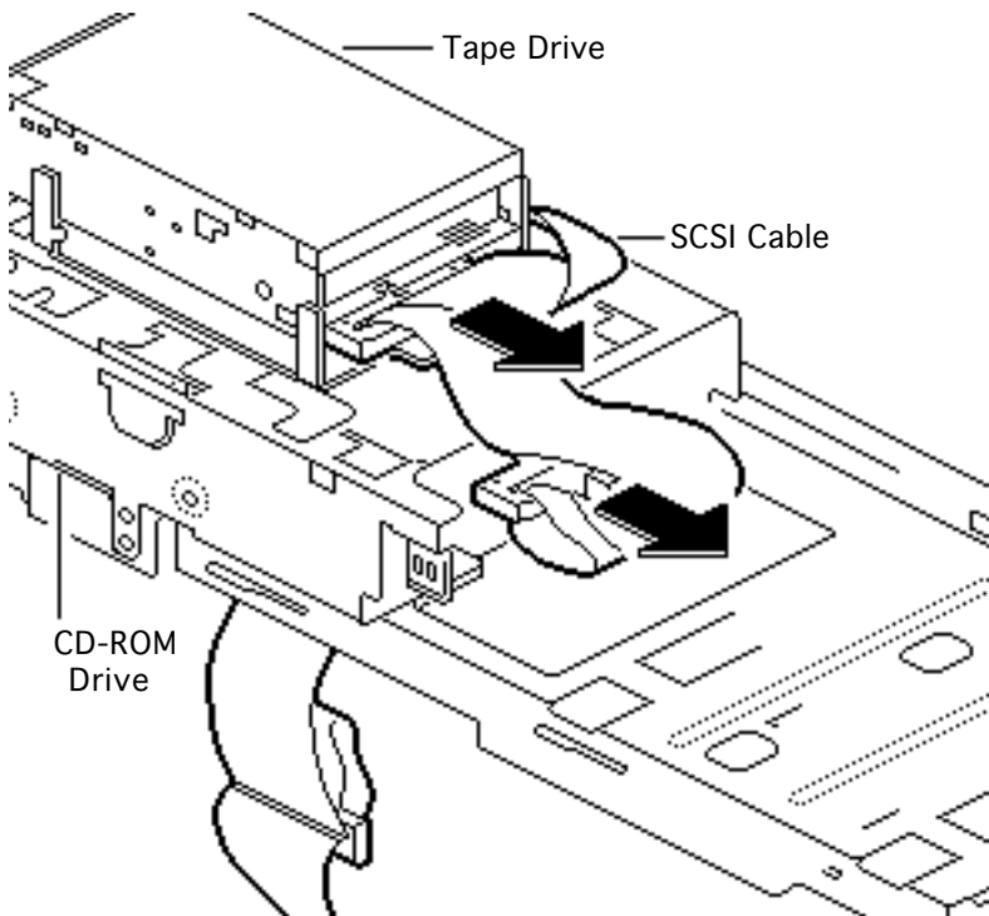




- 4 **Note:** In this step, be careful that none of the cables catch on the case.

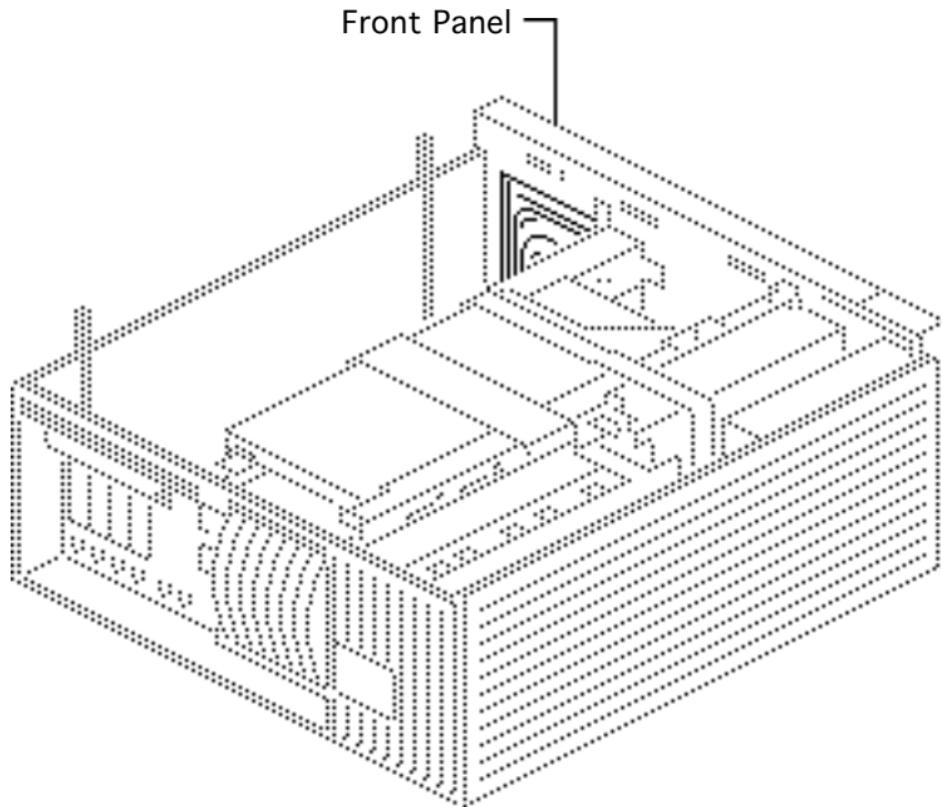
Grasp the cable tie and the metal tab and lift the drive shelf out of the computer.





- 5 Remove the SCSI cable from the tape drive and CD-ROM drive.



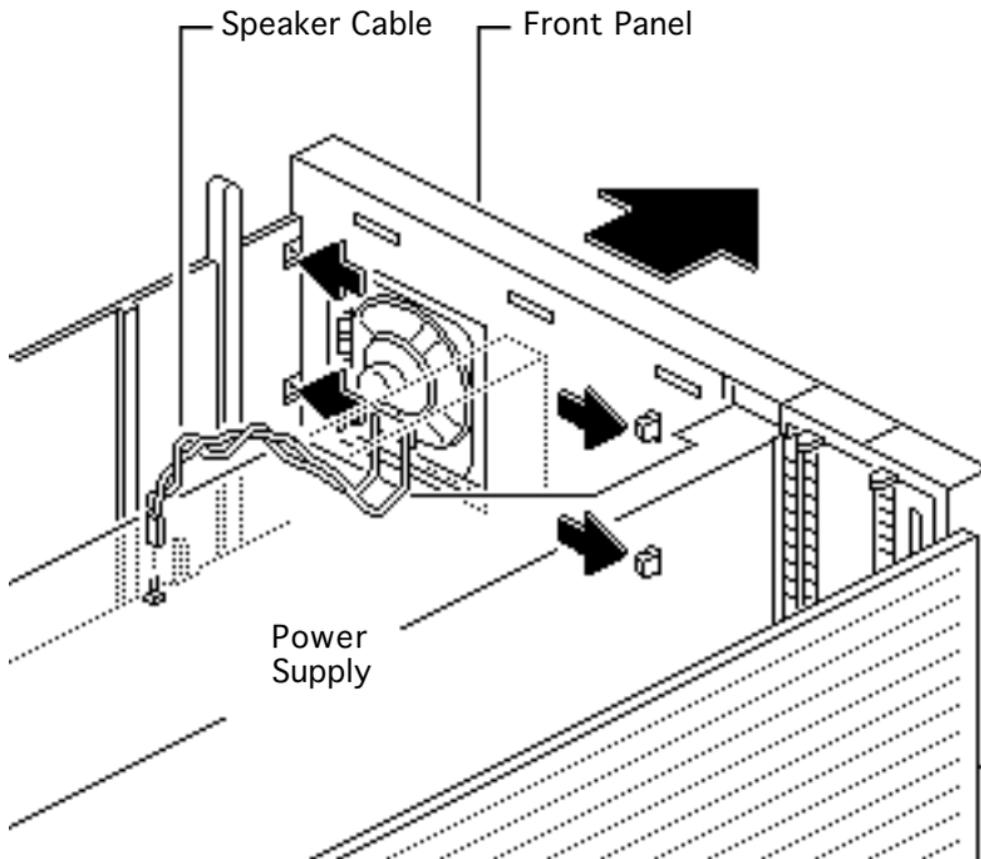


## Front Panel

Before you begin, remove the cover.

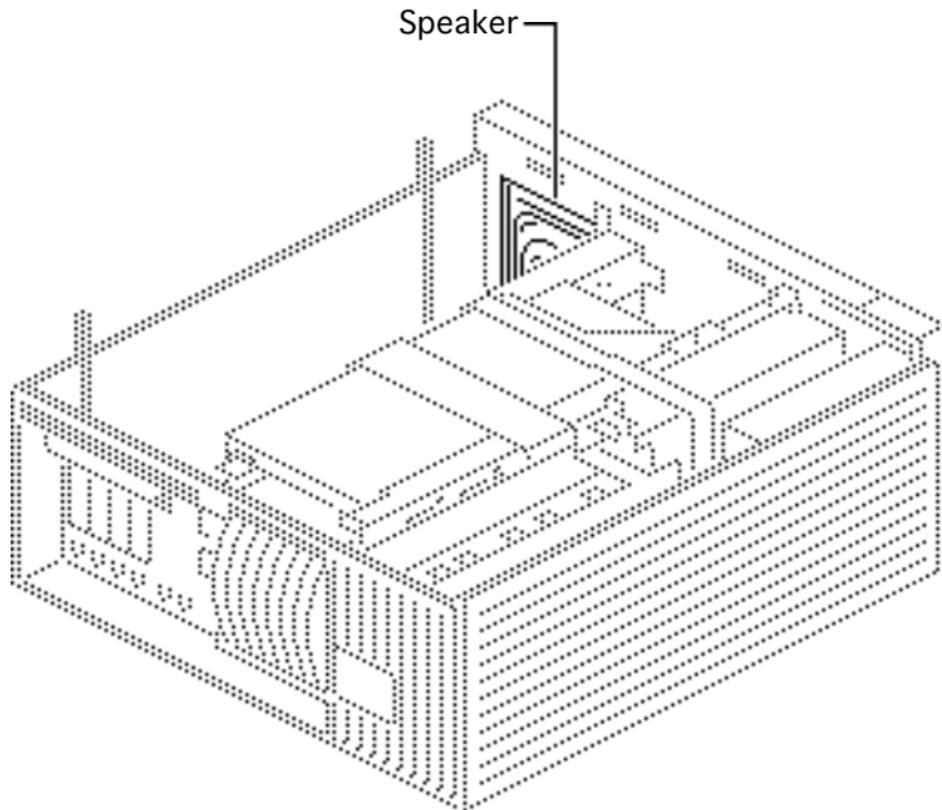
**Caution:** Review the ESD precautions in Bulletins/ Safety.





- 1 Disconnect the speaker cable from the logic board.
- 2 Release the four plastic latches on the inside of the front panel.
- 3 Remove the front panel from the computer.





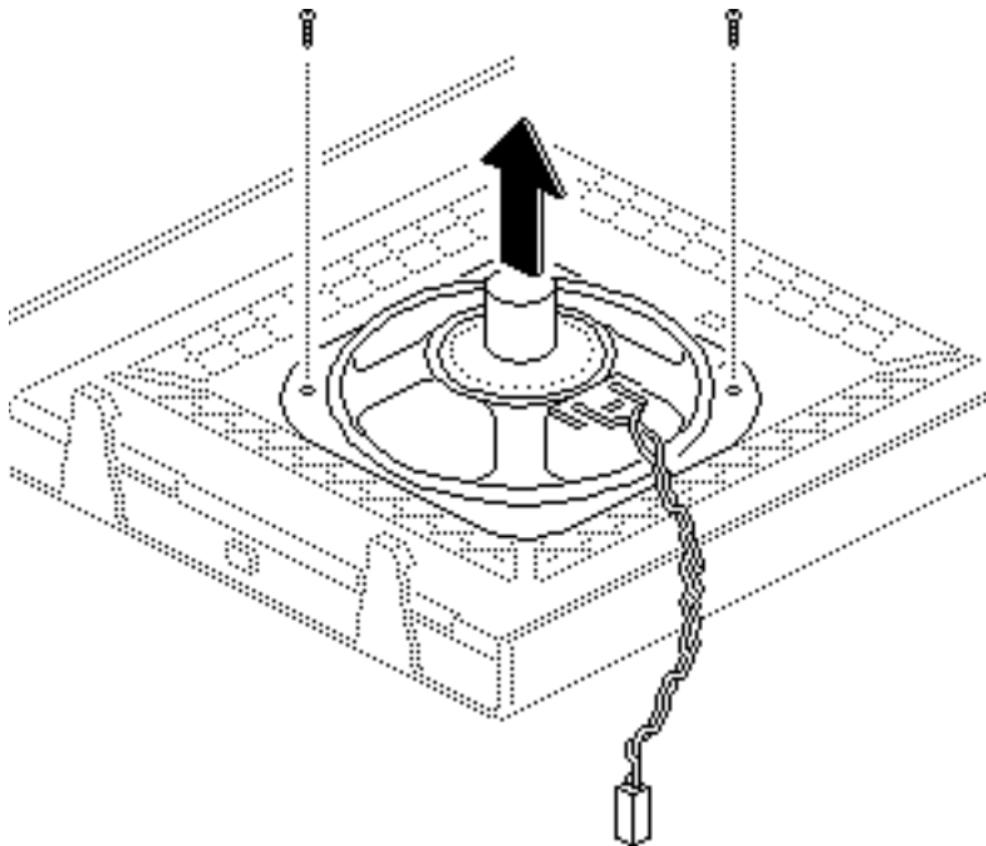
## Speaker

Before you begin, remove the following:

- Cover
- Front panel

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





Remove the two screws and lift the speaker off the front panel.

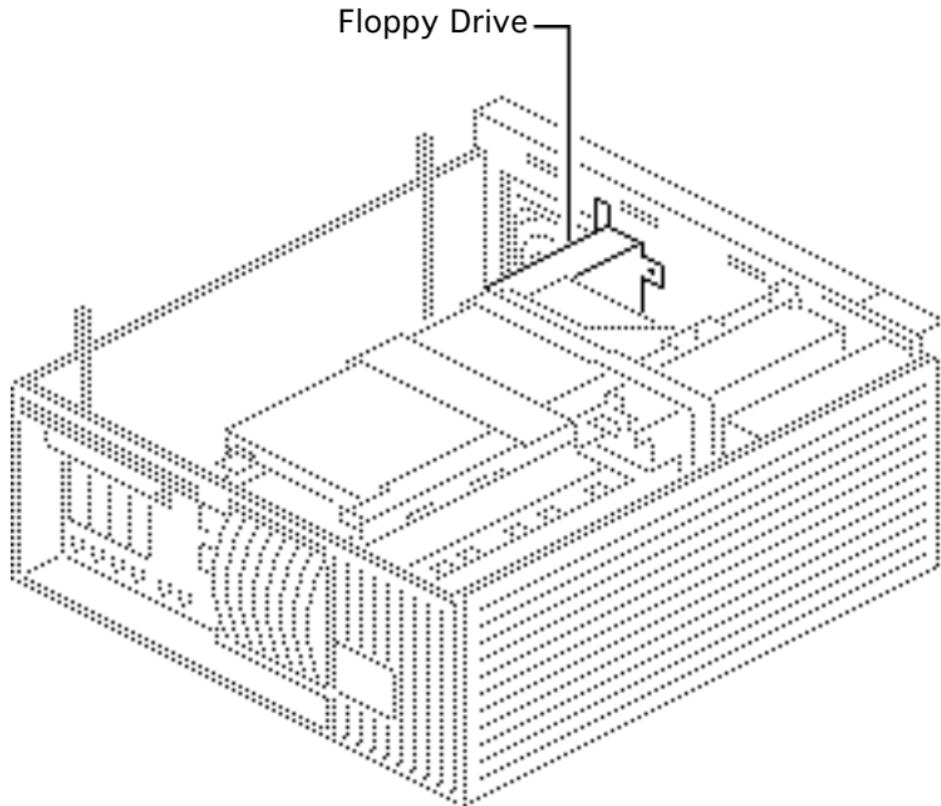




## Floppy Drive

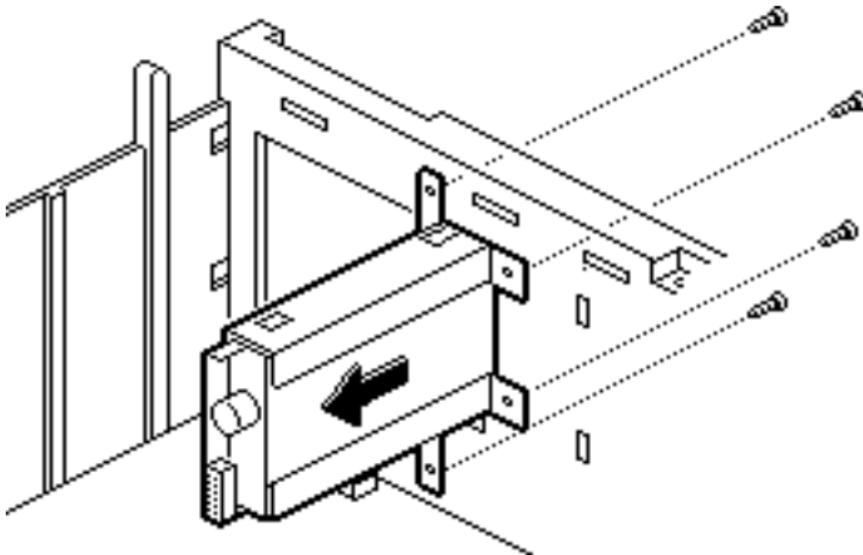
Before you begin, remove the following:

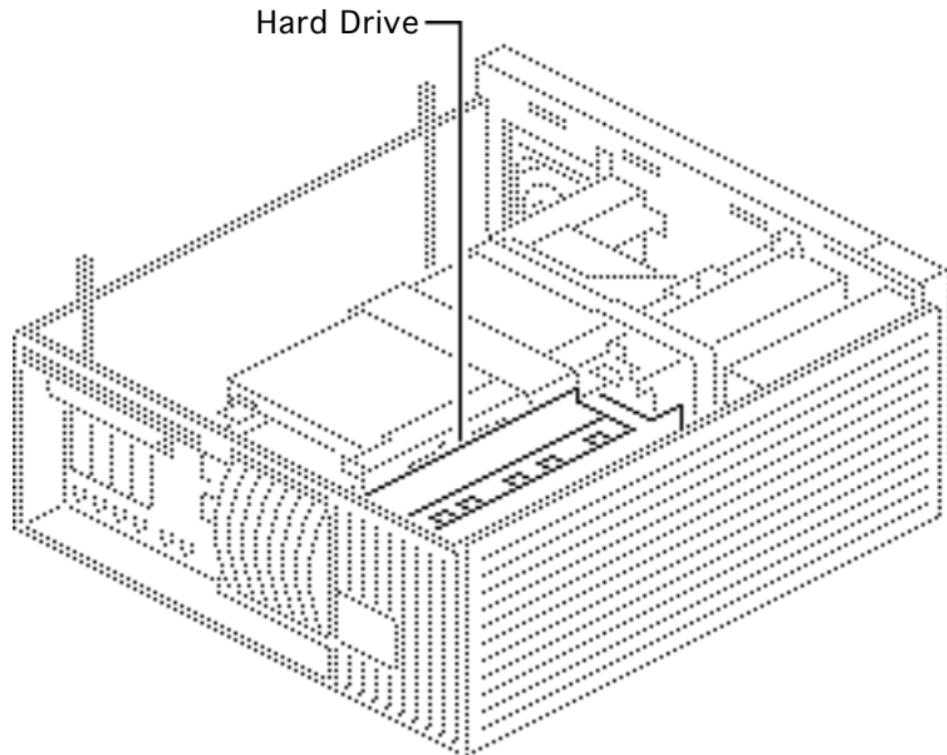
- Cover
- Front panel





- 1 Remove the four screws that secure the floppy drive carrier to the front chassis.
- 2 Lift the floppy drive and carrier out of the computer.





