



Macintosh Plus

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Basics

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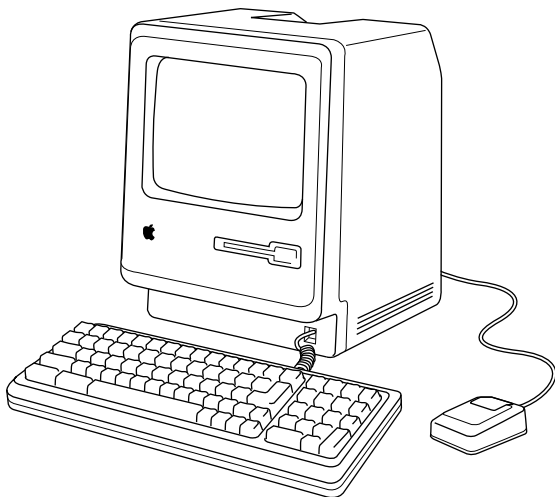
Macintosh Plus





## Overview

This manual contains complete repair procedures for the Macintosh Plus, shown at left.



**Figure: Macintosh Plus**





## Specifications

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Macintosh Plus





## Introduction

Specifications information for this product can be found in this chapter and also in the Spec Database, which you can access in one of three ways:

- Launch it directly by double-clicking the Apple Spec Database runtime alias at the top level of the Main Service Source CD.
- Select "Apple Spec Database" from the Service Source drop-down main menu.
- Click the Acrobat toolbar icon for the database, which is near the right end of the toolbar with the letters "SP."





## Processor

### CPU

Motorola 68000 microprocessor

7.83 MHz

32-bit internal data bus





## Memory

<b>RAM</b>	1 MB, expandable to 4 MB (150 ns or faster SIMMs)
<b>ROM</b>	128K
<b>PRAM</b>	CMOS custom chip with 4.5 V, user-replaceable battery backup (includes 256 bytes of memory; remembers system parameters even with the machine switched off)





## Disk Storage

### **Floppy Drive**

Internal, double-sided drive: uses 3.5-in., hard-case floppy disks—either double-sided, 800K capacity or single-sided, 400K capacity







## I/O Interfaces

### **Floppy Drive**

External drive port; DB-19 connector

### **SCSI**

One SCSI parallel port; DB-25 connector

### **Mouse**

Mouse port; DE-9 connector

### **Keyboard**

Synchronous serial keyboard bus; RJ-11 connector

### **Serial**

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





## I/O Devices

### **Keyboard**

78 keys, including numeric keypad and cursor keys; RJ-11 connector

### **Mouse**

Mechanical tracking; optical shaft encoding at 3.54 pulses per mm (90 pulses per in.) of travel; DE-9 connector





## Sound and Video

### **Sound Generator**

Four-voice sound with 8-bit digital/analog conversion, using 22-kHz sampling rate

### **Video Display**

9-in. (diagonal) screen; 512 by 342 pixel, bit-mapped display





## Electrical

**Line Voltage** 105-125 VAC

**Frequency** 50-60 Hz

**Maximum Power** 60 W





## Physical

### **Dimensions**

Height: 13.6 in. (34.5 cm)

Width: 9.6 in. (24.4 cm)

Depth: 10.9 in. (27.6 cm)

### **Weight**

16 lb. 8 oz. (7.5 kg)





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Troubleshooting  
Macintosh Plus





## 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

No video, but audio tone is present and drive operates

- 1 Turn contrast control fully clockwise.
- 2 Check video cable connections.
- 3 Replace power supply board.
- 4 Replace neck cable.
- 5 Replace logic board. Retain customer's SIMMs.

Screen is bright and audio is present, but no video information is present

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







## Drives

Disk ejects; display shows disk icon with blinking "X"

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

Unable to insert disk all the way

- 1 Insert paper clip into small hole beside drive slot, or switch off system power and hold mouse button down while switching system power back on to complete eject cycle. Then insert disk with metal slot forward and write-protect tab on bottom.
- 2 Replace floppy drive.



**Drives (Continued)**

Does not read disks  
on internal drive

- 1 Replace bad disk.
- 2 Replace floppy drive cable.
- 3 Replace Mylar RFI shield.
- 4 Replace floppy drive.
- 5 Verify ROMs on the logic board.
- 6 Replace logic board. Retain customer's SIMMs.

Does not read disks  
on external drive

- 1 Replace bad disk.
- 2 Replace floppy drive cable.
- 3 Replace Mylar RFI shield.
- 4 Replace external drive.
- 5 Verify ROMs on the logic board.
- 6 Replace logic board. Retain customer's SIMMs.



**Drives (Continued)**

Audio tone sounds at power on, video is present, but drive does not operate

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

Drive runs continuously

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

400K drive does not boot

- 1 If logic board has Rev. A ROMs and drive stepper motor is serial number F518 or higher, upgrade to Rev. B ROMs.
- 2 Replace floppy drive.





## Peripherals

Cursor does not move	<ol style="list-style-type: none"><li>1 Connect mouse.</li><li>2 Clean mouse.</li><li>3 Replace mouse.</li><li>4 Replace logic board. Retain customer's SIMMs.</li></ol>
Cursor moves but clicking mouse produces no response	<ol style="list-style-type: none"><li>1 Replace mouse.</li><li>2 Replace logic board. Retain customer's SIMMs.</li></ol>
No response to any key on keyboard	<ol style="list-style-type: none"><li>1 Replace keyboard cable.</li><li>2 Replace keyboard.</li><li>3 Replace logic board. Retain customer's SIMMs.</li></ol>
No response from a particular key	<ol style="list-style-type: none"><li>1 Replace keyswitch.</li><li>2 Replace keyboard.</li><li>3 Replace logic board. Retain customer's SIMMs.</li></ol>





## Peripherals (Continued)

Known-good  
ImageWriter or  
ImageWriter II does  
not print

- 1 Make sure that Chooser and Control Panel are set correctly.
- 2 Check that system software version is compatible. Replace software with known-good.
- 3 Reset PRAM.
- 4 Replace interface cable.
- 5 Replace logic board. Retain customer's SIMMs.

Known-good  
LaserWriter does not  
print

- 1 Make sure that Chooser and Control Panel are set correctly.
- 2 Check that system software version is compatible. Replace software with known-good.
- 3 Reset PRAM.





## Miscellaneous

When turned on, the Macintosh Plus continuously beeps and tries to power up

- 1 Perform voltage adjustment. Refer to Adjustments.
- 2 Disconnect internal disk drive. If this eliminates problem, replace drive.
- 3 Replace logic board. Retain customer's SIMMs.
- 4 Replace power supply board, logic board, and internal drive; then turn on Macintosh. Note: Replacing only power supply board may damage new power supply board.

Clicking or chirping sound

- 1 Connect logic board cable.
- 2 Perform voltage adjustment. Refer to Adjustments.
- 3 Replace power supply board.
- 4 Replace logic board. Retain customer's SIMMs.





## Miscellaneous (Continued)

Smoke/odor issues  
from the Macintosh  
Plus

Replace power supply board.

No video, no audio  
tone, and no drive  
operation

- 1 Connect power cord.
- 2 Turn power on.
- 3 Replace power cord.
- 4 Check fuse.
- 5 Replace power supply board.
- 6 Replace logic board. Retain customer's SIMMs.





### Miscellaneous (Continued)

MacTest displays  
128K/512K when  
1 MB Macintosh Plus is  
tested

Replace Macintosh Plus logic board. Retain customer's SIMMs.

When developer's  
switch is installed,  
Macintosh Plus  
sometimes resets  
intermittently

Remove switch and file it down about 1/16 inch.







