Apple Multiple Scan 15 AV Display

Basics

Apple Multiple Scan 15AV
Display

Overview

The Apple Multiple Scan 15AV Display is a 15-inch (13.75-inch viewable image size) color monitor that supports a variety of resolutions and that features a built-in amplifier and front-facing stereo speakers.

Monitor Features

Features of the Apple Multiple Scan 15AV Display include the following:

- Antistatic, antiglare screen surface
- Multiple screen resolutions ranging from 640x480 to 1024x768
- Front-facing, CD-quality speakers
- Easy-access front headphone jack
- Support for Mac OS and Windows 95
- Compatible with Apple ColorSync software for the closest possible color match between what is seen on the monitor and what is printed or scanned
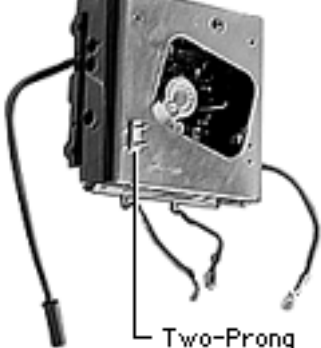
Repair Issues

The current configuration of the CRT/video board and the CRT ground strap differs from the original configuration. The differences affect the CRT/video board removal procedure in the Take Apart chapter, but they do not affect the performance of the display.

Note the differences in the following table:

Part	Original Configuration	Newer Configuration
CRT/Video Board	Two prongs on CRT/video board shield for connection to two-wire connector from CRT ground strap	Clip on CRT/video board shield for connection to spade lug-type connector from CRT ground strap
CRT Ground Strap connection to CRT/Video Board	Two-wire connector at end of two twisted wires from CRT ground strap	Spade lug-type connector at end of single braided cable from CRT ground strap

Note: Apple part number 076-0757 is a kit that includes the new configuration of the CRT/video board and a matching CRT ground strap with the lug-type connector. If your display already has a CRT ground strap with the lug-type connector, you do not need to replace the CRT ground strap. Otherwise, refer to "CRT Ground Strap" in the Take Apart chapter in this manual for replacement instructions.

Specifications

Apple Multiple Scan 15AV
Display

Characteristics

Picture Tube   15-in. CRT (13.75-in. diagonal viewable image size)
                        Raster Size: 10.6 in. x 7.9 in. (270 mm x 200 mm)
                        Multiple scan
                        Antistatic, antiglare surface treatment
                        Dot Pitch: 0.28 mm
                        White Point: 9300° K
                        Shipping Brightness: 25 foot Lamberts (± 5 fL)

Phosphor   Aluminized P22 (red, green, blue)
                        Phosphor CIE Coordinates:

Red	x = 0.610 ± 0.020	y = 0.342 ± 0.020
Green	x = 0.298 ± 0.020	y = 0.588 ± 0.020
Blue	x = 0.151 ± 0.015	y = 0.064 ± 0.015

Screen Resolution

Macintosh	640x480 at 60 Hz in VGA mode
	640x480 at 67 Hz in Macintosh mode
	800x600 at 60 Hz in SVGA mode
	800x600 at 72 Hz in SVGA mode
	832x624 at 75 Hz in Macintosh mode
	1024x768 at 60 Hz in Macintosh mode
	1024x768 at 70 Hz in Macintosh mode
	1024x768 at 75 Hz in Macintosh mode
PC-Compatibles	640x480 at 60 Hz in VGA mode
	800x600 at 60 Hz in SVGA mode
	800x600 at 72 Hz in SVGA mode
	1024x768 at 60 Hz in SVGA mode
	1024x768 at 70 Hz in SVGA mode
	1024x768 at 75 Hz in SVGA mode

Cable Connector   15-pin miniature D-type

Input Signals   Red, green, and blue signals; separate sync

Audio   Response: 50 Hz to 20,000 Hz
                             Output: 2 W
                             SPL: 82 db @ 1 kHz, 1 meter

**System
Requirements**
Power Macintosh, Macintosh Centris, Macintosh Quadra, some
Macintosh Performas, or any NuBus compatible Macintosh
with a Macintosh Display Card 24AC.

Macintosh II family, PowerBooks, Duo and Mini Dock, some
Macintosh Performa, Macintosh LC, LC II, LC III, and
Macintosh computers with Display Cards 4•8, 8•24, or
8•24GC installed work in 640x480 mode. Other modes
possible with additional adapters.

System software version 7.1 or later

Monitor Timings

	640x480 Resolution @ 60 Hz	640x480 Resolution @ 67 Hz
	Horizontal Timing	Horizontal Timing
	Back Porch: 48 dots	Back Porch: 96 dots
	H SYNC: 96 dots	H SYNC: 64 dots
	Front Porch: 16 dots	Front Porch: 64 dots
	1 dot: 39.72 ns	1 dot: 33.06878 ns
	1 H: 31.77 μs	1 H: 28.5714 μs
	1/dot: 25.175 MHz	1/dot: 30.24 MHz
	Vertical Timing	Vertical Timing
	Back Porch: 33 H	Back Porch: 39 H
	V SYNC: 2 H	V SYNC: 3 H
	Front Porch: 10 H	Front Porch: 3 H
	1/H: 31.5 kHz	1/H: 35.0 kHz
	1 V: 16.67 ms	1 V: 15.0 ms

Monitor Timings

800x600
<u>Resolution @ 60 Hz</u>

Horizontal Timing
Back Porch: 88 dots
H SYNC: 128 dots
Front Porch: 40 dots
1 dot: 25.0 ns
1 H: 26.4 µs
1/dot: 40.0 MHz

Vertical Timing
Back Porch: 23 H
V SYNC: 4 H
Front Porch: 1 H
1 H: 37.879 µs
1/H: 16.58 kHz
1 V: 16.58 ms

800x600
<u>Resolution @ 72 Hz</u>

Horizontal Timing
Back Porch: 64 dots
H SYNC: 120 dots
Front Porch: 56 dots
1 dot: 20.0 ns
1 H: 20.800 µs
1/dot: 50.0 MHz

Vertical Timing
Back Porch: 23 H
V SYNC: 6 H
Front Porch: 37 H
1/H: 48.077 kHz
1 V: 13.853 ms

Monitor Timings

832x624
Resolution @ 75 Hz

Horizontal Timing
1/H: 49.7 kHz
Back Porch: 224 dots
H SYNC: 64 dots
Front Porch: 32 dots
1 H: 20.1 μs
1/dot: 57.28 MHz

Vertical Timing
Back Porch: 38 H
V SYNC: 3 H
Front Porch: 2 H
1 V: 13.41 ms

1024x768
Resolution @ 75 Hz

Horizontal Timing
Back Porch: 160 dots
H SYNC: 136 dots
Front Porch: 24 dots
1 dot: 15.385 ns
1 H: 20.677 μs
1/dot: 65.0 MHz

Vertical Timing
Back Porch: 29 H
V SYNC: 6 H
Front Porch: 3 H
1/H: 48.363 kHz
1 V: 16.667 ms

Controls and Ports

User Controls
Front Panel: power, select, up, down, recall, brightness, contrast, sound volume

Additional picture controls available using the select button: horizontal and vertical shift, horizontal and vertical size

Automatic degauss at power-on; manual degauss by turning power switch off, then on (capable of full degauss after monitor is turned off for 20 minutes or more)

I/O Ports
Headphone/Speaker: one input port and one pass-through output port

Physical and Electrical

Power Supply Voltage: 100–240 VAC
Frequency: 50–60 Hz
Power: 75 W maximum; 8 W sleep mode

Input Frequency Range Horizontal: 30 kHz to 60.2 kHz
Vertical: 56 Hz to 75 Hz

Size and Weight Height: 14.93 in. (383 mm ± 5 mm)
Width: 17.3 in. (443 mm ± 5 mm)
Depth: 15.4 in. (395 mm ± 5 mm)
Weight: 31 lb. (14 kg)

Monitor Stand Removable tilt-and-swivel stand

Environmental

Temperature   Operating: 50°F to 104°F (10°C to 40°C)
                         Shipping: –4°F to +151°F (–40°C to +65°C)
                         Storage: 32°F to 140°F (0°C to 60°C)

Humidity   20% to 95% (noncondensing) over the range of 77°F to 104°F
                         (25°C to 40°C)

Altitude   Operating: 0 to 10,000 ft. (0 to 3,048 m)
                         Transit: 0 to 15,000 ft. (0 to 4,500 m)

Power Saving   Conforms to the Energy Star Program of the United States
Feature   Environmental Protection Agency

Troubleshooting

Apple Multiple Scan 15AV
Display

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.)

For additional assistance, contact Apple Technical Support.

First Checklist

Important: Many Apple Multiple Scan 15AV display modules returned for repair are found to be fully operational. Read this checklist before you return a module, and prevent needless module replacement and unnecessary time delays.

✔ The Apple Multiple Scan 15AV Display is not compatible with all computers.

This display works with both Macintosh and IBM PC-compatible computers. A video card may need to be installed to use this display with some computers. For more information, see the computer manual.

For more information on what computers or video cards are compatible with the display, see the Specifications chapter.

✔ The CRT raster will not always resemble a perfect rectangle.

CRT tolerances allow for some distortion. Additional distortion can be caused by magnetized metal objects (such as desks or file cabinets). Move the unit to a different location if you notice raster bowing or bent raster edges.

✔ Jitter, faint lines, or screen movement can be caused by external interference such as electronic devices and fluorescent lights.

Fluorescent lights, other monitors, or electronic appliances (such as coffee makers and copy machines) can cause raster distortion. Move the unit to another room or building to help determine if external interference is the source of the problem.

Note: If the raster has shifted up/down or right/left only, adjust it using the user controls. However, keep in mind that, if you then move the monitor, you may need to readjust the centering controls.

If the display changes (for better or worse) when you move it to another location, the environment is the source of the problem. Relocate the monitor or move the distortion-causing object.

✔ **A maladjusted screen can mimic the symptoms of main deflection board or CRT failures.**

By performing the adjustment procedures, you might determine if one or more of the adjustments is the cause of the problem.

✔ **CRTs rarely fail.**

Needless CRT replacement can be prevented by checking display adjustments, checking the possibility of other defective modules, and accepting small imperfections in screen display.

If you have any doubts about whether a CRT is defective, contact Apple Technical Support.

Symptom Charts

No Raster

No raster (screen is black); power indicator light on

1   Ensure that the display is connected to a known-good video source.
2   Adjust the front panel brightness and contrast controls.
3   Check the monitor's video cable for breakage or damage. Perform a continuity check to ensure that the video cable is not at fault.
4   Slowly adjust the screen control on the flyback transformer to see if the raster appears. If it reappears, perform the "Cutoff and White Balance" procedure in the Adjustments chapter.
5   Replace the main deflection board.

No raster; power indicator light off

1   Ensure that the display is plugged in and that the power cord is not damaged.
2   Replace the main deflection board.

Video

Display has one predominant color

1   Verify that the CRT/video board is connected securely to the CRT socket.
2   Inspect the video cable connector (at P301) on the CRT/ video board for breakage/continuity. This cable carries the Red, Green, and Blue signals from the main deflection board to the CRT/video board.
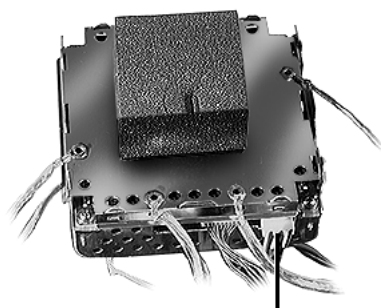
P301

3   Perform the "Cutoff and White Balance" procedure in the Adjustments chapter.
4   Replace the CRT/video board.
5   If you suspect a defective CRT, contact Apple Technical Support.

Video (Continued)

Areas of the screen have blotches of color

1   Since this type of problem (purity) is often caused by magnetic fields in the area, place unit in another location to see if symptom disappears, changes in its intensity, or changes location on the screen.

2   Turn off the monitor power switch, wait five minutes, then turn it back on. This enables the monitor's internal degaussing coil.

3   Severe magnetic field problems require the use of an external degaussing coil. (Degaussing coils can be purchased at most larger electronic parts stores.)

Screen is too bright; adjusting Brightness control does not lower intensity

1   Perform the "Cutoff and White Balance" procedure in the Adjustments chapter.

2   Replace the CRT/video board.

3   Replace the main deflection board.

4   If you suspect a defective CRT, contact Apple Technical Support.

Geometry

Raster not centered

1 Adjust either or both horizontal center and vertical center controls. See "Geometry" in the Adjustments chapter.
2 Adjust the horizontal center switch (SW701 on version G only). See "Horizontal Centering" in the Adjustments chapter.

Size of the horizontal and/or vertical raster is incorrect

Use the appropriate size controls to set the vertical height to 200 mm (7.9 inches) and the horizontal width to 270 mm (10.6 inches). Refer to "Geometry" in the Adjustments chapter.

One or both sides of the raster is bowed

1 To minimize the bowing, perform the "Pincushion" procedure in the Geometry section of the Adjustments chapter. Keep in mind that there is some allowed tolerance and the setting will NOT always be perfect.
2 **Important:** As mentioned in step one, some degree of bowing is still considered to be within tolerance. If you have any doubts, contact Apple Technical Support before replacing a board that may not fix the problem.
3 Replace the main deflection board.

Raster is narrower or wider at the top of the screen than at the bottom

1 To set the keystone control for optimum screen performance, perform the "Keystone" procedure in the Geometry section of the Adjustments chapter. Keep in mind that there is some allowed tolerance and the setting will NOT always be perfect.
2 **Important:** As mentioned in step one, some trapezoidal imperfection is still considered to be within tolerance. If you have any doubts, contact Apple Technical Support before replacing a board that may not fix the problem.
3 Replace the main deflection board.

Sound Problems

Distorted or no sound coming through one speaker

Disconnect the wires to both speakers. Using jumper cables, connect the right speaker wire to the left speaker and the left speaker wire to the right speaker. This will isolate the problem to a defective speaker or a defective main deflection board.

Distorted or no sound in both speakers

1   Try another sound source to ensure that you are not using a defective CD or other sound device.
2   Replace the main deflection board.

On a Performa 6400, sound comes through Performa subwoofer even though headphones are plugged into headphone jack on front of display

To mute the subwoofer, do any one of the following:
- Keep headphones plugged into headphone jack on front of display, but mute subwoofer using Sound and Displays Control Panel.
- Keep headphones plugged into headphone jack on front of display, but lower volume of subwoofer by turning balance control knob at rear of Performa 6400 fully counterclockwise.
- Plug headphones into headphone jack on front of Performa 6400.
- Plug headphones into headphone jack at rear of Performa 6400.

Take Apart

Apple Multiple Scan 15AV Display

Safety Guidelines for Taking Apart the Apple Multiple Scan 15AV Display

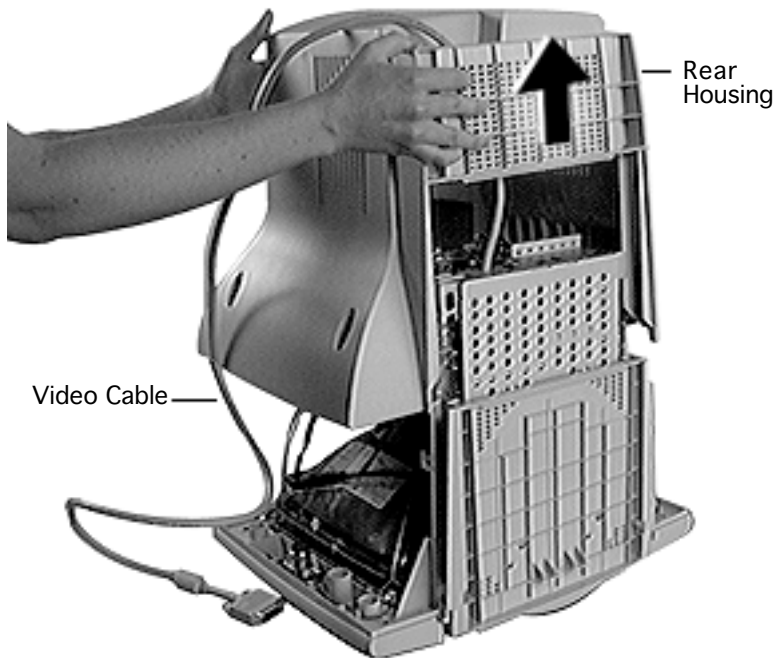⚠️**Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.

⚠️**Warning:** Never use a grounding wriststrap until after discharging the CRT and setting up an ongoing ground connection.

Important: Whenever the housing of the monitor is removed and before replacing a module, you must

1   Discharge the CRT and remove the anode cap.

2   Establish an ongoing ground by using a cable with alligator clips at both ends. Connect one end to the anode aperture, and connect the other end to the braided ground strap that wraps around the CRT.

3   With the CRT discharged and the ongoing ground in place, wear a grounding wriststrap to prevent equipment damage from static electricity.

CRT Discharge Tool

Anode Cap
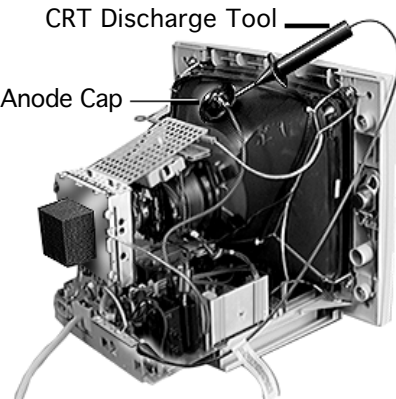
Note: The ground strap and CRT/video board on newer displays are somewhat different than pictured here. Refer to "Repair Issues" in the Basics chapter for details.

Anode Aperture   Ongoing Ground   Ground Strap
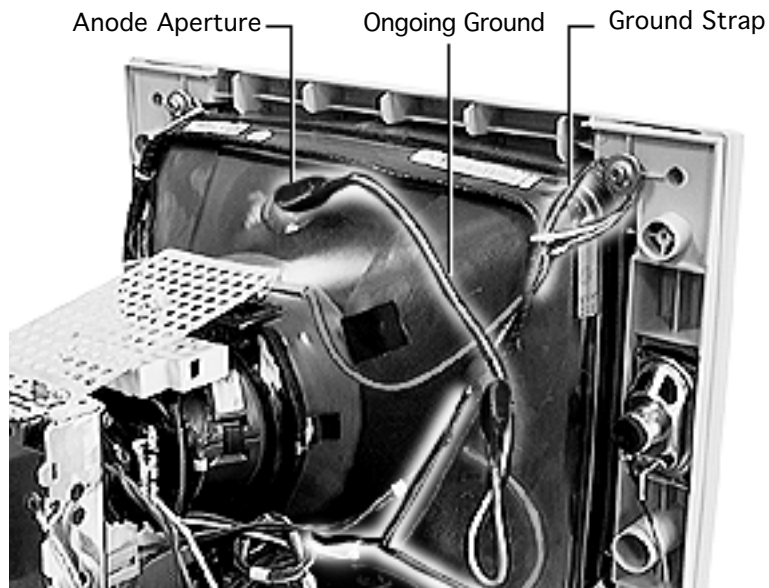
Control Panel Door

Control Panel Door

No preliminary steps are required before you begin this procedure.

1 Position the monitor close to the edge of a table and so that the screen faces you.

2 Press down on the center of the door so it flips open.

Control Panel Door

3 Grasp each side of the door and pull the door down to release it from its hinges.

Replacement Note: Position the door under the bezel so the hinges line up with the bezel contacts. Push the door onto the bezel until it snaps into place.

Tilt-Swivel
Stand

Tilt-Swivel Stand

Before you begin, remove the control panel door.

Note: Because this procedure requires you to place the monitor face down, you need to remove the control panel door to prevent damaging it.

Tab   Tilt-Swivel Stand   Tab
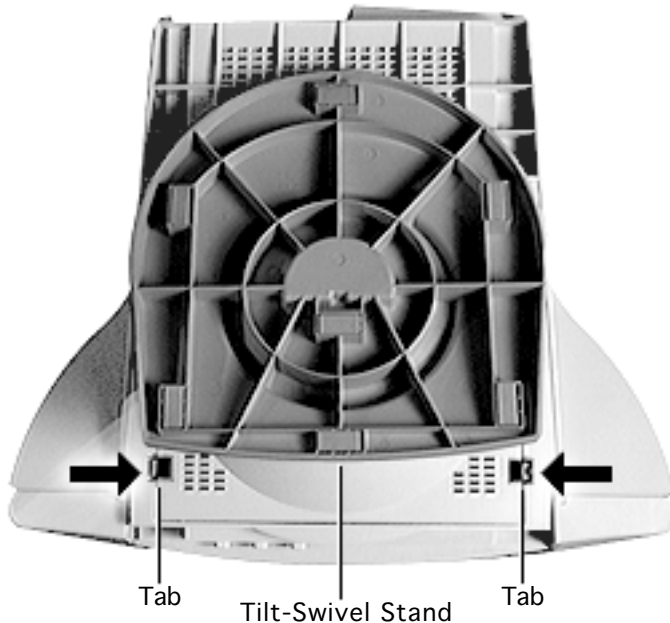
1. Place the monitor face-down on a padded surface with the bottom of the stand facing you.