## Hard Drive

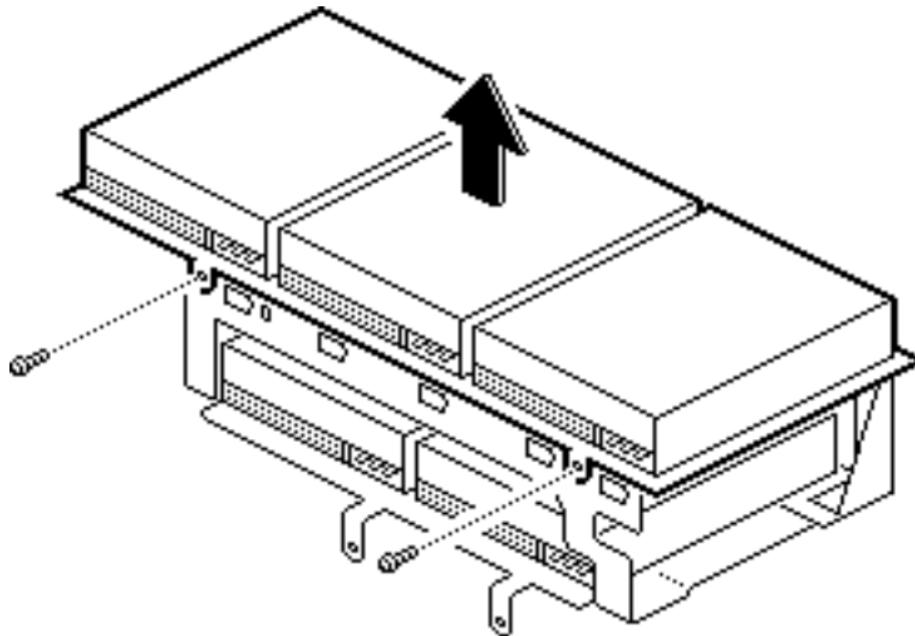
Before you begin, remove the following:

- Cover
- 5-drive carrier

Review the ESD precautions in Bulletins/Safety.

**Important:** If replacing a hard drive in the WS 9150/120, you must first remove the drive's termination resistors. Refer to Additional Procedures ("Modifying 3.5 Drives") in the Hard Drives manual for information.



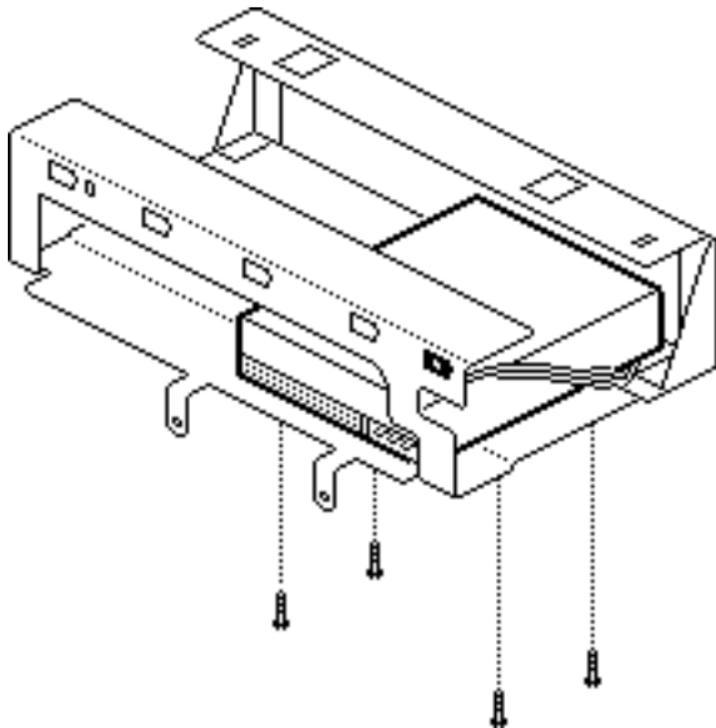


- 1 Remove the two screws that secure the top of the drive carrier to the bottom of the drive carrier.

**Replacement Note:** Be careful not to pinch the cables that run from the SCSI ID select switches.

- 2 Lift off the top of the drive carrier.





- 3 Remove the hard drive mounting screws.
- 4 Lift the hard drive out of the 5-drive carrier.

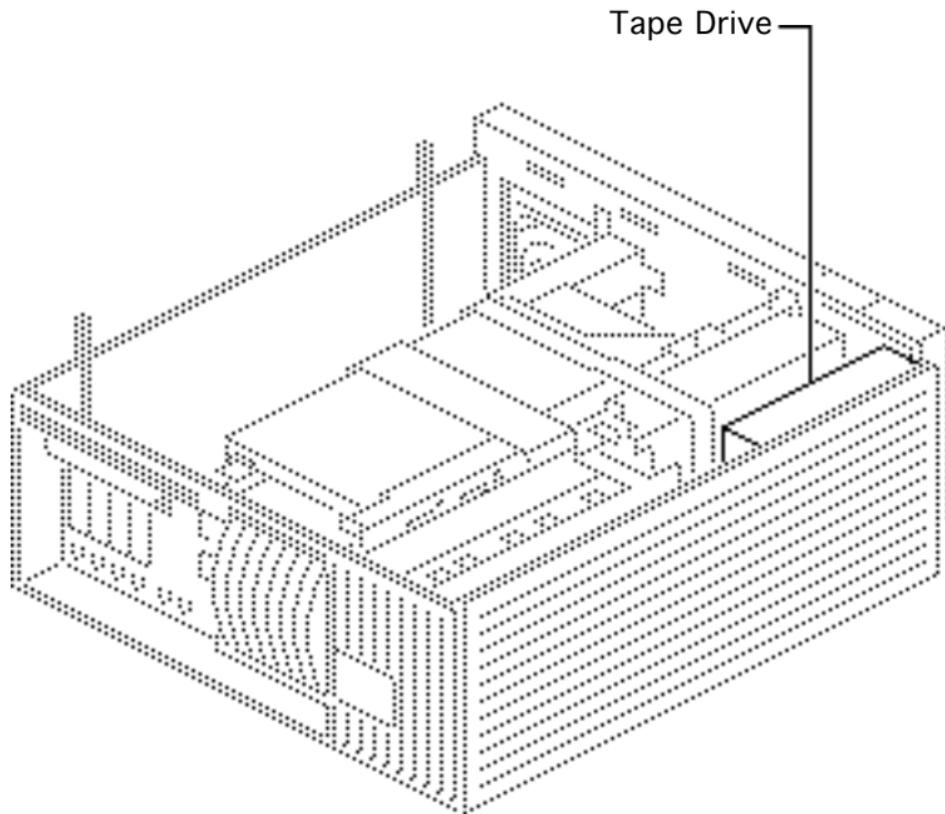
**Replacement Note:** If replacing a hard drive in the WS 9150/120, you must first remove the drive's termination resistors. Refer to Additional Procedures ("Modifying 3.5 Drives") in the Hard Drives manual for more information.





**Replacement Note:** For information on removing the hard drive from the carrier and returning drives, cables, and carriers to Apple, refer to Additional Procedures in the Hard Drives manual.





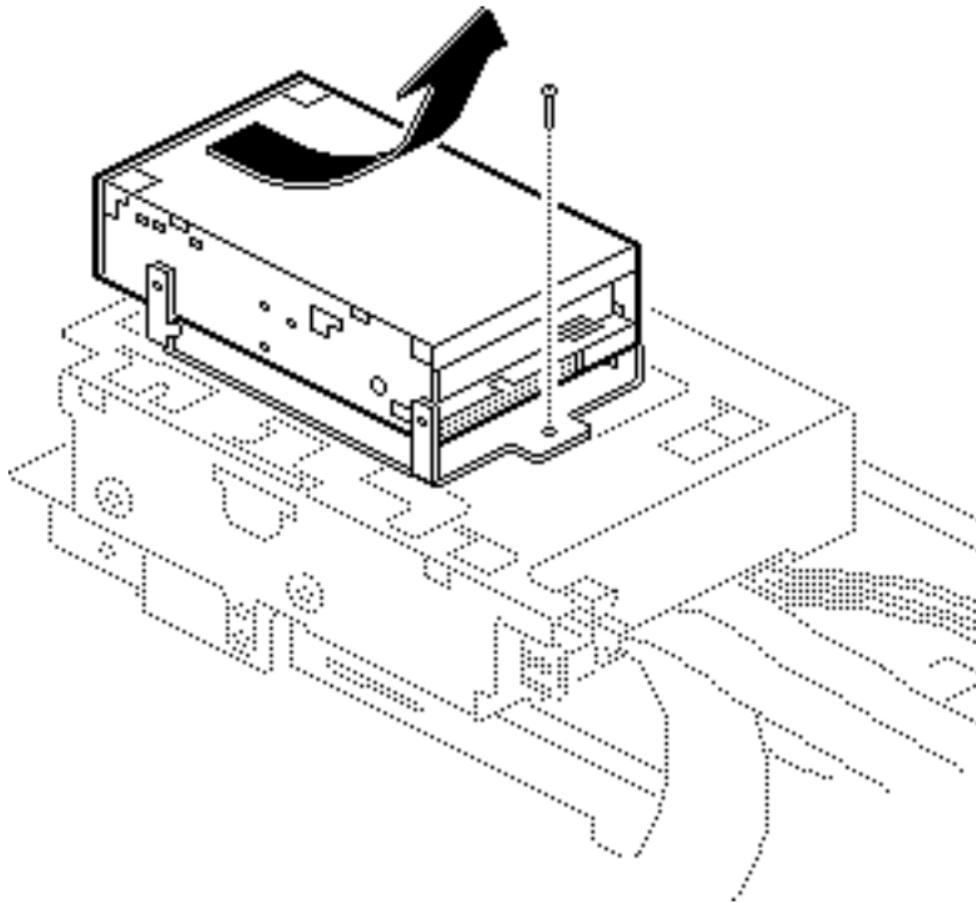
## Tape Drive

Before you begin, remove the following:

- Cover
- 5-drive carrier
- Drive shelf

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





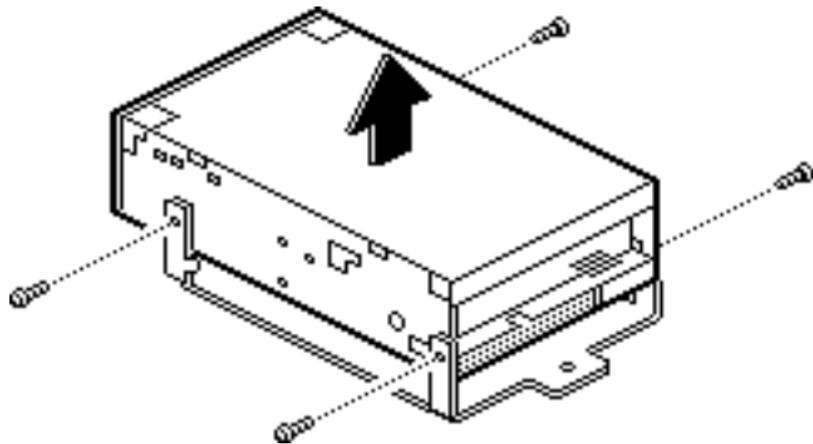
- 1 Remove the screw that secures the tape drive carrier to the drive shelf.
- 2 Lift the tape drive, along with its carrier, from the drive shelf.

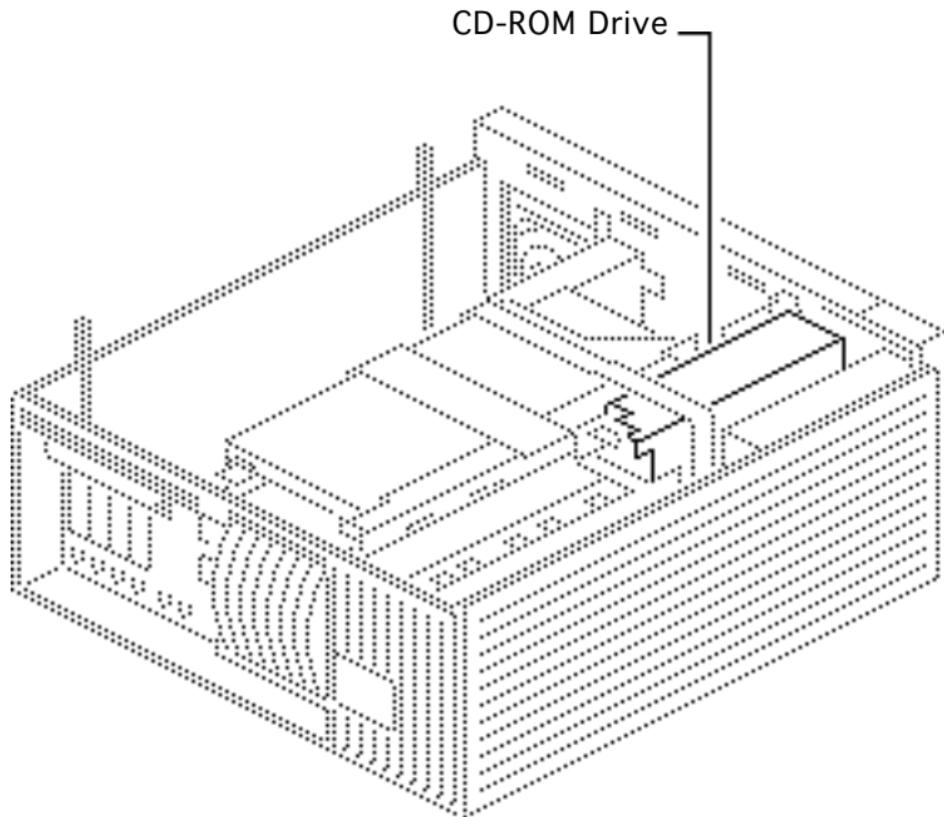




- 3 Remove the four screws that secure the tape drive to its carrier and lift up on the tape drive to remove it.

**Note:** Before returning the tape drive to Apple, you must remove it from its carrier.



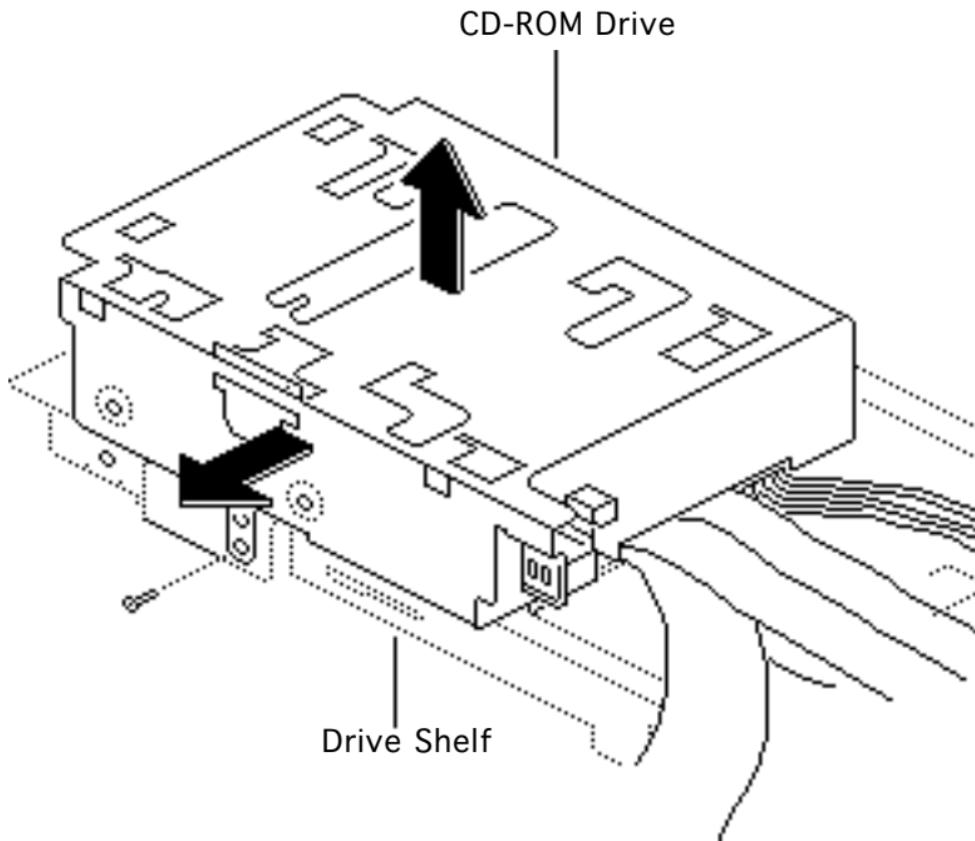


## CD-ROM Drive

Before you begin, remove the following:

- Cover
- 5-drive carrier
- Drive shelf
- Tape drive



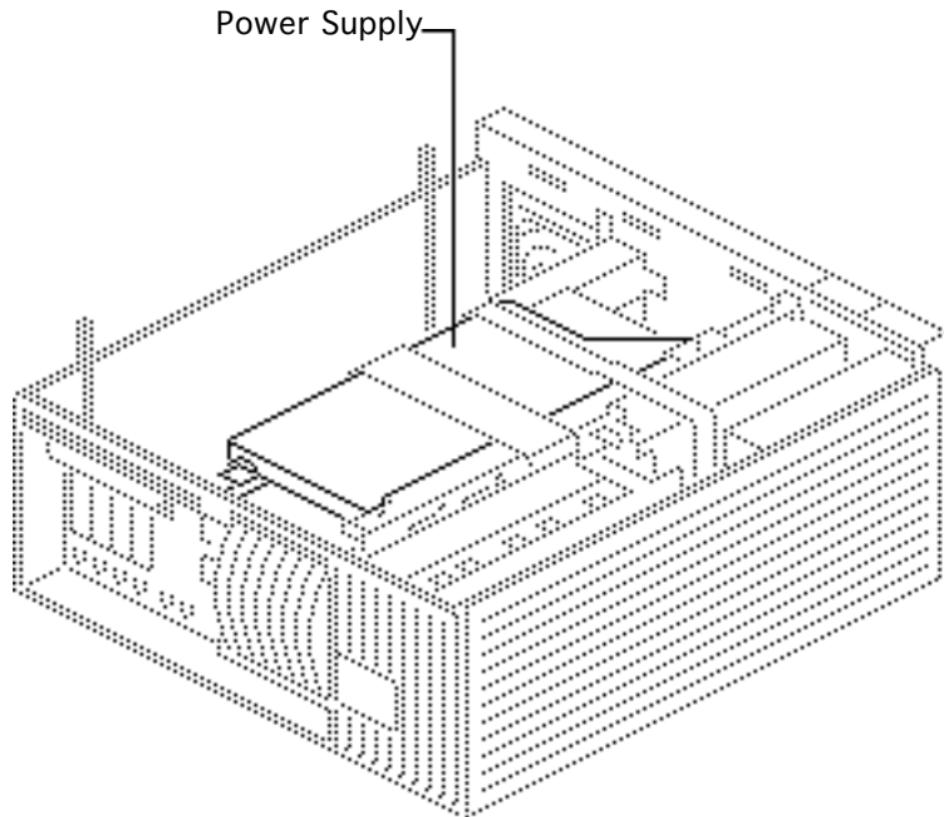


- 1 Remove the one screw that secures the CD-ROM drive to the drive shelf.
- 2 Lift the CD-ROM drive, along with its carrier, from the drive shelf.