### Miscellaneous (Continued)

- |   |  |
|---|--|
| Macintosh Plus hangs on startup                       | <ol style="list-style-type: none"><li>1 If logic board has ROMs 342-0341-A or B (ROM HI) and 342-0342-A (ROM LO) and a peripheral device is connected to SCSI port, peripheral device must be turned on before powering on Macintosh Plus.</li></ol> |
| Macintosh Plus boots but keyboard behaves erratically | <ol style="list-style-type: none"><li>1 Replace keyboard.</li><li>2 Check that logic board grounding clip is not touching solder points beneath logic board.</li><li>3 Replace logic board. Retain customer's SIMMs.</li></ol>                       |





Take Apart  

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Macintosh Plus





Cover

Battery  
Compartment  
Cover

Reset/Interrupt  
Switch

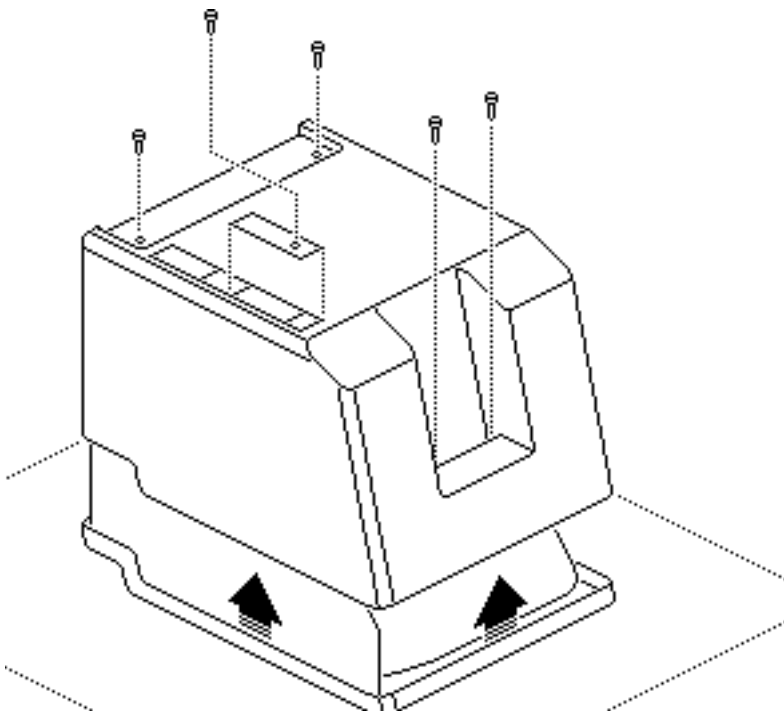
## Cover

No preliminary steps are required before you begin this procedure.

**⚠ Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT Safety in Bulletins/Safety.

- 1 Remove the battery compartment cover.
- 2 Remove the reset/interrupt switch, if present.

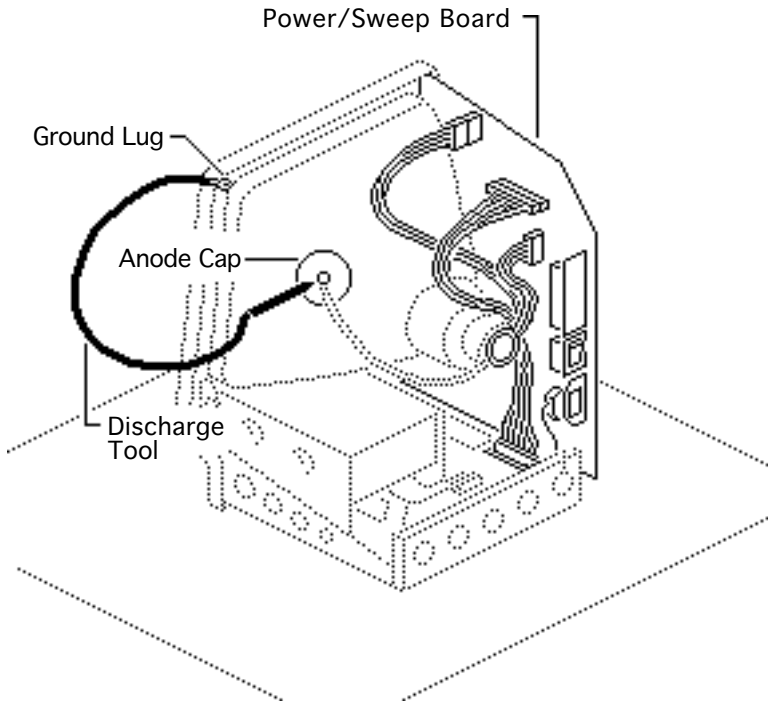




- 3 Using a Torx screwdriver, remove the case screws, including the one in the battery compartment. Using the pull-apart tool, gently pry off the cover.

**⚠ Warning:** The edges of the metal chassis may be sharp. When moving the computer with the cover off, be sure to handle the chassis carefully.





## Power/Sweep Board

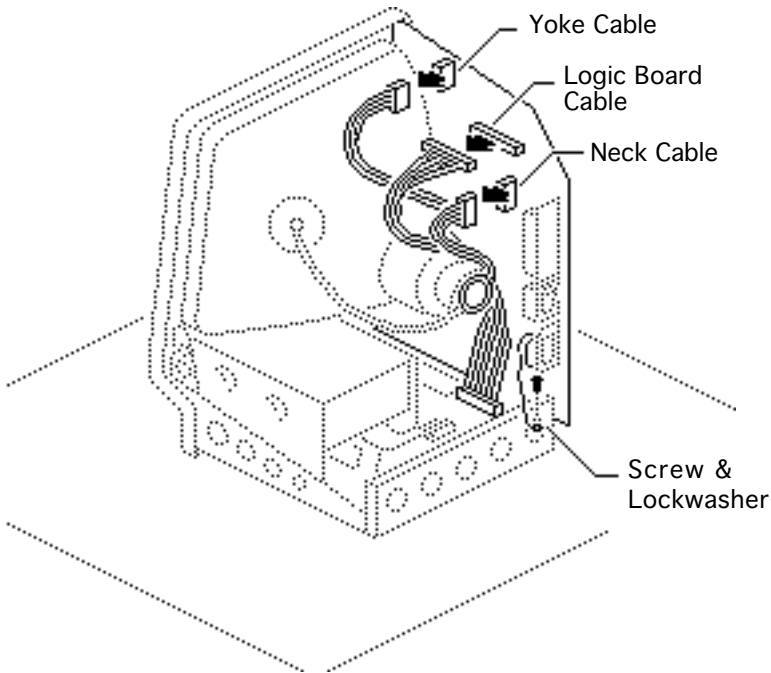
Before you begin,

- Remove the cover
- Discharge the CRT
- Remove the anode cap

**⚠ Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT Safety in Bulletins/Safety.

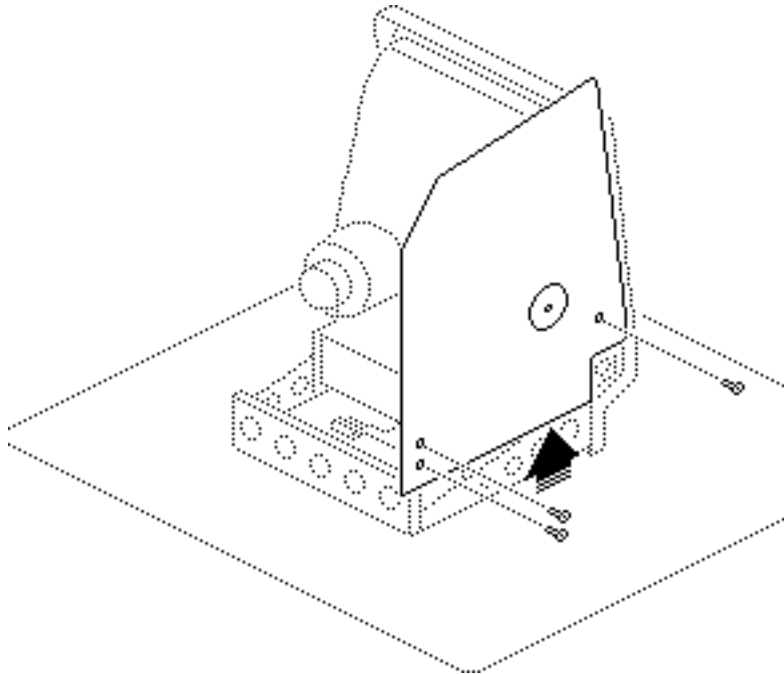
**⚠ Warning:** Never use a grounding wriststrap until after discharging the CRT.





- 1 Disconnect the following cable connectors from the power/sweep board:
  - Yoke cable
  - Logic board cable
  - Neck cable
- 2 Remove the screw and lockwasher that hold the ground wire to the chassis.





