



## Macintosh 12 RGB Display

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## Specifications

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Macintosh 12" RGB Display





## Characteristics

### **Picture Tube**

12-in. viewable diagonal screen  
90° deflection angle; black matrix-type dot screen  
Phosphor type P22 (aluminized)  
Spherical, antiglare surface

### **Screen Resolution**

512x384 lines; 64 dpi  
Displays up to 256 colors with Macintosh Display Card 4•8 and  
16.7 million colors with Macintosh Display Card 8•24

### **Scan Rates**

Vertical refresh rate: 60.15 Hz  
Horizontal scan rate: 24.48 kHz  
Rise and fall time: 27 ns maximum





**Active Video  
Display Area**

8.08 in. by 6.02 in. (205 mm by 153 mm)

**Input Signals**

Video: red, green, and blue analog video; RS-343 standard





## Controls

### **User Controls**

Rear panel: power switch

Right side: brightness and contrast controls





## Physical and Electrical

### **Power Supply (International)**

Universal power supply

Voltage: 90–270 VAC, self-configuring

Frequency: 47–63 Hz, single-phase

Power: 90 W maximum

### **Power Supply (Domestic)**

Voltage: 100–120 VAC

Frequency: 50–60 Hz

Power: 90 W maximum

### **Size and Weight**

Height: 12.2 in. (310 mm)

Width: 14.4 in. (365 mm)

Depth: 10.0 in. (253 mm)

Weight: 35 lb. (15.9 kg)





## Operating Environment

**Temperature**

50°F–104°F (10°C–40°C)

**Humidity**

95% maximum, noncondensing

**Altitude**

10,000 ft. (3,048 m) maximum

104°F (40°C) operation from 0–7000 ft. (2,134 m) and derated linearly to maximum 64°F (25°C) at 10,000 ft.





# Troubleshooting

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## Macintosh 12" RGB 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.)

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

### No Raster

No raster, LED off

- 1 Ensure monitor's video cable is connected to the computer or the video card in the computer.
- 2 Check power cord.
- 3 Check internal power connectors.
- 4 Replace blown fuse.
- 5 Replace external power cable assembly.
- 6 Replace main deflection board.

No raster, LED on

- 1 Ensure monitor's video cable is connected to the computer or the video card in the computer.
- 2 Adjust contrast and brightness user controls.
- 3 Verify that video card in monitor is working properly.
- 4 Check main deflection board and CRT/video board connectors.
- 5 Replace blown fuse.
- 6 Perform screen adjustment.
- 7 Replace main deflection board.
- 8 Replace CRT/video board.
- 9 Replace CRT.





## Geometry

Raster size short/  
tall, narrow/wide

- 1 Adjust V-HEIGHT or H-WIDTH controls on main deflection board.
- 2 Replace main deflection board.
- 3 Replace CRT.

Raster not centered

- 1 Verify that distortion is not due to environmental conditions. Move monitor to another location.
- 2 Adjust H-CENT or V-CENT external controls.
- 3 Replace main deflection board.

Horizontal linearity  
bad (screen sides  
differ)

Replace main deflection board.





## Geometry (Continued)

Vertical linearity bad  
(screen top and  
bottom differ)

- 1 Adjust V-LIN control on main deflection board.
- 2 Replace main deflection board.

Raster bows

- 1 Verify that distortion is not due to environmental conditions. Move monitor to another location.
- 2 Check V-HEIGHT and V-CENT adjustment controls and H-WIDTH and H-CENT controls. (Some bowing from environmental conditions is normal and is within manufacturing tolerances. Slight bowing does not impair functionality of monitor.)
- 3 Replace main deflection board.
- 4 Replace CRT.





## Geometry (Continued)

Entire raster is tilted

- 1 Verify that distortion is not due to environmental conditions. Move monitor to another location.
- 2 Adjust yoke assembly as follows:
  - Switch off power and remove rear cover
  - Loosen frontmost screw on neck of CRT
  - Twist yoke assembly as appropriate
  - Retighten screw on neck of CRT (Do not overtighten screw; you could break neck of CRT.)
  - Switch on monitor and check display
- 3 Replace main deflection board.





## Geometry (Continued)

Abnormal/distorted raster (other than above)

- 1 Verify that distortion is not due to environmental conditions. Move monitor to another location.
- 2 Check all cable connections.
- 3 Perform geometric adjustments.
- 4 Replace main deflection board.
- 5 Replace CRT/video board.
- 6 Replace CRT.