**Replacement Note:** Feed the four metal tabs on the bottom of the CD-ROM drive carrier through the appropriate openings in the drive shelf.

**Replacement Note:** Run the CD-ROM power cable through the Velcro strap on the side of the drive shelf.





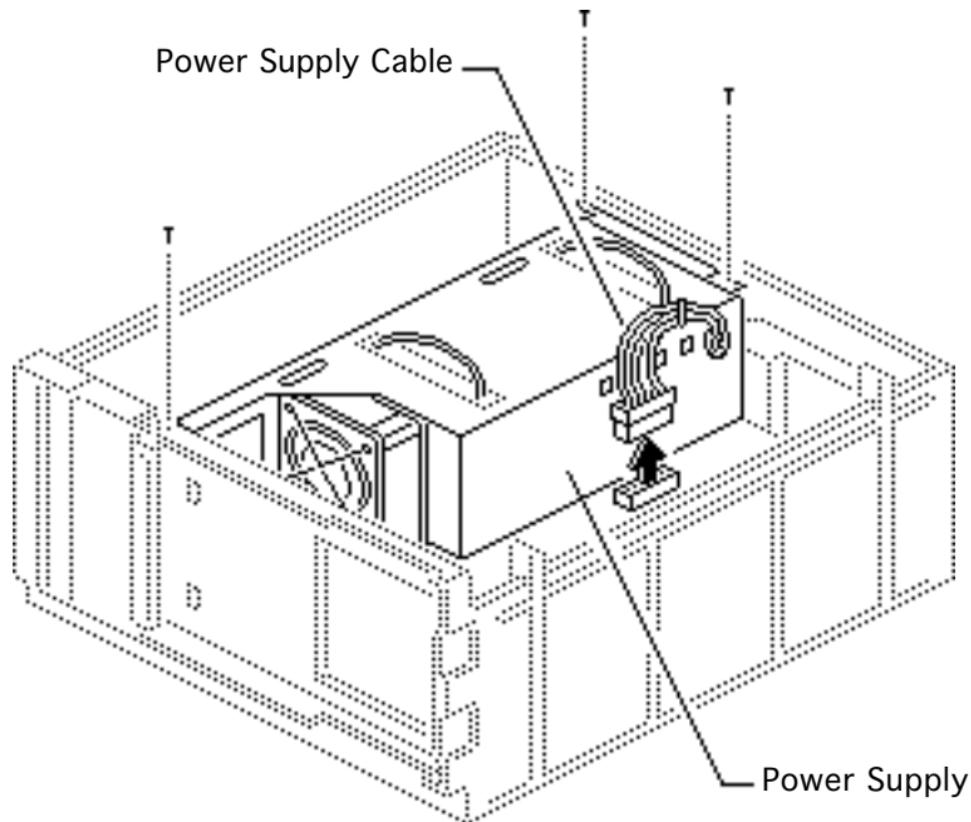
## Power Supply

Before you begin, remove the following:

- Cover
- 5-drive carrier
- Drive shelf

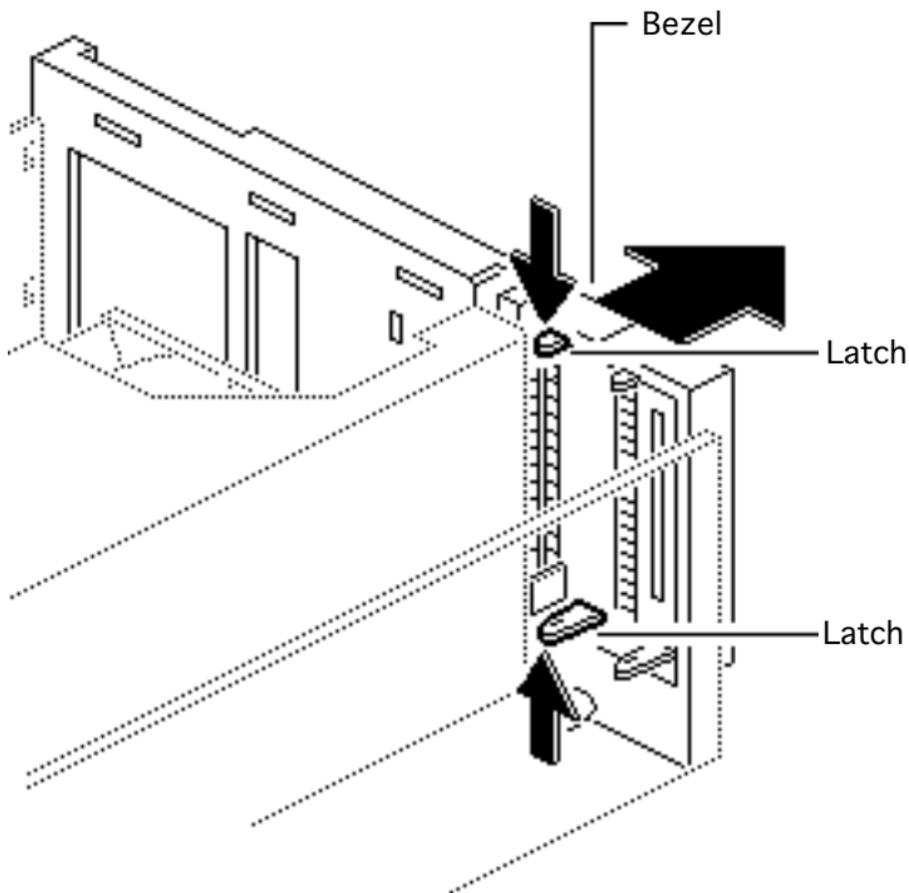
**Note:** The WS 9150/120 has a processor fan that attaches to the underside of the power supply and plugs into the logic board. You must unplug this fan before removing the power supply.





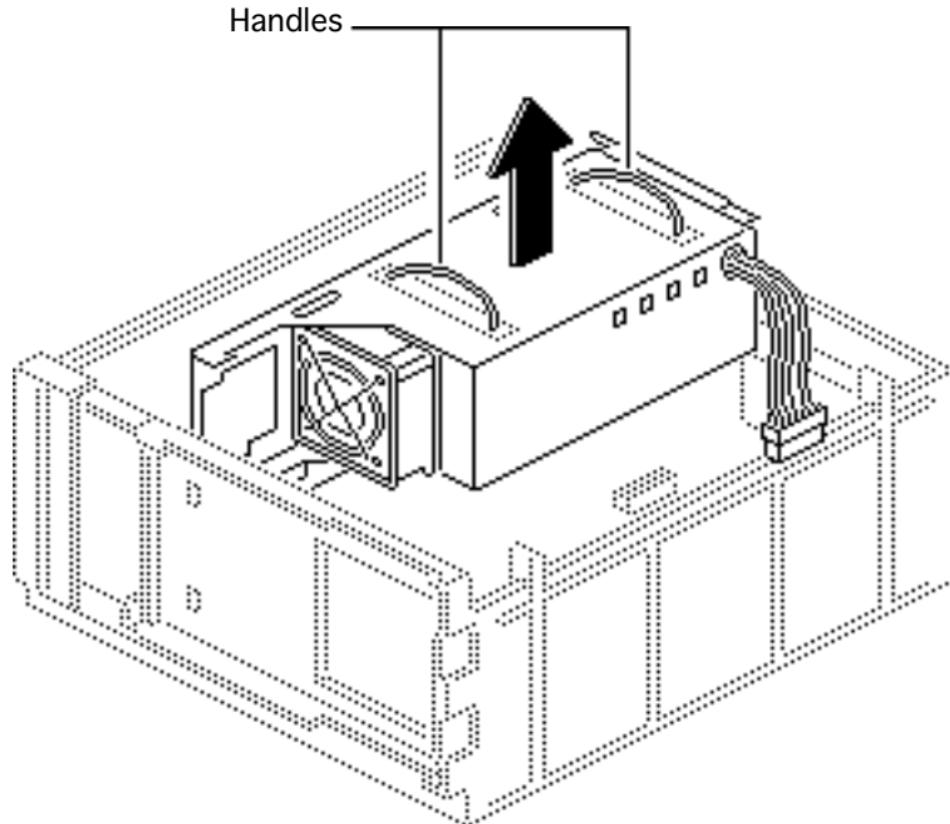
- 1 Disconnect the power supply cable from the logic board.
- 2 Remove the three power supply mounting screws.





- 3 Release the two plastic latches on the inside of the CD-ROM bezel and remove the bezel.





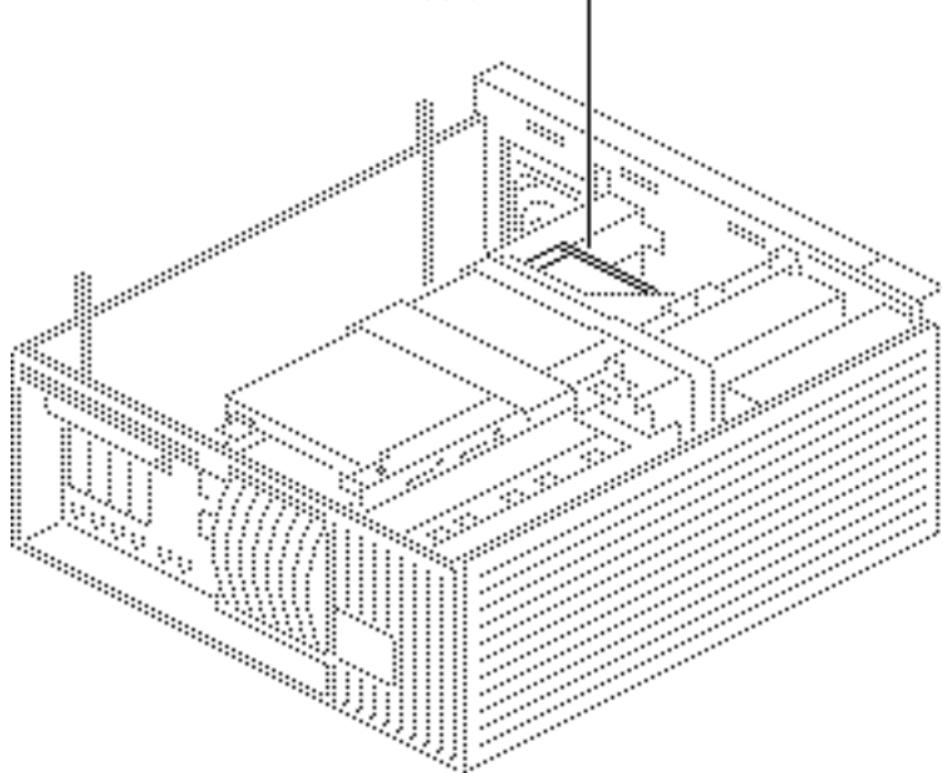
- 4 **Note:** If you are servicing a Workgroup Server 9150/120, you must disconnect the processor fan from the logic board before removing the power supply. The processor fan attaches to the underside of the power supply.

Grasp the two handles and, pulling evenly, lift the power supply straight up out of the computer.





Power Supply Fan

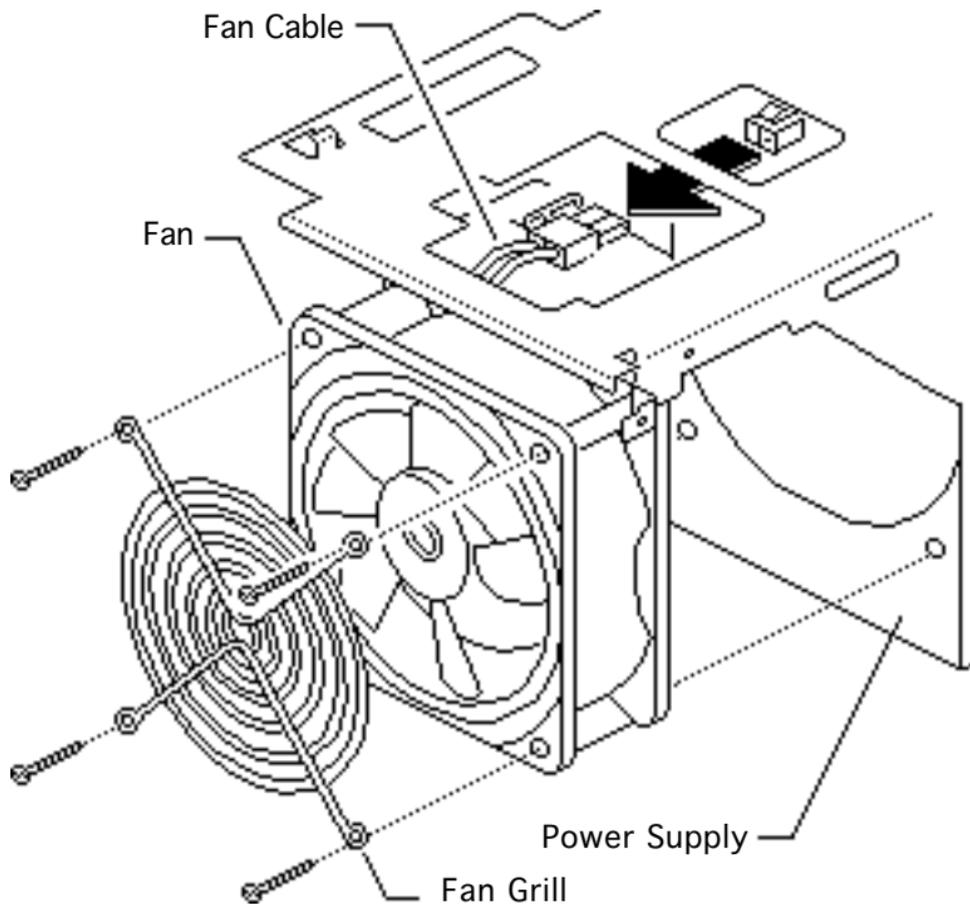


## Power Supply Fan

Before you begin, remove the following:

- Cover
- 5-drive carrier
- Drive shelf
- Power supply





- 1 Disconnect the fan cable from the power supply.
- 2 Remove the four fan mounting screws.
- 3 Remove the fan and fan grill from the power supply.



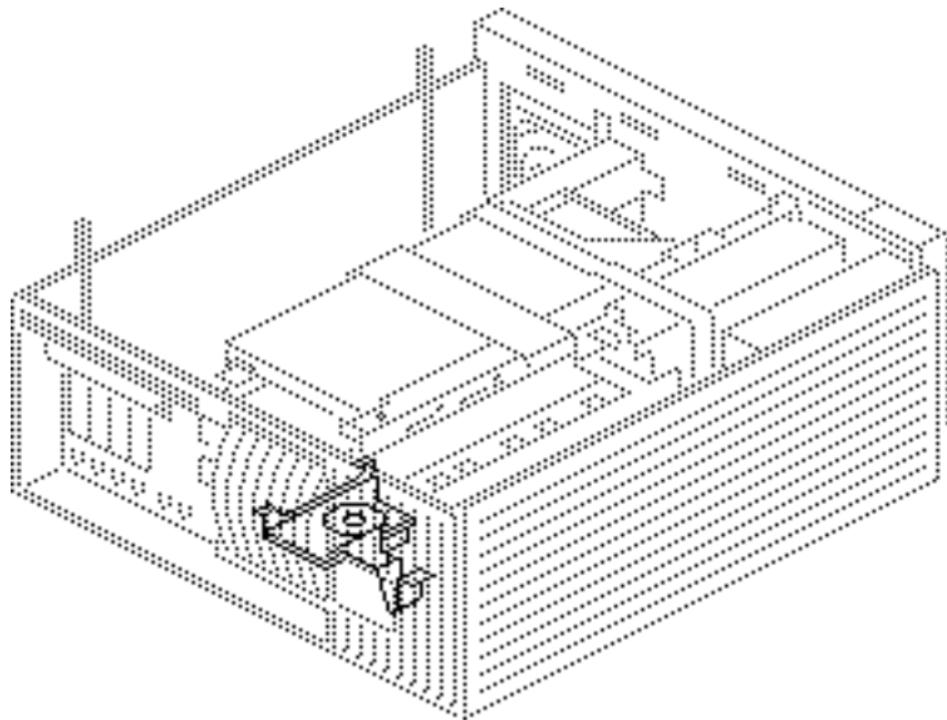


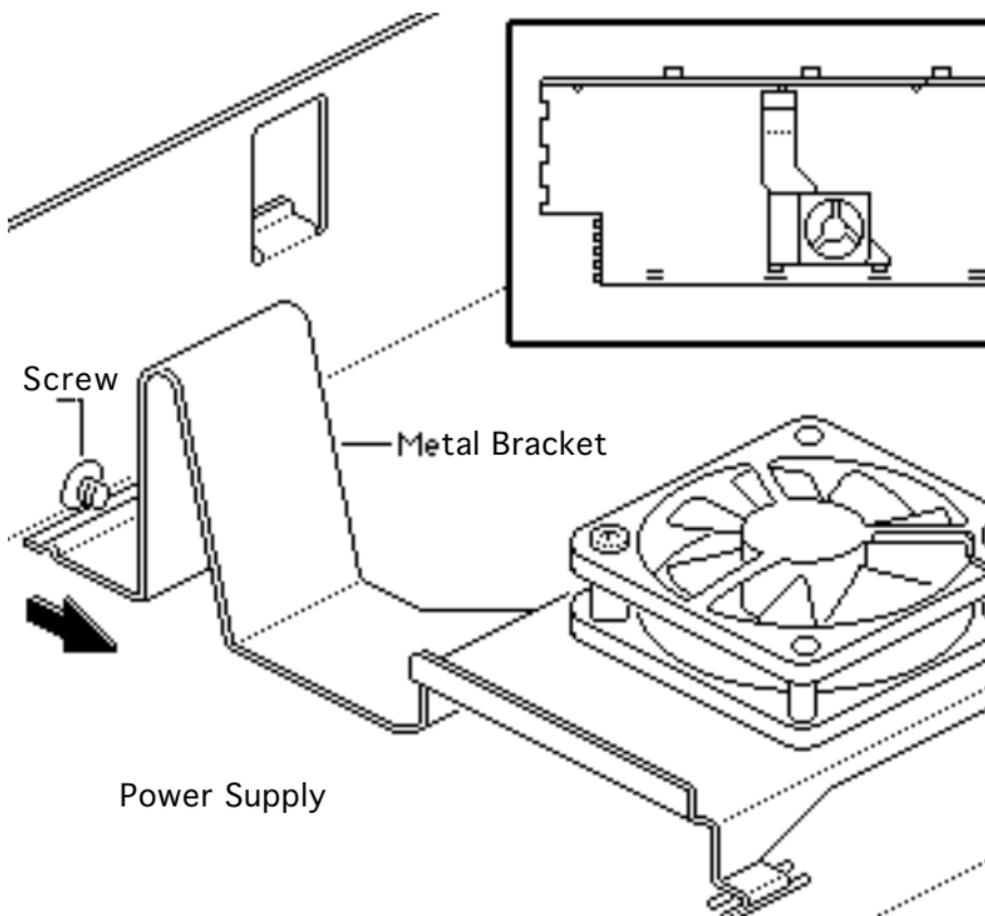
## Processor Fan

Before you begin, remove the following:

- Cover
- 5-drive carrier
- Drive shelf
- Power supply

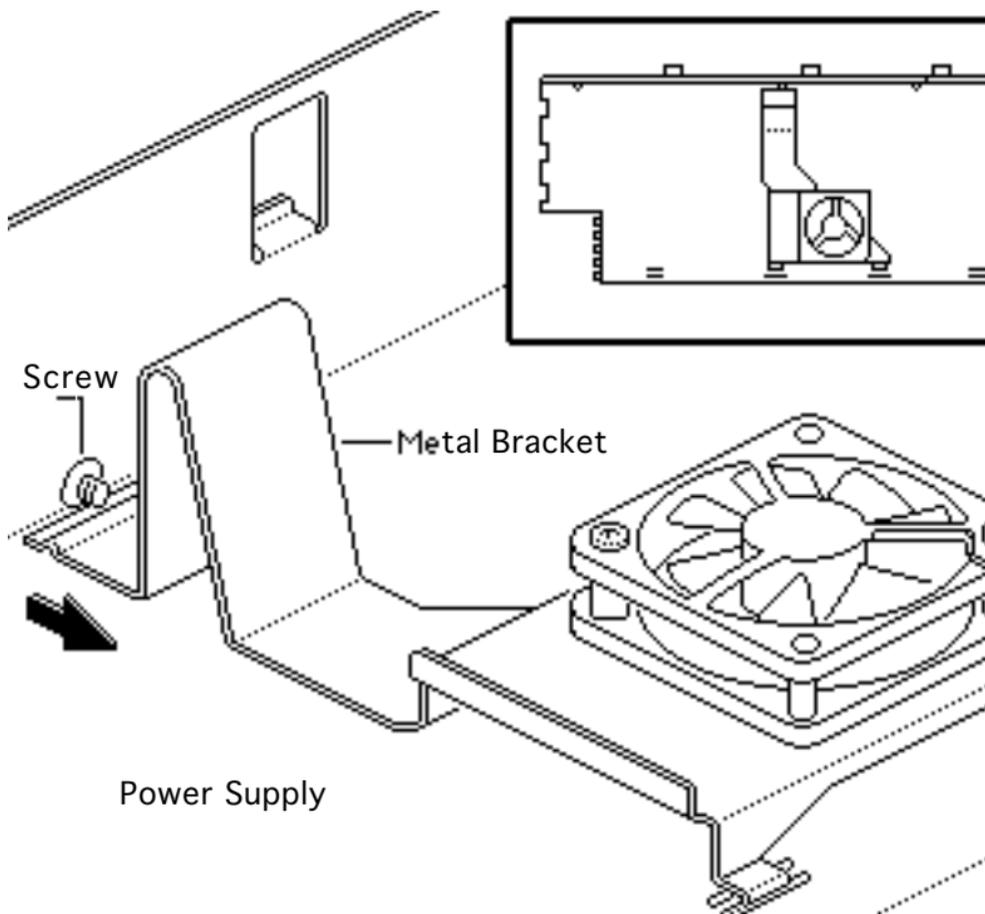
**Note:** The processor fan attaches to the underside of the power supply and plugs into the logic board.