- Note:** You may need to remove the insulating paper from the power/sweep board to access the mounting screws.

Remove the three mounting screws and washers, and lift the power/sweep board from the chassis.

**Replacement Note:** After replacing all parts except the cover, perform the voltage and video adjustment procedures. See “Voltage” and “Video” in Adjustments.

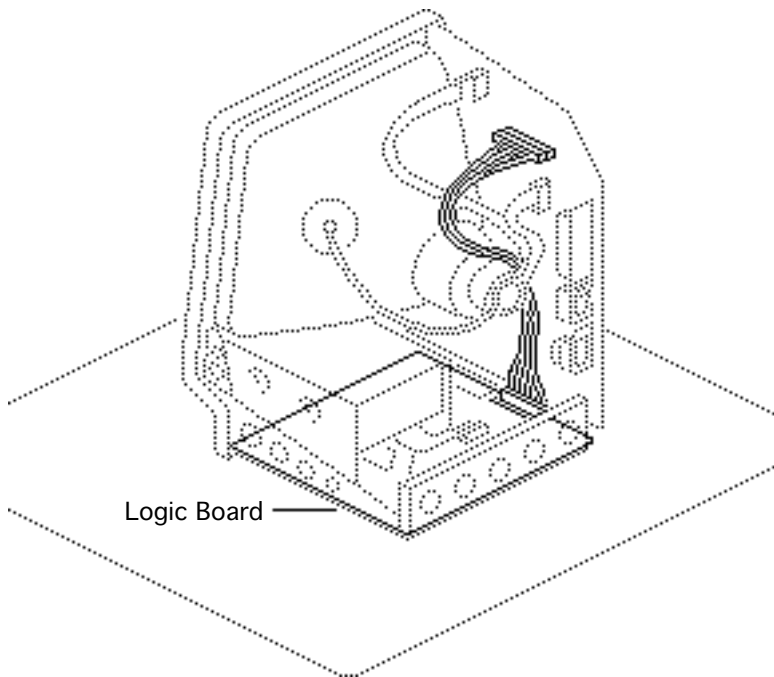




**Replacement Note:** When sending Apple a defective power/sweep board, be sure to include the cable that connects to the logic board. Make sure the contrast control knob and battery have been removed from the defective board and reinstalled onto the exchange board.







## Logic Board

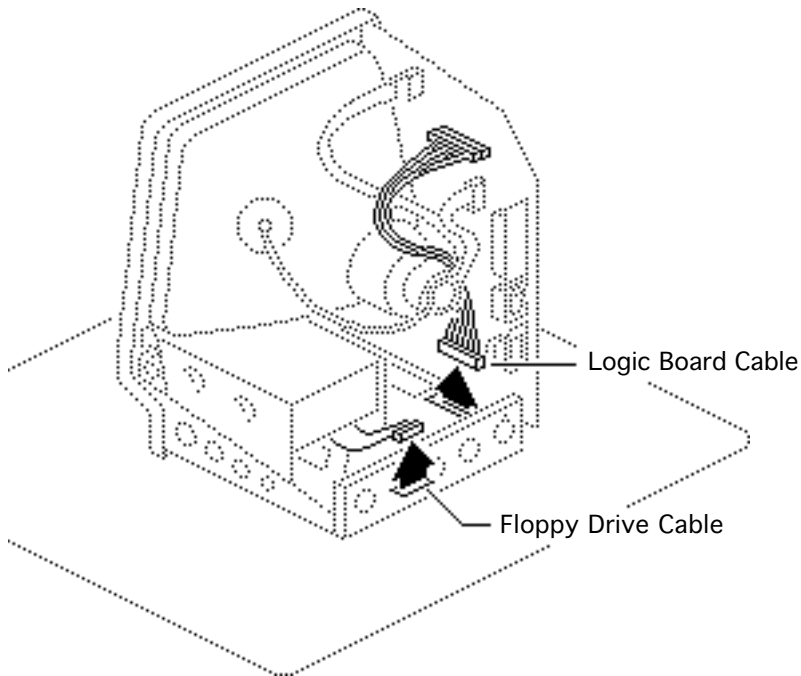
Before you begin,

- Remove the cover
- Discharge the CRT

**⚠ Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT Safety in Bulletins/Safety.

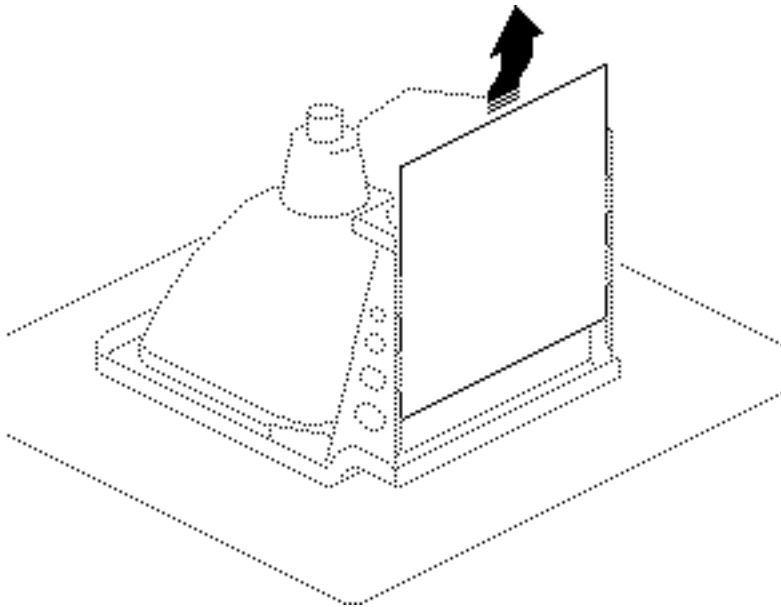
**⚠ Warning:** Never use a grounding wriststrap until after discharging the CRT.





- 1 Disconnect the following cable connectors from the logic board:
  - Floppy drive cable
  - Logic board cable

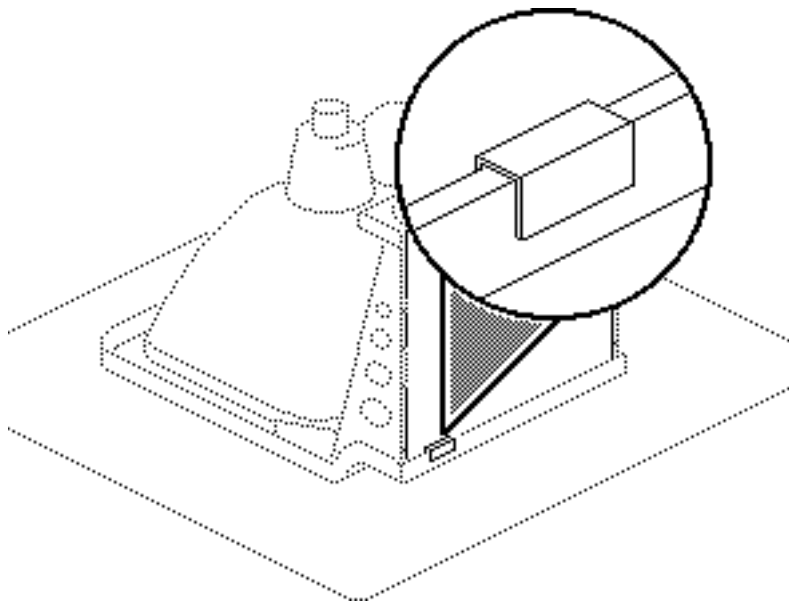




- 2 **Caution:** When removing the logic board, be careful not to damage the SIMMs — especially the larger DIP SIMMs that may be installed on the board.

Pull back on the top of the logic board, and carefully slide out the logic board.