## Synchronization

- |  |   |  |
|--|---|--|
| Picture breaks into diagonal lines           | 1 | Connect another monitor to computer and verify video signal. |
|  | 2 | Adjust H-HOLD control on main deflection board.              |
|  | 3 | Replace main deflection board.                               |
| Picture rolls vertically                     | 1 | Verify that video card in monitor is working properly.       |
|  | 2 | Adjust V-HOLD control on main deflection board.              |
|  | 3 | Replace main deflection board.                               |
| Single vertical or horizontal line on screen | 1 | Check yoke connector DY.                                     |
|  | 2 | Replace main deflection board.                               |
|  | 3 | Replace CRT.   |





## Video

Predominant red,  
blue, or green tint

- 1 Check video cable connection.
- 2 Verify that video card in monitor is working properly.
- 3 Perform white balance adjustments.
- 4 Replace CRT/video board.
- 5 Replace CRT.

Picture too dark or  
too bright

- 1 Adjust contrast and brightness knobs.
- 2 Verify that video card in monitor is working properly.
- 3 Perform video adjustments (cutoff and white balance).
- 4 Replace main deflection board.
- 5 Replace CRT/video board.
- 6 Replace CRT.





## Video (Continued)

Cannot adjust  
brightness, contrast,  
or color

- 1 Replace contrast/brightness assembly.
- 2 Replace main deflection board.
- 3 Replace CRT/video board.

Out of focus

- 1 Adjust focus control on flyback transformer.
- 2 Perform screen adjustment.
- 3 Replace main deflection board.
- 4 Replace CRT.





## Miscellaneous

Intermittently shuts down	<ol style="list-style-type: none"><li>1 Ensure monitor's video cable is connected to the computer or the video card in the computer.</li><li>2 Replace main deflection board.</li></ol>
Picture jitters or flashes	<ol style="list-style-type: none"><li>1 Check that ground cables are secure.</li><li>2 Check that adjacent computer equipment is properly grounded. Move other electrical devices away from monitor. Shut off fluorescent lights.</li><li>3 Replace main deflection board.</li></ol>
Flashing or wavy screen	<ol style="list-style-type: none"><li>1 Crimp metal connector tabs on video connector.</li><li>2 Replace main deflection board.</li></ol>
Black spots on screen (burnt phosphors)	Replace CRT.