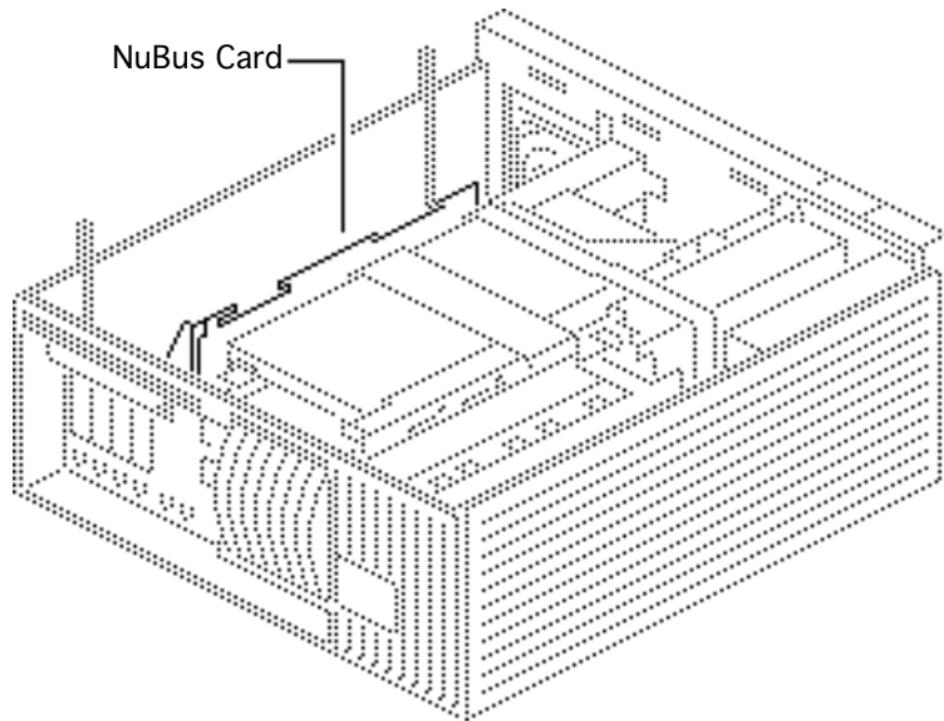
- 1 Pull back on the processor fan's metal bracket until it clears the screw securing it to the power supply.
- 2 Lift up on the bracket to remove it from the power supply.





**Replacement Note:** The processor fan attaches to the middle of the power supply on the underside. Position the fan bracket at a 90 degree angle to the power supply. Insert the two tabs on the bottom of the bracket into the metal slots on the power supply. Lay the fan and bracket flat against the power supply and push the end of the metal bracket under the screw that secures it to the power supply.





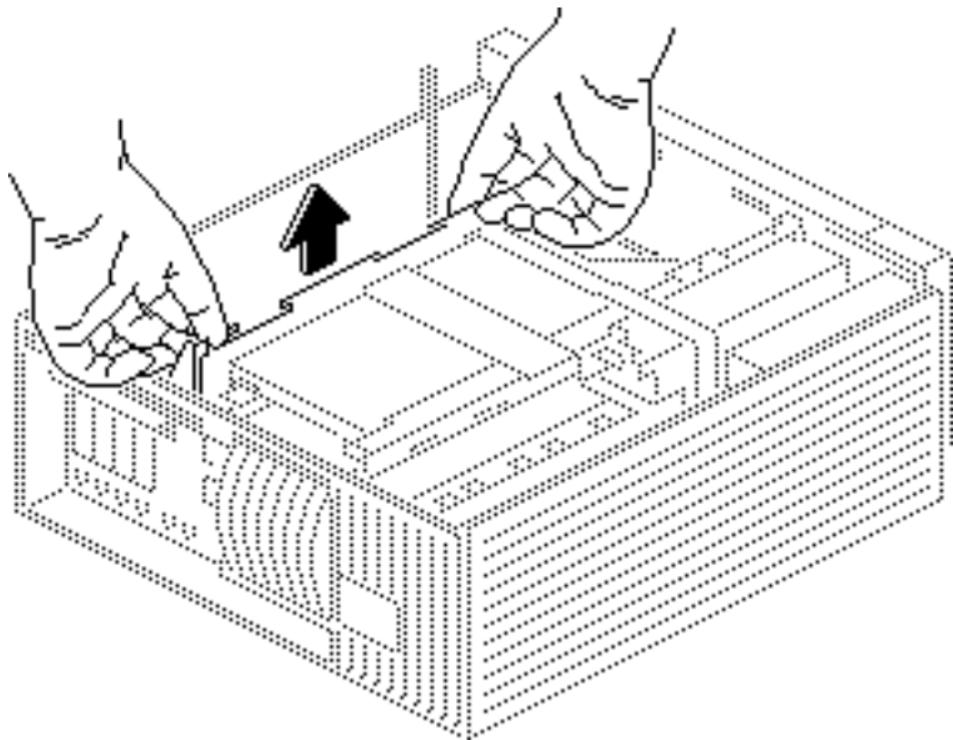
## NuBus Cards

Before you begin, remove the cover.

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

**Caution:** You must unplug the computer prior to removing or installing NuBus cards. Failure to unplug the computer could cause damage to the logic board and/or cards.





**Caution:** In the next step, pull up evenly on both sides of the card to avoid bending the connector pins.

Carefully grasp each end of the card and pull up to remove it.

**Note:** Grasp the rear of the card by the metal bracket.

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



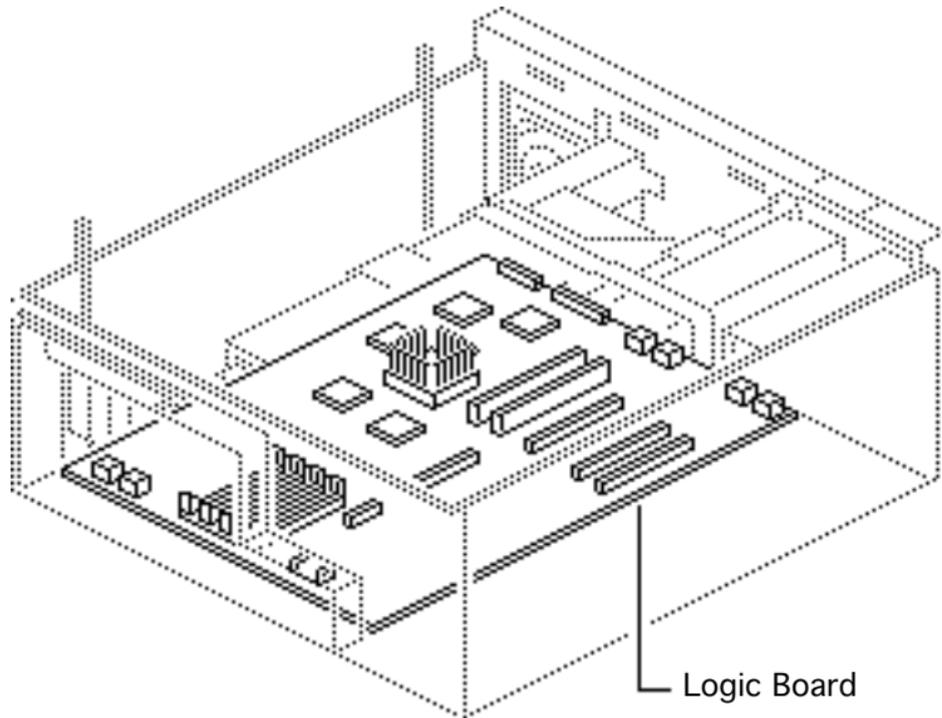


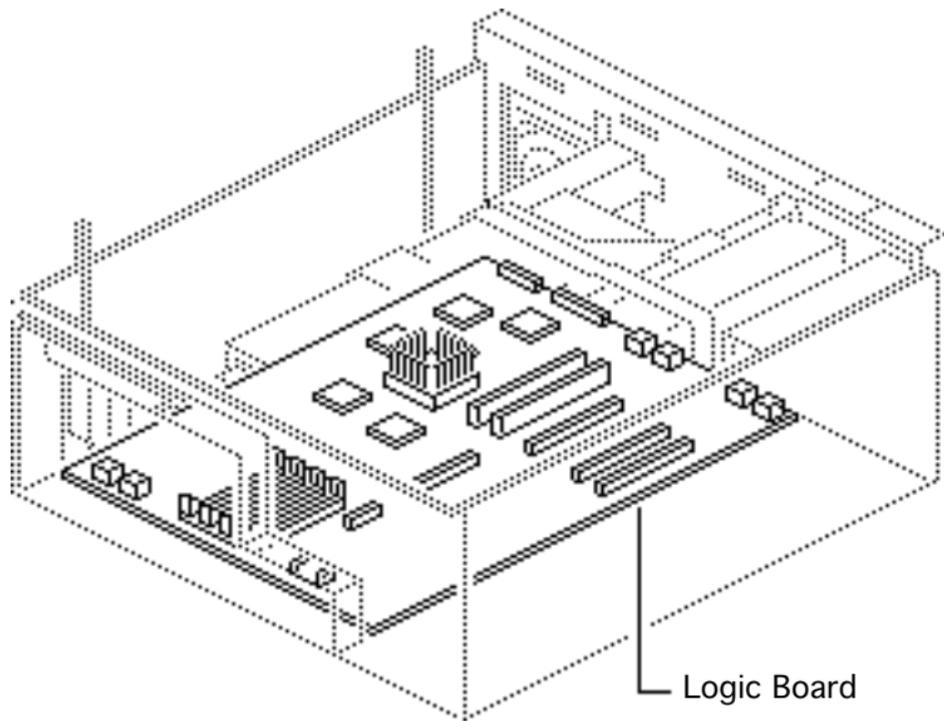
## Logic Board

Before you begin, remove the following:

- Cover
- 5-drive carrier
- Drive shelf
- Power supply
- NuBus cards

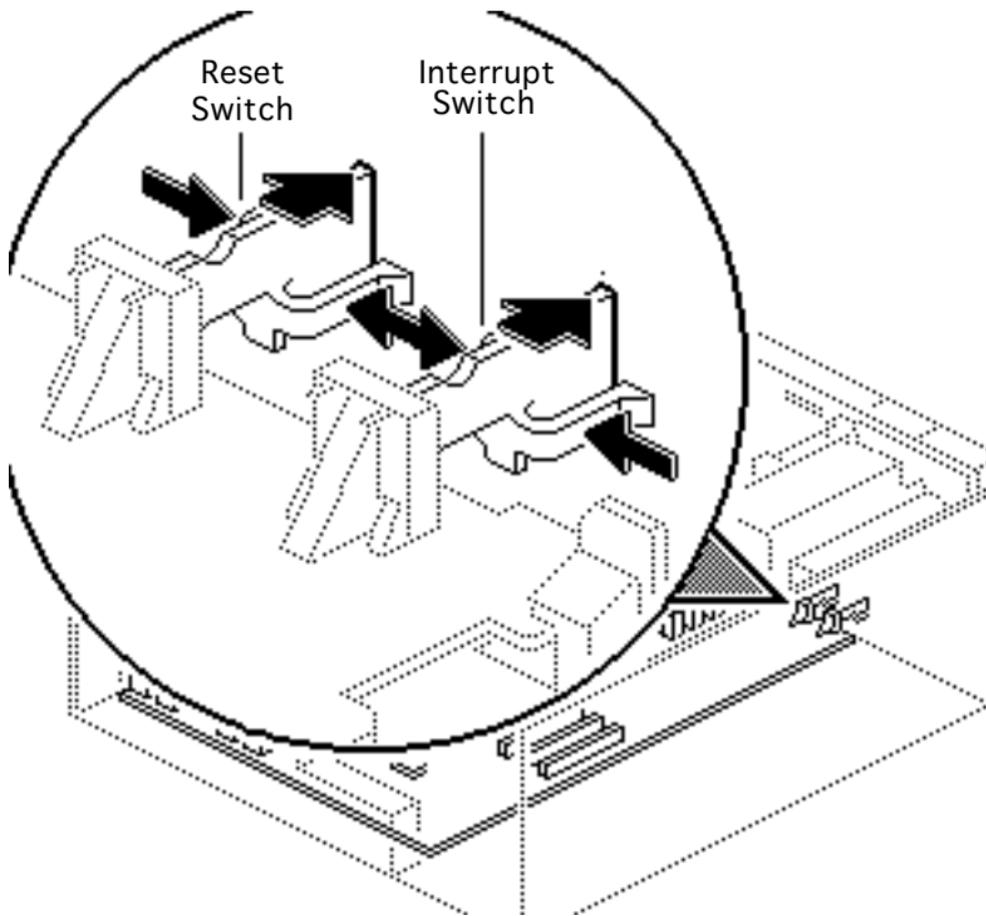
**Caution:** Unplug the computer prior to removing NuBus cards or you may damage the logic board and/or cards.





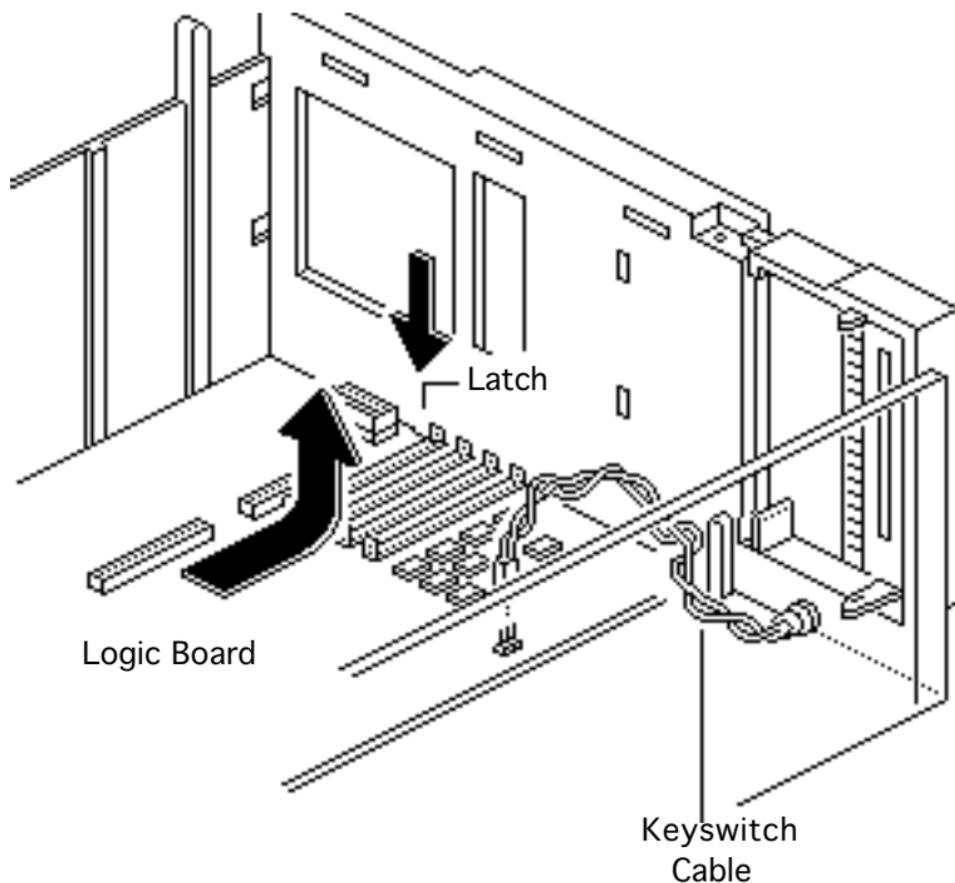
**Note:** When returning the logic board to Apple, return it with the ROM SIMM and terminator card (located in the Power Macintosh video slot) installed, but remove the cache and DRAM SIMMs before returning the board.





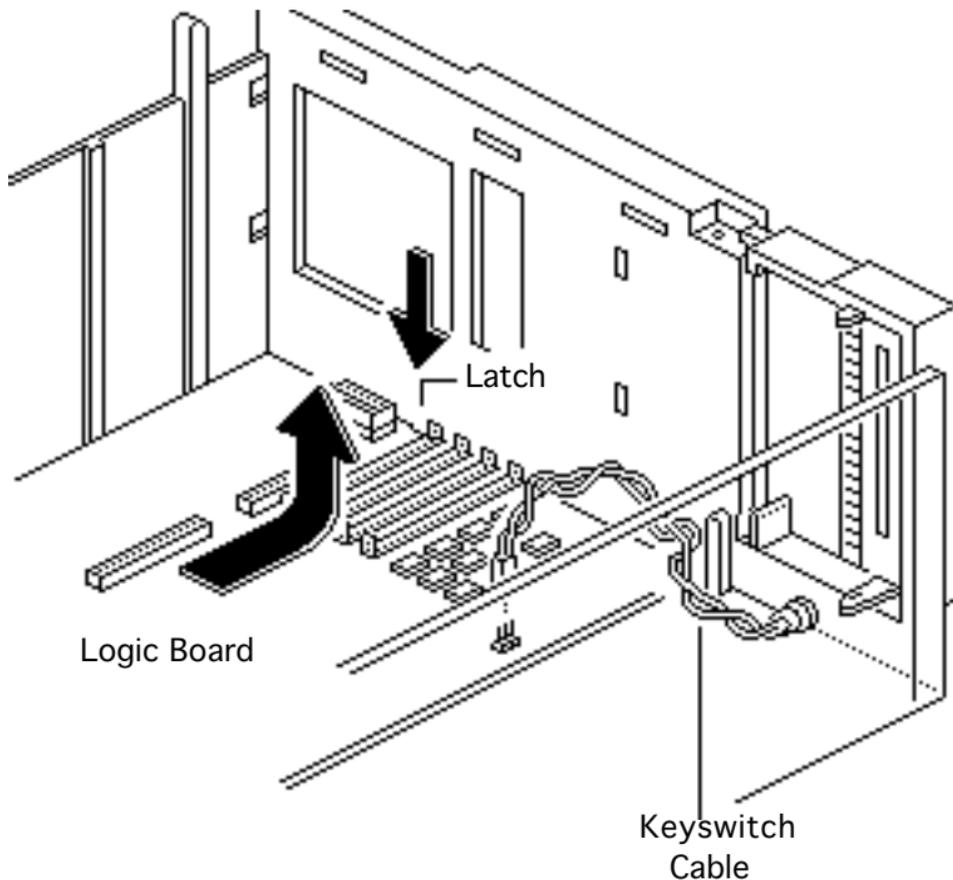
- 1 Press in on the sides of the interrupt and reset switches and push them out of the case.