2. Press inward on both tabs on the sides of the stand.

Hook   Tilt-Swivel Stand   Hook

3 Tilt the stand upward and off the bottom housing.

Replacement Note: With the monitor face down, insert the two hooks on the back of the tilt-swivel stand into the two slots on the bottom housing. Push the stand onto the housing until its tabs snap into place.
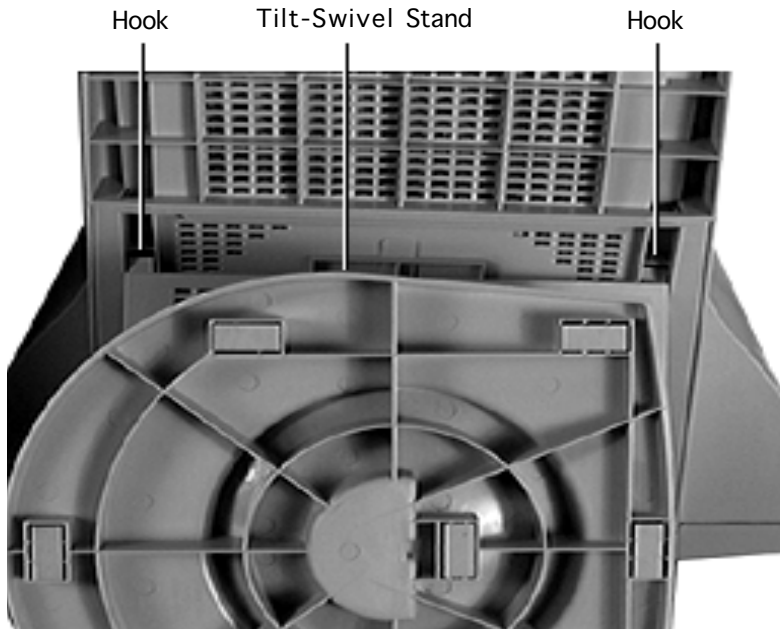
Rear Housing

Rear Housing

Before you begin, remove

• Control panel door
• Tilt-swivel stand

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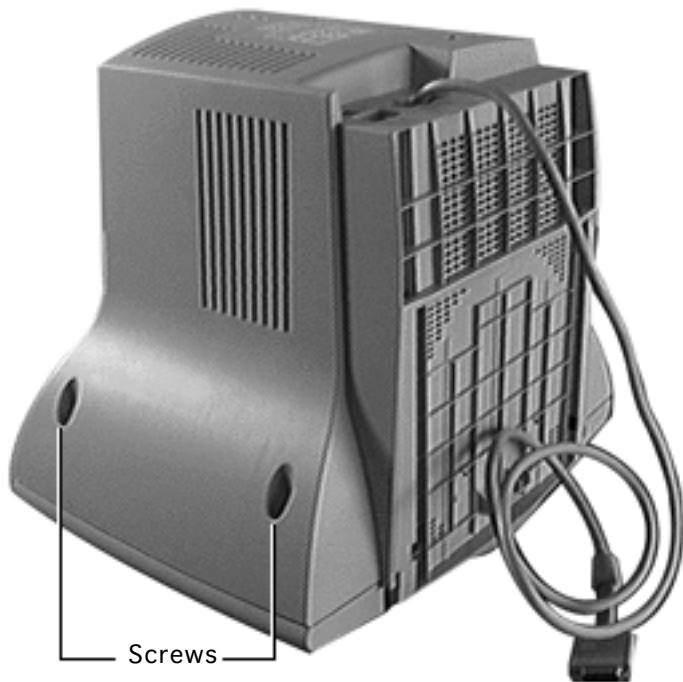
Screws

1. Place the monitor face-down on a padded surface.

2. Remove the four Phillips screws (two on each side).

Rear Housing

Video Cable

3   Lift the rear housing straight off the CRT assembly and route the video cable through the opening in the rear housing.
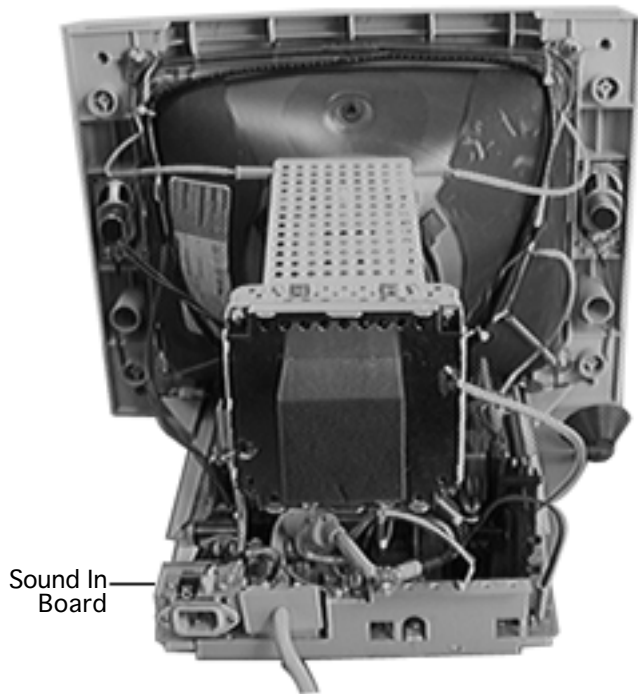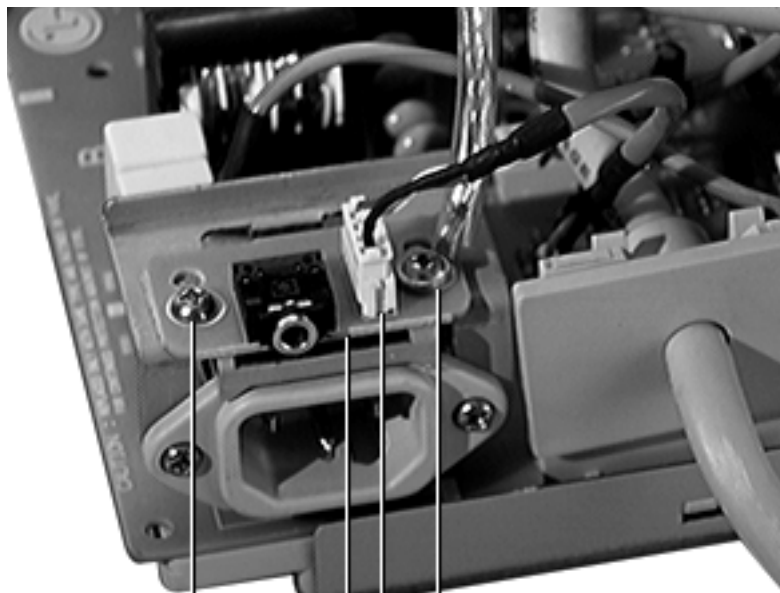
Speakers

Speaker

Before you begin,

- Remove the control panel door
- Remove the tilt-swivel stand
- Remove the rear housing
- Discharge the CRT

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Speaker Connectors
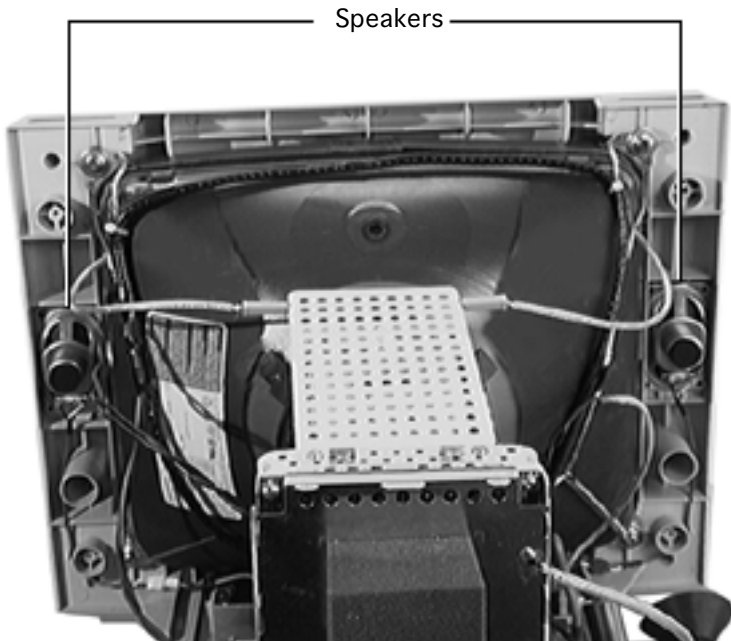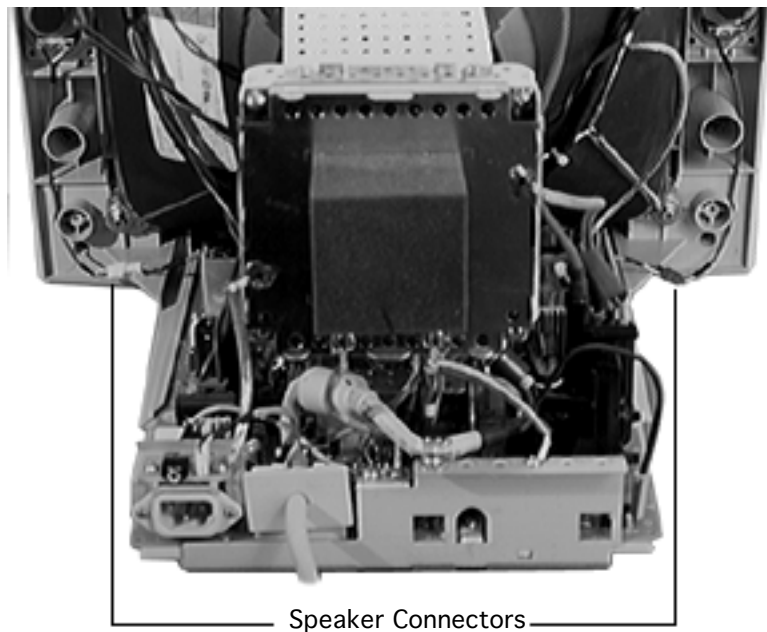
1 Locate the inoperative speaker and disconnect the speaker connector near the display's bottom corner, either
- Red speaker connector on the right
- White speaker connector on the left

Routing
Channel

Speaker Wire

2 Remove the speaker wire
   from its routing channel.

Screwdriver

Foam Gasket
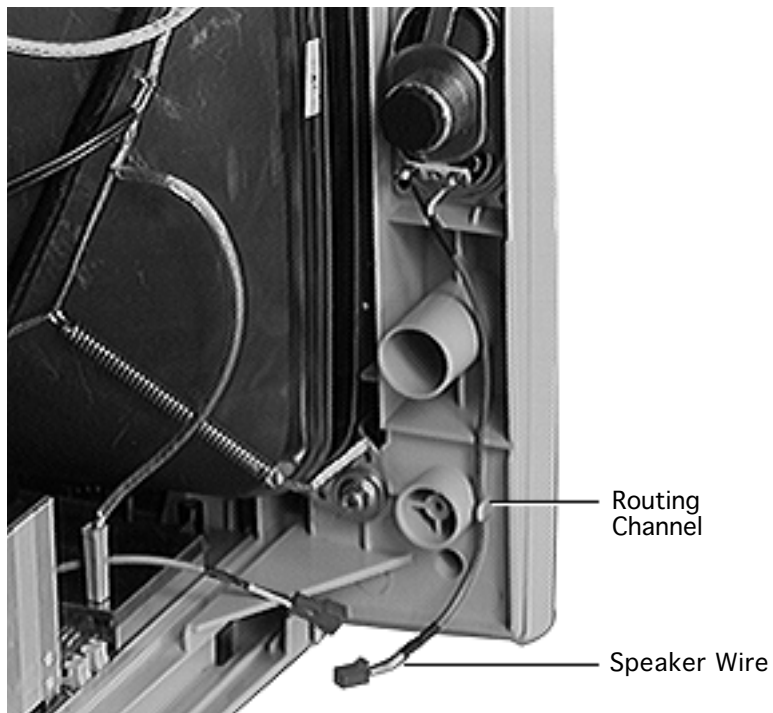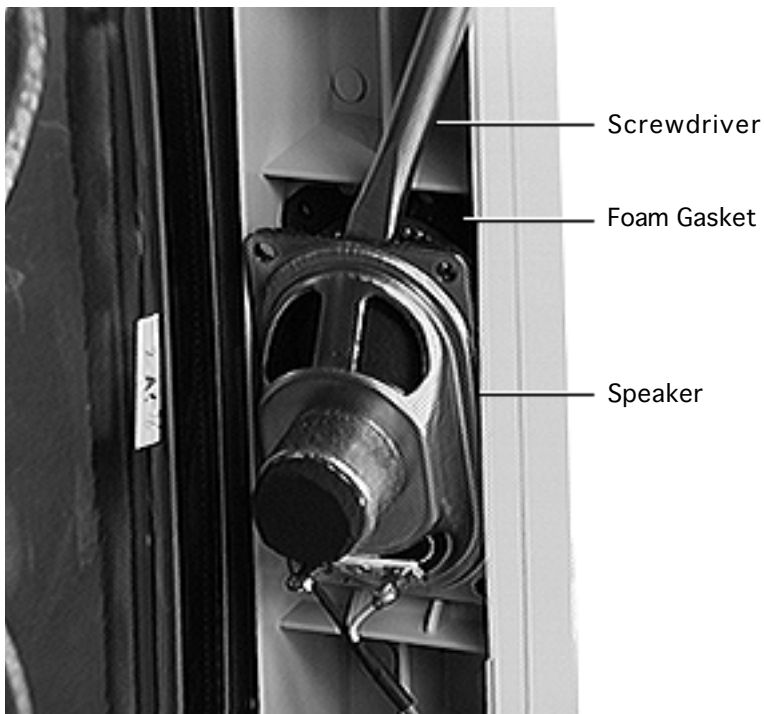
Speaker

3 Use a flat-blade screwdriver to pry off the speaker and its foam gasket from the bezel.

4 Lift the speaker from the inside bezel.

Replacement Note: When replacing a speaker, verify that the bezel is clean, peel off the foam gasket's adhesive backing, and apply the speaker to the bezel.

The speakers are fully interchangeable, so you can replace a speaker on either side of the bezel.

Speaker Grilles

Speaker Grille   Speaker Grille

Before you begin,

- Remove the control panel door
- Remove the tilt-swivel stand
- Remove the rear housing
- Discharge the CRT

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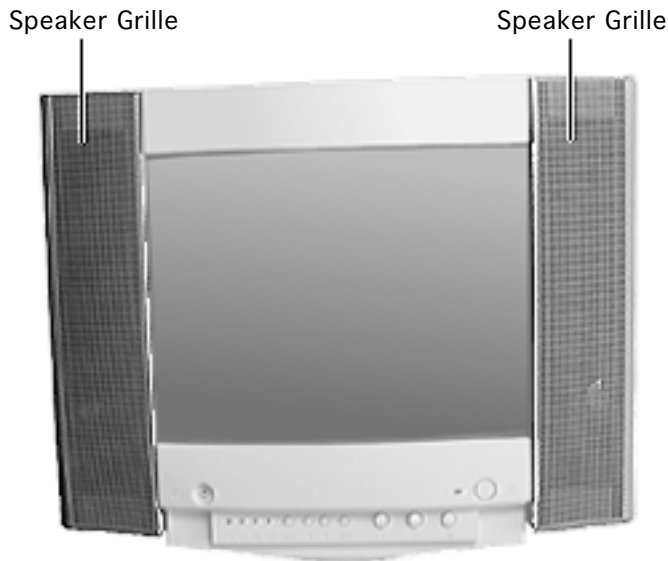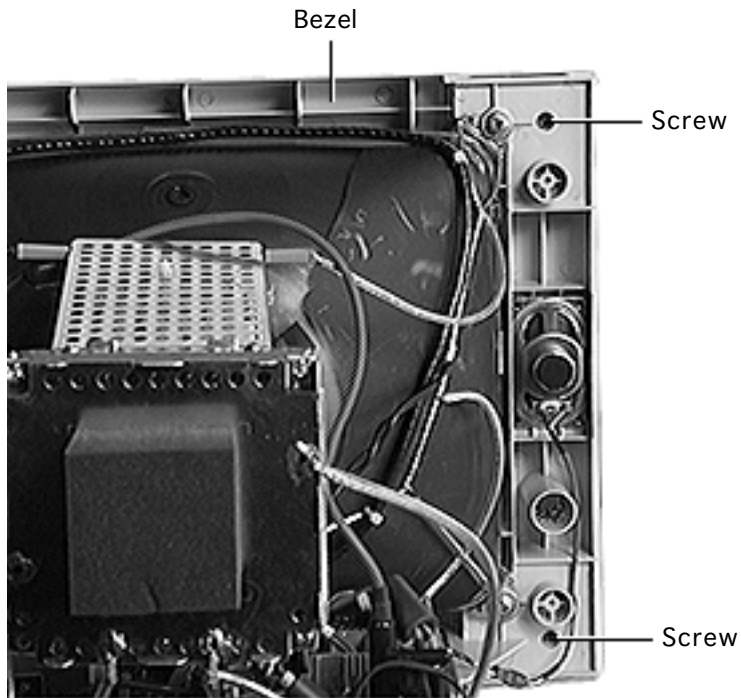
Bezel

Screw

Screw

1. Remove the two recessed screws at the top and bottom of the inner bezel sides.

   Caution: Do not remove the CRT corner screws.

Screwdriver

Bezel
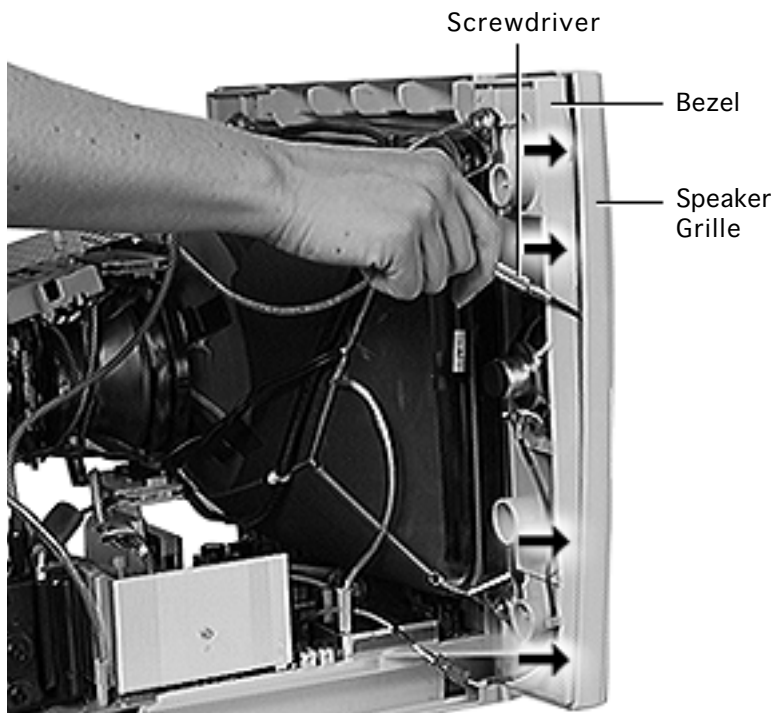
Speaker Grille

2 Insert a small flat-blade screwdriver between the outside speaker grille and bezel. Pry off the grille in four places to release the four side tabs.
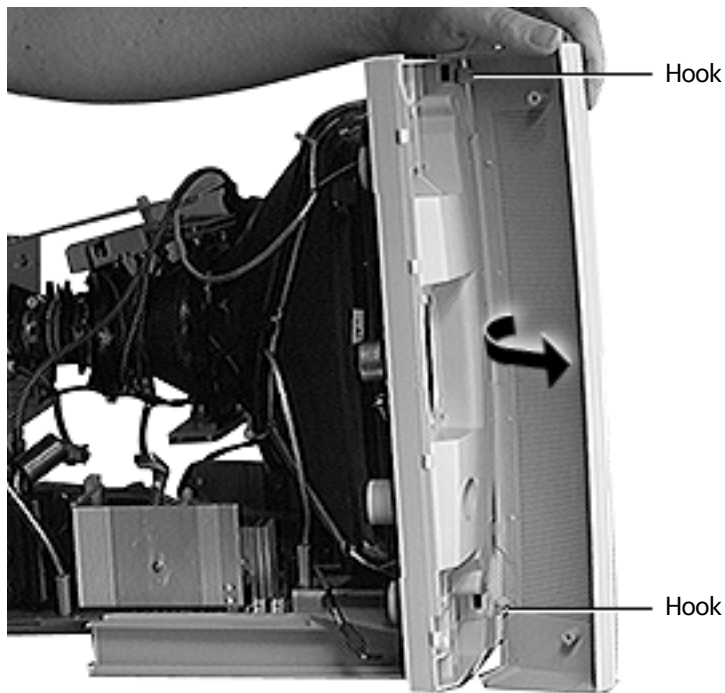
Hook

Hook

3 Gently tilt the speaker grille toward the display face to release it from the bezel hooks.

4 Repeat steps 1 through 3 for the other speaker grille.

Replacement Note: The left and right speaker grilles come as a pair and are not interchangeable.

Sound In
Board

Sound In Board

Before you begin,

- Remove the control panel door
- Remove the tilt-swivel stand
- Remove the rear housing
- Discharge the CRT

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Screw — Sound In Board — Screw — P156

1 Remove
   • Two screws
   • P156 connector

2 Lift the board off the metal bracket.

CRT/Video Board
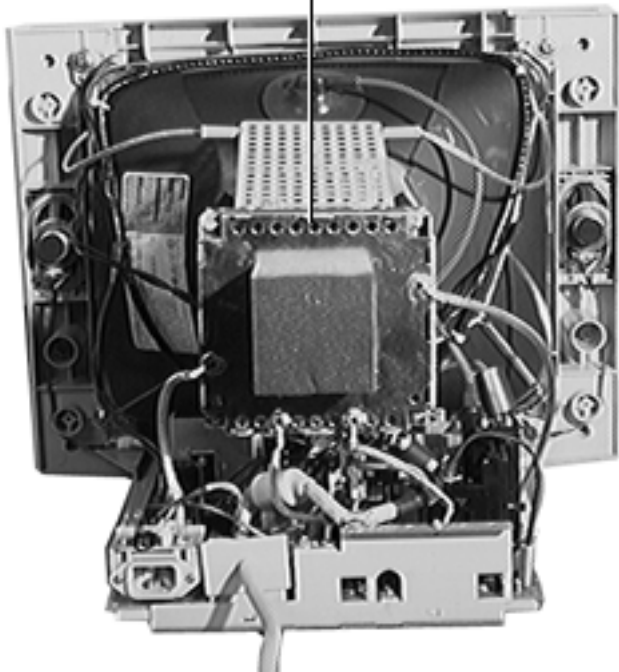
CRT/Video Board

Before you begin,

- Remove the control panel door
- Remove the tilt-swivel stand
- Remove the rear housing
- 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 and read the safety guidelines at the beginning of this chapter.