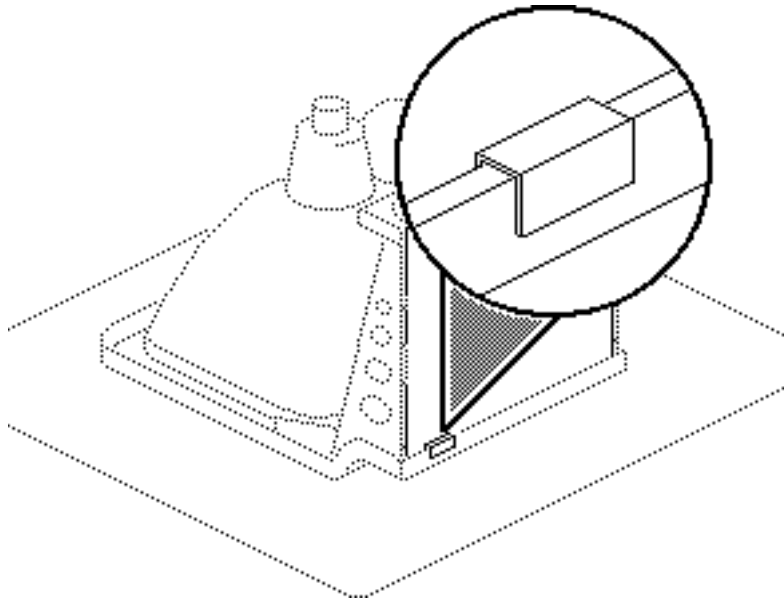




- 3 **Note:** If your replacement board is Rev. D (part number 820-XXXX-D) or higher, you should install a ground clip. Do not use the ground clip with any logic board lower than Rev. D.

**Caution:** Contact between the ground clip and pins or solder points on the underside of the logic board could cause a short, resulting in erratic keyboard behavior. Make sure the





clip does not touch any solder points.

Install the ground clip to the inner plastic lip on the bottom front bezel.

**Replacement Note:** Remove the SIMMs from the defective logic board and install them on the replacement logic board.

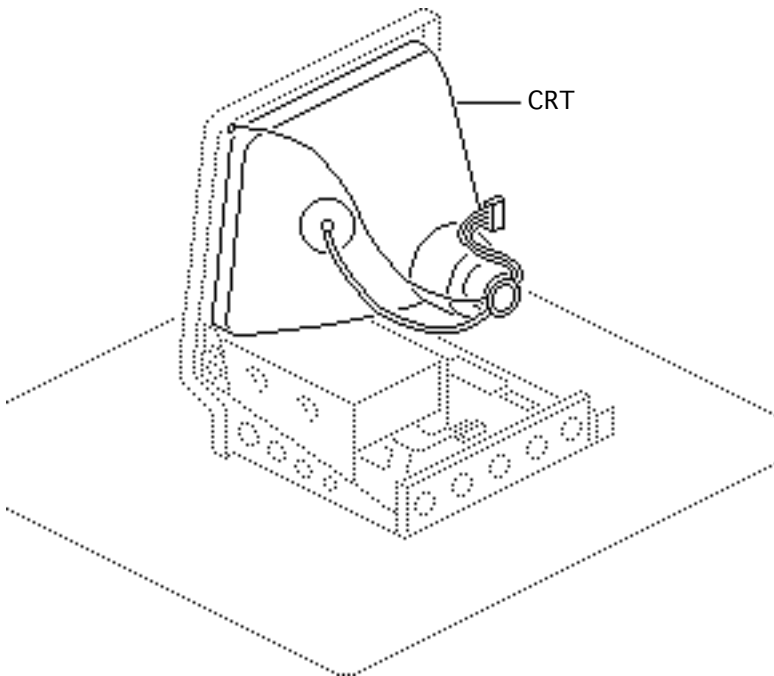
**Replacement Note:** When exchanging the 512K logic board, you must swap ROMs to the new logic board.





**Replacement Note:** After replacing all parts except the cover, perform the voltage adjustment procedures. See “Voltage” in Adjustments.





## CRT

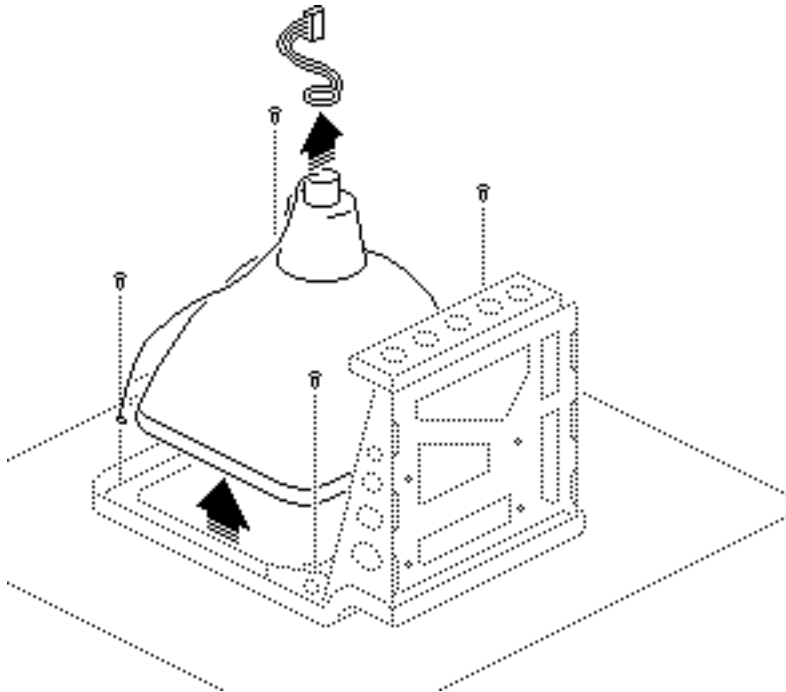
Before you begin,

- Remove the cover
- Discharge the CRT
- Remove the power/sweep board

**⚠ Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT Safety in Bulletins/Safety.

**⚠ Warning:** Never use a grounding wriststrap until after discharging the CRT.





**⚠ Warning:** Handle the CRT by its sides only. Do not grasp the neck on the CRT or touch the anode.

- 1 Slide the CRT socket cable straight off the neck of the CRT.
- 2 Remove the four mounting screws and the ground wire, and lift the CRT off the bezel.

**⚠ Warning:** If you need to dispose of the CRT, refer to the CRT disposal instructions in Bulletins/Safety.







**Replacement Note:** If you replace the CRT, perform the voltage, video, and yoke adjustment procedures. See “Voltage,” “Video,” and “Yoke” in Adjustments.