Take Apart

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Macintosh 12" RGB Display

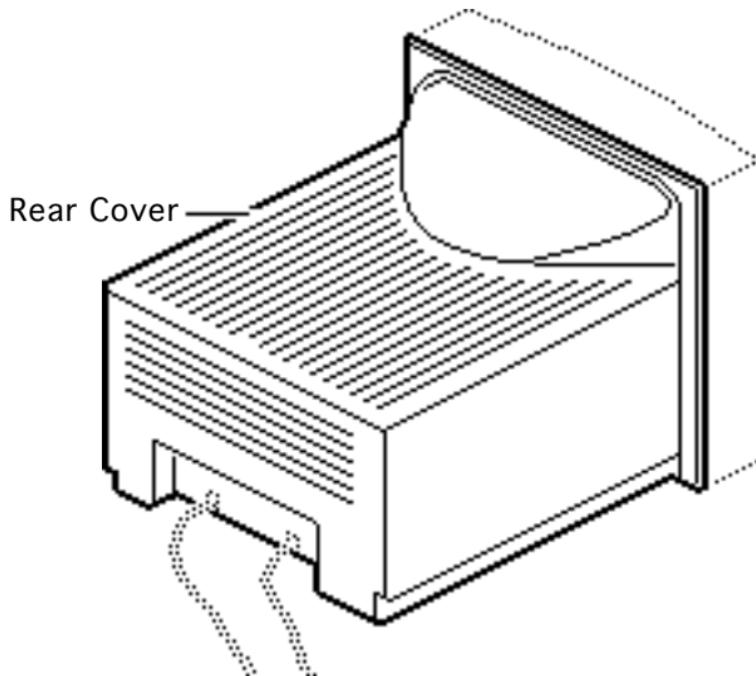


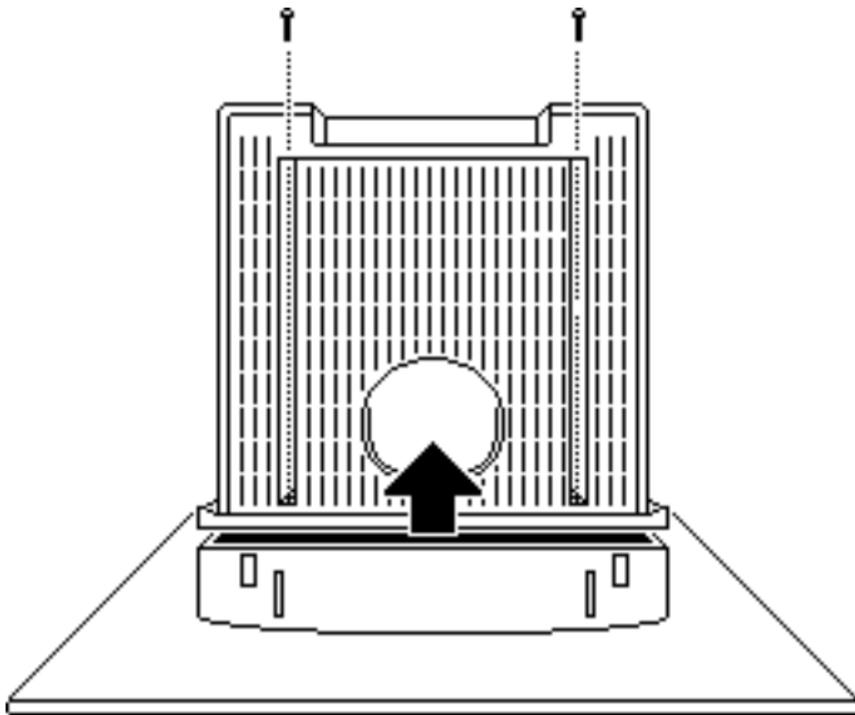


## Rear Cover

No preliminary steps are required before you begin this procedure.

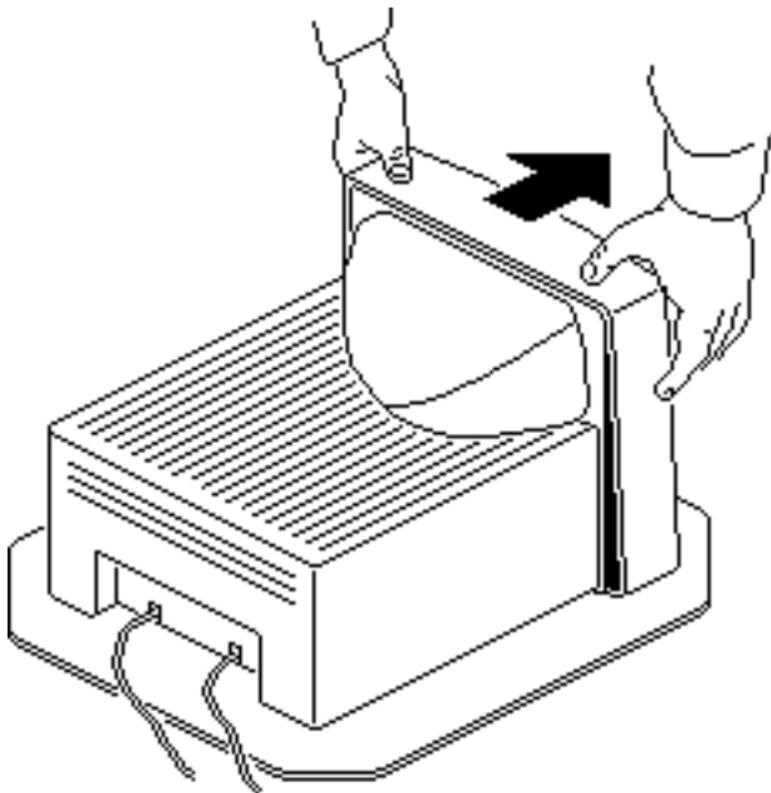
**⚠ Warning:** This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.





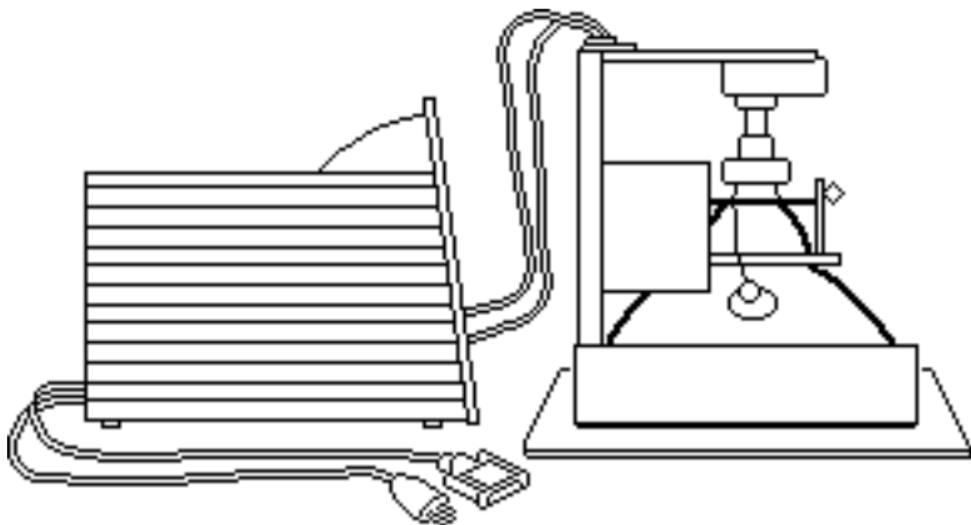
- 1 Place the monitor face-down on a protective pad and remove the two case screws.
- 2 Separate the bottom of the rear cover from the bezel.