Ground Cable — CRT Shield — Ground Cable
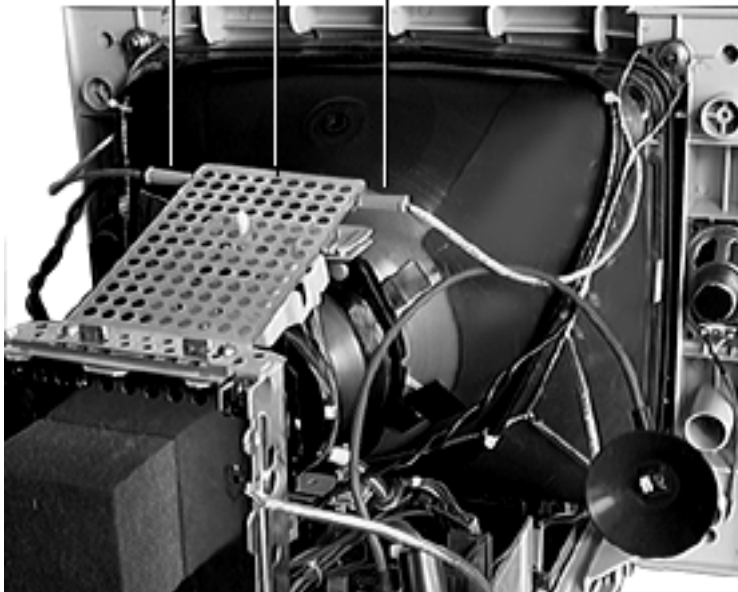
Caution: When disconnecting cables from the CRT/video board, be careful not to apply excessive pressure on the neck of the CRT.

1 Disconnect the two braided CRT ground cables located on both sides of the CRT shield.
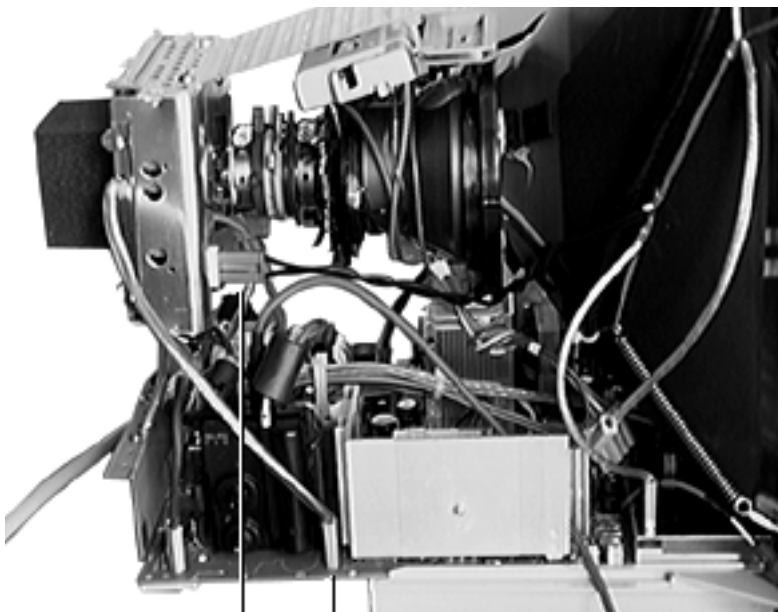
Two-Wire Connector — Braided Cable at E2

2 From the side of the CRT assembly, disconnect
   • Two-wire connector behind CRT/video board (On newer displays the two-wire connector was replaced by a braided cable with a spade lug-type connector.)
   • Braided cable at E2 to the right of the flyback transformer on the main deflection board

Screen   Screen
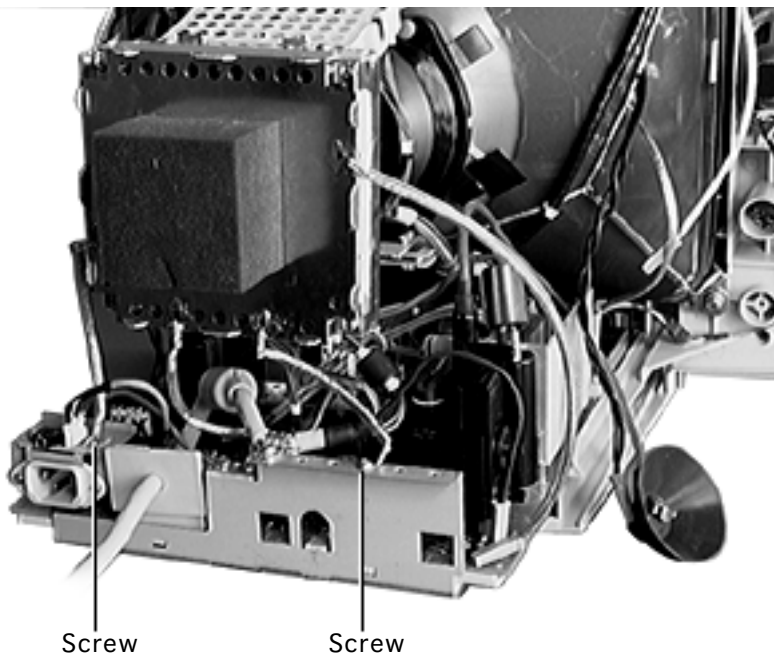
3 From the back of the CRT
  assembly, remove
   • Phillips screw that
     connects the braided
     cable to the sound in
     board
   • Phillips screw that
     attaches the braided
     cable to the back
     panel flange
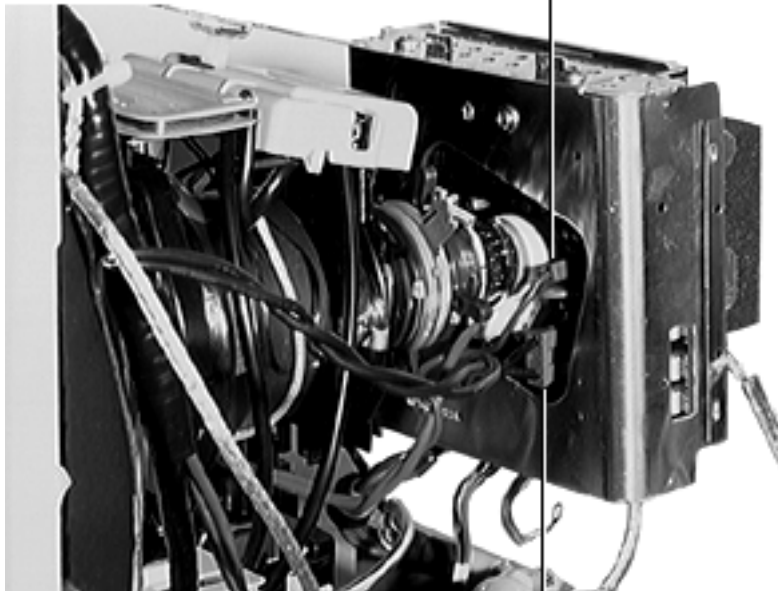
Red Wire at P304

Two-Wire Connector at P305

4 From the side of the CRT assembly, disconnect
   • Red wire with the gray connector on the CRT/video board at P304
   • Black two-wire connector on the CRT/ video board at P305

Neck
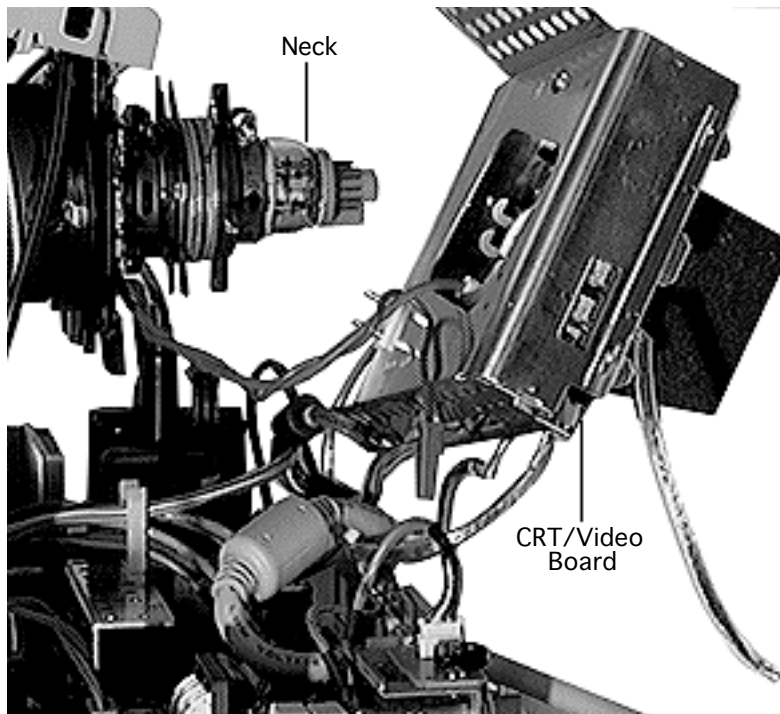
CRT/Video Board

5 **Caution:** Twisting, bending, or applying force to the CRT/video board could damage the neck of the CRT.

   With a gentle side-to-side motion, ease the CRT/video board off the neck of the CRT until it clears the neck pins.

6 With some wires still attached, set the CRT/video board on the table.
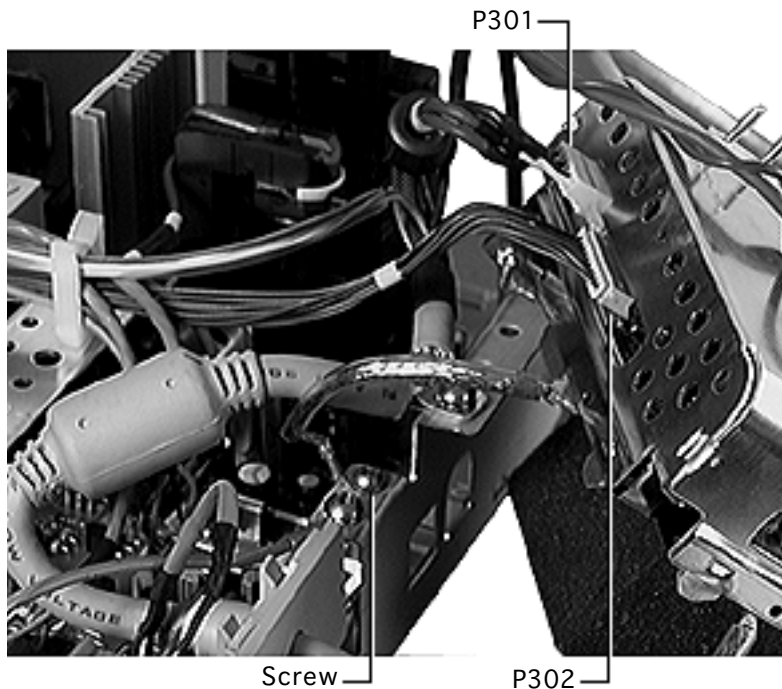
P301

Screw

P302

7 Using a Phillips screwdriver, remove the screw holding the braided cable to the back panel flange.

8 Disconnect
• Connector P302
• Connector P301

Lock — Screwdriver
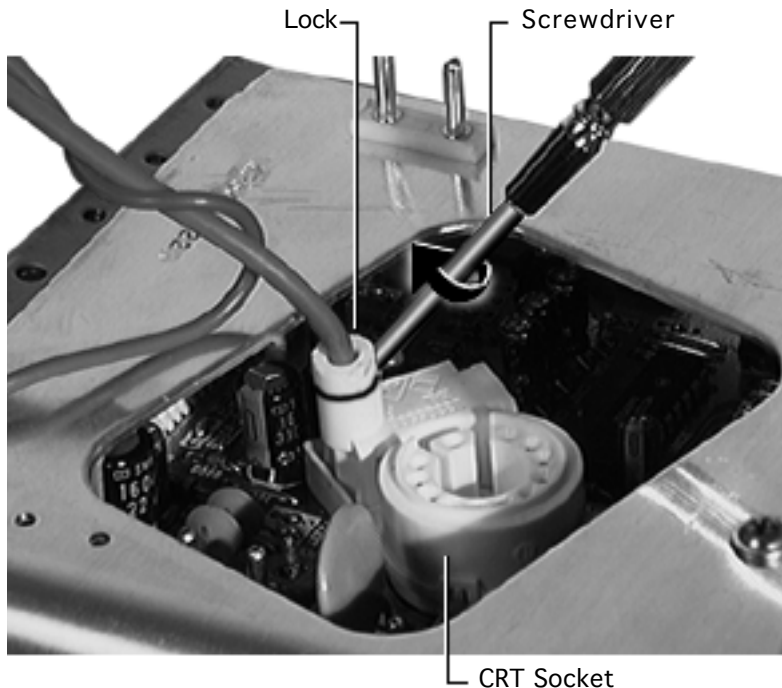
CRT Socket

9 Use a flat-blade jeweler's screwdriver to gently pry up the wire lock (about one to two millimeters) from the CRT socket base.

Note: On newer displays the lock is not present.
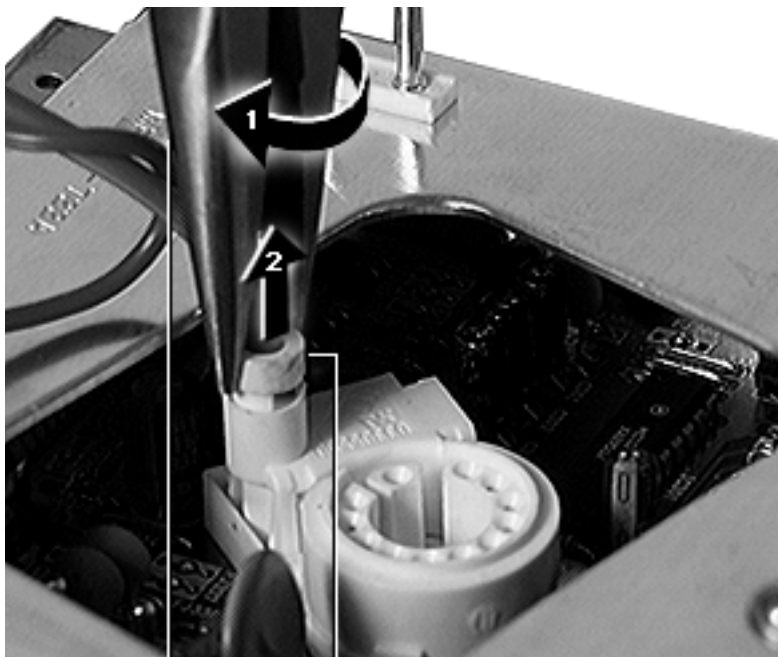
Needlenose Pliers   Lock

10 Using needlenose pliers, firmly grasp the lock and twist it in a clockwise direction (about one-eighth of a turn) while pulling the lock straight up.

Note: On newer displays where the lock is not present, firmly grasp the wire and twist it in a clockwise direction three to four turns. Pull the wire straight up.
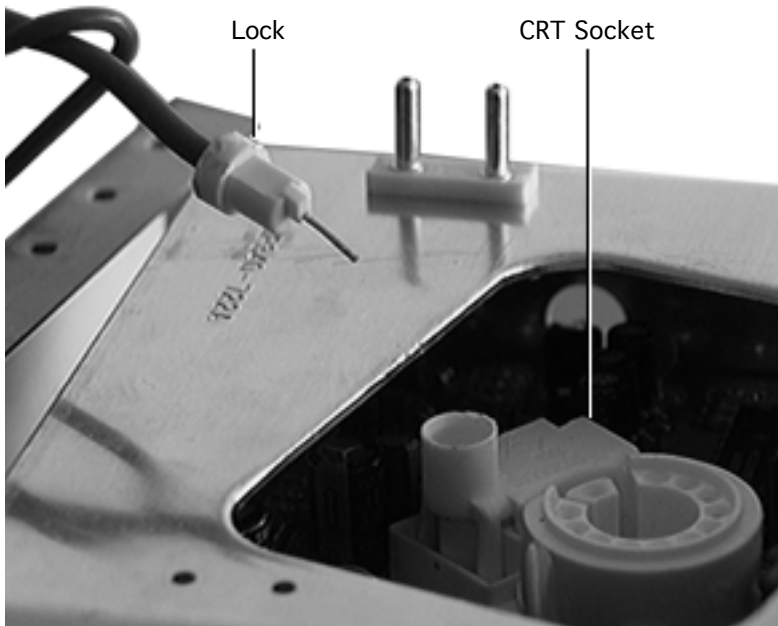
Lock   CRT Socket

11 Pull the wire lock and wire from the CRT socket.

Because the lock fits loosely over the wire, slightly bend the wire so the lock cannot slide off.

Replacement Note: Before securing the lock inside the CRT socket, ensure the end of the wire is straight. With the lock attached, push the wire straight down as far as it will go. Then secure the lock in the socket with a counterclockwise turn.
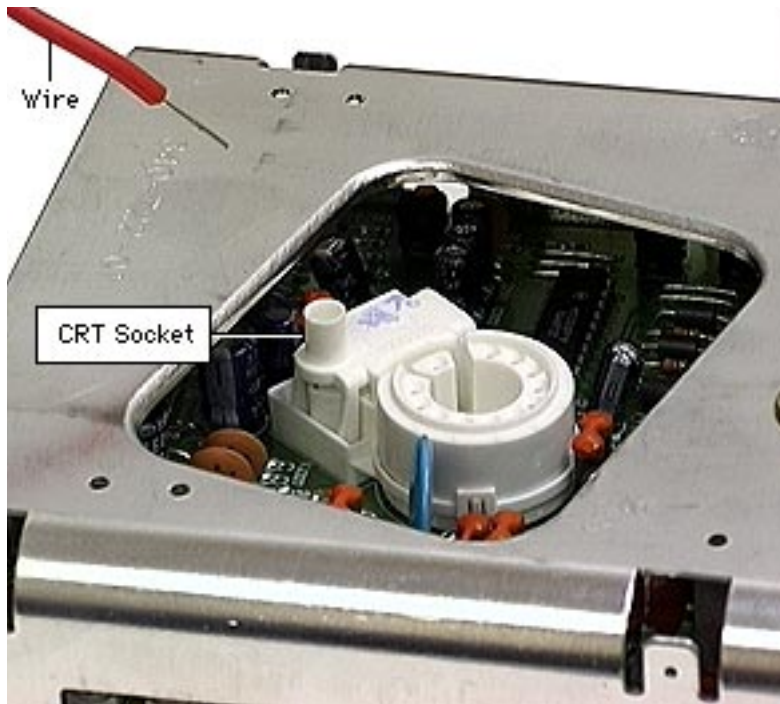
Replacement Note: On newer displays the wire lock is not present and the wire receptacle on the CRT socket is smaller. To replace the wire, ensure the end of the wire is straight and push it down as far as it will go. Gently tug on the wire to ensure a secure fit.
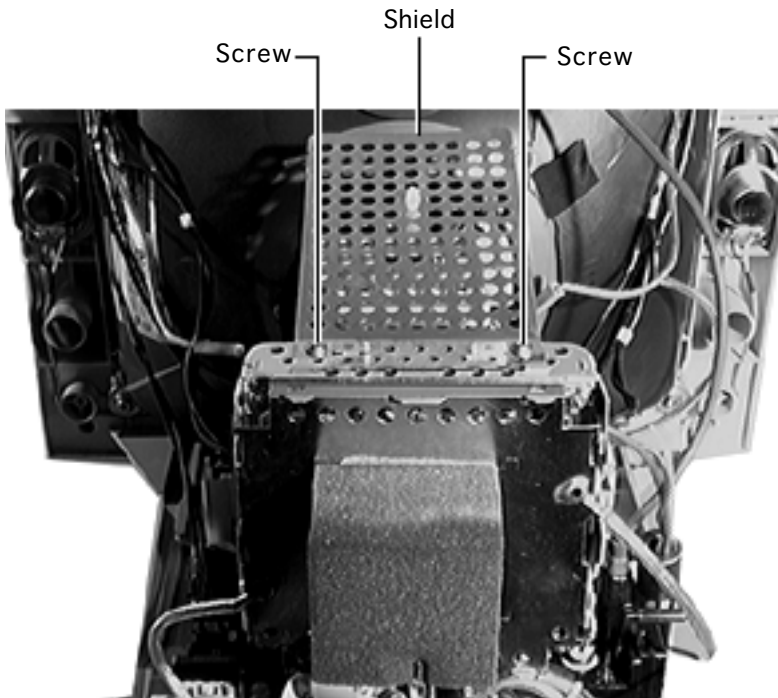
Screw — Shield — Screw

Replacement Note: Before returning a CRT/video board for replacement, remove and retain the shield so you can attach it to the replacement board.

Remove the two Phillips screws that secure the shield onto the CRT/video board.