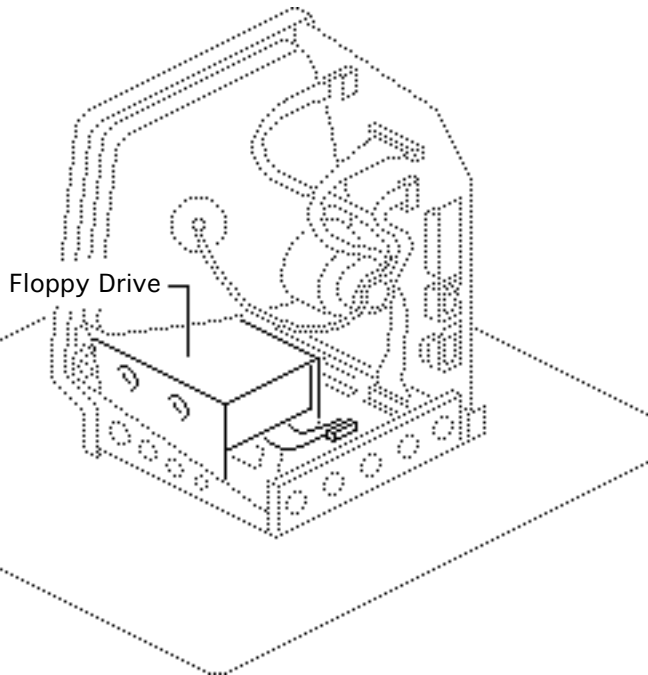
## Floppy Drive

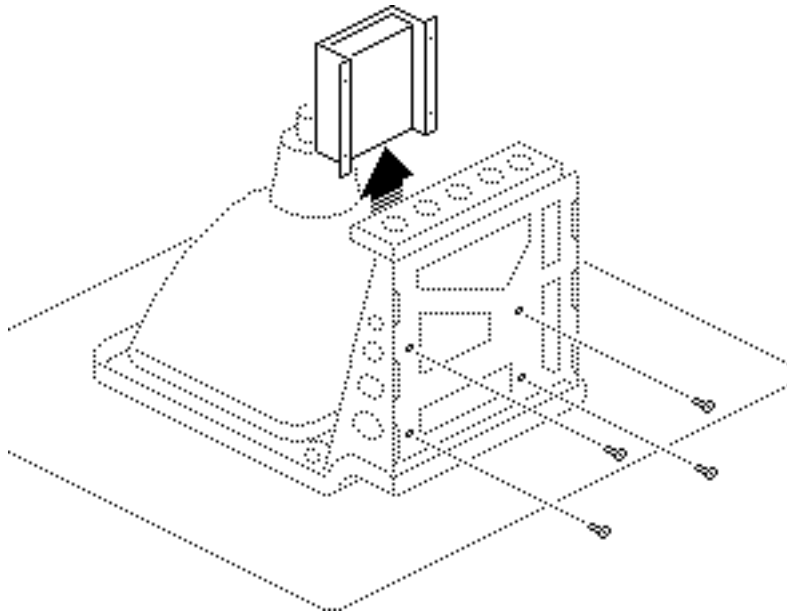
Before you begin,

- Remove the cover
- Discharge the CRT
- Remove the logic board

**⚠ Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT Safety in Bulletins/Safety.

**⚠ Warning:** Never use a grounding wriststrap until after discharging the CRT.

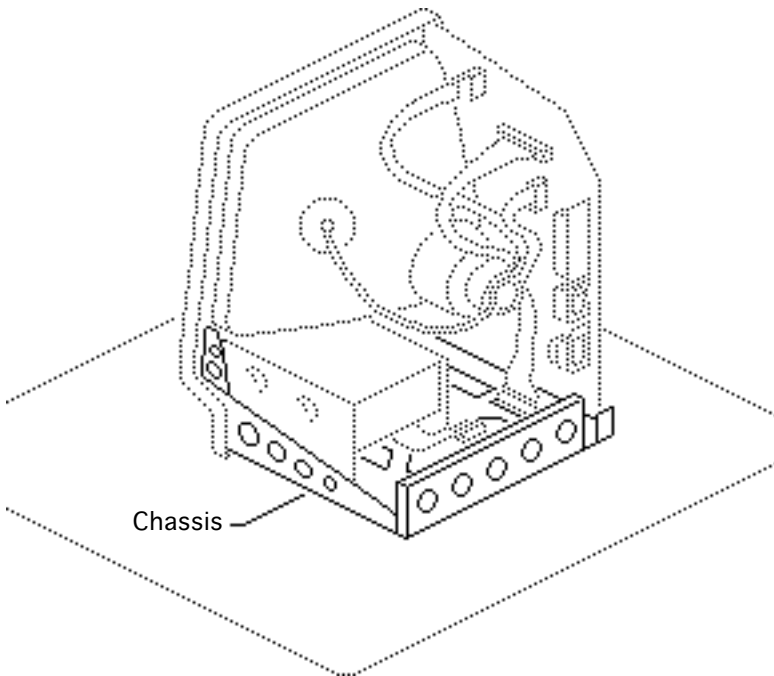




Remove the four mounting screws, and slide the floppy drive out of the chassis.

**Replacement Note:** Before you install a replacement drive, remove the dust shield, if there is one.





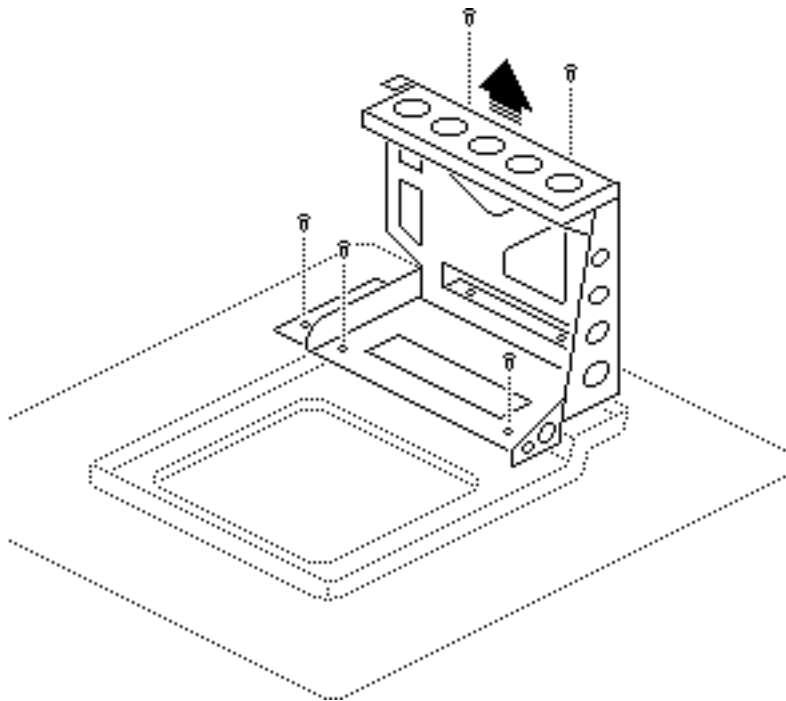
## Chassis

Before you begin,

- Remove the cover
- Discharge the CRT
- Remove the logic board
- Remove the power/sweep board
- Remove the floppy drive

**⚠ Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT Safety in Bulletins/Safety.





**⚠ Warning:** Never use a grounding wriststrap until after discharging the CRT.

Remove the five mounting screws and lift the chassis off the bezel.





Upgrades

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Macintosh Plus





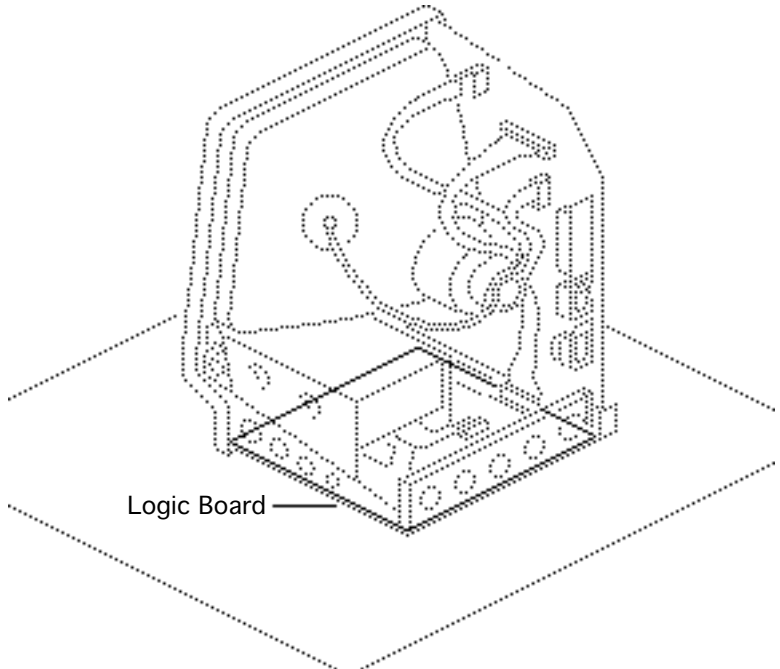
## Memory Upgrade

Before you begin,

- Remove the cover
- Discharge the CRT
- Remove the logic board

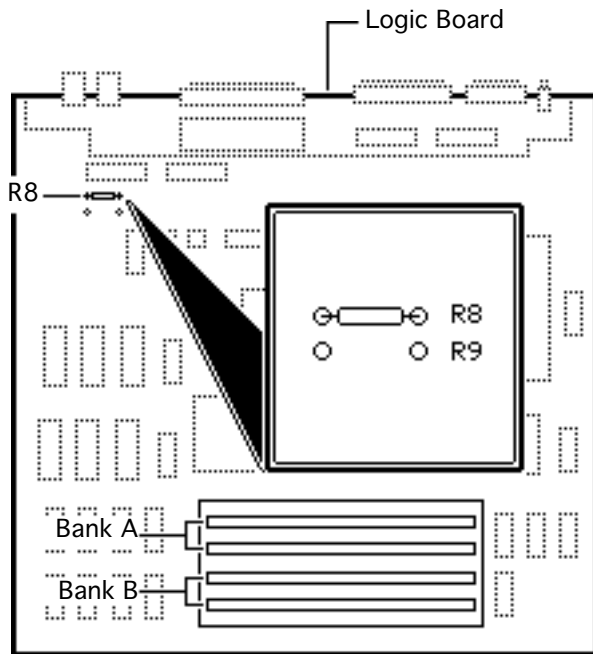
**⚠ Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT Safety in Bulletins/Safety.