- 2 Disconnect the keyswitch cable from the logic board.
- 3 Press down on the latch and slide the logic board toward the front of the computer.
- 4 Lift the logic board, front first, from the computer.





**Replacement Note:**  
Remove any DRAM SIMMs from the defective logic board and install them on the replacement logic board provided they are in matching pairs. If there is a cache SIMM on the defective logic board, remove it and install it on the replacement board.



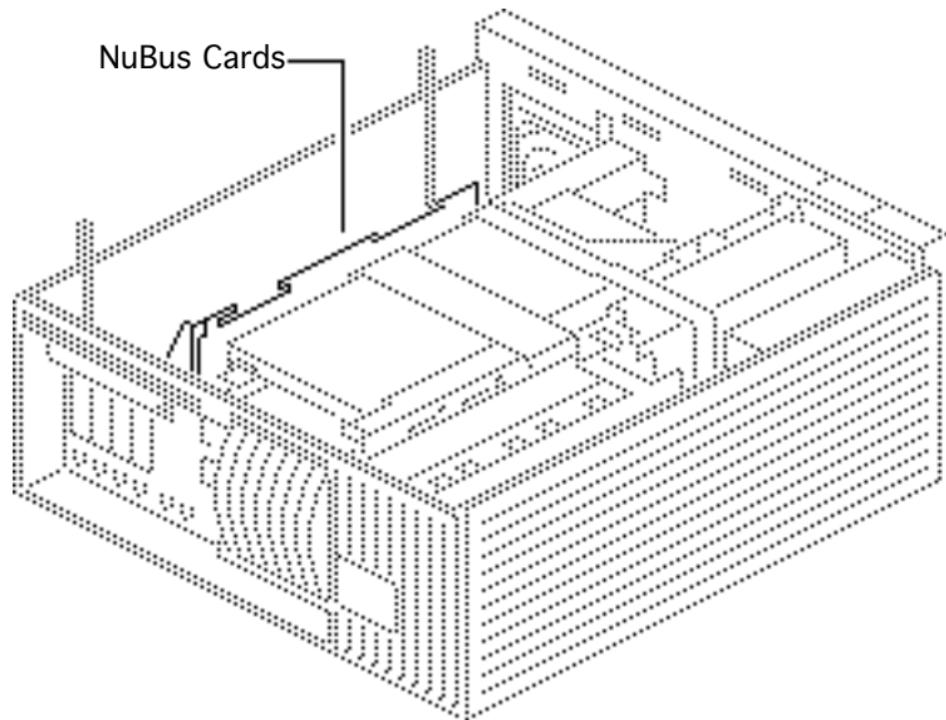


## Upgrades

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Workgroup Server 9150





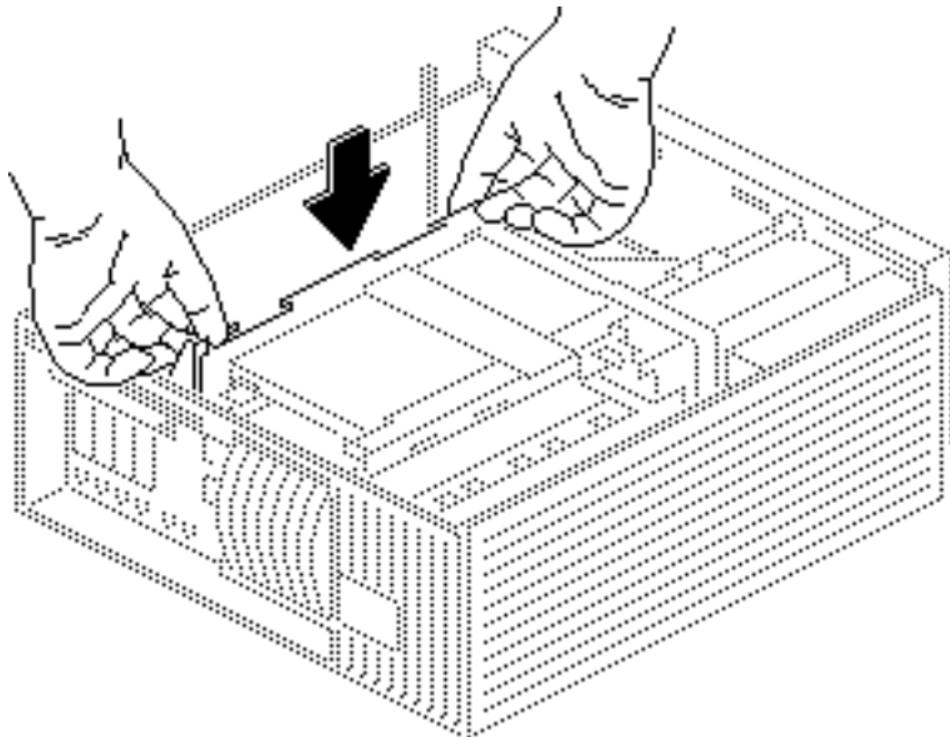
## NuBus Cards

Before you begin, remove the cover.

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

**Caution:** You must unplug the computer prior to removing or installing NuBus cards. Failure to unplug the computer could cause damage to the logic board and/or cards.





Gently push down on each end of the card to install it in the NuBus slot.

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

**Note:** When removing a NuBus card, pull up evenly on both sides of the card to avoid bending the connector pins.





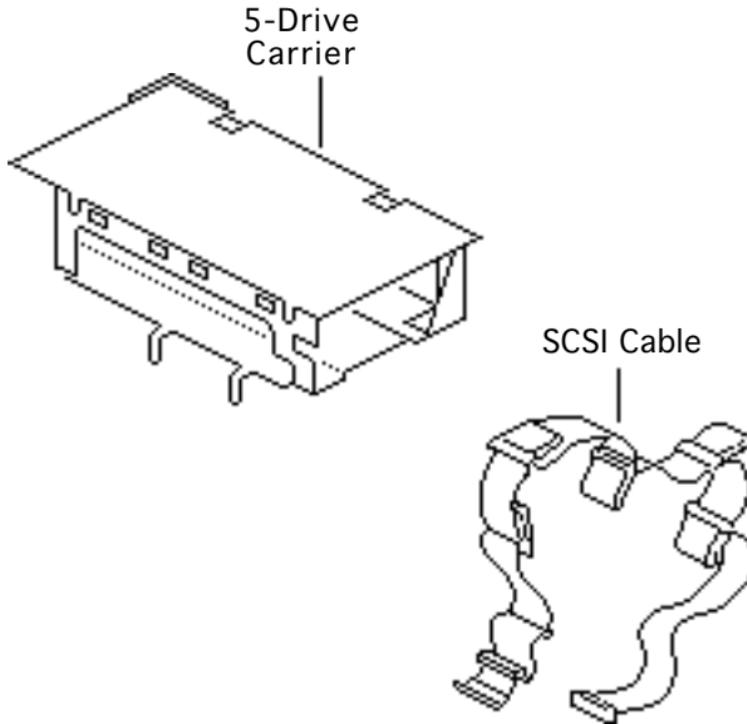
## Hard Drive Upgrades

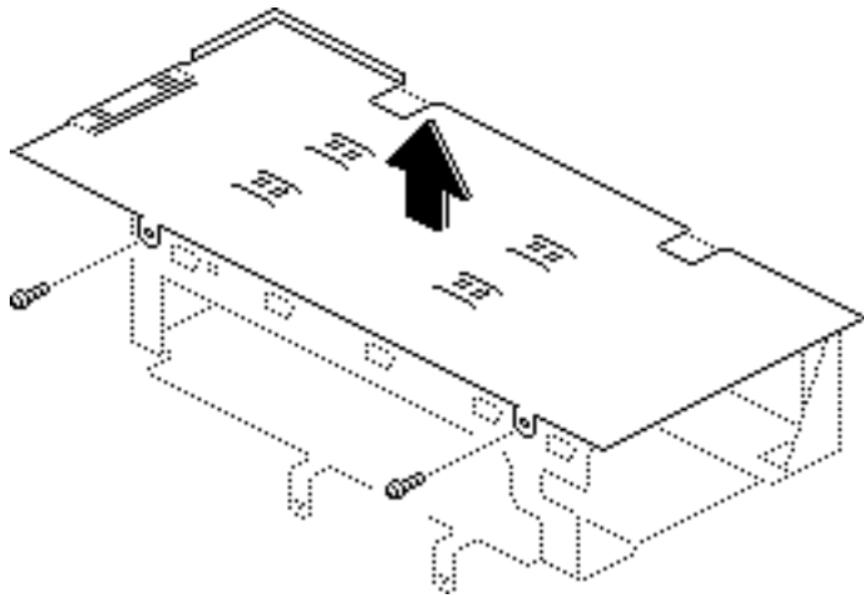
Before you begin, remove the following:

- Cover
- 5-drive carrier

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

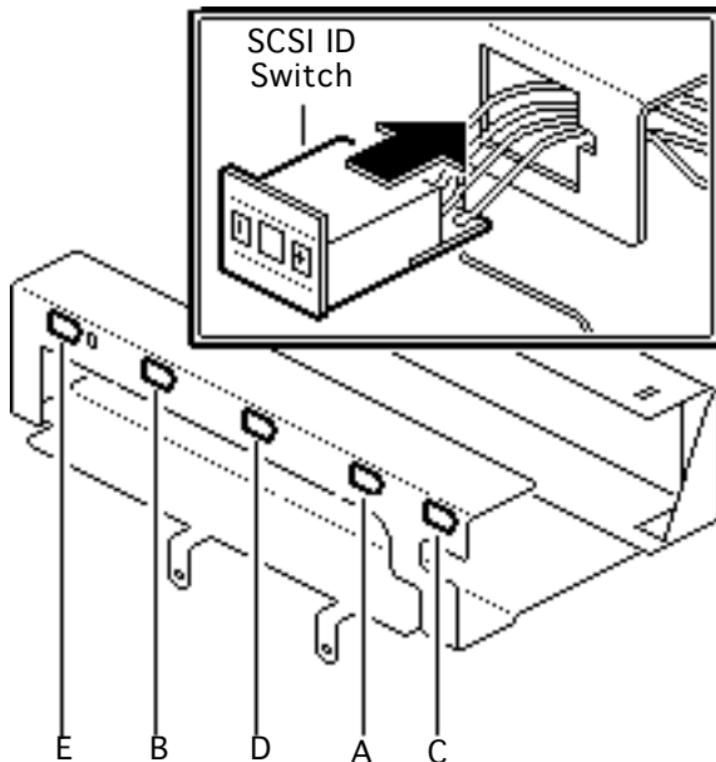
The WS 9150 hard drive carrier holds up to five hard drives. This procedure explains how to install drives in the carrier and how to connect the SCSI cable.





- 1 Remove the two screws that secure the top of the 5-drive carrier to the bottom piece.
- 2 Remove the top piece of the drive carrier.



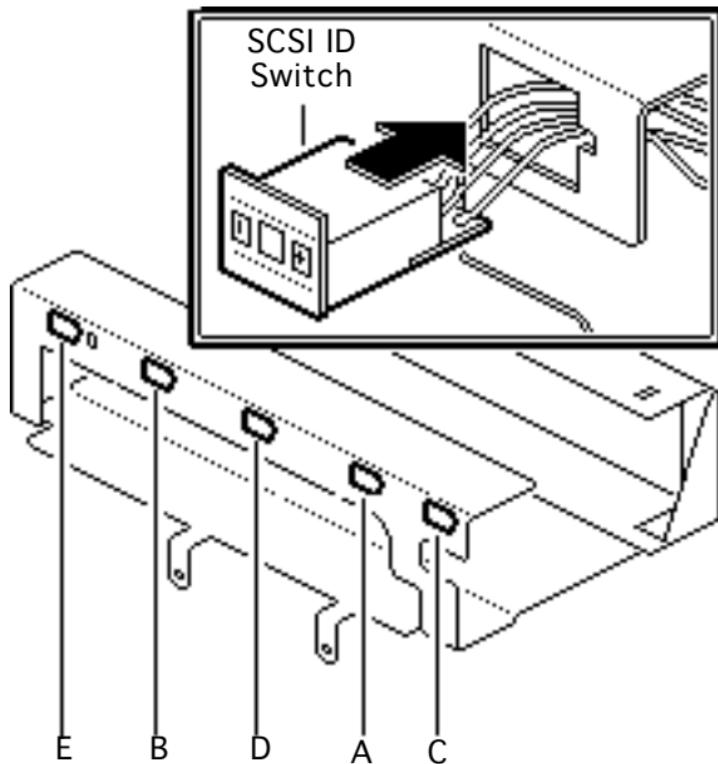


- 3 There are five openings in the bottom panel of the drive carrier for the SCSI ID switches. The openings are labeled A-E.

**Note:** The type of SCSI ID switch you install will depend on the drive type.

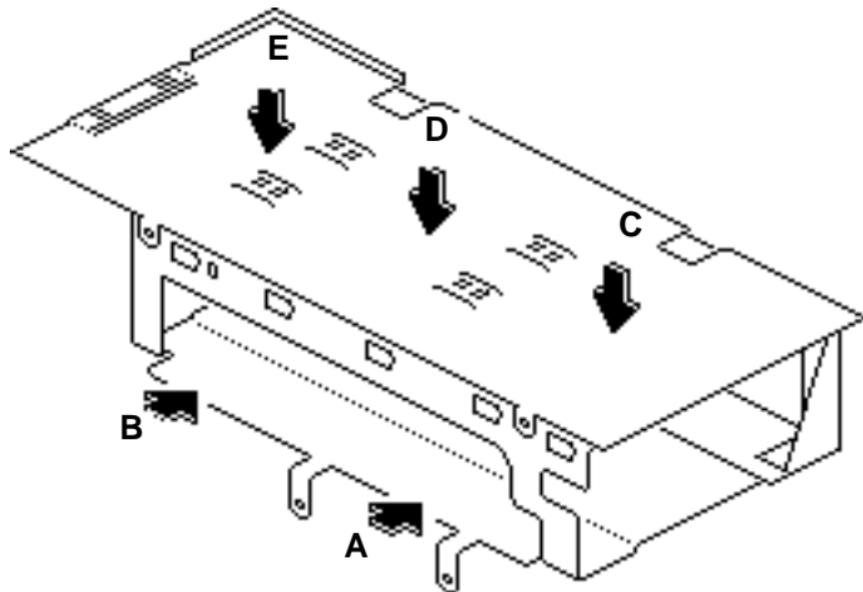
Install the SCSI ID switch for the first drive by feeding the connector end of the SCSI ID cable through the opening labeled A on the drive carrier.





- 4 Push in on the SCSI ID switch until it clicks into place.
- 5 Repeat this procedure to install the remaining SCSI ID switches.

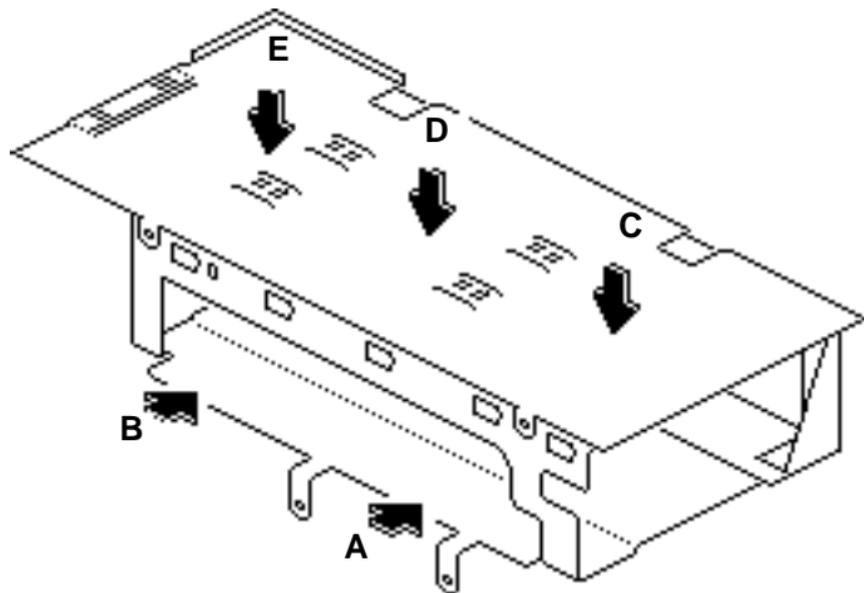




- 6 Connect the free end of the first SCSI ID switch cable to the first hard drive, which you will be installing in drive slot A.

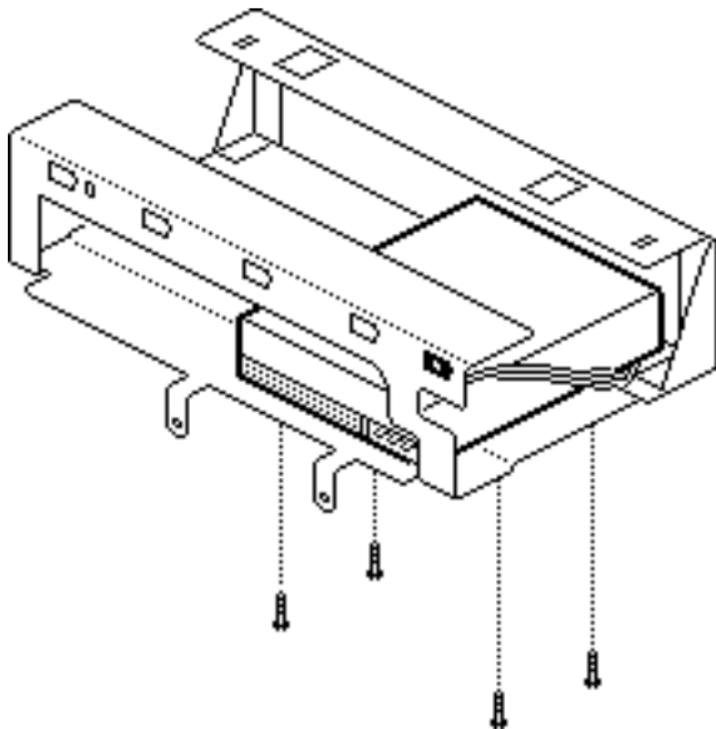
**Note:** When setting the SCSI ID switches, make sure no two peripherals, including the tape drive, are using the same SCSI ID. Also, do not set any of the SCSI ID switches to 7.





**Note:** Hard drives must be installed in the five-drive carrier in the order shown. If you install fewer than five drives, you must still install the drives in the order shown.