CRT Ground Strap

CRT Ground Strap
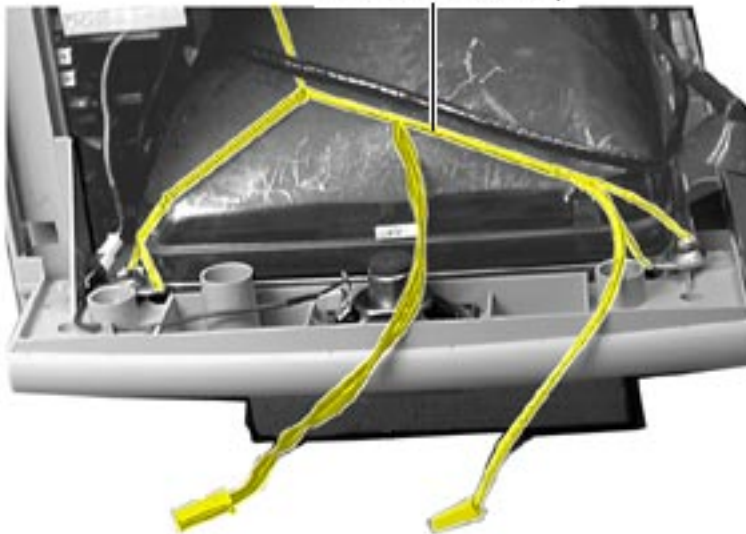
Replacement Note: When replacing the CRT/video board, you might need to replace the CRT ground strap as well. Check the ground connection on the CRT/video board shield and the connector on the CRT ground strap. The connections must match. Refer to "Repair Issues" in the Basics chapter for more details.
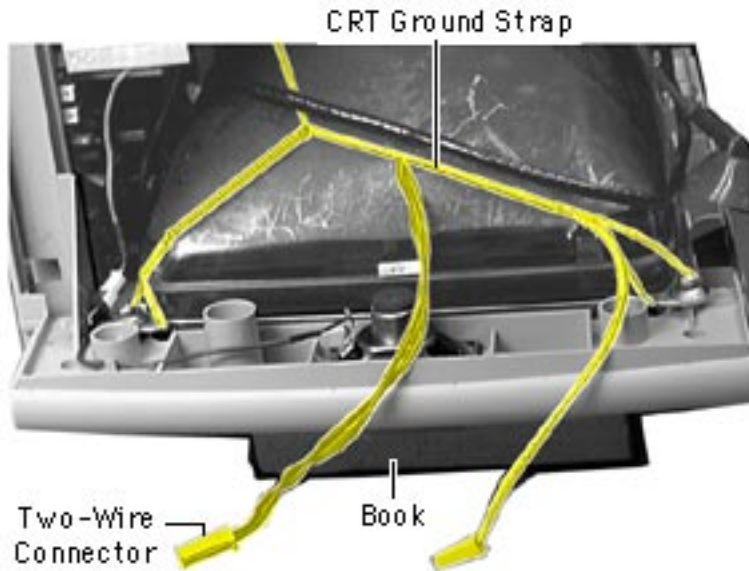
Removing the Old CRT Ground Strap

1 Place the display face-down on a thick book that is slightly smaller than the dimensions of the display face.

Note: The graphic at left shows the original ground strap configuration with the two-wire connector. If you have installed a new CRT/video board, use the replacement ground strap included in the CRT/video board kit (Apple part number 076-0757).

Degauss Coil
CRT Ground Strap
Cable Tie
Screw
Washer
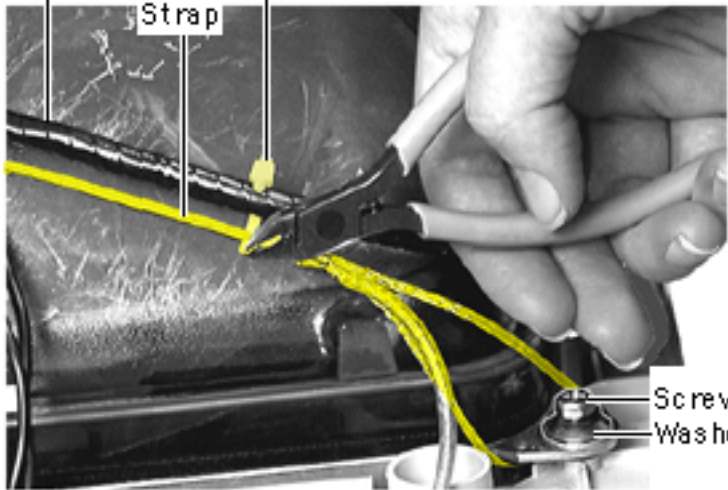
2 Cut the four plastic cable ties that secure the CRT ground strap to the degauss coil.

3 Remove the four CRT corner screws and washers; ensure the rubber grommets remain in the corner tabs.

4 Starting at the top corner of the CRT, lift off the end loop of the ground strap from the corner tab. Repeat for the other three loops.

5 Remove the old CRT ground strap from the display assembly.
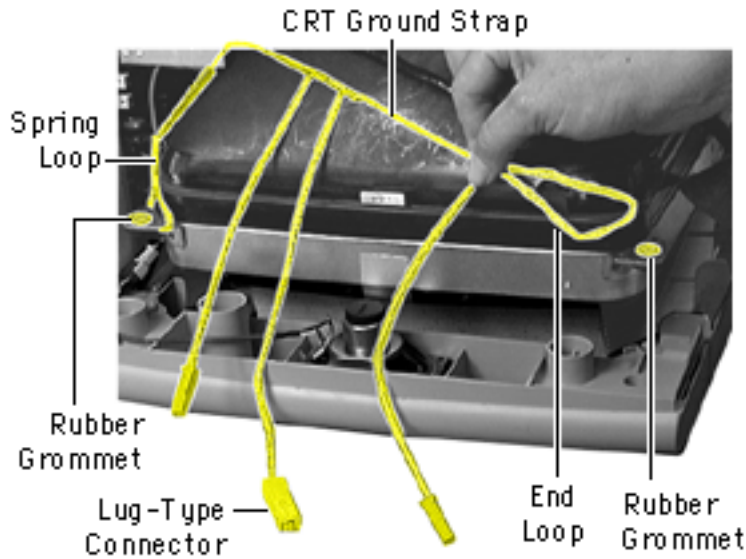
Installing the New CRT Ground Strap

1   Locate the lug-type connector on the new ground strap. Starting at that end, slip the end loop over the top left corner tab.

2   Locate the loop that is connected with a spring. Slip the spring loop over the bottom left corner tab, as shown.

Ensure the rubber grommets remain in place in the corner tabs.

CRT Ground Strap   Screw

Washer

Bezel
Assembly
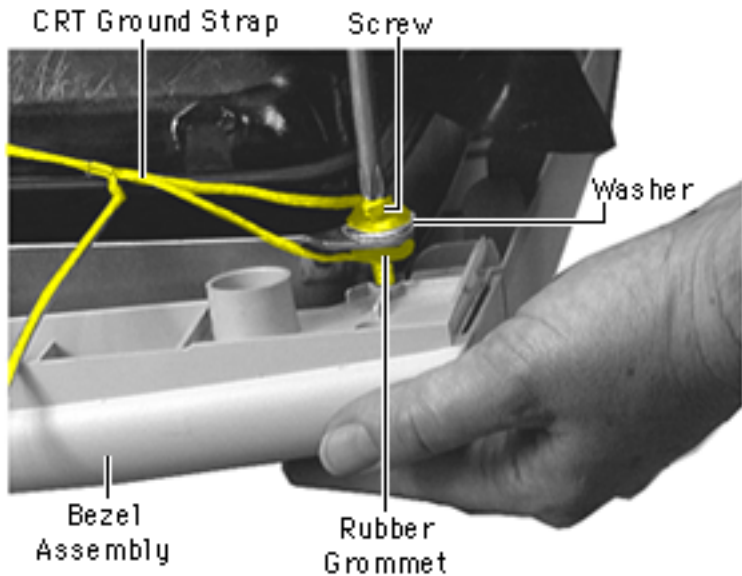
Rubber
Grommet

3 Route the rest of the strap to the other side of the CRT in between the CRT yoke and the main deflection board. Ensure the CRT ground strap slips beneath the degauss coil.

4 Attach the remaining two loops over the corner tabs.

5 Ensure the rubber grommets remain in the corner tabs. Lift up and support the bezel assembly to secure the four corner screws.

6   Ensure the CRT ground
    strap maintains contact
    with the CRT on all three
    sides and the degauss coil
    is centered on the CRT.
    Adjust as necessary.

7   Using the plastic cable
    ties included with the
    ground strap in the CRT/
    video board kit, secure
    the ground strap to the
    degauss coil at the two
    top corners. Use the
    remaining two cable ties
    to secure the ground
    strap to the middle of the
    degauss coil.
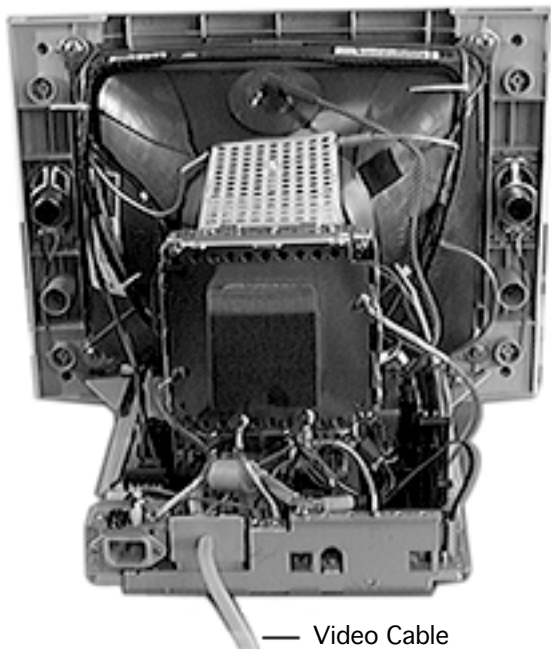
— Video Cable

Video Cable

Before you begin,

- Remove the control panel door
- Remove the tilt-swivel stand
- Remove the rear housing
- 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 and read the safety guidelines at the beginning of this chapter.

Ground Cable   Ground Cable
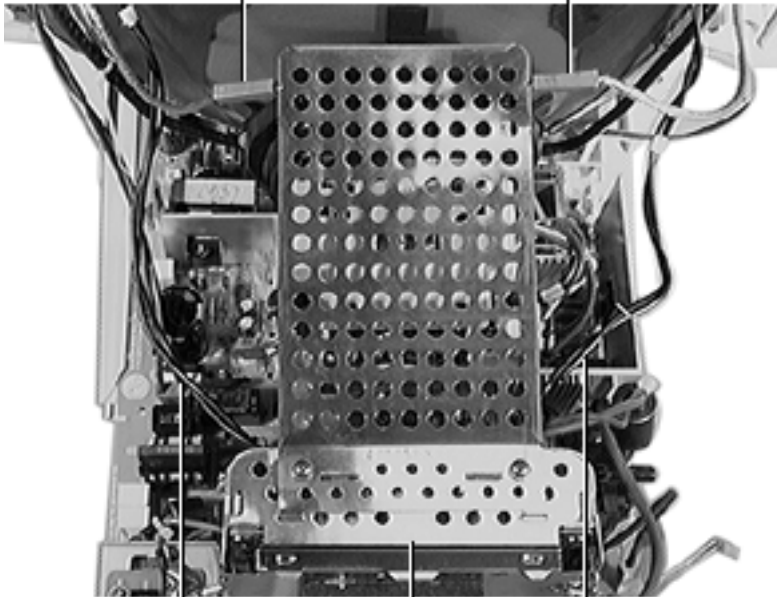
Two-Wire   CRT/Video Board   Two-Wire
Connector   Connector

Caution: Twisting, bending, or applying force to the CRT/video board could damage the neck of the CRT.

1 Disconnect
   • Two braided CRT ground cables from the CRT shield
   • Two two-wire connectors from the CRT/video board

2 With a gentle side-to-side motion, ease the CRT/video board off the neck of the CRT until it clears the neck pins.

Ground Screw   Cable Clip
Screw
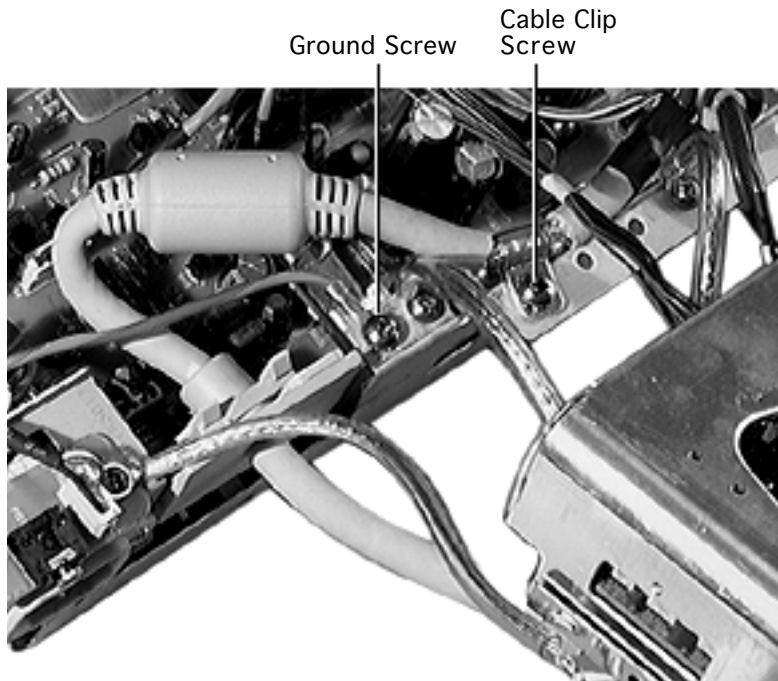
3 With some wires still
   attached, move the CRT/
   video board so that you
   can reach the back panel
   screws.

4 Remove
   • Phillips ground screw
     and lock washer
   • Phillips screw and
     lock washer at the
     cable clip

P301

E3
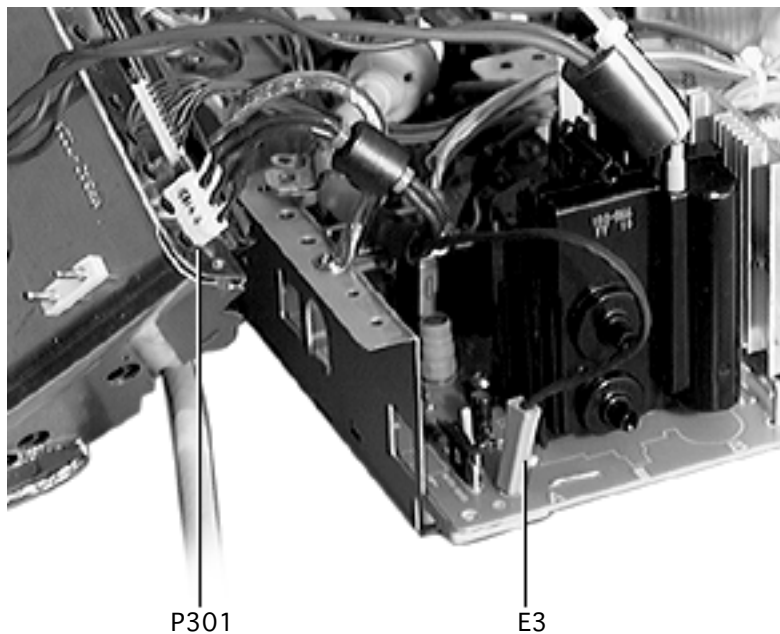
5 Disconnect
- Connector P301
- Pin E3
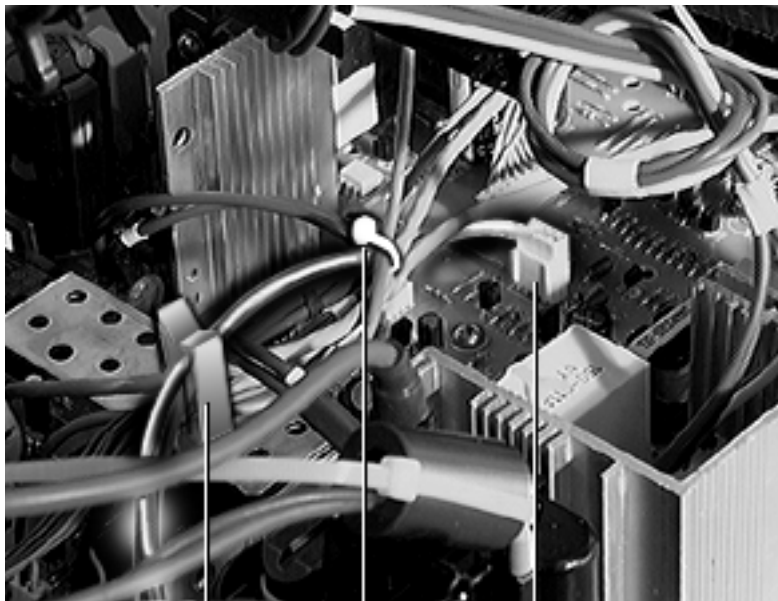
Cable Clamp   Tie Wrap   P401

6 Disconnect P401 from the center of the main deflection board.

7 Cut the tie wrap that holds the P401 cable.

8 Remove the cable from the cable clamp.

   Replacement Note:
   Secure the P401 cable by routing it through the cable clamp and using a new wire tie wrap.
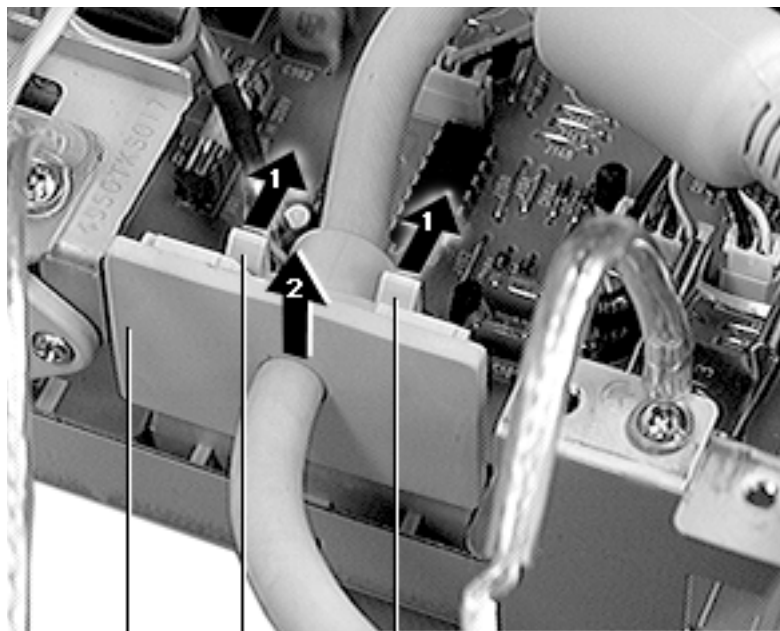
Video Cable   Hook   Hook
Strain Relief

9 At the video cable strain relief, press the two hooks forward and pull up on the video cable strain relief to release it from the slot.

Main Deflection Board

Before you begin,

- Remove the control panel door
- Remove the tilt-swivel stand
- Remove the rear housing
- Discharge the CRT and disconnect the anode cap
- Remove the CRT/video board

Main Deflection Board
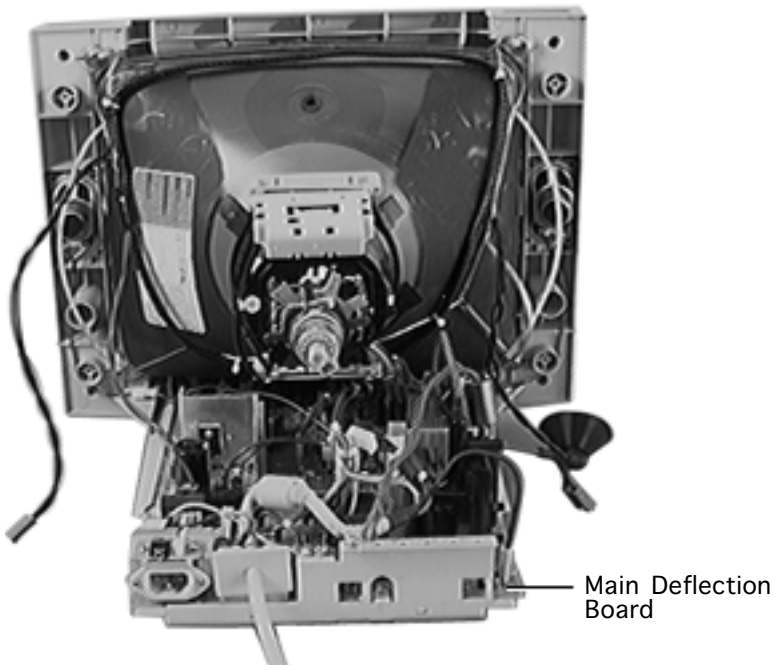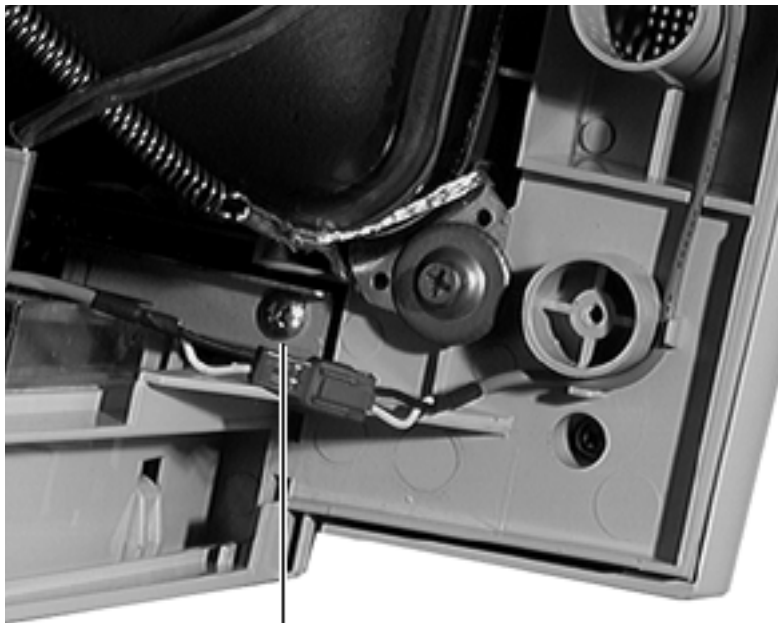
Screw

Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety and read the safety guidelines at the beginning of this chapter.