- 3 Set the monitor upright.
- 4 Press down about one inch from the outside edges of the bezel to separate the top of the rear cover from the bezel.



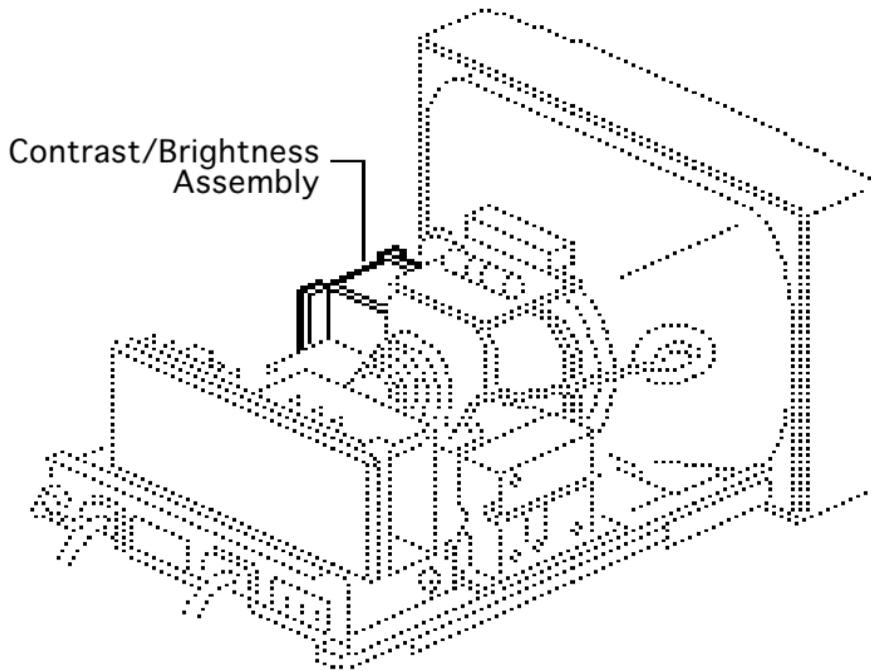


- 5 Place the monitor face-down on a protective pad.
- 6 Lift off the loosened rear cover.
- 7 Pull the AC power cord and video cable through the cover.