**⚠ Warning:** Never use a grounding wriststrap until after discharging the CRT.



Logic Board



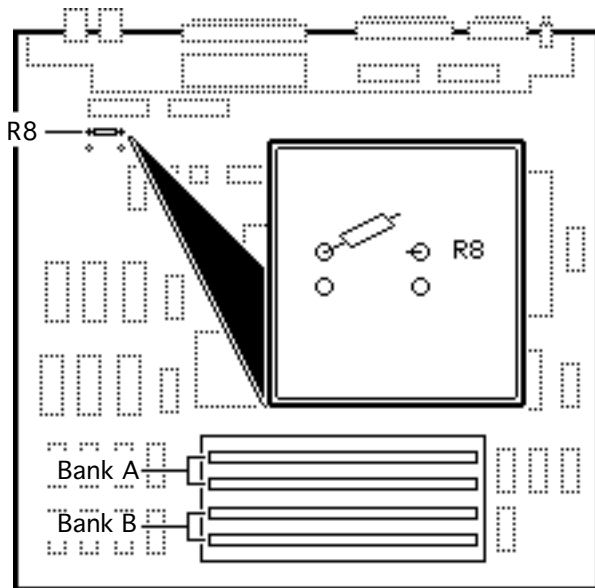


**Note:** You can configure the Macintosh Plus with 1 MB, 2.5 MB, or 4 MB of RAM. The standard 1 MB configuration has a SIMMs resistor installed in R8 and four 256K SIMMs in both banks. To add memory, you must install SIMMs and remove the SIMMs resistor.

**Note:** The Macintosh Plus requires 150-ns or faster SIMMs. RAM speed is indicated by the -xx number after the manufacturer's part number (-15 indicates a 150-ns SIMM).







**Clip** one end of resistor R8 and **move** the resistor away from the clipped lead.

**Replacement Note:** You can retack the resistor later, if necessary.

### 2.5 MB RAM Upgrade

**Install** two 1 MB SIMMs in Bank A and two 256K SIMMs in Bank B.

### 4 MB RAM Upgrade

**Install** two 1 MB SIMMs in Bank A and two 1 MB SIMMs in Bank B.



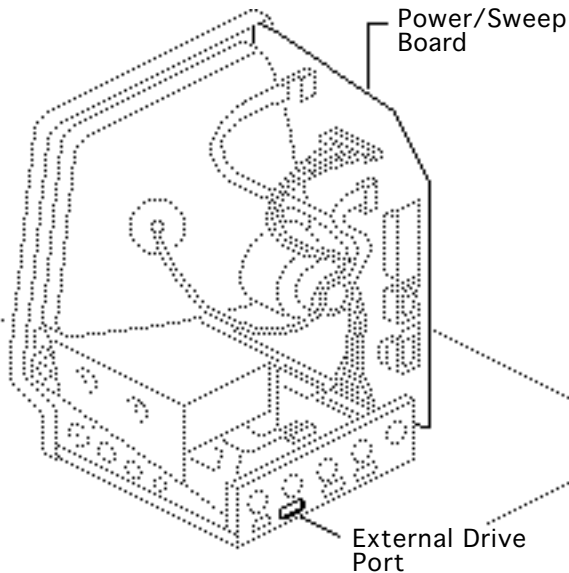


Adjustments

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Macintosh Plus





## Voltage

You must verify voltages after you replace the logic board or the power/sweep board.

Before you begin, remove the cover.

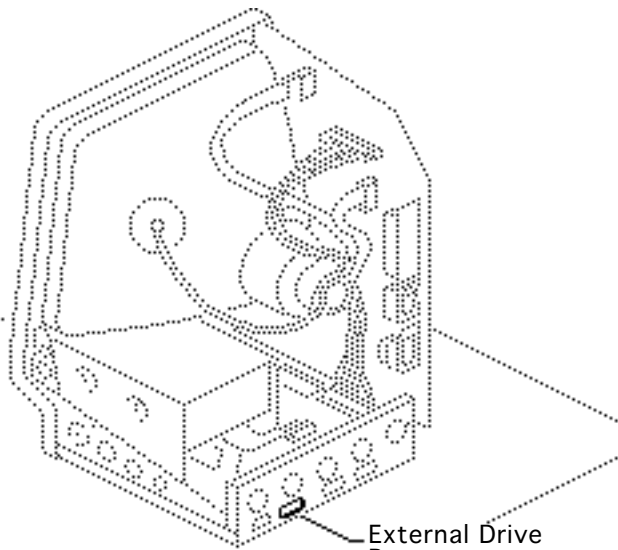
**⚠ Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT Safety in Bulletins/Safety.





**⚠ Warning:** Because you must make voltage adjustments from the rear of the computer, use a mirror to view the computer screen. Do not reach around the computer to adjust the controls.





External Drive Port

- 1 Set the voltmeter to 20 volts.
- 2 Connect the Macintosh voltage test cable (Apple part number 077-0135) to the external drive port.
- 3 **Caution:** Shorting the test cable plugs to each other can damage the computer. Pull the hoods over the plugs.

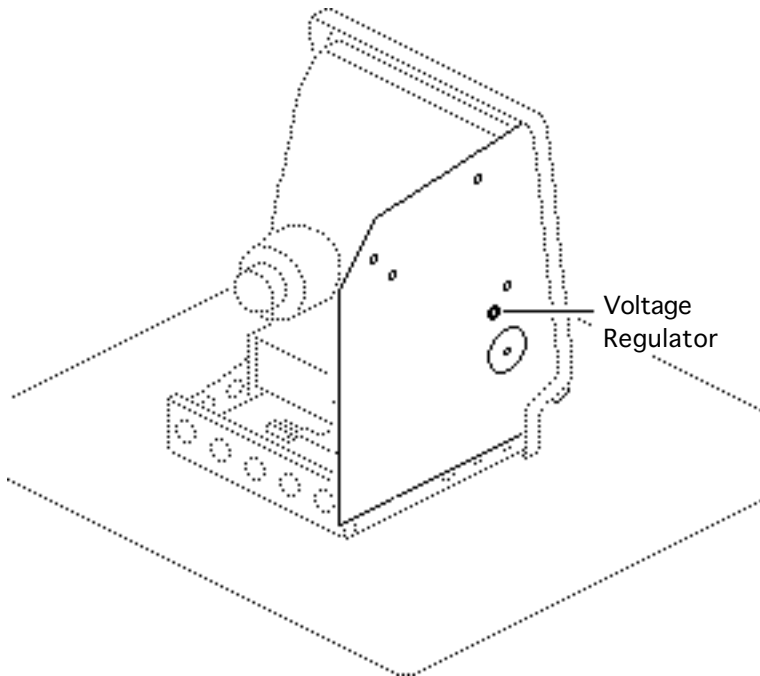
Connect the black voltmeter test lead between the voltmeter ground terminal and the computer chassis.





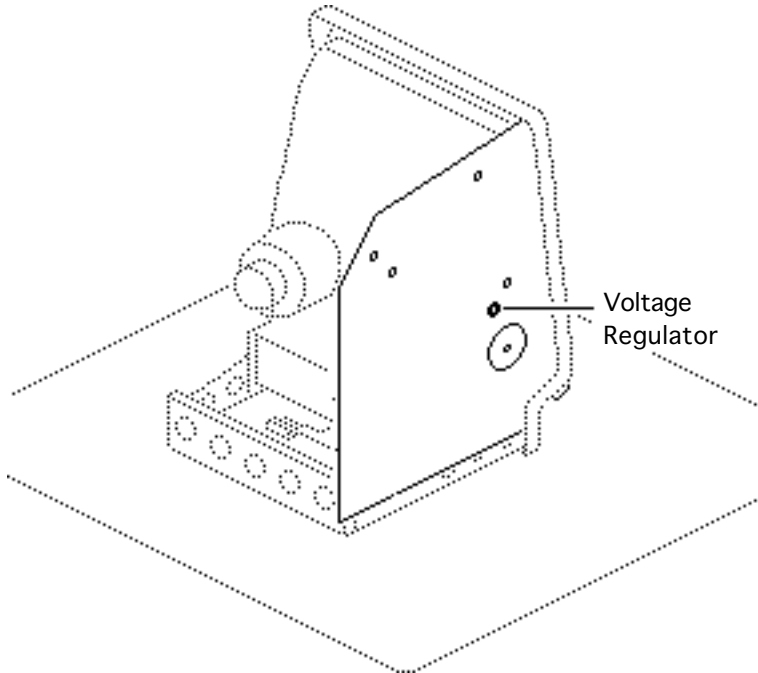
- 4 Connect the orange test cable lead to the voltage input terminal on the voltmeter.