1 Remove the Phillips screw from the chassis bracket (next to the bottom right CRT corner screw).
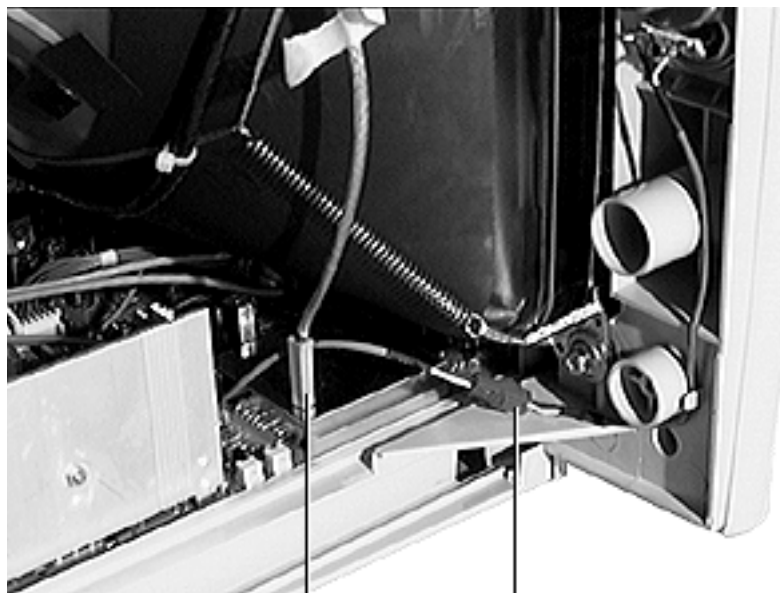
Ground Pin   Speaker
                    Connector

2   Disconnect
    • Speaker connector
    • Ground pin

P701

3 Disconnect the CRT yoke wire at P701.
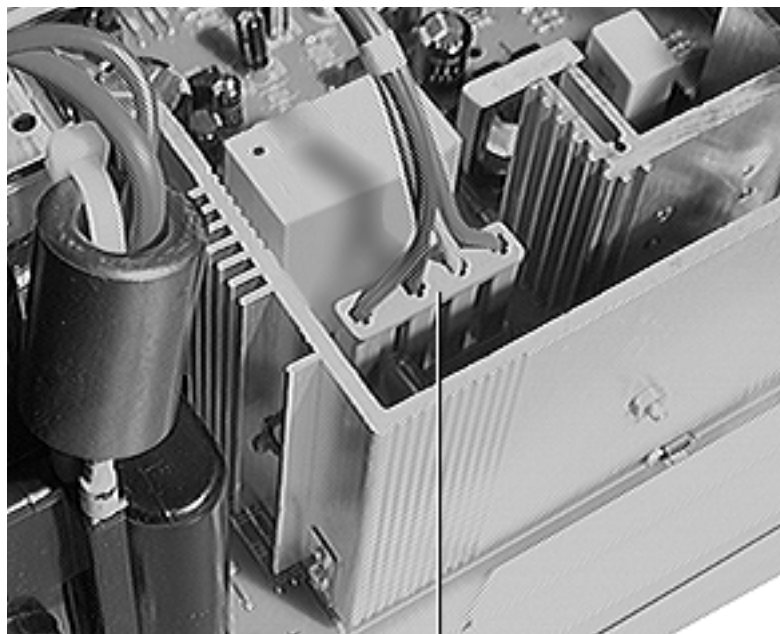
Speaker
Connector
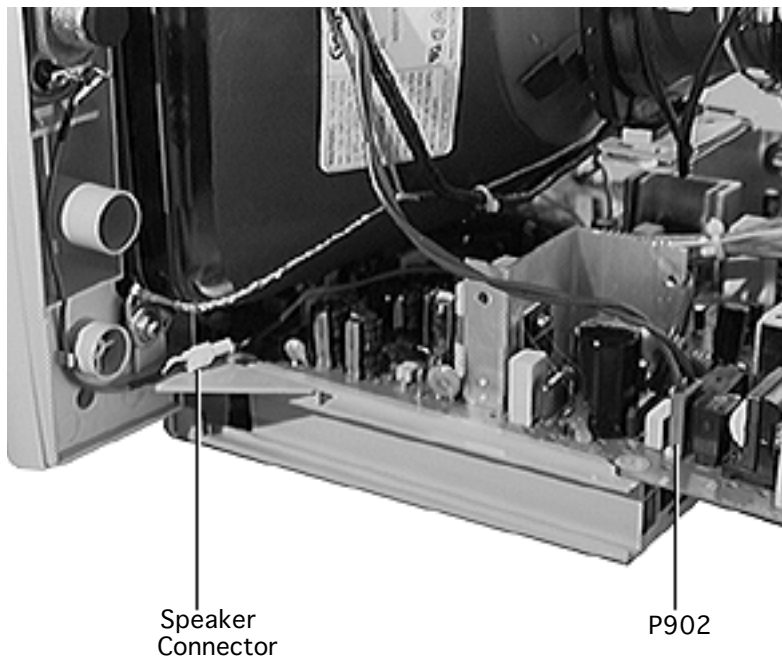
P902

4 Disconnect
• Speaker connector
• Degaussing coil at
  P902

Bottom
Housing

Screw   Screw

5 Place the monitor face-
   down on a padded surface.

6 Remove the two Phillips
   screws from the bottom
   housing.

Chassis

Screwdriver — Tab — Tab
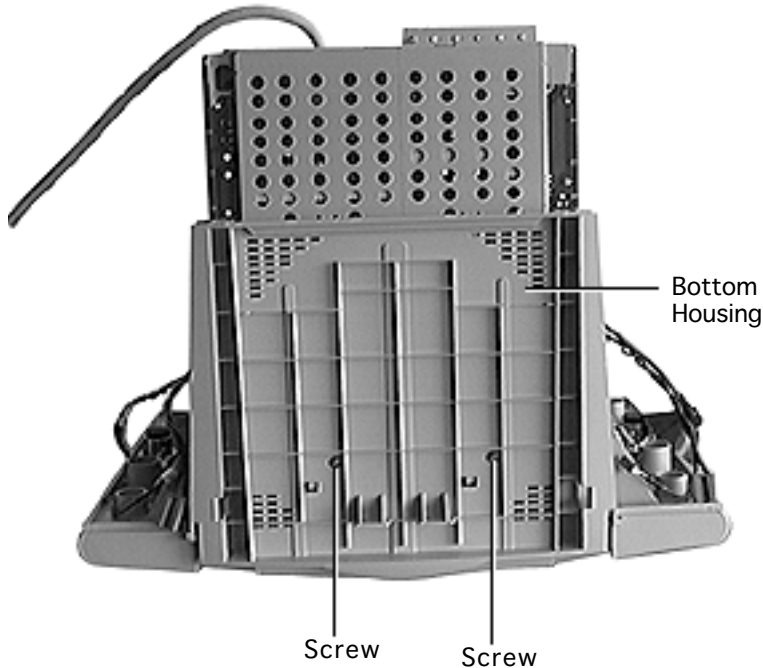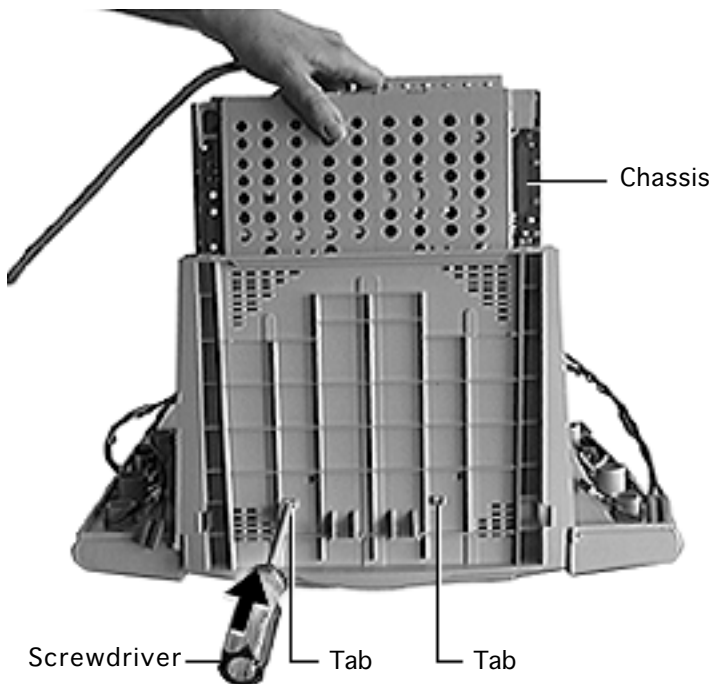
7 While grasping the end of the main deflection board chassis with one hand, use a flat-blade screwdriver to press in on one of the two tabs on the bottom of the bezel assembly.

   Press in on the other tab, and slide the main deflection board straight up and off of the CRT assembly.

8 Refer to this chapter to remove the sound in board, video cable, and control panel board that

Slide Rails   Bottom Housing   Slide Rails
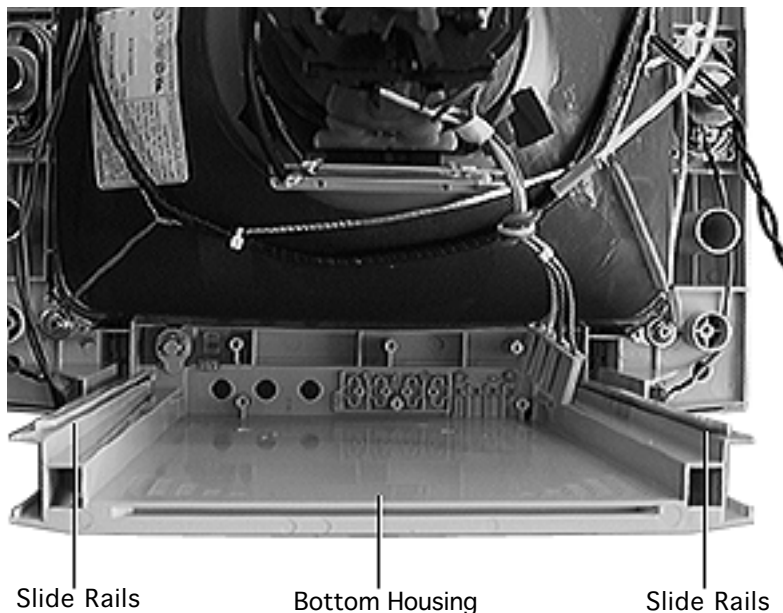
are attached to the main deflection board chassis.

Replacement Note: With the control panel board secured to the replacement main deflection board, align the side edges of the main deflection board with the two slide rails on the bottom housing.

Ensure no cables get pinched as you slide the board into place. With the board in place, be sure to reconnect all cables including the anode cap.
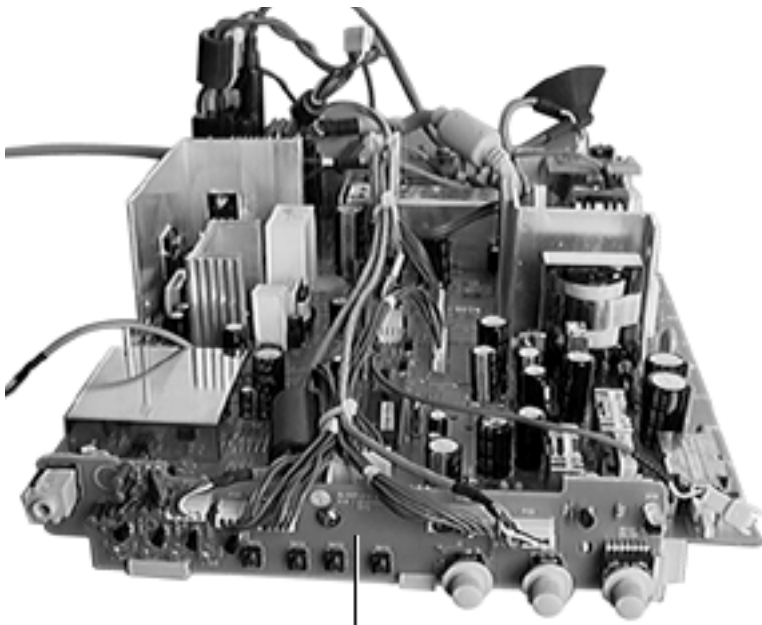
Control Panel Board

Control Panel Board

Before you begin,

- Remove the control panel door
- Remove the tilt-swivel stand
- Remove the rear housing
- Discharge the CRT
- Remove the CRT/video board
- Remove the main deflection board

⚠️ **Warning:** This product contains high voltage and a high-vacuum picture tube.
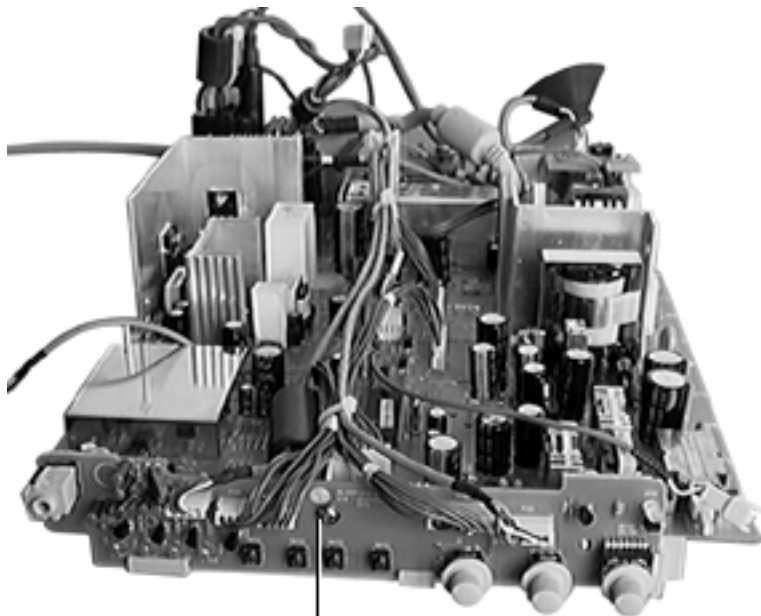
Screw

To prevent serious injury, review CRT safety in Bulletins/Safety and read the safety guidelines at the beginning of this chapter.
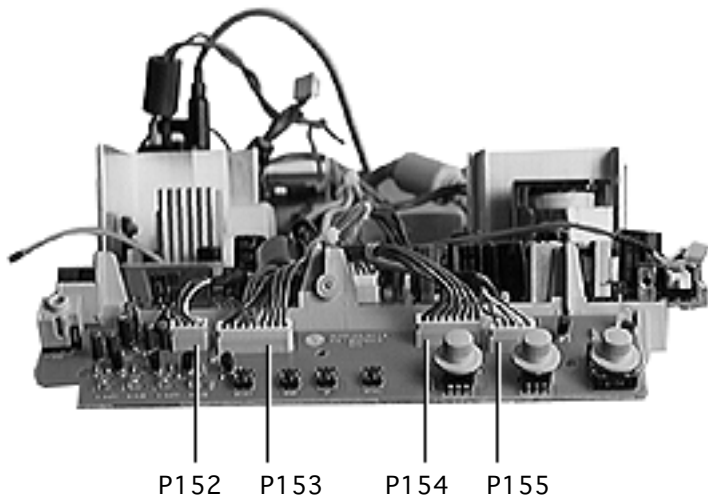
1 Remove the Phillips screw.

Holder

2 Slightly tilt the control panel board forward, and slide it out of the plastic holder.
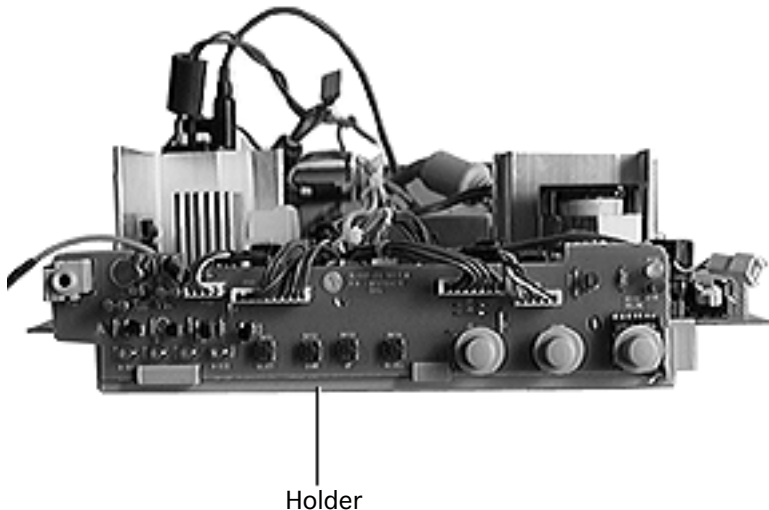
P152   P153   P154   P155

3 Disconnect the following
   four connectors:
   • P152
   • P153
   • P154
   • P155

Replacement Note: Remove
and retain the three knobs
from the control panel board
so you can attach them to the
replacement board.
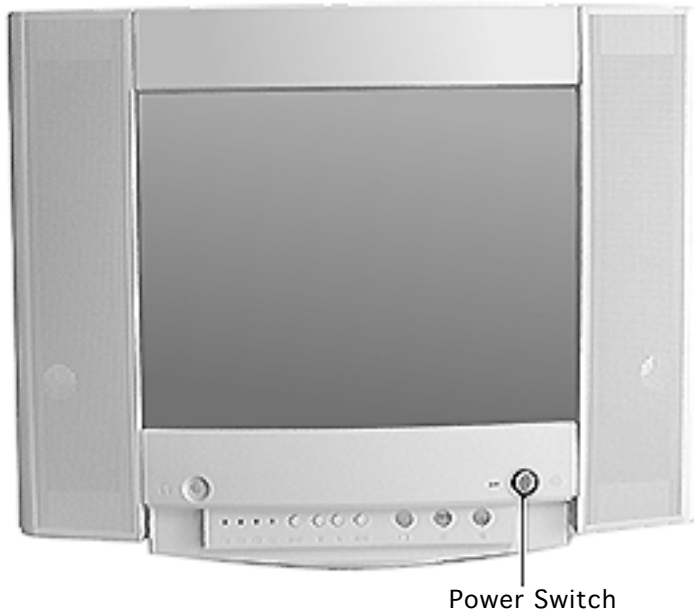
Power Switch

Power Switch

Before you begin,

- Remove the control panel door
- Remove the tilt-swivel stand
- Remove the rear housing
- Discharge the CRT
- Remove the CRT/video board
- Remove the main deflection board

⚠Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury,
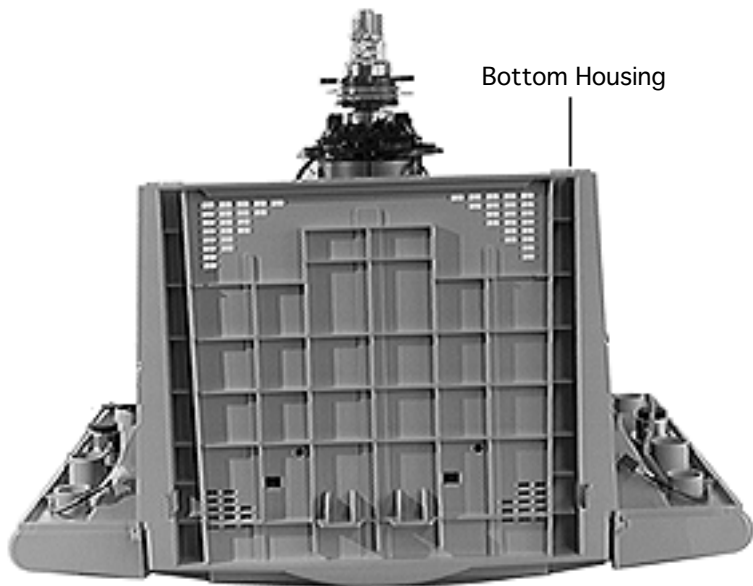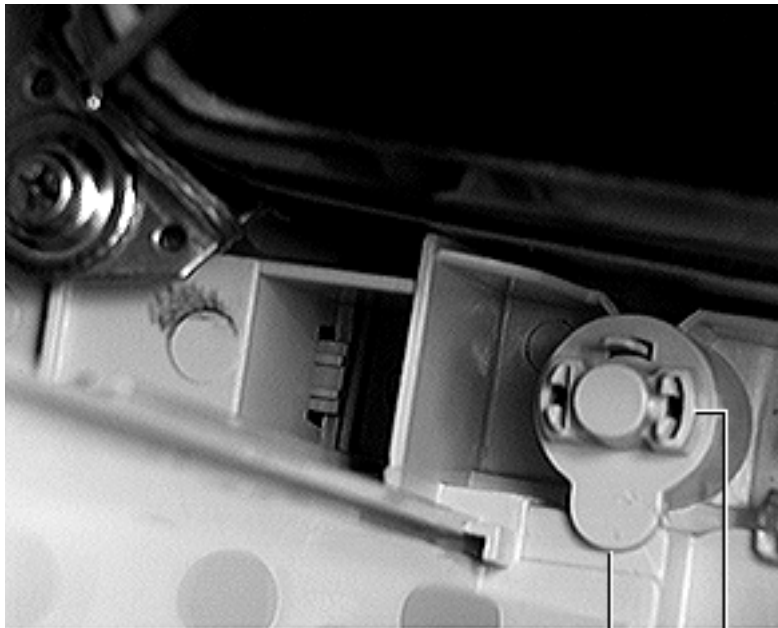
Bottom Housing

review CRT safety in Bulletins/Safety and read the safety guidelines at the beginning of this chapter.