## Contrast/ Brightness Assembly



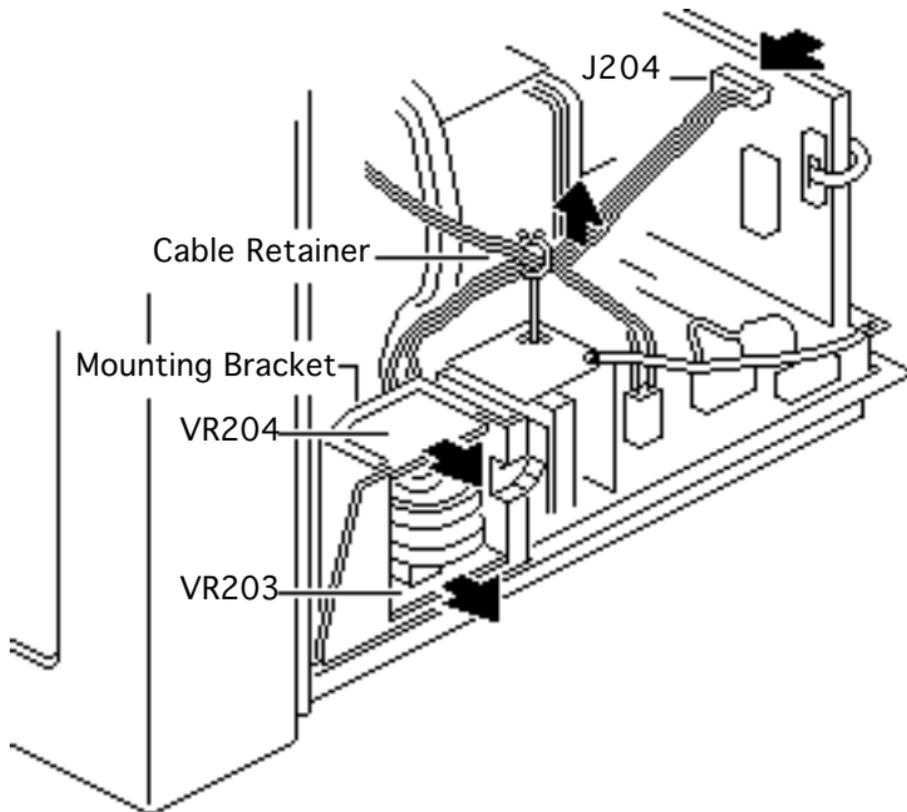
Before you begin,

- Remove the rear 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

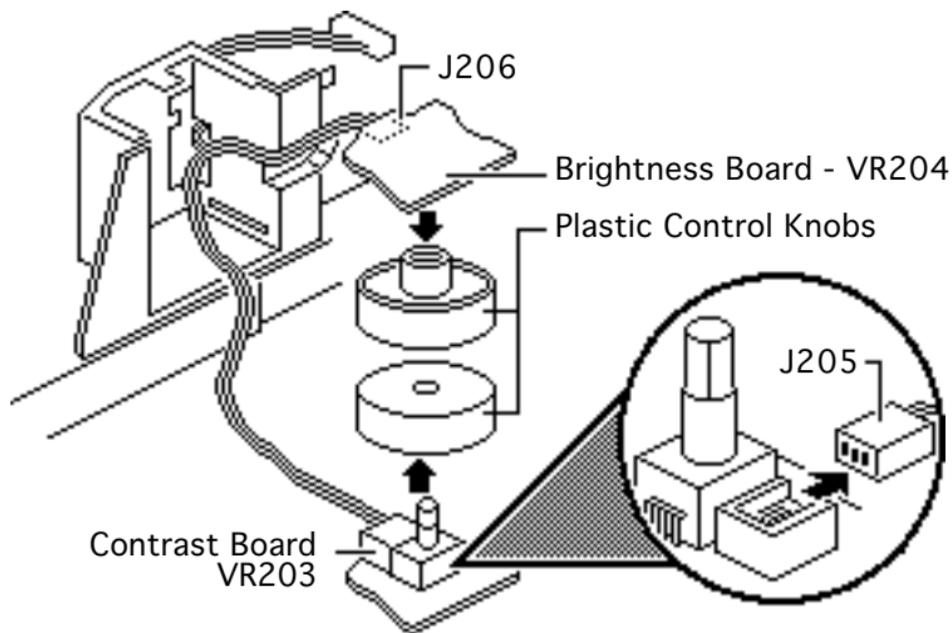




grounding wriststrap until after discharging the CRT.

- 1 Disconnect the six-wire cable from connector J204 on the CRT/video board. Remove the six wires from the cable retainer.
- 2 Remove brightness board VR204 and contrast board VR203 from the mounting bracket.
- 3 Unhook and pull the six wires through the back of the mounting bracket.





- 4 Pull off the two control knobs.
- 5 Disconnect cable connector J206 from the brightness board and cable connector J205 from the contrast board.