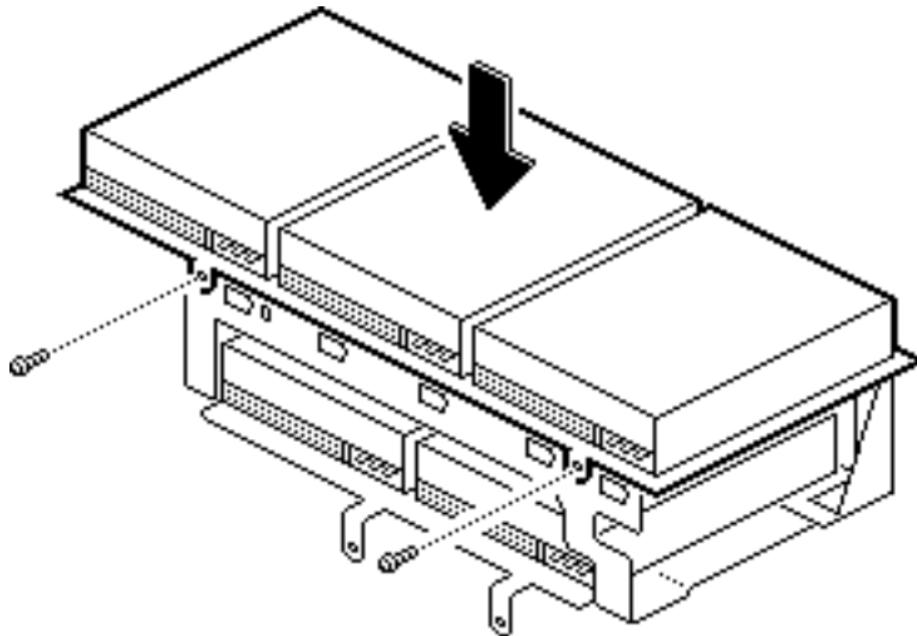




**Note:** Remove the terminating resistors from the drives before installation.

- 7 Install the first hard drive in slot A (the lower right slot) of the drive carrier.
- 8 Insert the four screws that secure the hard drive to the drive carrier. Tighten the screws. Follow this procedure to install up to four additional hard drives in the order previously shown.

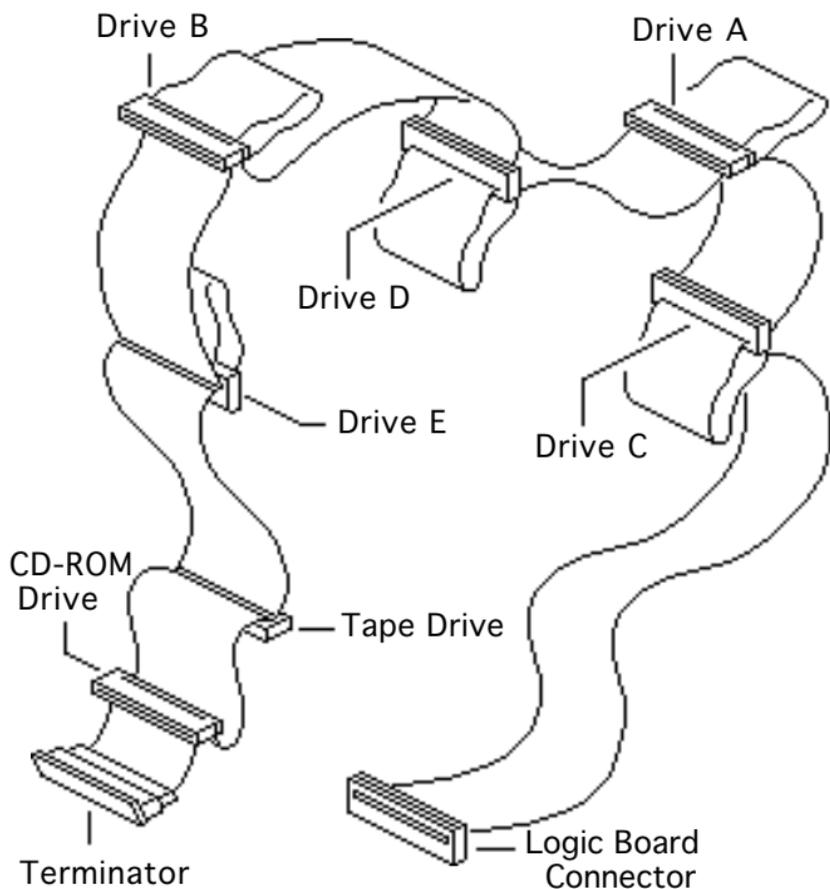




- 9 Once you have installed all the hard drives, replace the top of the carrier.
- 10 Replace the two screws that secure the top of the drive carrier to the bottom of the drive carrier.

**Caution:** Be careful not to pinch the cables that run from the SCSI ID select switches.



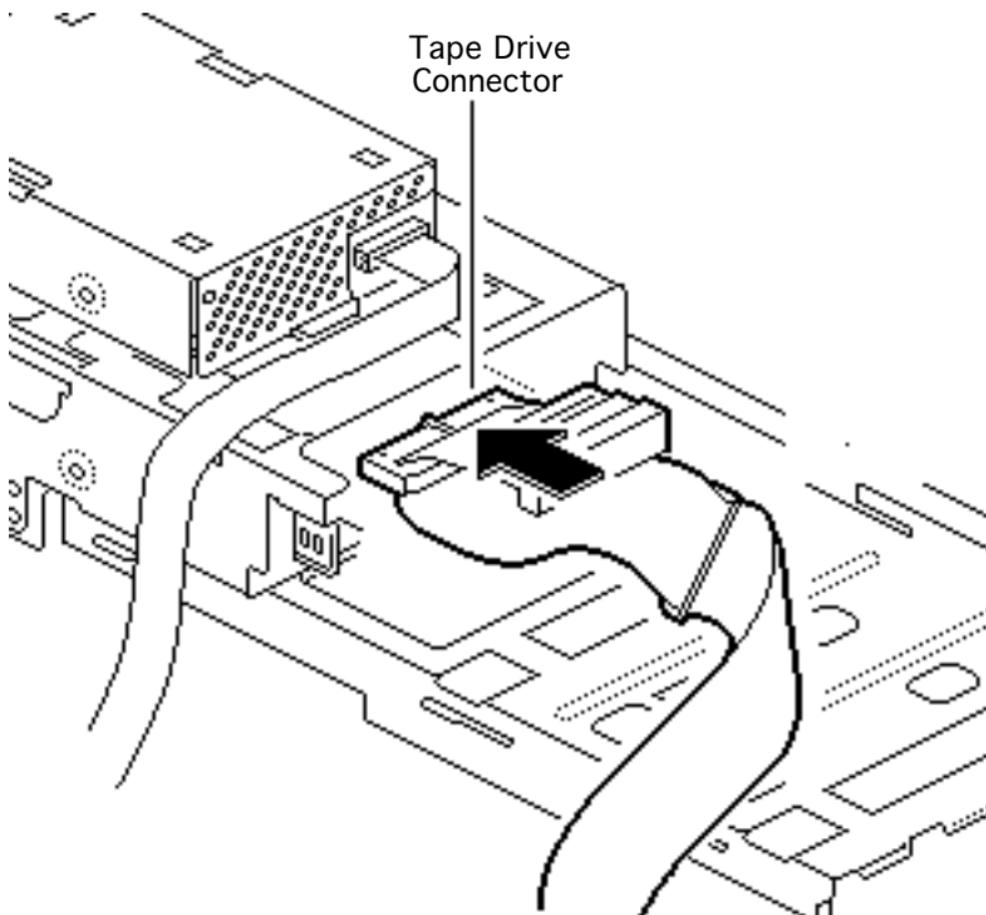


The SCSI cable connects up to five hard drives and one tape drive. The illustration on this page indicates which connectors attach to which peripherals. The pull tabs on the cable are marked as illustrated.

**Note:** Connect the tape drive first. (See next page.)

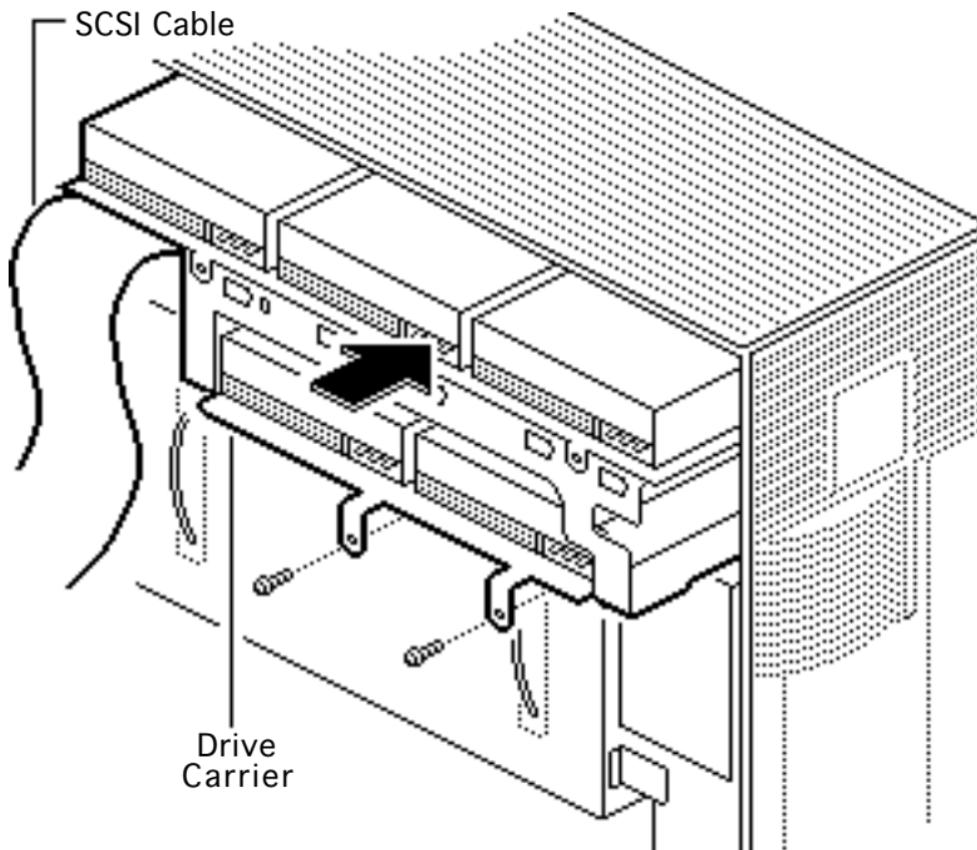
**Note:** If fewer than six peripherals are present, leave the connectors for the missing peripherals disconnected.





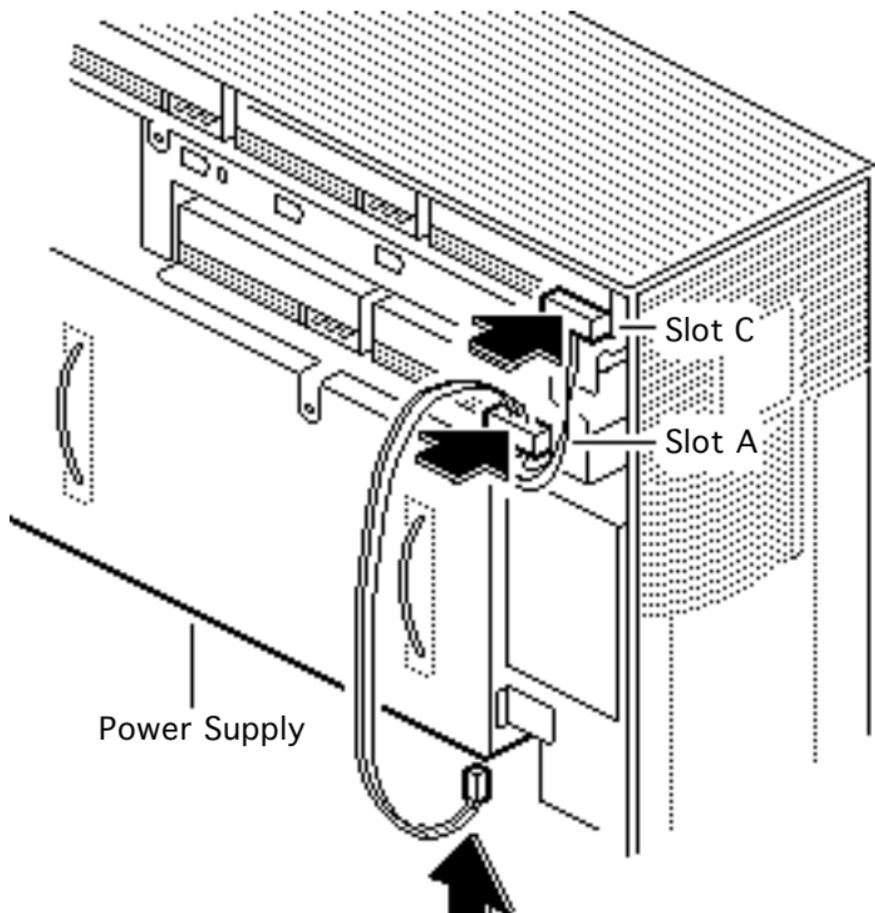
- 11 Attach the end of the SCSI cable to the connector on the tape drive (if present).
- 12 Pull through the cable that connects the floppy drive to the logic board so the cable will not obstruct the insertion of the drive carrier.





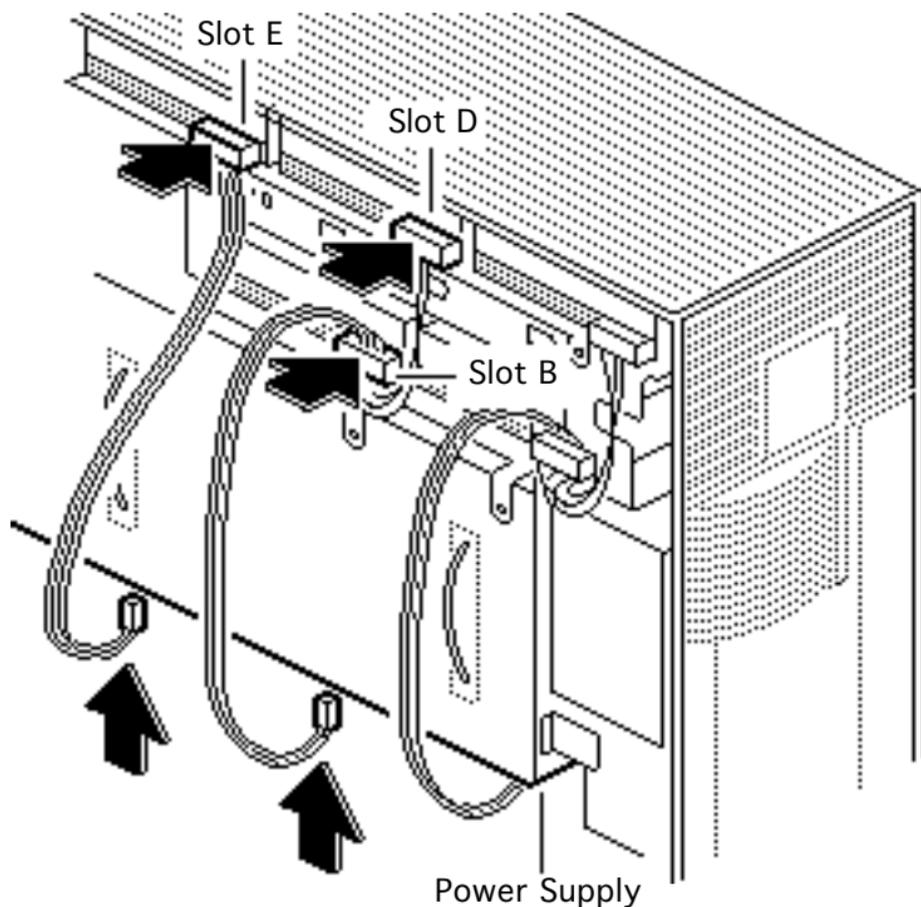
- 13 Hold up the five-drive SCSI cable so that it does not obstruct the insertion of the drive carrier.
- 14 Insert the drive carrier in the upper right area of the tower (above the power supply).
- 15 Insert the two screws that secure the drive carrier to the metal frame. Tighten the screws.





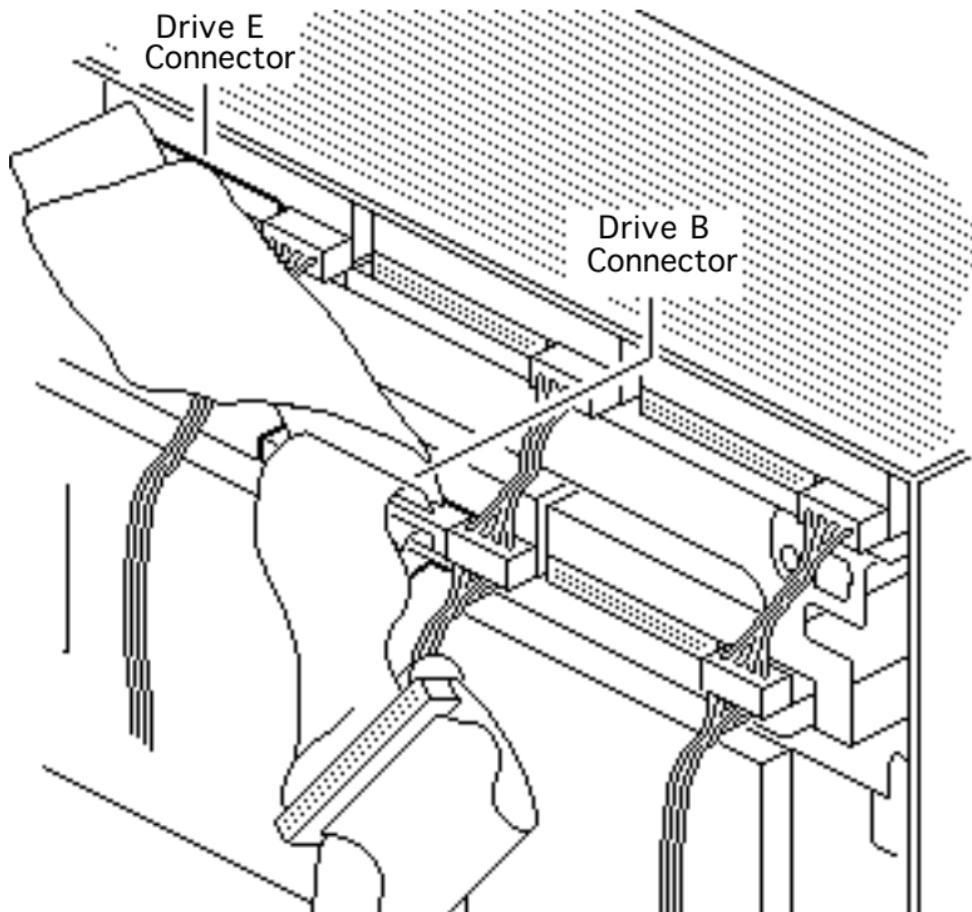
- 16 Attach the second connector on one of the hard drive power cables to the drive in slot A.
- 17 Attach the first connector on the same hard drive power cable to the drive in slot C.
- 18 Connect the free end of the same power cable to the first connector (the far right connector) on the underside of the power supply.