1 Place the monitor face down on a padded surface so the bottom housing faces you.

Lock   Bezel
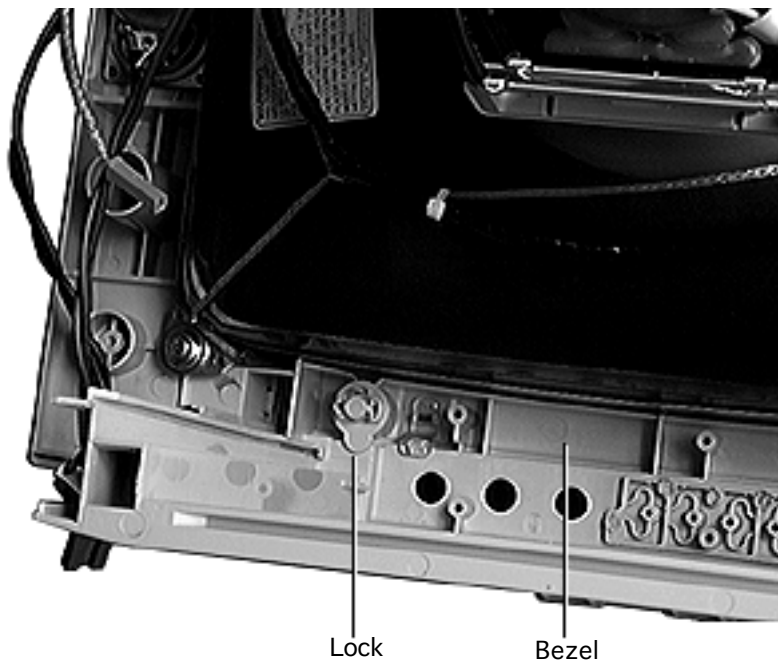
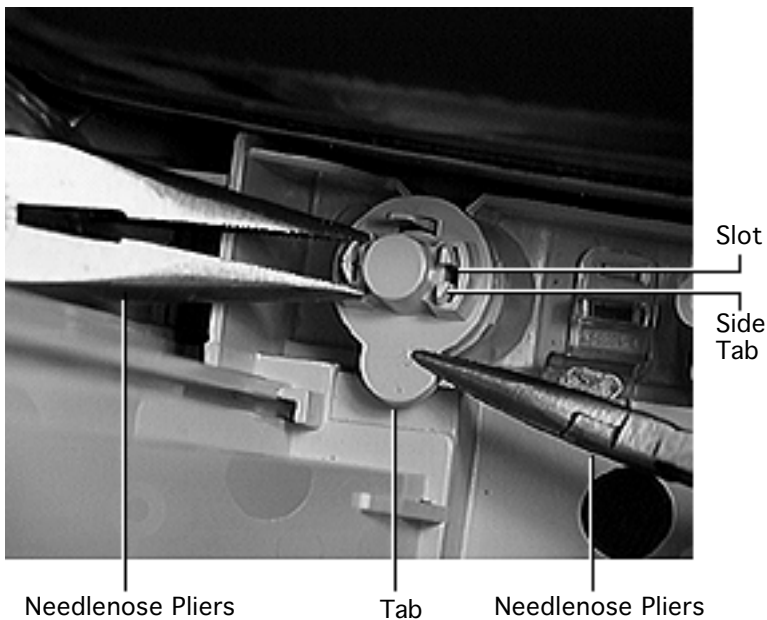2 Locate the power switch lock inside the bezel.

Tab   Lock

3 Use needlenose pliers to grasp the lower tab of the power switch lock. Pull up the lock as far as it will go.

Slot

Side
Tab

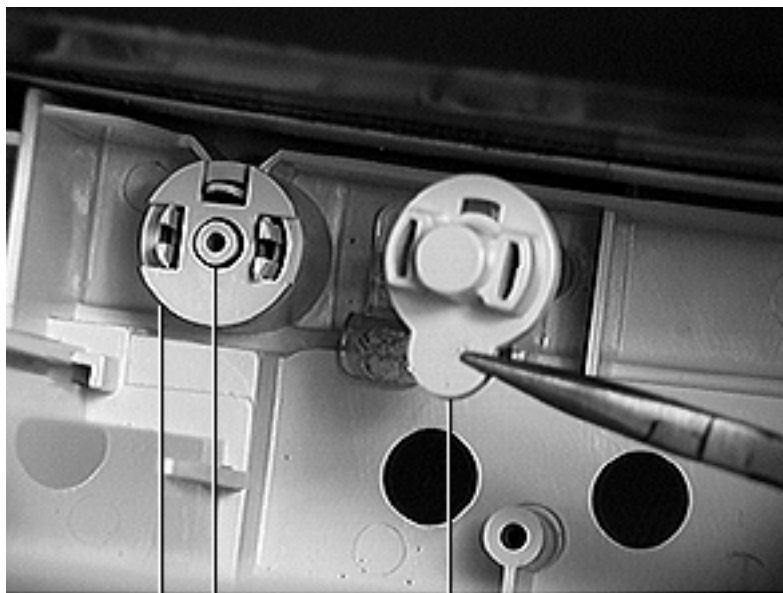Needlenose Pliers   Tab   Needlenose Pliers

4   While holding the lock
    tab up, use a second pair
    of needlenose pliers to
    pinch the two side tabs
    so that they fit through
    the slot in the lock.

    Repeat for the other side
    tabs.

Power Switch — Spring — Lock

5 Pull the lock off of the power switch and spring.

6   Tilt up the CRT assembly
    to pull out the power
    switch and spring from
    the front side of the
    bezel.

    The power switch
    assembly consists of the
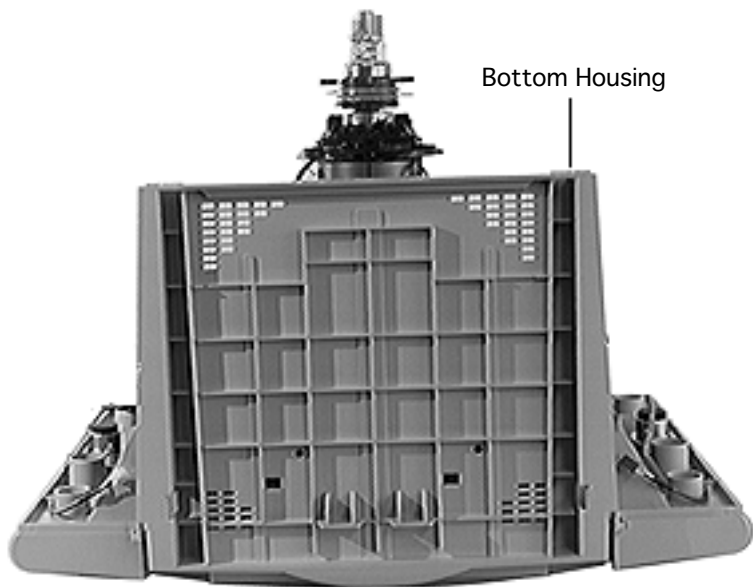   three pieces shown here.

Lock

Spring   Power
         Switch
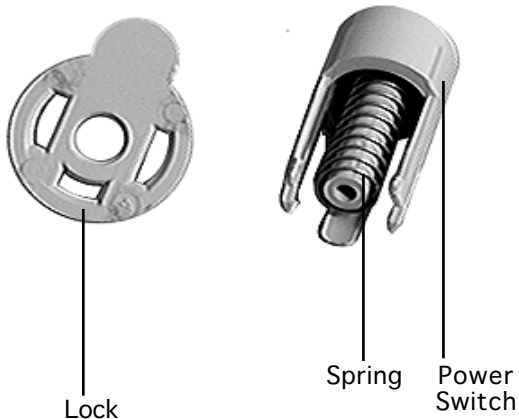
Front Bezel

Front Bezel

Before you begin,

- Remove the control panel door
- Remove the tilt-swivel stand
- Remove the rear housing
- Discharge the CRT
- Remove the CRT/video board
- Remove the main deflection board
- Remove the speakers
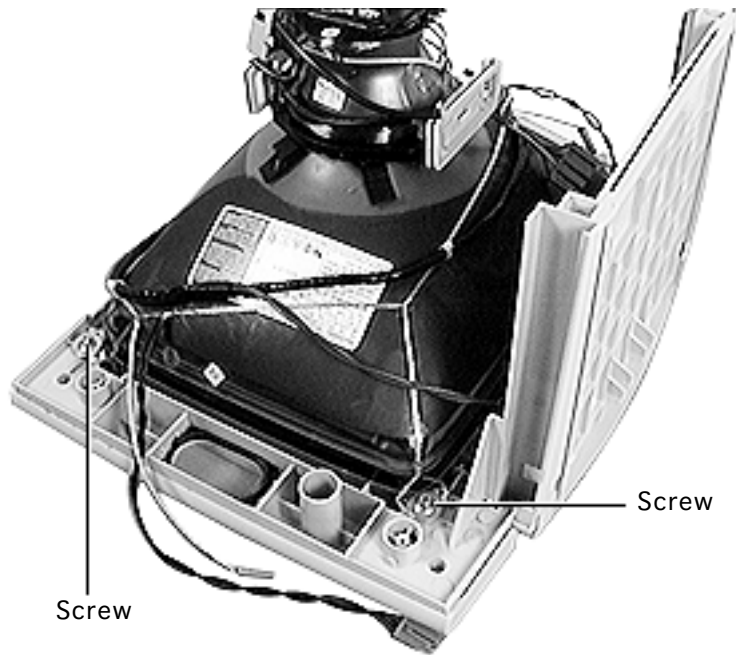- Remove the power switch

Bottom Housing

Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety and read the safety guidelines at the beginning of this chapter.
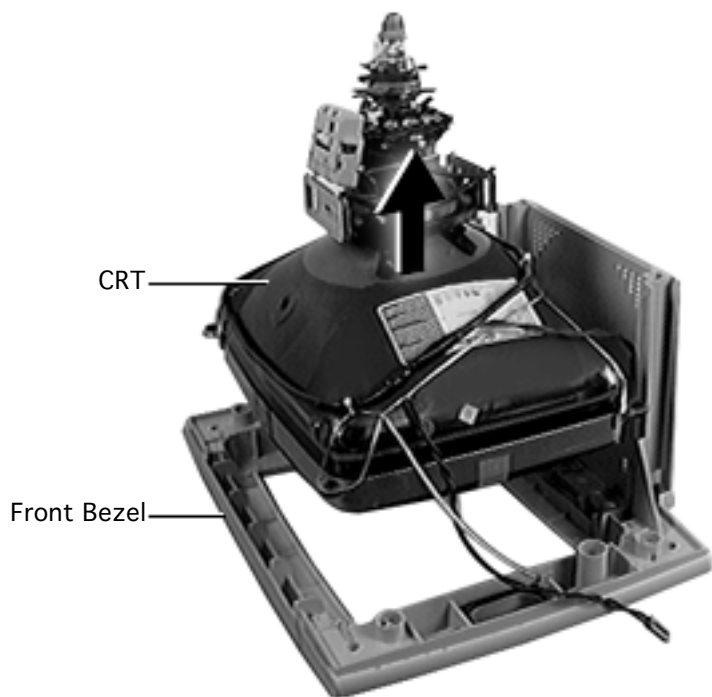
1 Place the monitor face down on a padded surface so the bottom housing faces you.

2 Using a Phillips
   screwdriver, remove
   the four CRT corner
   screws and washers (two
   on each side).

Screw

Screw

CRT

Front Bezel

3 Using both hands, lift the CRT off of the front bezel.

Adjustments

Apple Multiple Scan 15AV
Display

Power Supply Voltage

Before you begin, refer to the Take Apart chapter to remove the rear housing.

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

Note: Perform the power supply voltage adjustment whenever the main deflection board is replaced.
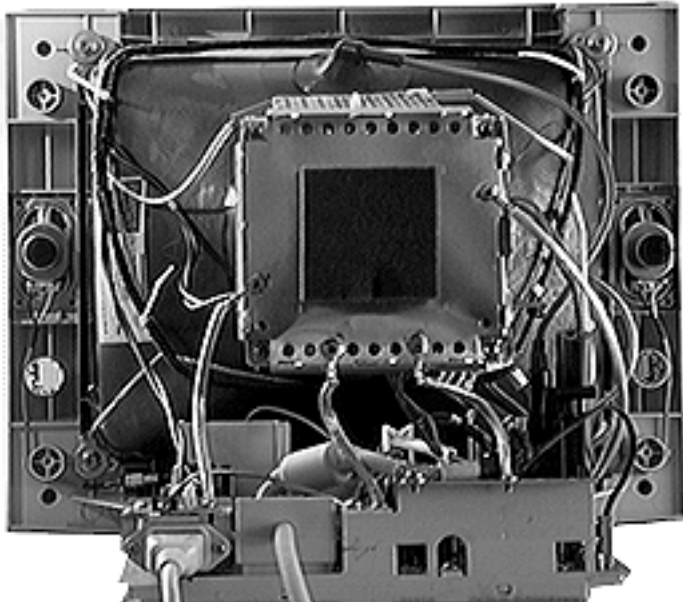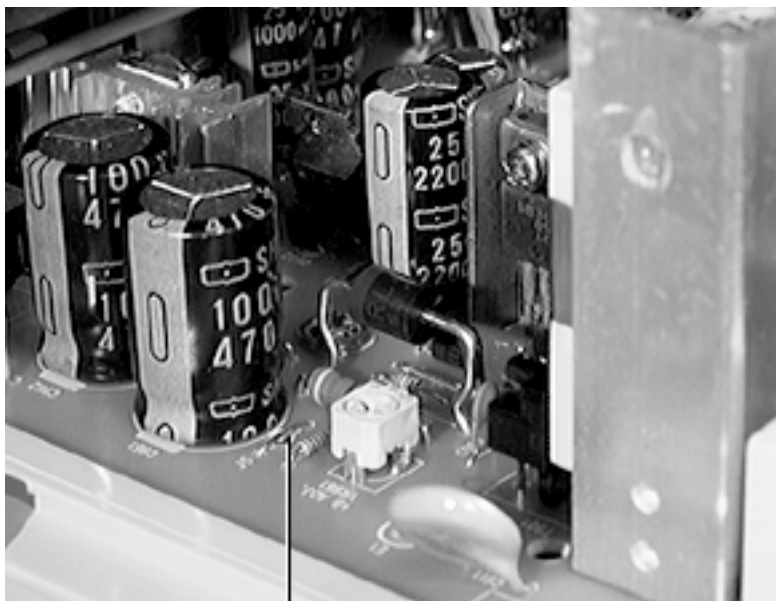
1 Turn on the display and let it warm up for five minutes.

2 Using the control strip, set the screen resolution to 640x480.

3 Using the Display Service Utility, select the crosshatch display pattern with the black background from the Standard Patterns screen.
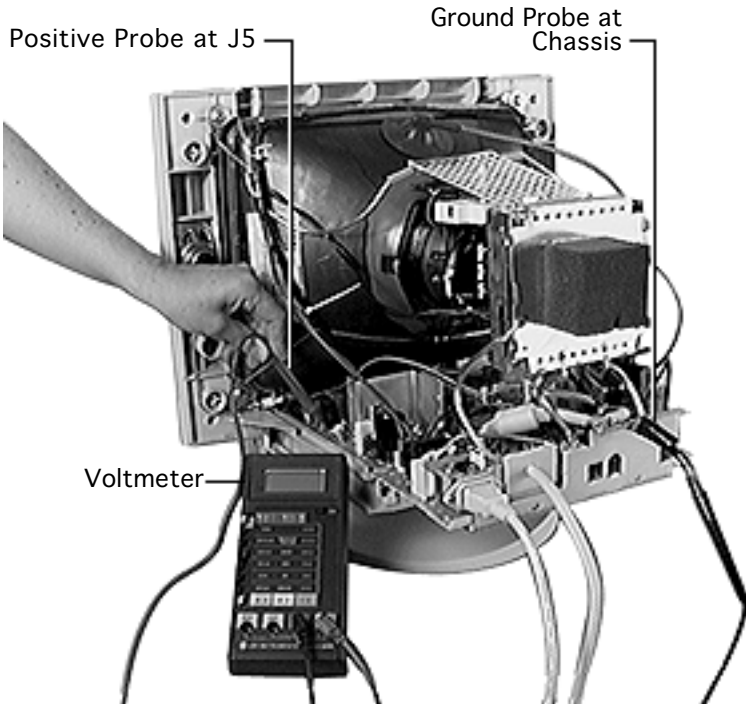
J5

4   Locate jumper wire J5
   on the left side of the
     main deflection board.

Positive Probe at J5

Ground Probe at Chassis

Voltmeter

5 Connect the positive probe (red wire) of a digital voltmeter to jumper J5 and connect the ground probe (black wire) to the metal chassis.

6   While maintaining the voltmeter probe connections, use a plastic screwdriver to adjust VR951 until the voltmeter reads 50 VDC ± 0.2V.
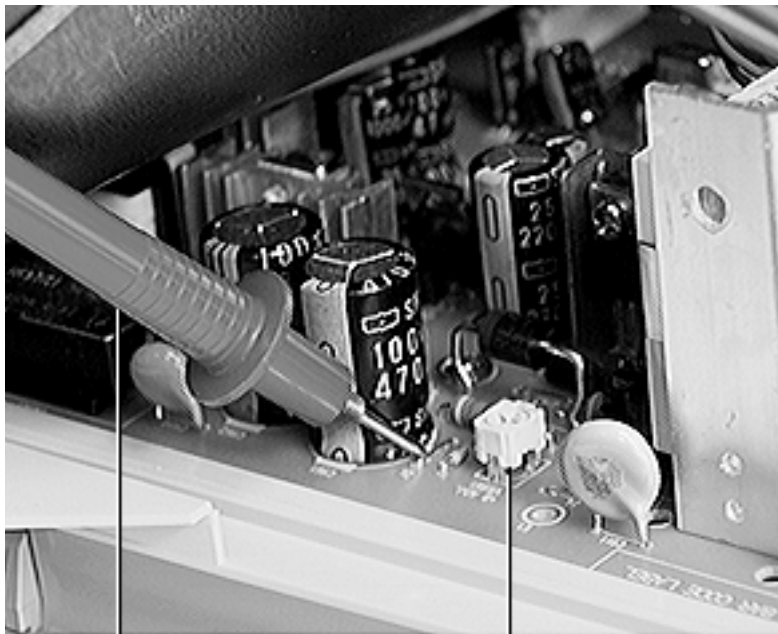
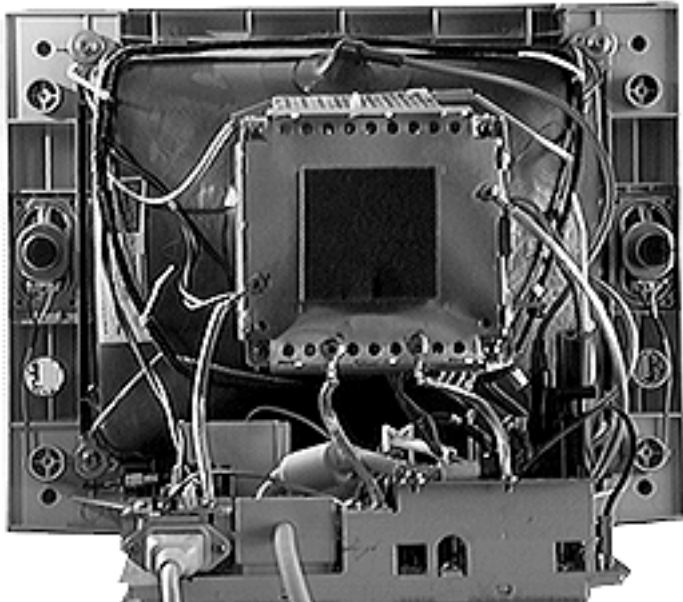Positive Probe at J5   VR951

High Voltage

Before you begin, refer to the Take Apart chapter to remove the rear housing.

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

Note: Perform the high-voltage adjustment whenever the main deflection board is replaced.

1   Turn on the display and
    let it warm up for five
    minutes.

2   Using the control strip,
    set the screen
    resolution to 640x480.

3   Using the Display
    Service Utility, select
    the crosshatch display
    pattern with the black
    background.
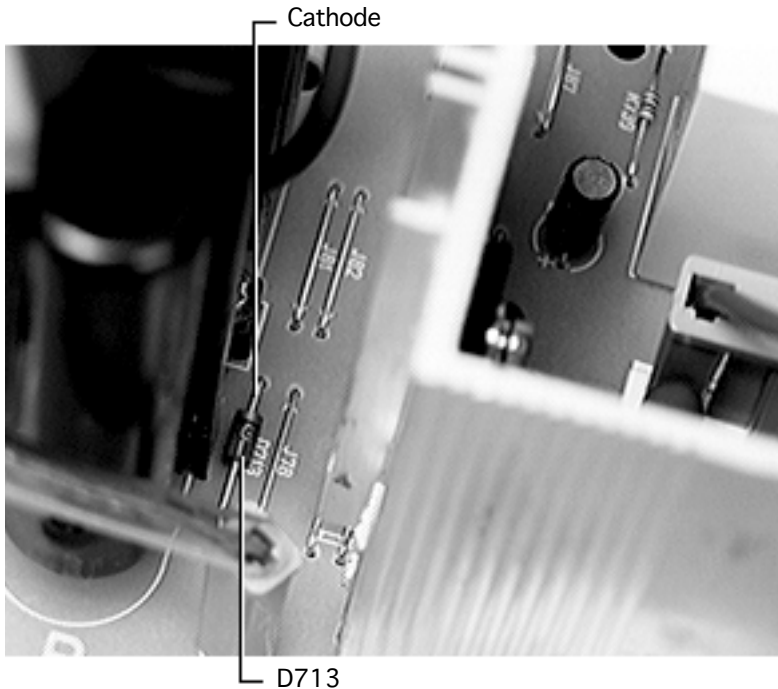
Cathode

D713

4 Locate diode D713 between the flyback transformer and large heatsink on the main deflection board.

Notice the cathode (striped end) of D713.