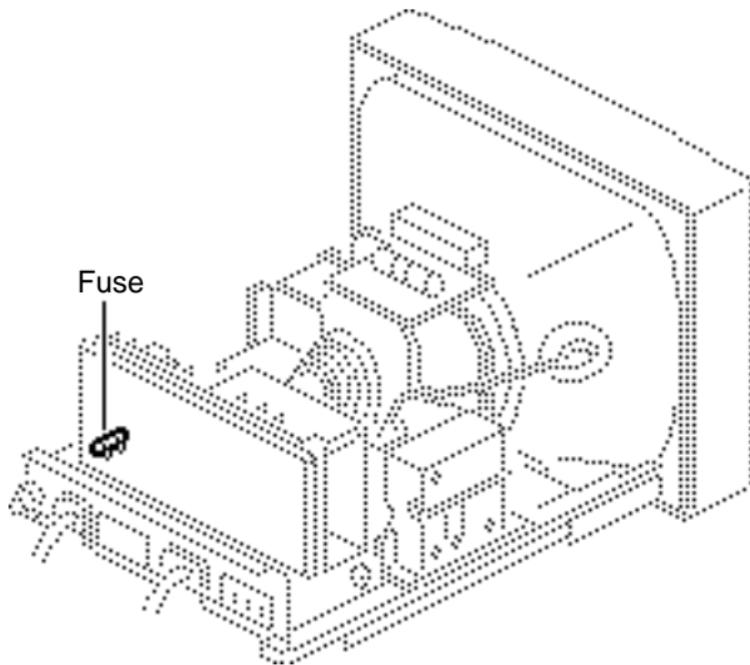
## Fuse

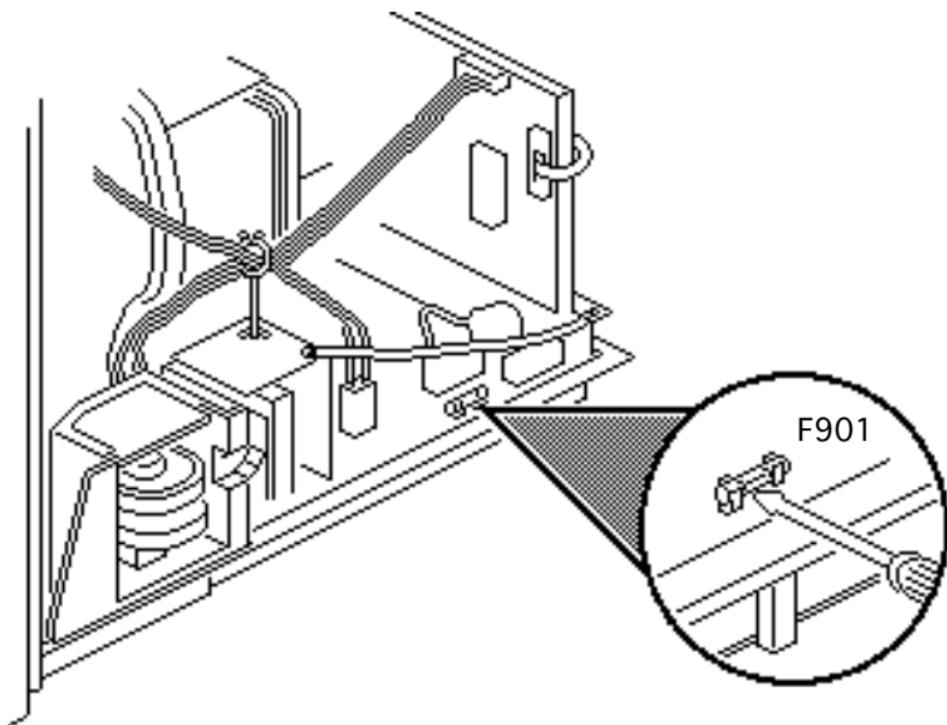
Before you begin,

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

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





Using a small flat-blade screwdriver, pry the defective fuse from connector F901 on the deflection board.