- 5 Switch on the computer.
- 6 Adjust the voltage regulator on the power/sweep board to between 11.90 and 12.75 volts.
- 7 Switch off power.
- 8 Disconnect the orange test lead and pull the insulated hood over the plug.

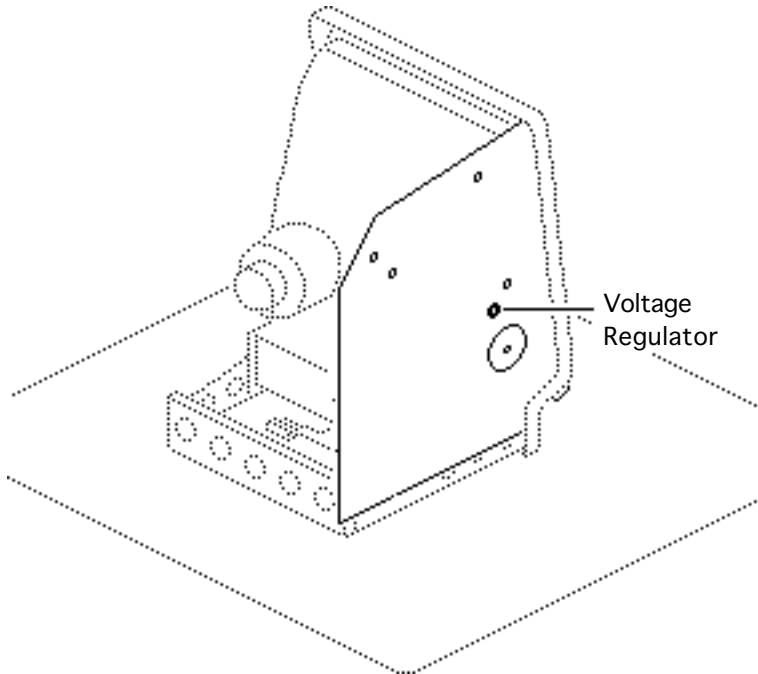




- 9 Connect the red test cable lead to the voltage input terminal on the voltmeter.
- 10 Switch on the computer.
- 11 Adjust the voltage regulator on the power/sweep board to between 4.85 and 5.15 volts.







- 12 Switch off power.
- 13 Disconnect the red test lead and pull the insulated hood over the plug.
- 14 Repeat the tests to verify that both voltages are within the specified tolerances.

**Note:** If the power/sweep board will not adjust so that both voltages fall within tolerance, replace the board.





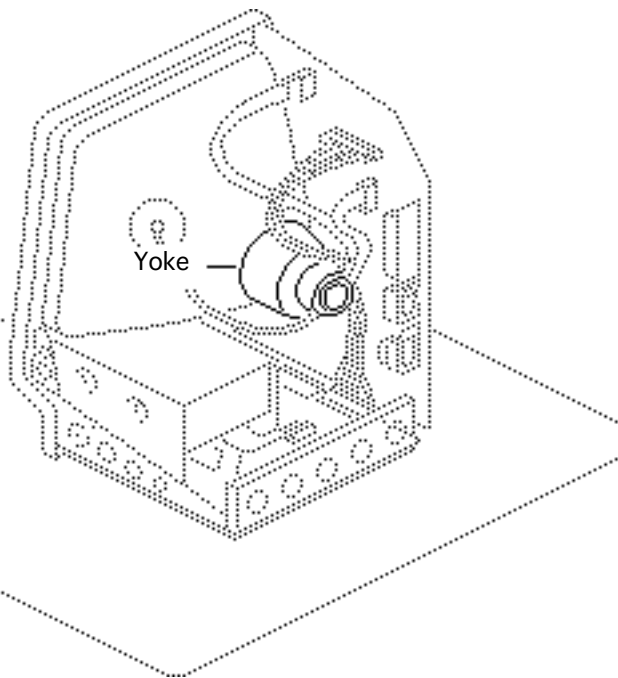
## Yoke

If you replace the CRT, you may need to adjust the yoke.

Before you begin:

- Remove the cover
- Discharge the CRT

**⚠ Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT Safety in Bulletins/Safety.





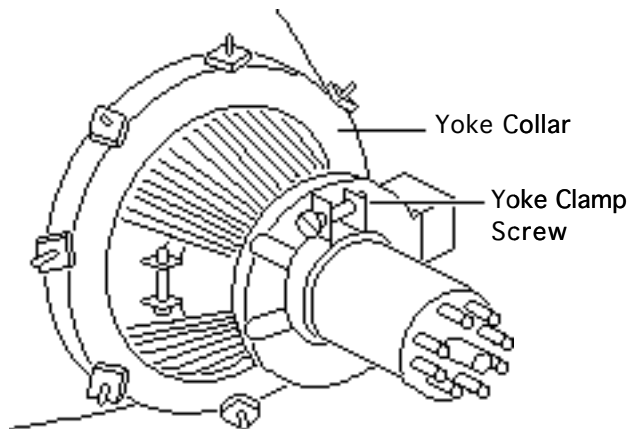
**⚠ Warning:** Because you must make yoke adjustments from the rear of the computer, use a mirror to view the computer screen. Do not reach around the computer to adjust the controls.





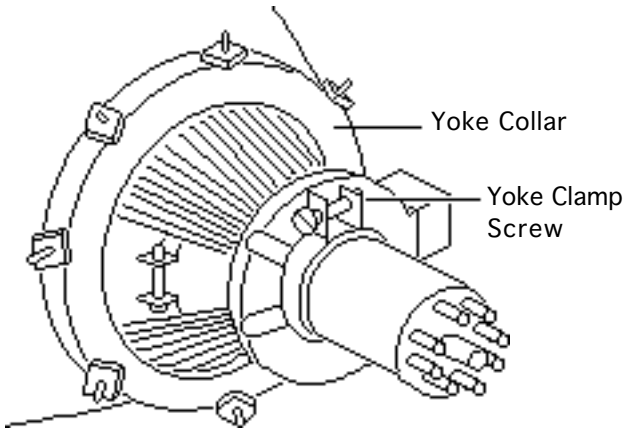
## Tilt Adjustment

**Note:** If glue holds the yoke collar in place, use an art knife to cut through the glue.



- 1 Loosen the yoke clamp screw two or three turns.
- 2 Switch on the computer.
- 3 With one hand, grasp the plastic spokes of the yoke collar and rotate the yoke collar until the top and bottom edges of the picture are parallel with the top and bottom of the bezel.





- 4 Switch off and unplug the computer.
- 5 Discharge the CRT.
- 6 Hold the plastic collar in position and slowly tighten the yoke clamp screw so that the collar cannot slip. Do not overtighten the screw.
- 7 Replace the cover and switch on the computer. Make sure the top and bottom edges of the picture are parallel with the top and bottom of the bezel.