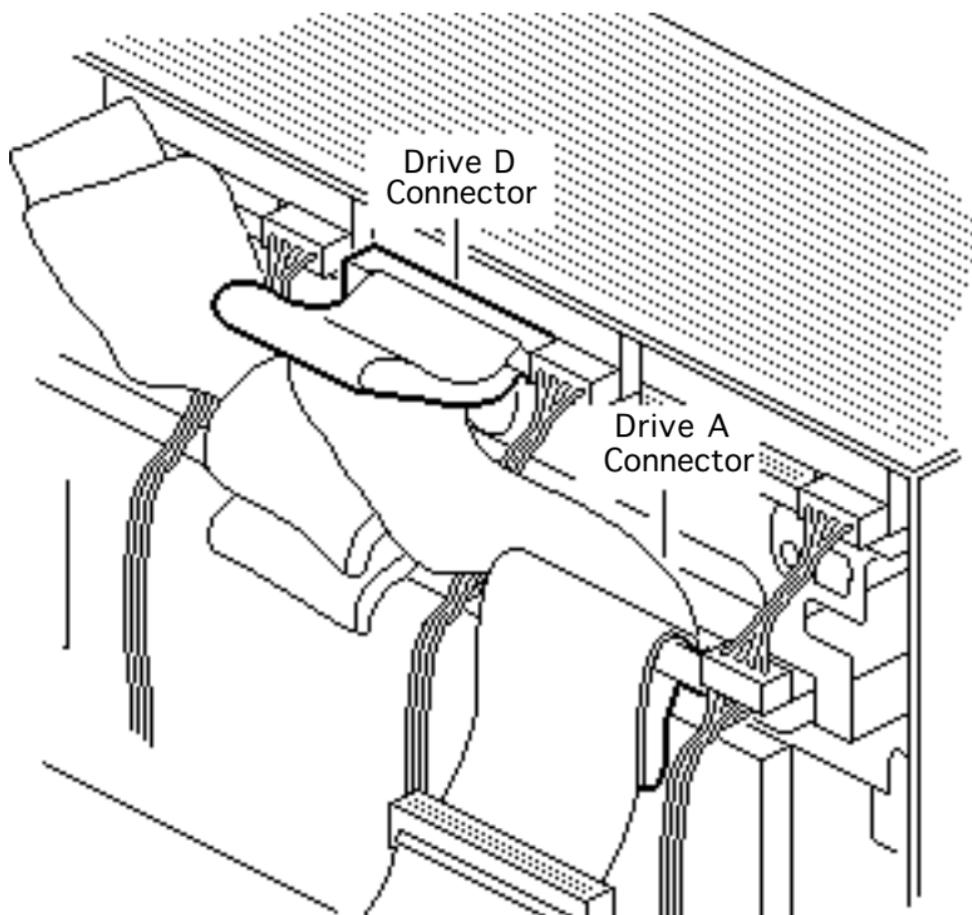
- 19 Repeat the procedure on the previous page to connect the drives in slots D and B.
- 20 Use the last hard drive power cable to connect the single drive in slot E.





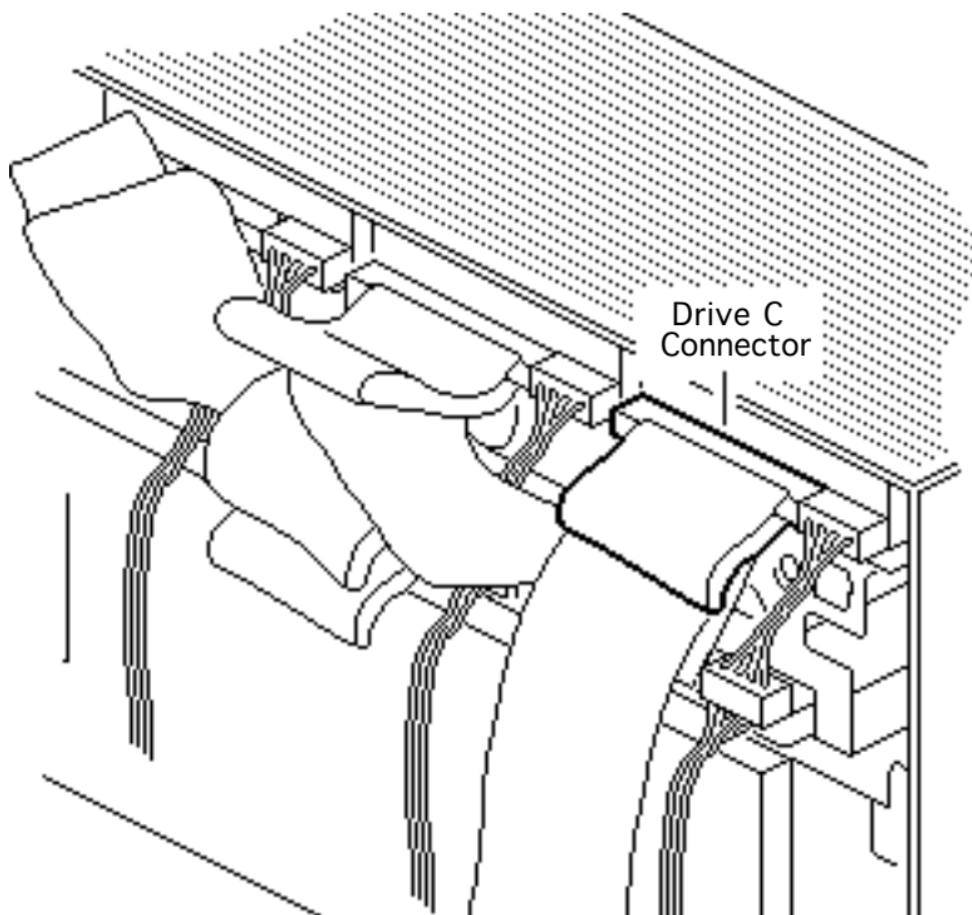
- 21 Attach the drive E connector on the five-drive SCSI cable to the hard drive in slot E.
- 22 Fold over the cable and attach the drive B connector to the drive in slot B.





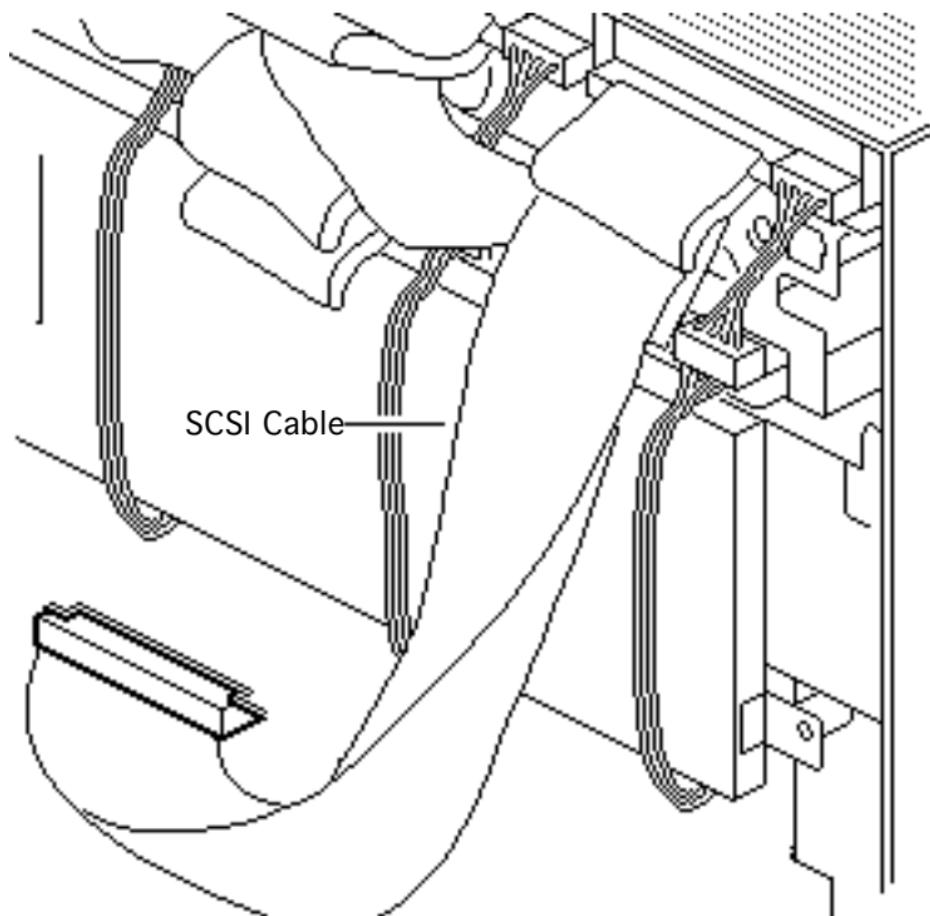
- 23 Attach the drive D connector on the five-drive SCSI cable to the hard drive in slot D.
- 24 Fold over the cable and attach the drive A connector to the drive in slot A.





25 Fold over the cable and attach the drive C connector to the drive in slot C.





- 26 Attach the end of the five-drive SCSI cable to the internal SCSI connector on the logic board.

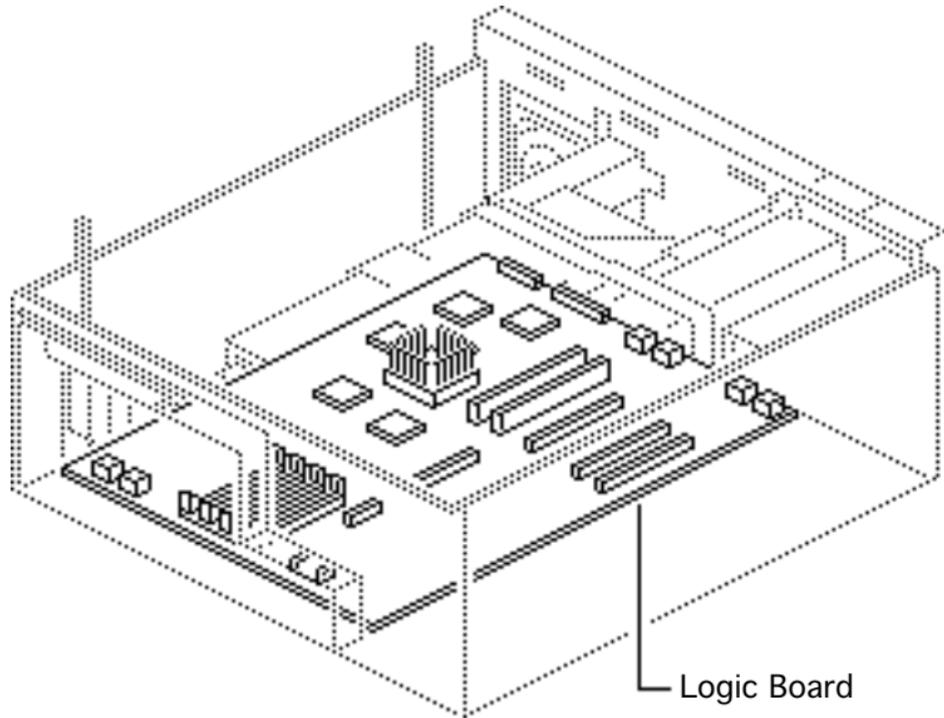


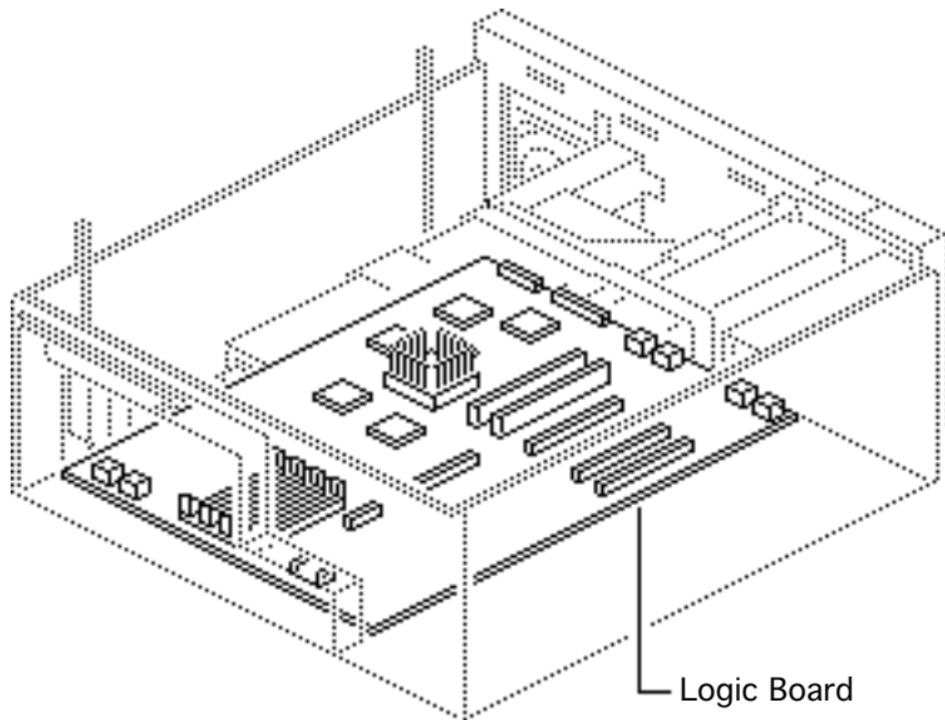


## WS 9150 Upgrade

Before you begin, to upgrade a Quadra 900 or 950 computer to a WS 9150, you must install the WS 9150 logic board. Upgrading to the 120 MHz version of the WS 9150 also requires the installation of a processor fan.

Refer to the Logic Board and Processor Fan topics in Take Apart for installation instructions.





**Important:** You must install the processor fan with the WS 9150/120 logic board or you will damage the board.

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

**Note:** You cannot use the RAM in the Macintosh Quadra 900 or 950 computers when upgrading to the WS 9150. Additional RAM may be required.





## Additional Procedures

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Workgroup Server 9150



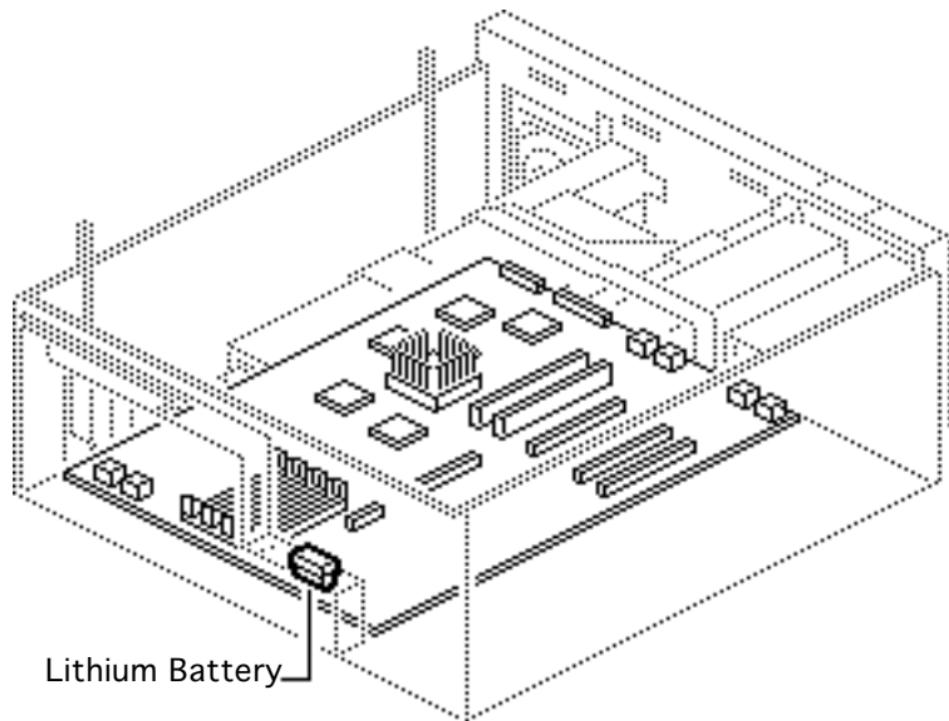


## Battery Verification

Before you begin, remove the cover.

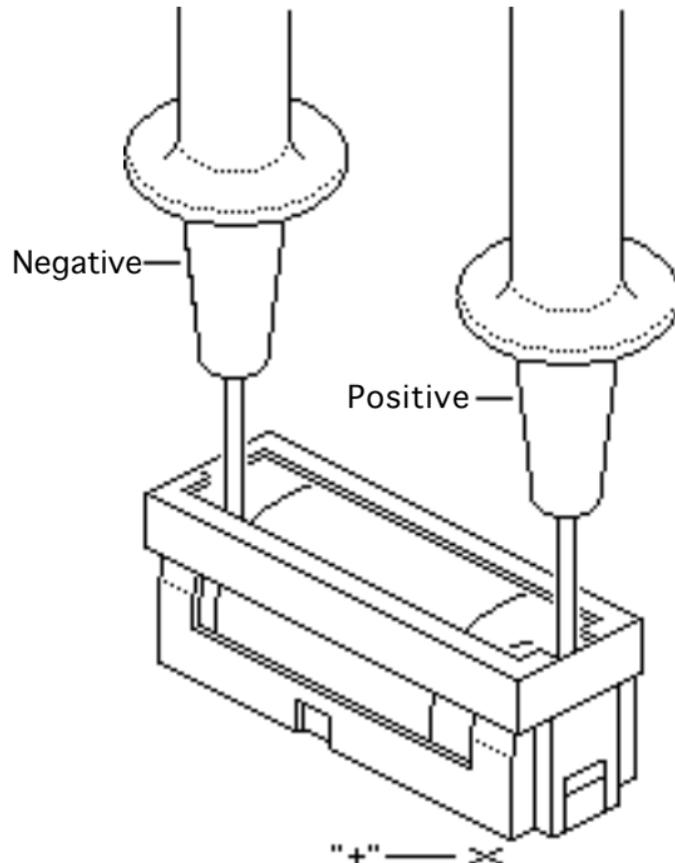
**⚠ Warning:** If handled or discarded improperly, the lithium battery in the computer could explode. Review battery handling and disposal instructions in Bulletins/Safety.

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



Lithium Battery





- 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.



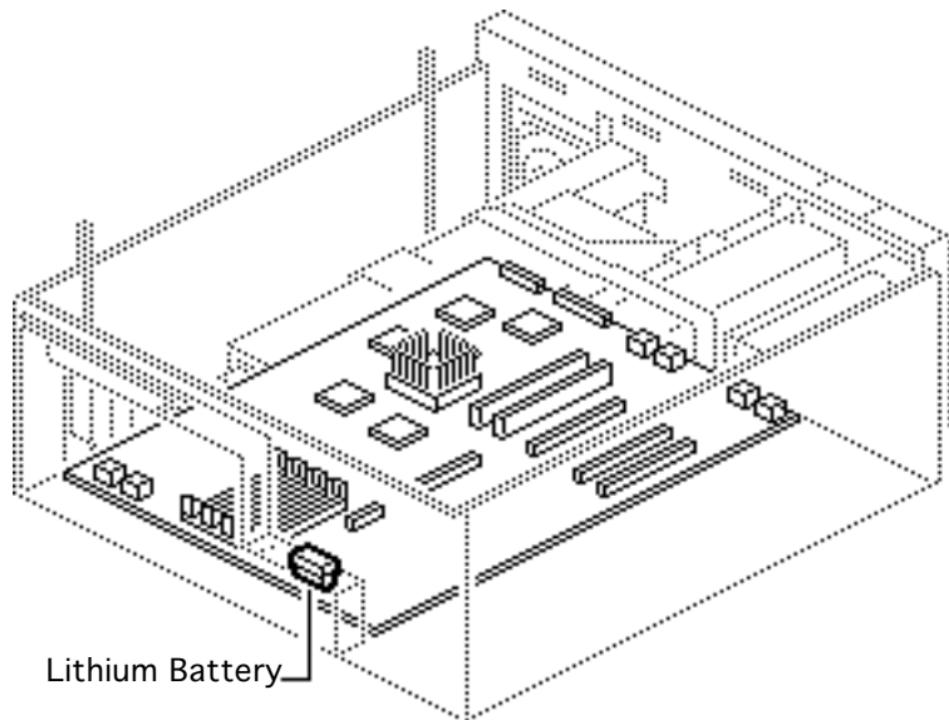


## Battery Replacement

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.