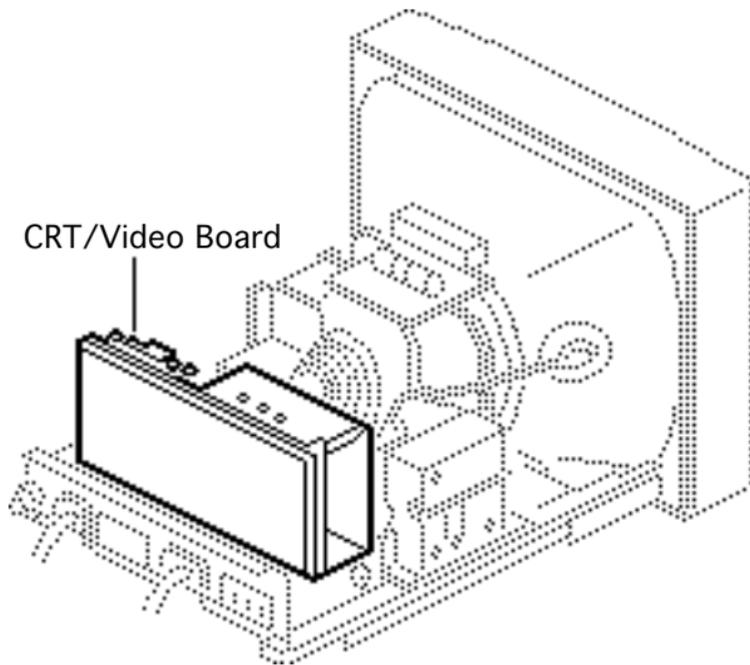
## CRT/Video Board

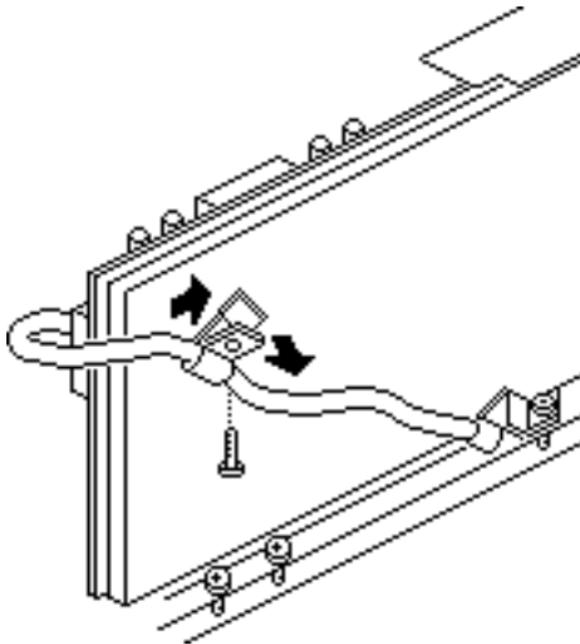
Before you begin,

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

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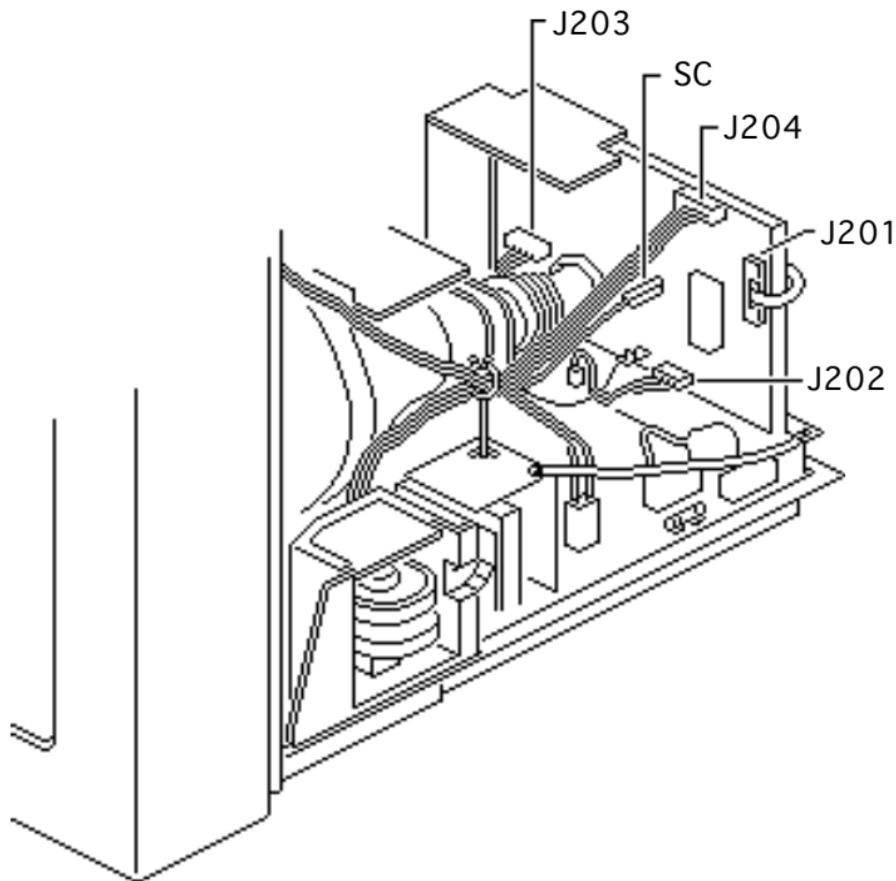
**⚠ Warning:** Never use a grounding wriststrap until after discharging the CRT.





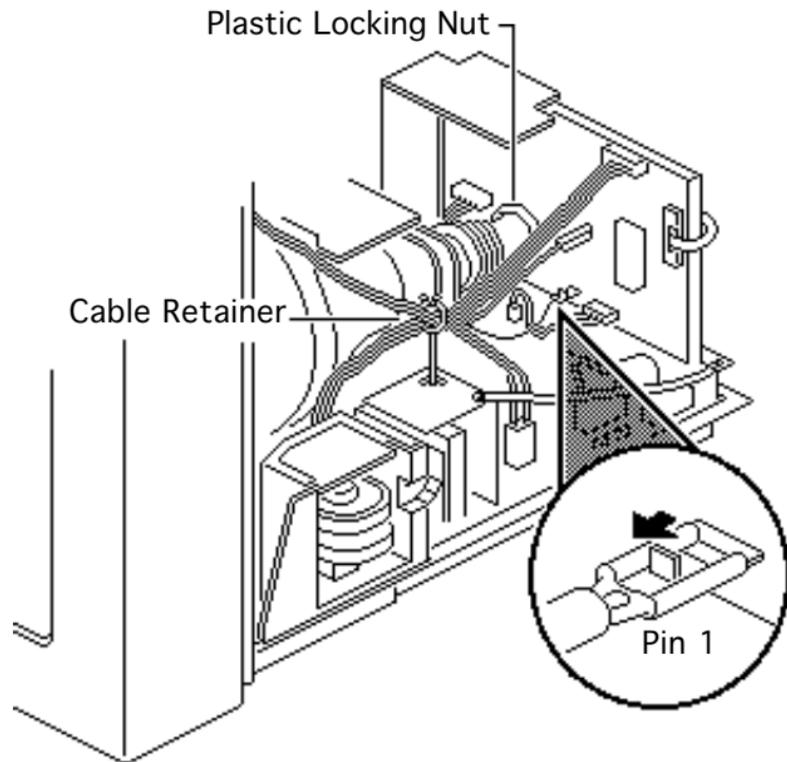
- 1 Remove the screw that secures the video cable to the cable clamp at the back of the CRT/video board.
- 2 Remove the video cable from the clamp and remove the clamp from the CRT/video board.