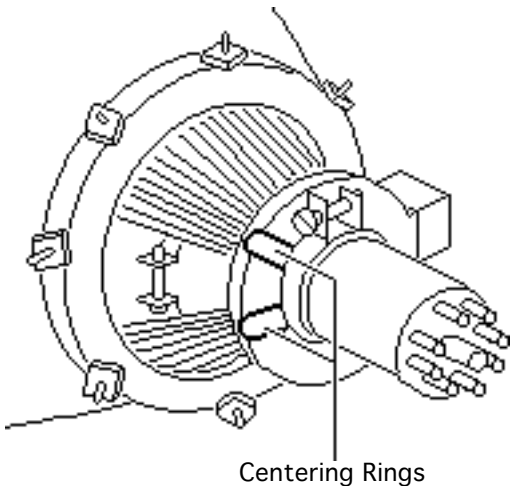


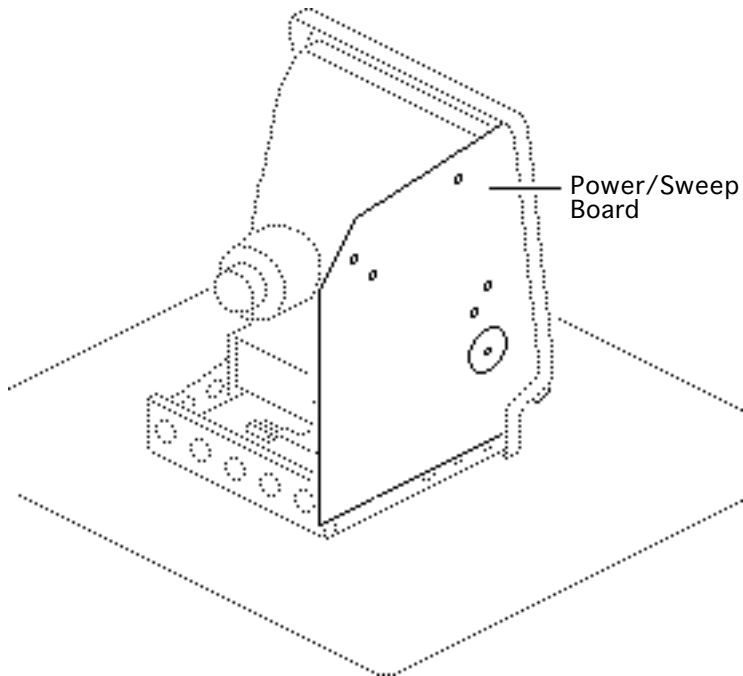


## Centering Ring Adjustment

**Note:** If glue holds the yoke collar in place, use an art knife to cut through the glue.

To center the picture, hold the front centering ring steady and move the rear ring. Then hold the rear centering ring steady and move the front ring.





## Video

You must perform the video adjustments whenever the CRT or the power/sweep board is replaced.

Before you begin, remove the cover.

**⚠ Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT Safety in Bulletins/Safety.



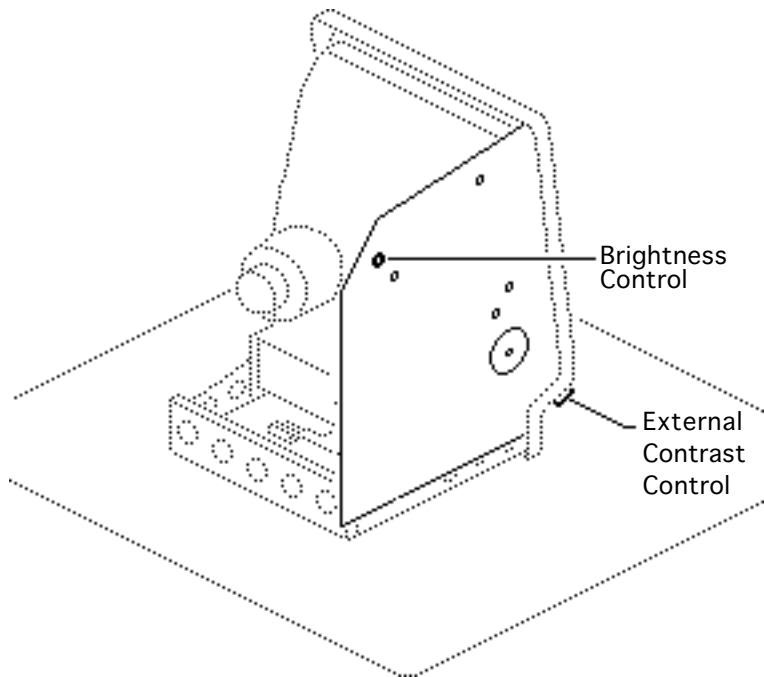


**⚠ Warning:** Because you must make video adjustments from the rear of the computer, use a mirror to view the computer screen. Do not reach around the computer to adjust the controls.

Switch on the computer.



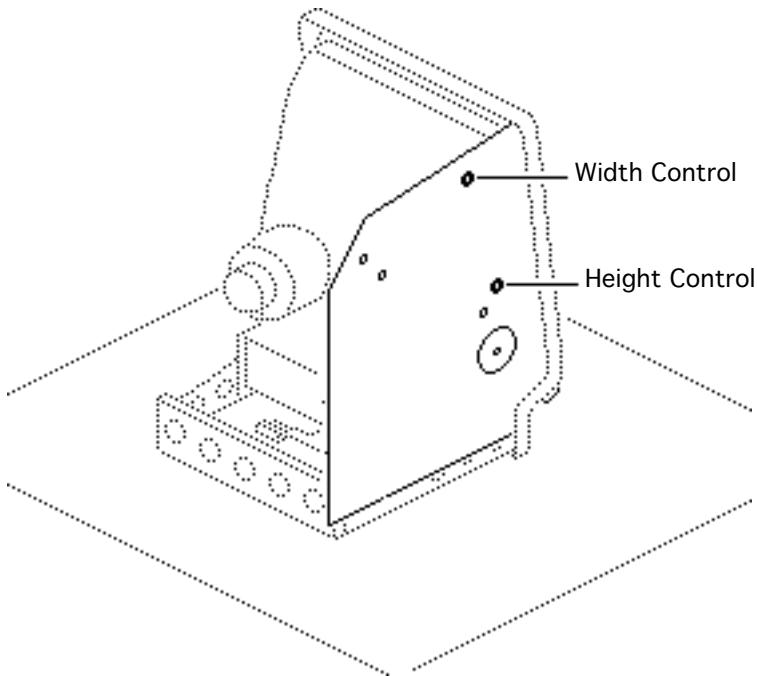




## Brightness and Contrast

- 1 Turn the external contrast control fully clockwise.
- 2 Turn the brightness control fully counterclockwise so that white lines are visible. Turn the brightness control clockwise until the white lines just disappear.
- 3 Turn the external contrast control  $1/8$  of a turn counterclockwise.



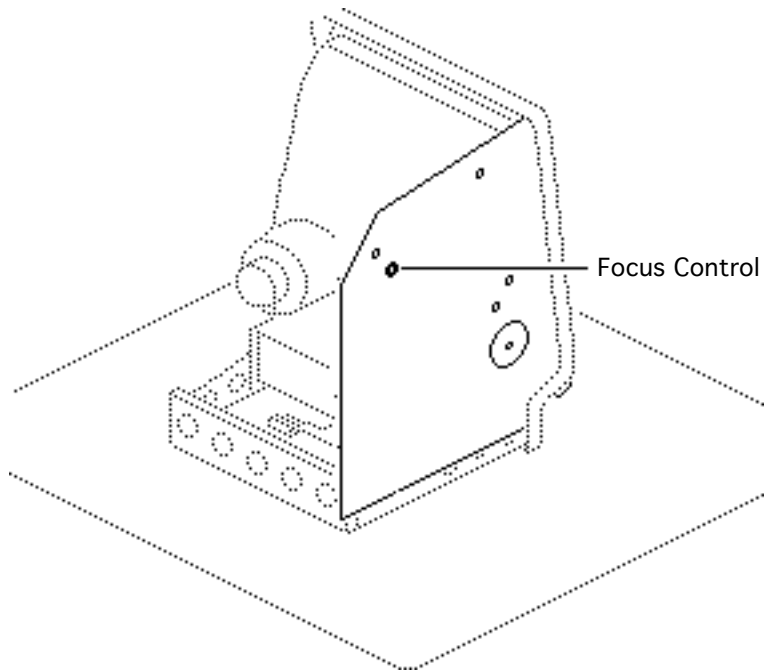


## Size Adjustment

Using the alignment tool, adjust the width control until the raster is 7 inches (177.8 mm) wide.

Using the alignment tool, adjust the height control until the raster is 4.7 inches (119.4 mm) high.





## Focus Adjustment

- 1 Turn the focus control clockwise to its limit.
- 2 Turn the focus control counterclockwise 1/8 of a turn.





Exploded View

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Macintosh Plus





# Exploded View