Ground Probe at Chassis   Positive Probe at Cathode of D713   VR501
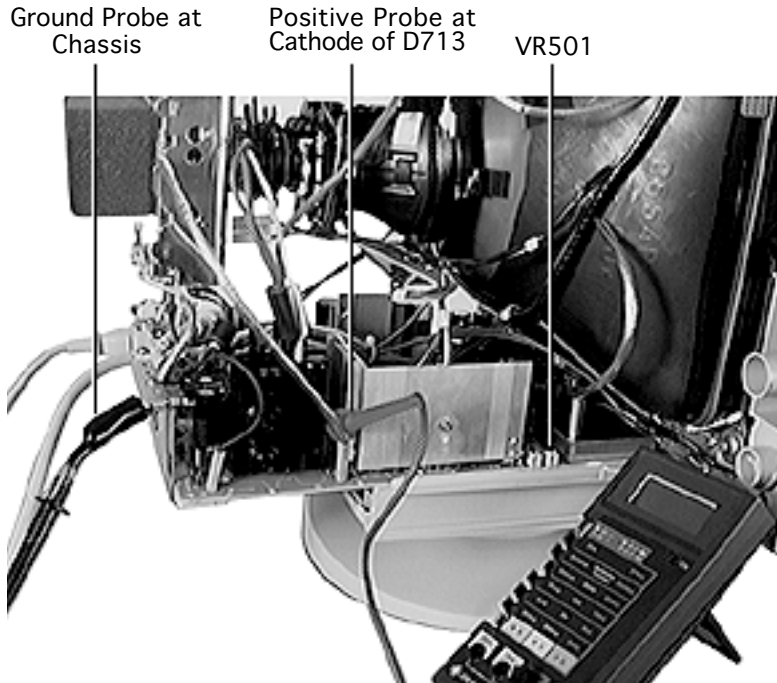
5   Connect the positive probe (red wire) of a digital voltmeter to the cathode (striped end) of D713.

6   Connect the ground probe of the digital voltmeter (black wire) to the monitor's metal chassis.

7   Use a plastic screwdriver to adjust VR501 so that the voltmeter reads a voltage of 42.5 VDC ± 0.2V.
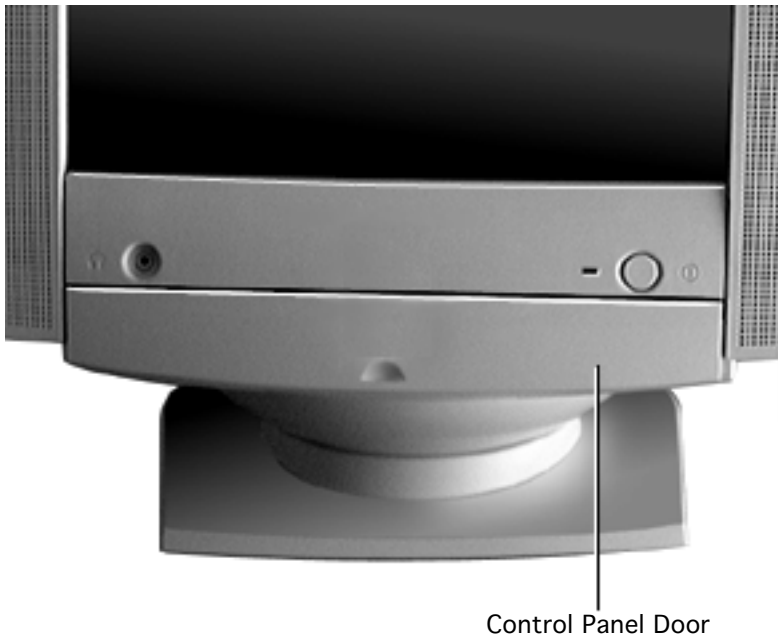
Control Panel Door

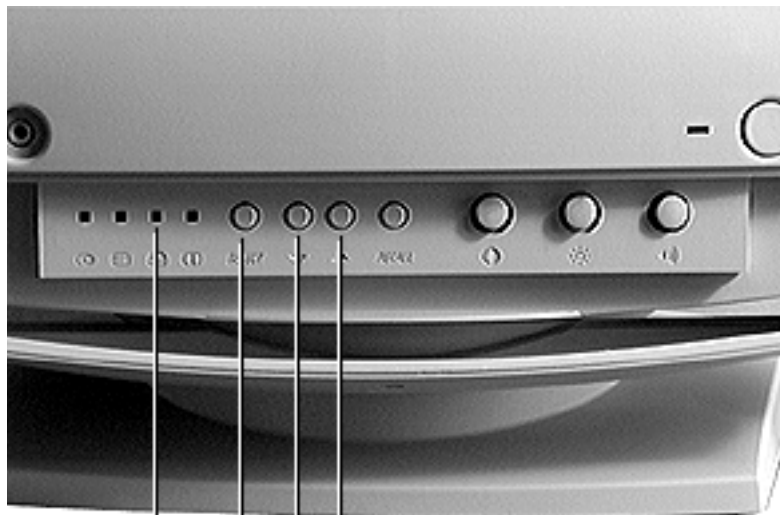# Geometry

Before you begin, open the control panel door.

Note: In most cases, the preset factory settings require no adjustments to the picture. However, you can fine-tune the screen display by using the front panel controls.

Vertical Center

1 Press the Select button until the vertical center indicator light turns on.

2 Press the up button or down button to move the center of the picture up or down.

Vertical Center

Select Button

Up Button

Down Button

Horizontal
Center

Select Button

Up Button

Down Button

Horizontal Center

1 Press the Select button until the horizontal center indicator light turns on.

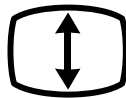2 Press the up button or down button to move the center of the picture right or left.

Vertical Size —

Select Button —

— Up Button

— Down Button

Vertical Size

1. Press the Select button until the vertical size indicator light turns on.

2. Press the up button or down button to increase or decrease the height of the picture.
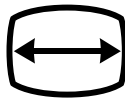
Horizontal Size

1   Press the Select button until the horizontal size indicator light turns on.

2   Press the up button or down button to increase or decrease the width of the picture.
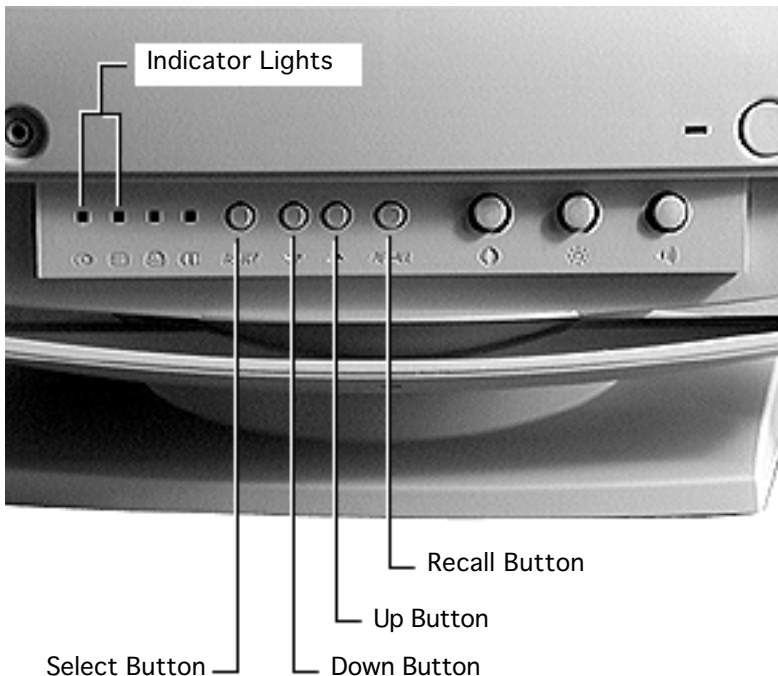
Horizontal Size

Select Button

Up Button

Down Button

Indicator Lights
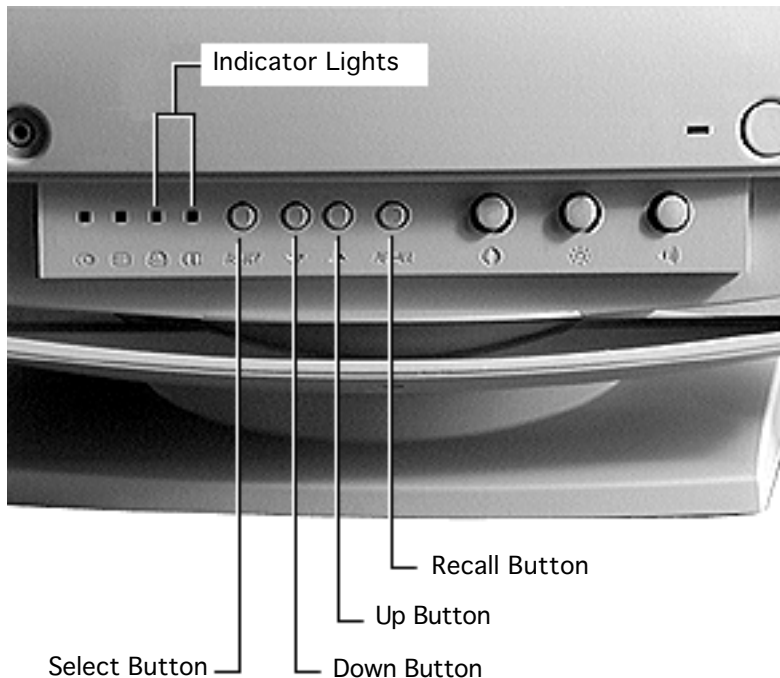
Recall Button

Up Button

Down Button

Select Button

Pincushion

1 Simultaneously press the Select and Recall buttons so that the two leftmost indicator lights turn on.

2 Press the up button or down button to change the curvature of the right and left sides of the picture.

Indicator Lights

Recall Button

Up Button

Select Button   Down Button

Keystone

1 Simultaneously press the Select and Recall buttons so that the two leftmost indicator lights turn on.

2 Press the Select button so that the two rightmost indicator lights turn on.

3 Press the up button or down button to change the slant of the right and left sides of the picture.

Recall Button

Recalling Factory Settings

Important: The monitor controls are set at the factory. To fine-tune and adjust the picture, use the front panel controls. The monitor will use your settings each time the computer is turned on.

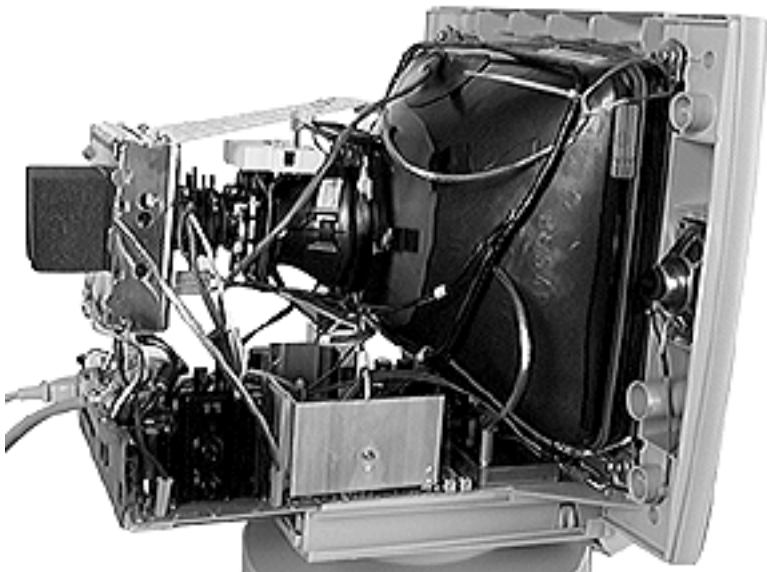To revert to factory settings, press the Recall button.

Focus Adjustment

Before you begin, refer to the Take Apart chapter to remove the rear housing.

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

Display
● (highest resolution)

⚠ Warning: Because you make adjustments from the rear of the monitor, position a mirror to view the monitor screen. Do not reach around the monitor to adjust the controls.

1   Turn on the display and let it warm up for five minutes.

2   Using the control strip, set the display to its highest resolution.

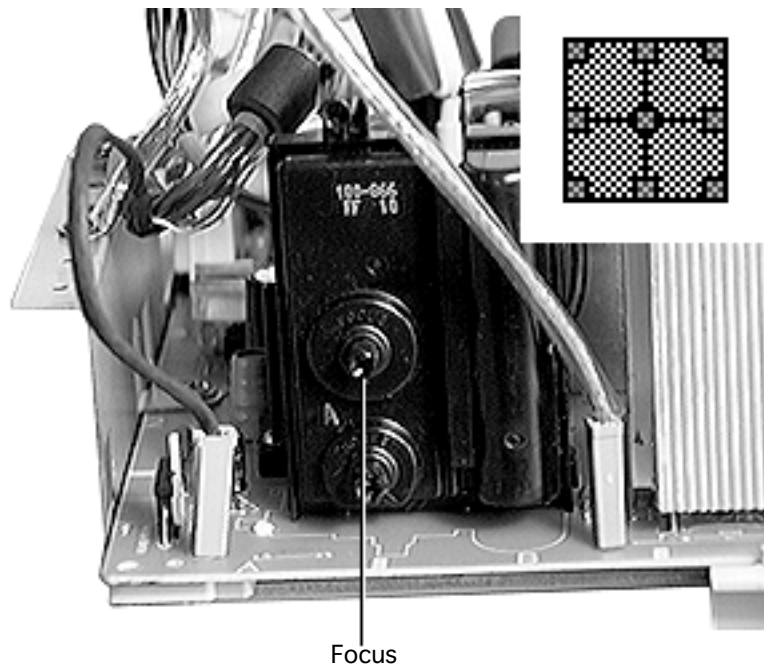3   Using the Display Service Utility, select the focus pattern.

◀ IIII ▶

Contrast

Brightness

4   Set the brightness and
    contrast controls to
    maximum (turn fully
    clockwise).

Focus

5   Use a plastic
    screwdriver to adjust
    the Focus control on the
    flyback transformer for
    best center screen focus.

Brightness

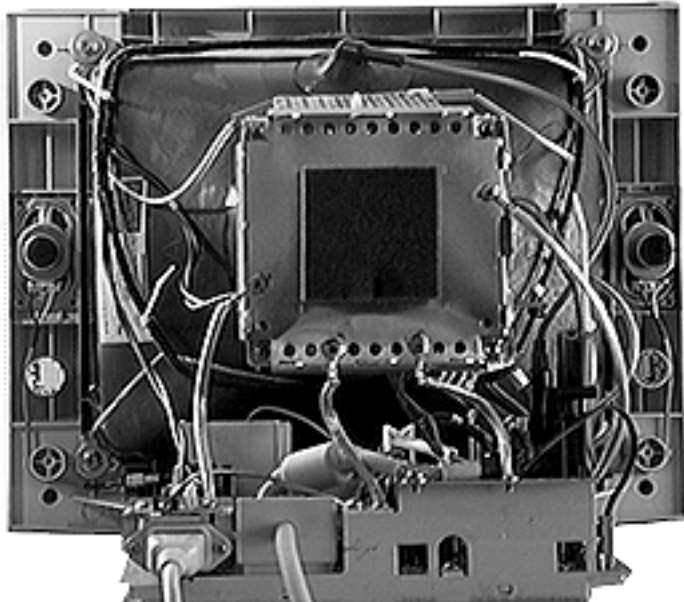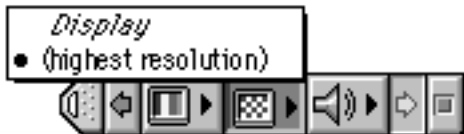6   Reset the brightness control to its detent (middle) position.

Horizontal Centering

Before you begin, refer to the Take Apart chapter to remove the rear housing.

⚠ **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 make adjustments from the rear of the monitor, position a mirror to view the

Display
● (highest resolution)

monitor screen. Do not reach around the monitor to adjust the controls.

Note: Perform the horizontal centering adjustment whenever the horizontal center control on the front panel does not have sufficient range.

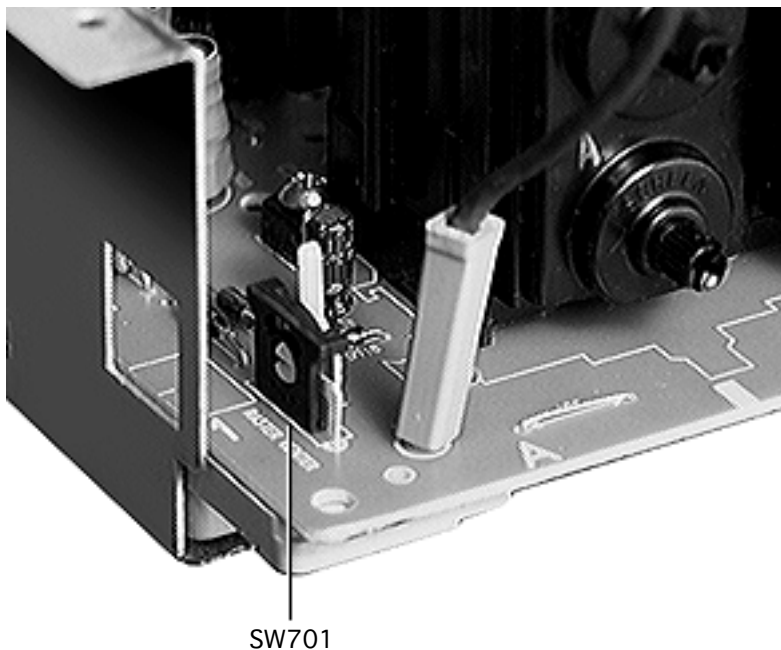1   Using the control strip, set the monitor to its highest resolution.

Contrast

Brightness

2 Set both brightness and contrast controls to maximum (turn fully clockwise).

SW701

3 Use a plastic
   screwdriver to position
   the arm of the horizontal
   center switch (SW701)
   until the raster is
   centered.

Brightness

4 Reset the brightness control to its detent (middle) position.

Cutoff and White Balance

Before you begin, refer to the Take Apart chapter to remove the rear housing.

⚠ **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 make adjustments from the rear of the monitor, position a mirror to view the
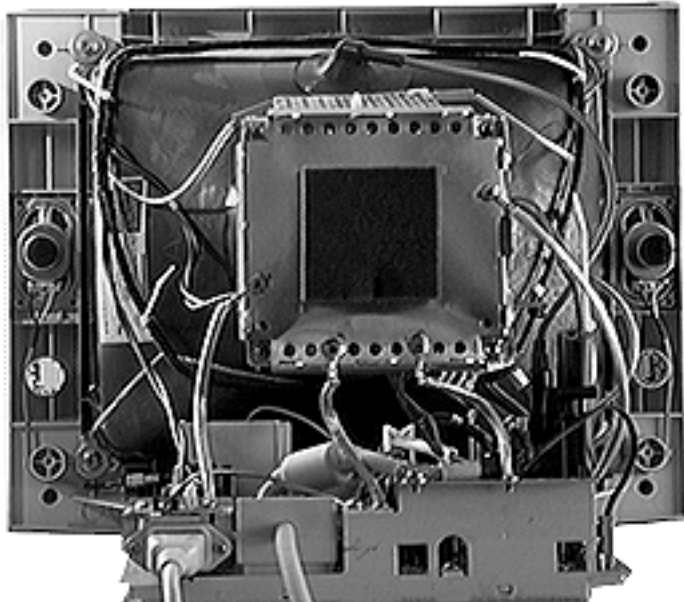
monitor screen. Do not reach around the monitor to adjust the controls.

Caution: When adjusting the controls on the CRT/video board, be careful not to apply excessive pressure to the neck of the CRT.

Note: Perform cutoff and white balance adjustments whenever the CRT/video board has been replaced or the screen exhibits a predominant color tint.