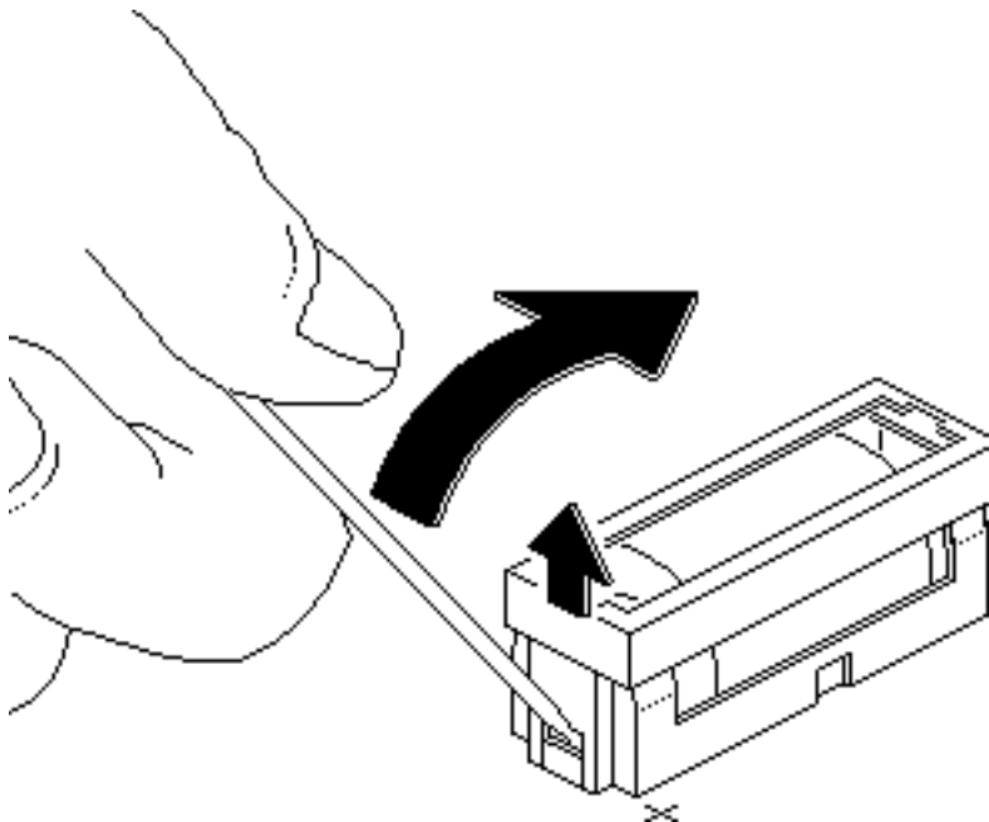


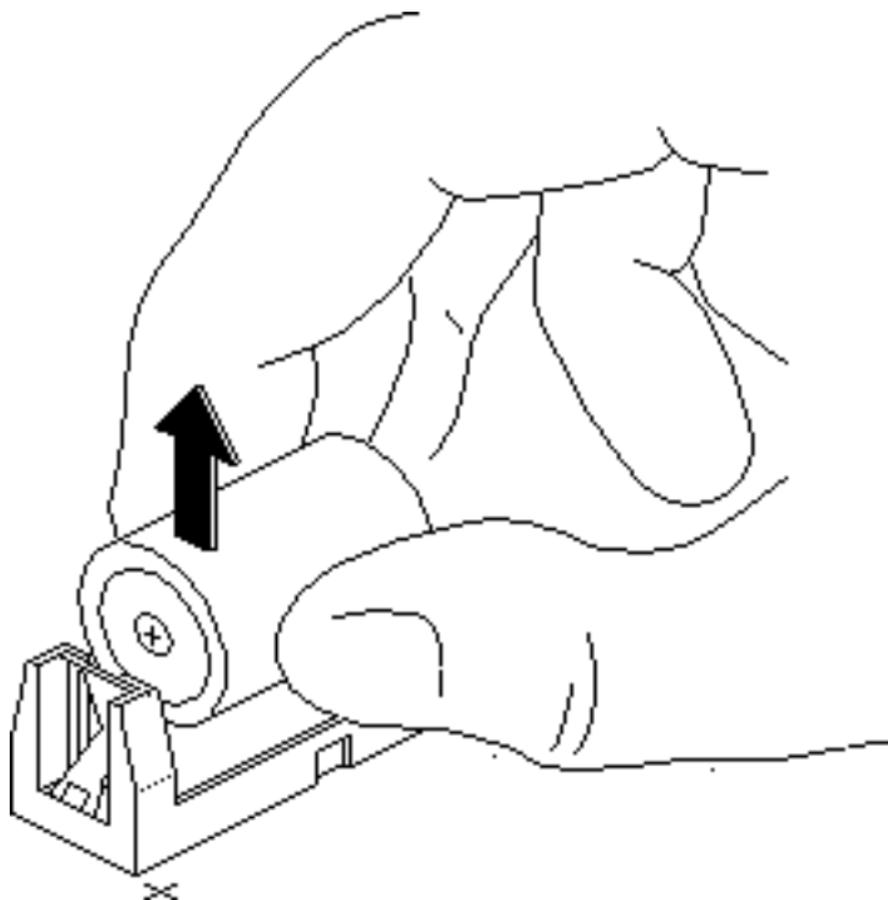
Lithium Battery





- 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,





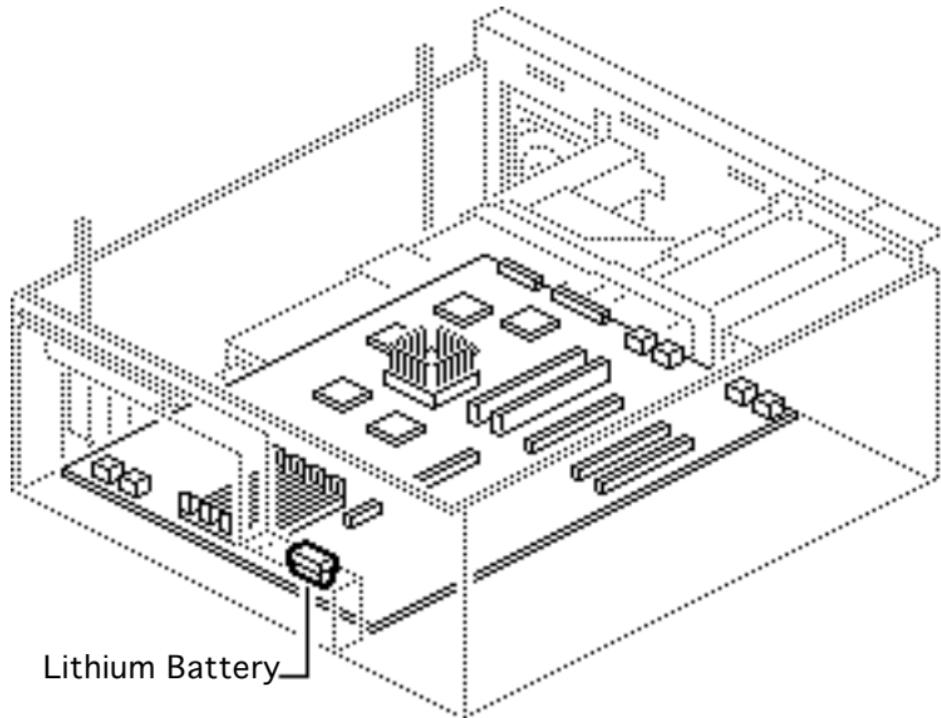
## Reset Logic Board

Before you begin:

- Remove the cover
- Unplug the computer

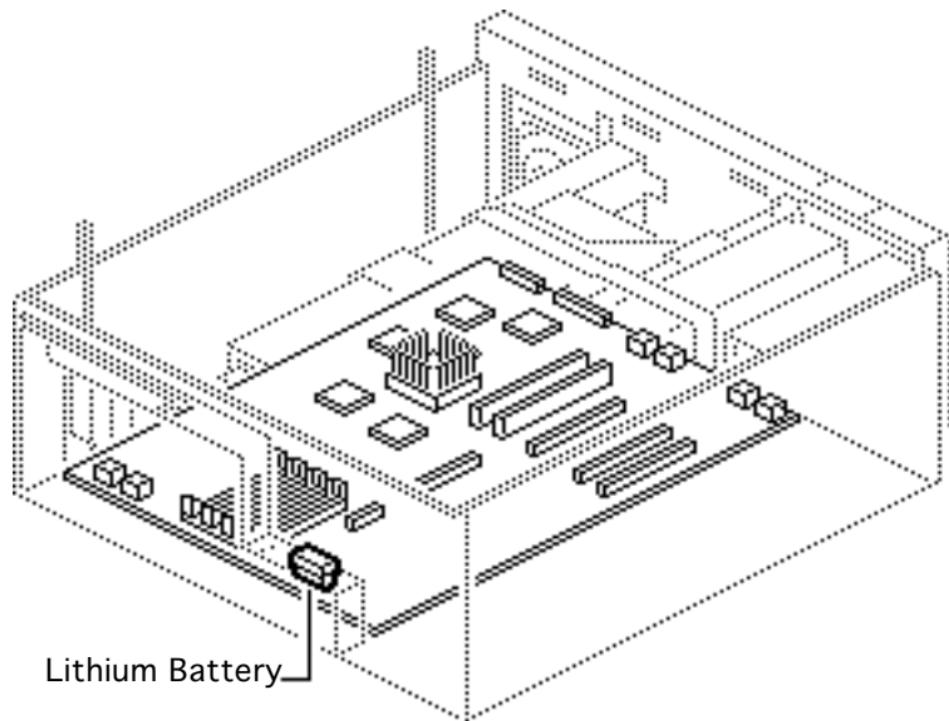
**Note:** Whenever you have a unit that fails to power up, you should follow this procedure to reset the logic board **before** replacing any modules.

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



Lithium Battery

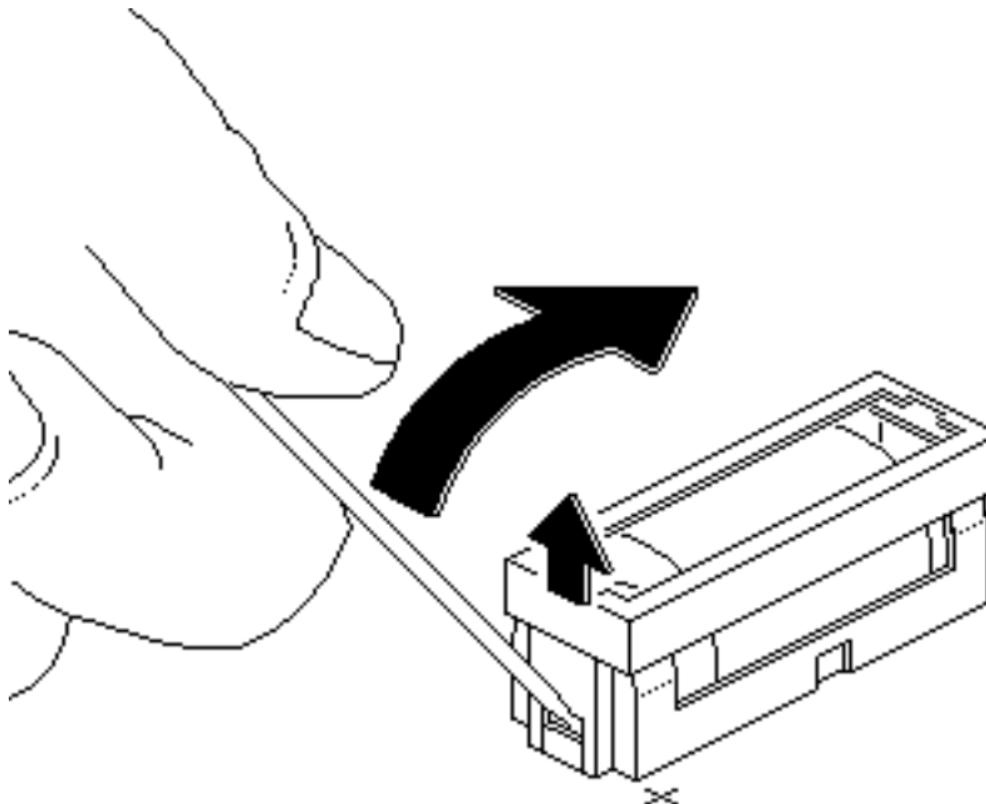




Lithium Battery

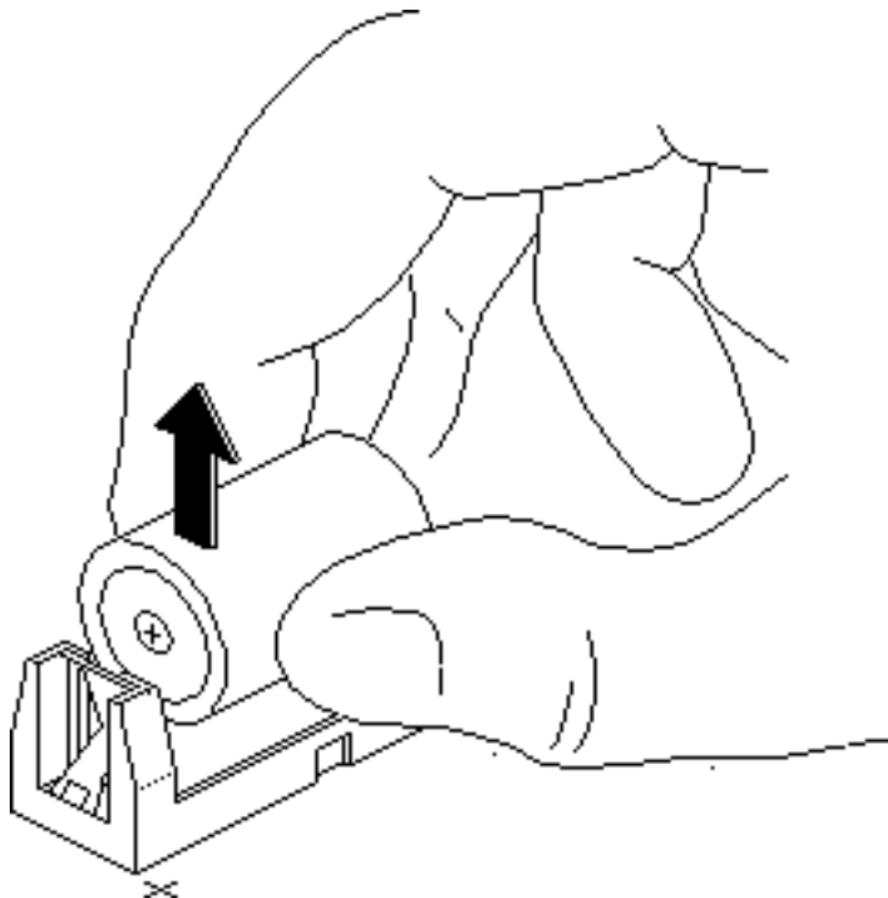
**⚠ Warning:** If handled or discarded improperly, the lithium battery in the computer could explode. Review battery handling and disposal instructions in Bulletins/Safety.





- 1 Unplug the power supply from the logic board.
- 2 Using a small flat-blade screwdriver, pry open the latch at the end of the battery holder and lift off the cover.





- 3 Grasp the battery and remove it from the holder.
- 4 Press the computer's power-on button. Verify that the power supply cable is disconnected from the logic board. Wait 5-10 minutes and then
  - Replace the battery
  - Reassemble the computer





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

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



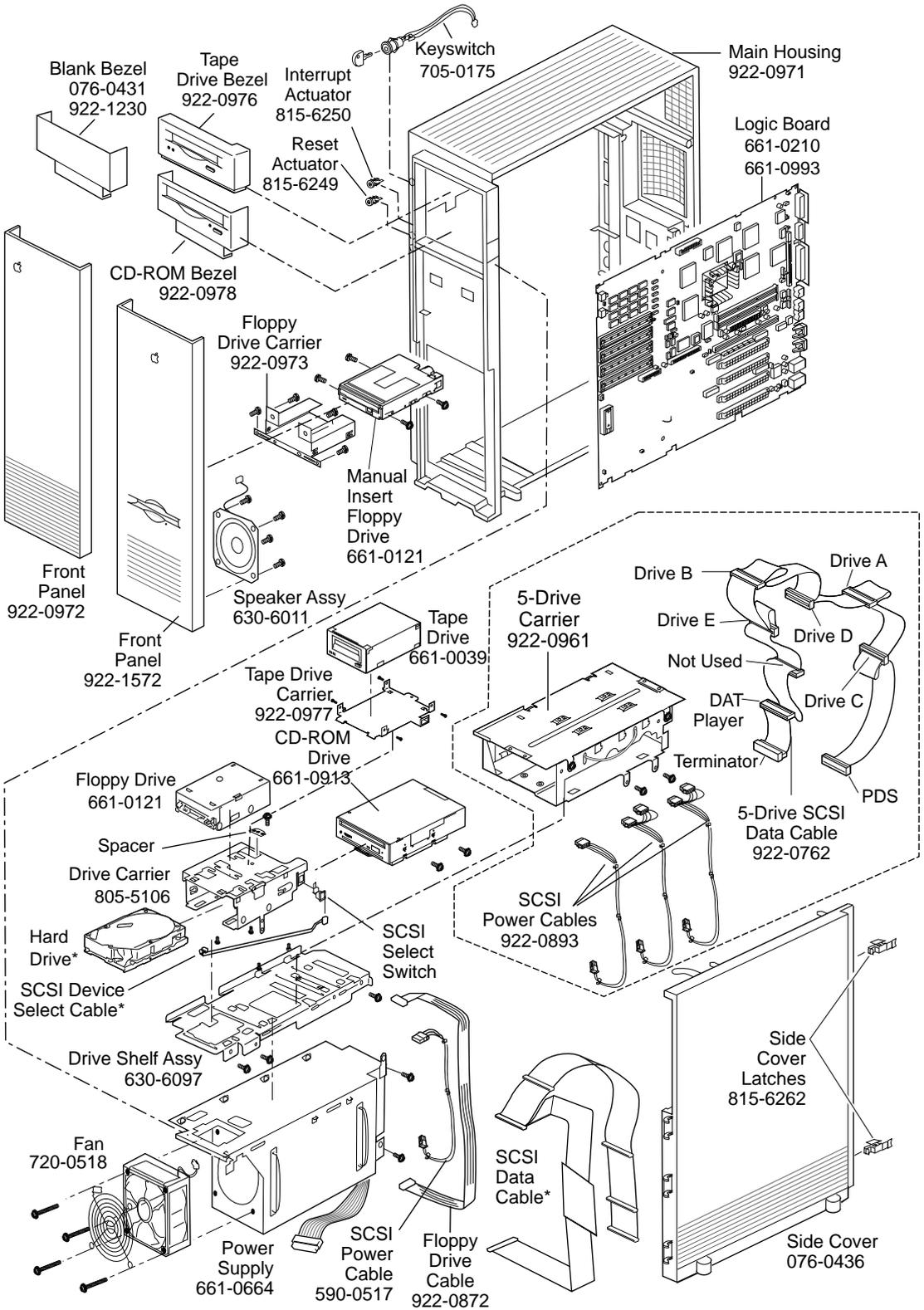


Exploded View

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Workgroup Server 9150





Product family configurations may vary. For parts with asterisk (\*), refer to parts list.

WS 9150