Display
● (highest resolution)

1 Turn on the display and let it warm up for at least 10 minutes.

2 Using the control strip, set the display to its highest screen resolution.

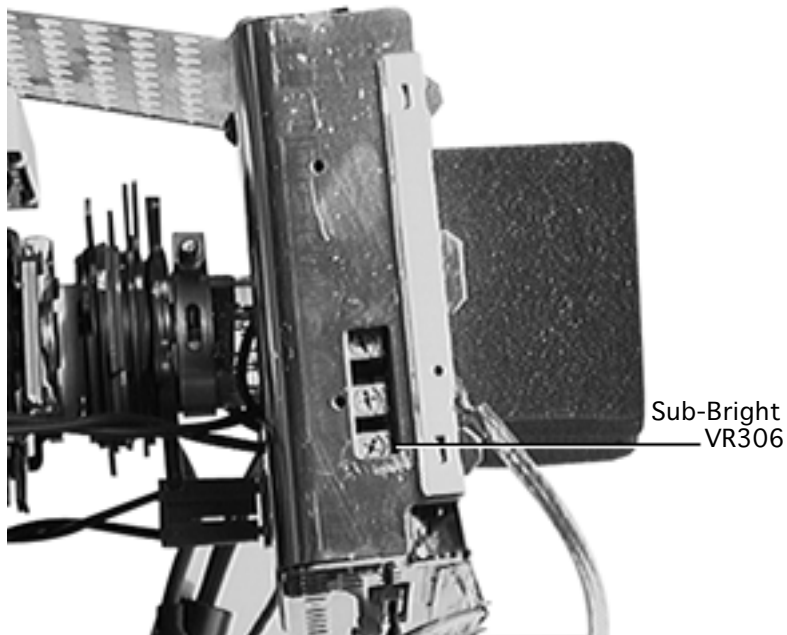3 Using the Display Service Utility, select the all-black display pattern.
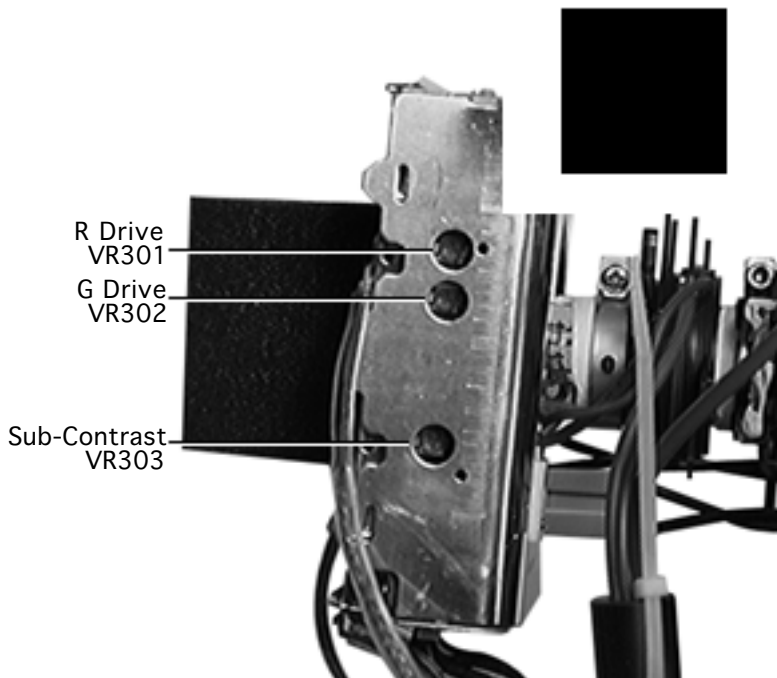
Contrast
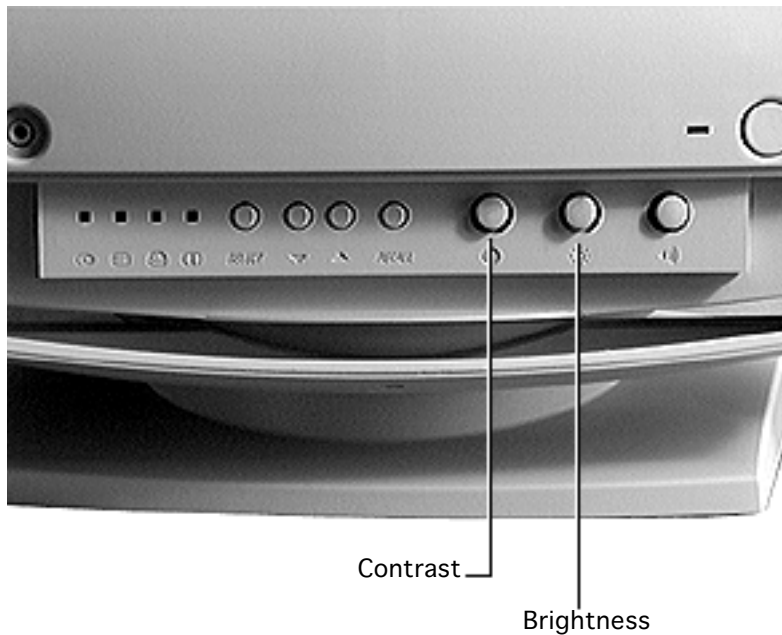
Brightness

4 Preset both brightness and contrast controls to maximum (turn fully clockwise).

Sub-Bright
VR306

5 Use a plastic screwdriver to preset the Sub-Brightness control (VR306) to its maximum setting (counterclockwise).

R Drive
VR301

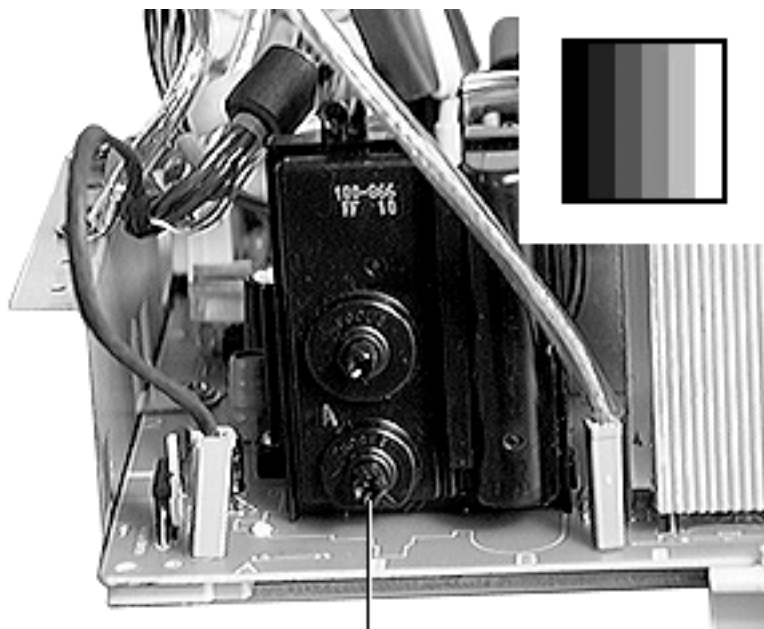G Drive
VR302

Sub-Contrast
VR303

6 Preset the following controls to their center positions.
   • Sub-Contrast control (VR303)
   • R Drive control (VR301)
   • G Drive control (VR302)

7 If you have set the controls correctly and the monitor is operating normally, the raster should have a bluish cast. If not, recheck the controls you preset in steps 4, 5, and 6.
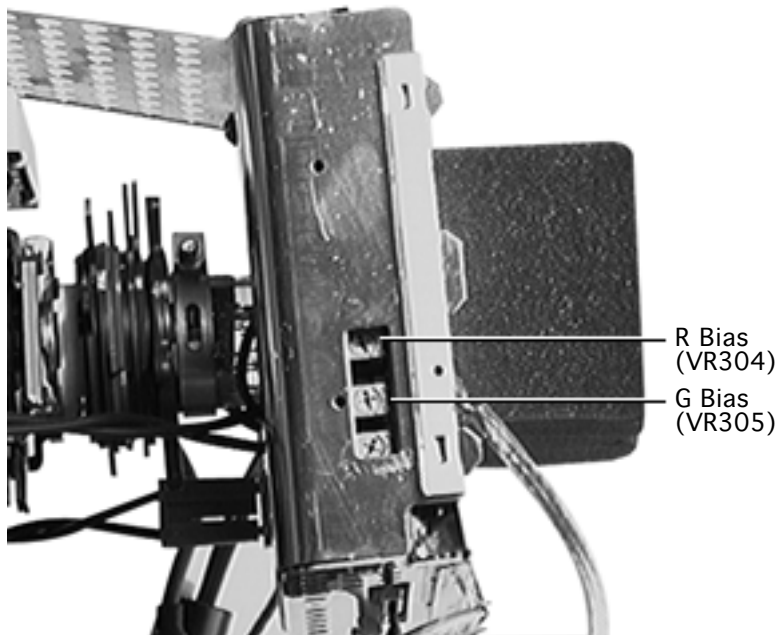
Screen

8   Using the Display
    Service Utility, select
    the gray bars display
    pattern.

9   With the room lights
    dimmed, use a plastic
    screwdriver to slowly
    adjust the Screen control
    so that the leftmost bar
    is completely black.

R Bias
(VR304)

G Bias
(VR305)

10 Use a plastic
   screwdriver to adjust
   the G Bias (VR305)
   cutoff control until the
   screen has a bluish-
   green hue in the darkest
   bars.

11 Adjust the R Bias
   (VR304) cutoff control
   to produce neutral gray
   in the darkest bars.

   Note: If you still see a
   predominant color in
   the darkest bars,
   continue adjusting the
   two bias controls as
   follows until the bars

Brightness

become neutral gray:
- If the display looks too red, turn up the G Bias or turn down the R Bias
- If the display looks too green, turn up the R Bias or turn down the G Bias

12 Set the brightness control to its detent (middle) position.

R Drive

G Drive

13 The drive controls normally will not require an adjustment. However, if a predominant color remains in the eight brightest bars, adjust the R Drive and/or G Drive controls to make these bars appear whiter.
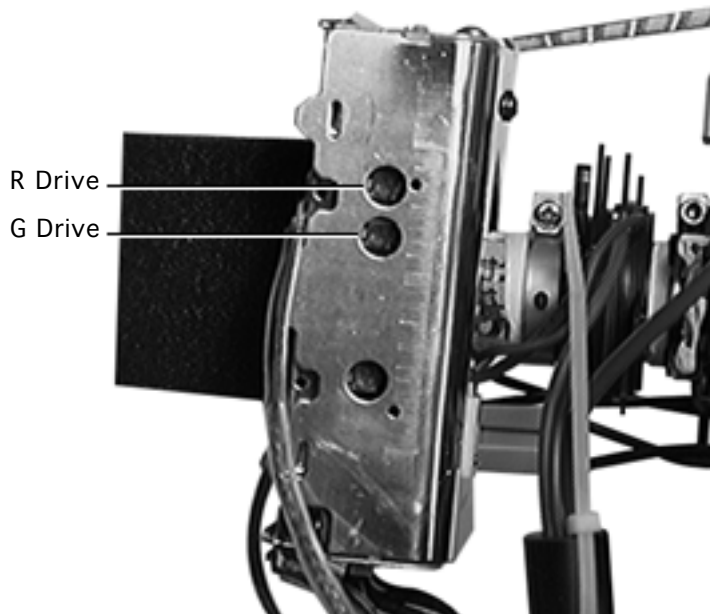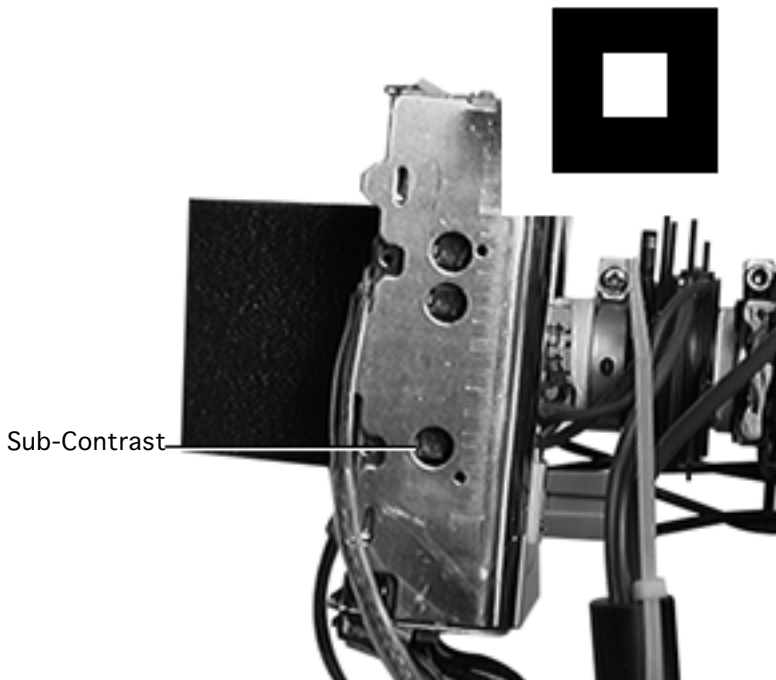
14 If required, perform a slight readjustment of the G Bias and R Bias cutoff controls to maintain neutral gray in the eight darkest bars.

R Bias

G Bias
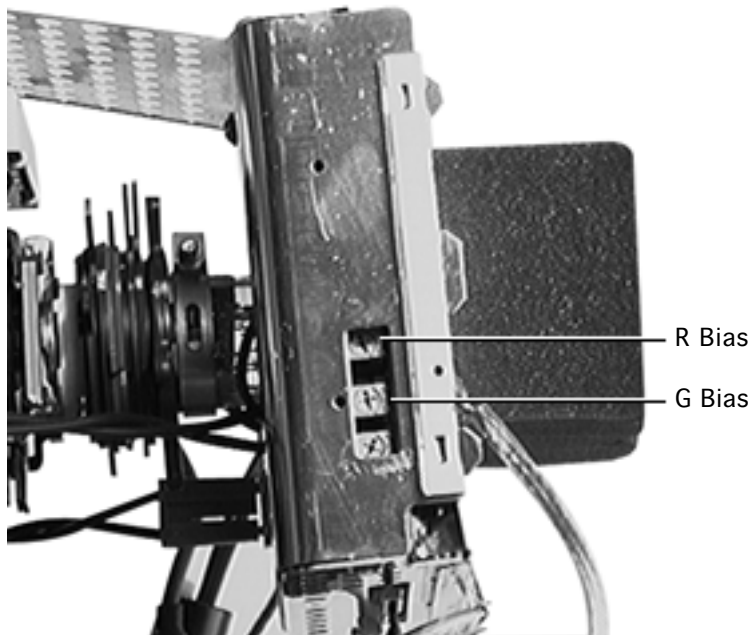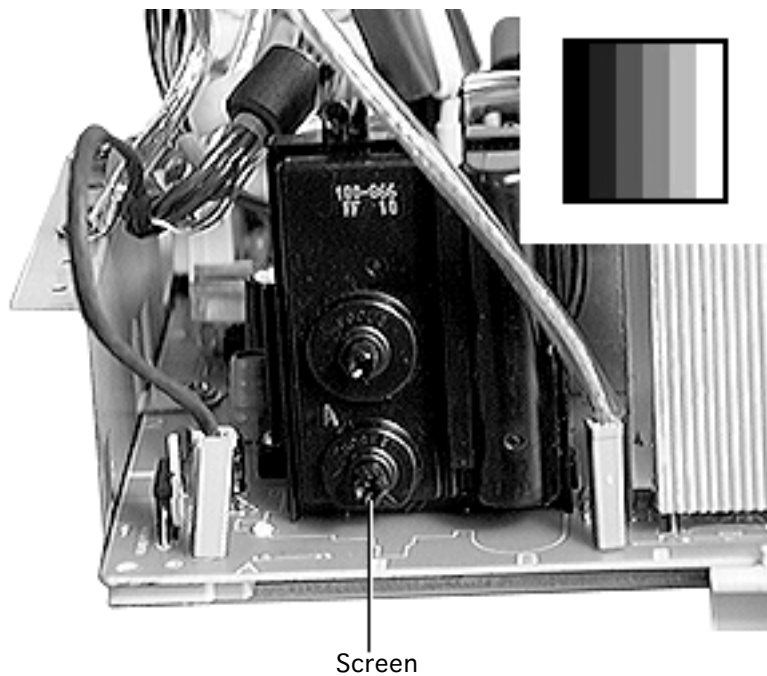
Screen

15 If the previous two steps caused more than the leftmost bar to become completely black, perform a slight readjustment of the Screen control so that only the leftmost bar is completely black.

16 Using the Display Service Utility, select the Apple MultiScan 1705 selection screen, and then select the display pattern with the small white square in the center of a black screen.

17 Adjust the Sub-Contrast control so that the luminance in the center of the screen measures 25 foot lamberts on a photometer, which on a light meter is

  • 21 on the bottom

Sub-Contrast

scale of the R77 light meter

• 21 on the red scale of the 246 light meter

See the next section, "Light Meter Setup," for instructions on how to use the light meters.

10X Multiplier Plate

Lens

200-1000 fc
50-250 fc
10-50 fc

RTS   R77

Light Meter Setup

This topic covers setup for two light meter models: R77 and 246. Model R77 (Apple part number 076-0310) is the newest model available.
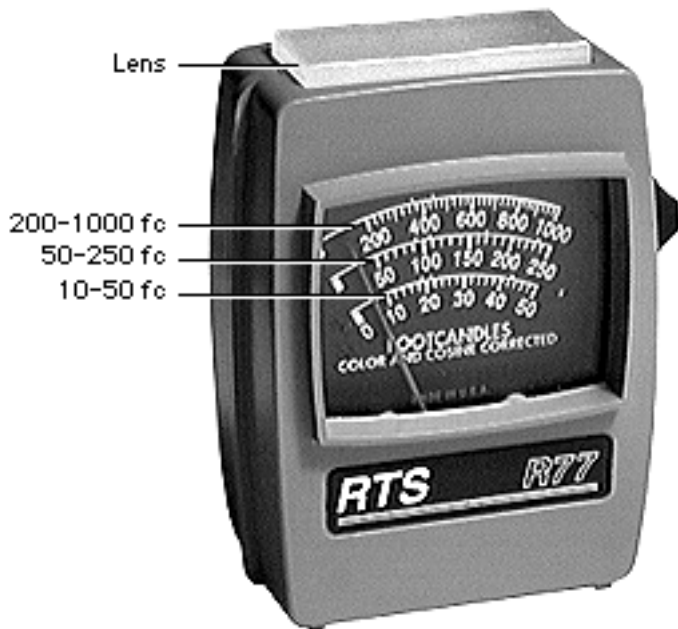
Model R77

The R77 light meter is capable of reading luminance from 10 to 1,000 footcandles (fc).

Before you begin, remove the 10X multiplier plate
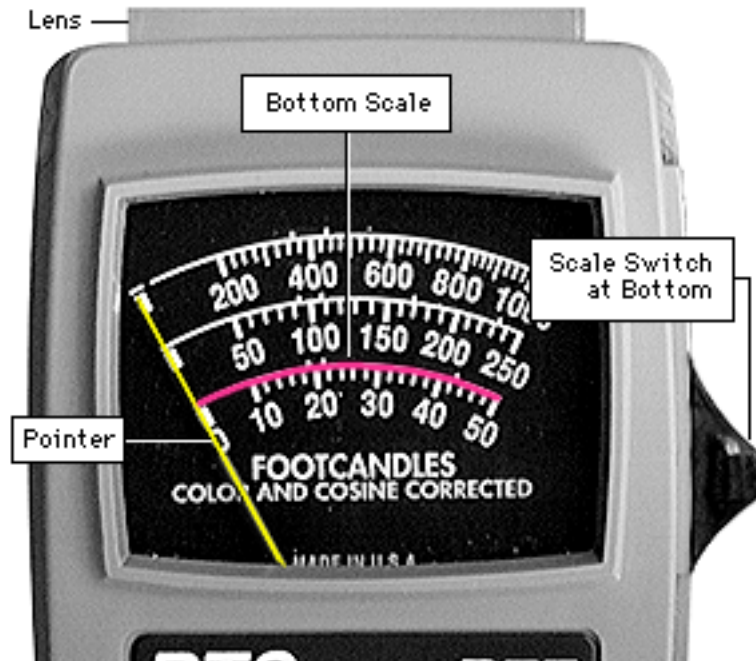
Lens

200-1000 fc
50-250 fc
10-50 fc

from the lens.

Three scales are shown on
the light meter:
• 200-1000 fc
• 50-250 fc
• 10-50 fc

Because display screen
luminance typically ranges
from 10 to 50 fc, take
readings from the bottom
scale only.

To measure a display
screen's luminance,

1 Set the scale switch to
   the bottom position (to
   set up the 10-50 fc
   scale).

2 Place the lens against the
   middle of the screen and
   read the bottom scale.

Note: When the light meter
is not in use, slide the scale
switch to its top position,
and store the meter in its
protective case.

Important: If you suspect the
light meter is giving false

Manufacturing
Date Stamp
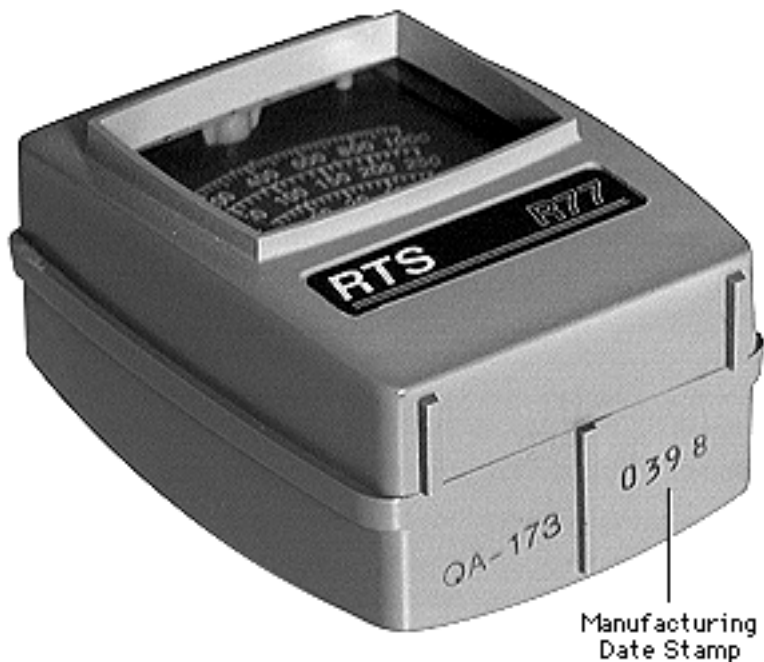
readings, verify the readings with a known-good light meter or photometer. Also check the age of the R77 light meter by its four-digit manufacturing date stamp (such as 0398 for March 1998).

Caution: Dropping the meter can permanently damage its accuracy. A shock-damaged meter might read incorrectly or its pointer may not drop to zero.

Lens

Swivel Head

Scale
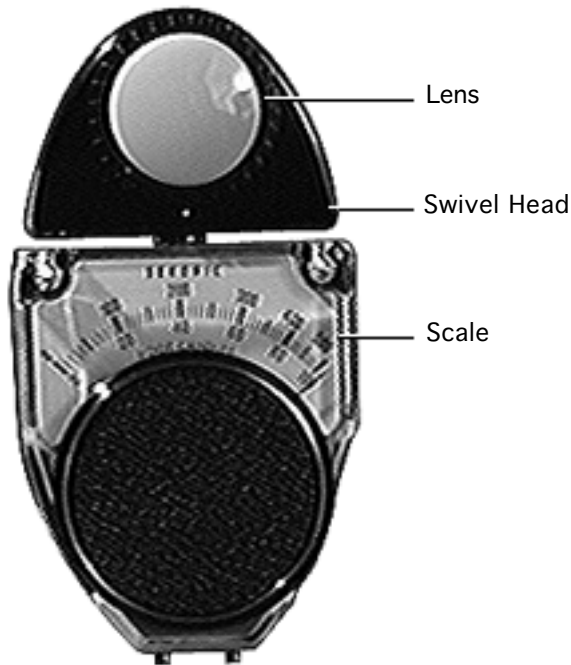
Model 246

1 Remove the metal slide, if installed, from the top of the light meter.

2 Install the white lens with the red dot.

3 Rotate the swivel head so the lens of the meter faces the monitor.

Place the lens against the middle of the screen and read the scale.

Exploded View

Apple Multiple Scan 15AV
Display

CRT/Video Board Kit
with Ground Strap
076-0757

Rear Housing
922-2244

Speaker Grille Gaskets
922-2240

Sound-Out Cable
922-1781

Main Deflection Board
661-1143

Sound In Board
922-2238

Control Panel Board
922-2237

Bezel
922-2432

Speaker
922-2245

Control Panel
Door
922-2243

Monitor Stand
922-2242

Power Button
922-2433

Video Cable
922-2241

Speaker Cover Set
922-2239

Power Cord
590-0380