- 3 Disconnect the following cable connectors from the CRT/video board:
- 6-wire cable from J204
  - 8-wire video cable from J201
  - Single-pin cable from SC
  - 5-wire, 7-pin cable from J202
  - 6-wire, 8-pin cable from J203



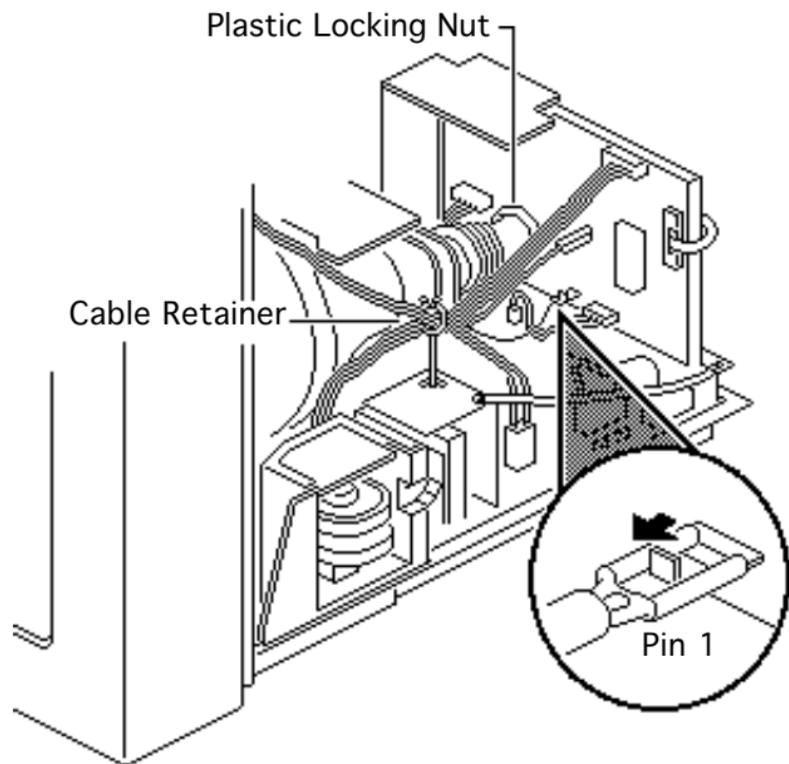


- 4 **Note:** To unhook the CRT ground cable, you must first press the small metal catch in the center of the connector.

Disconnect the CRT ground cable from connector PIN 1 on the CRT/video board.

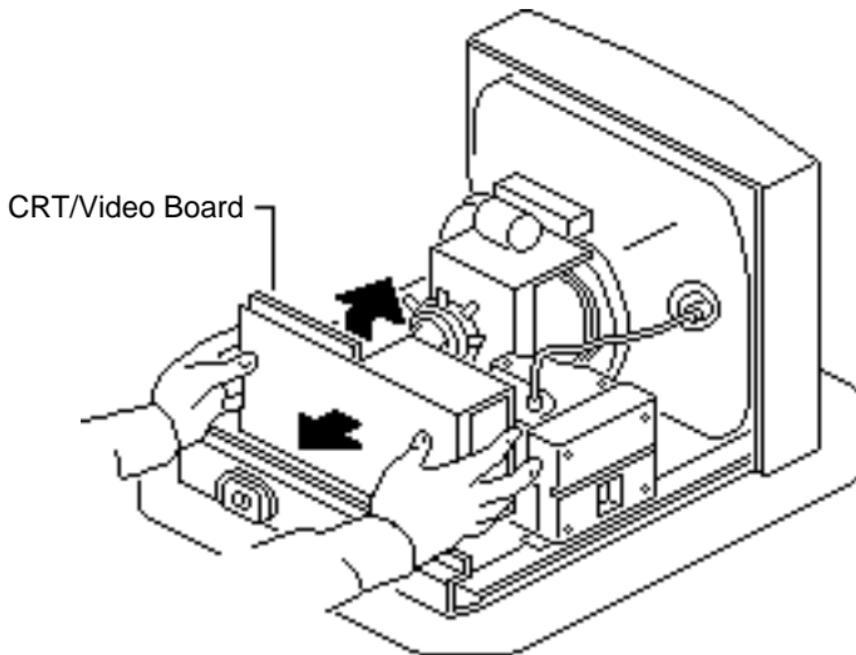
- 5 Remove the two cables from the cable retainer on the main deflection board beneath the neck of the CRT.





- 6 Loosen (turn clockwise, as viewed from the rear of the monitor) the plastic locking nut on the neck of the CRT.

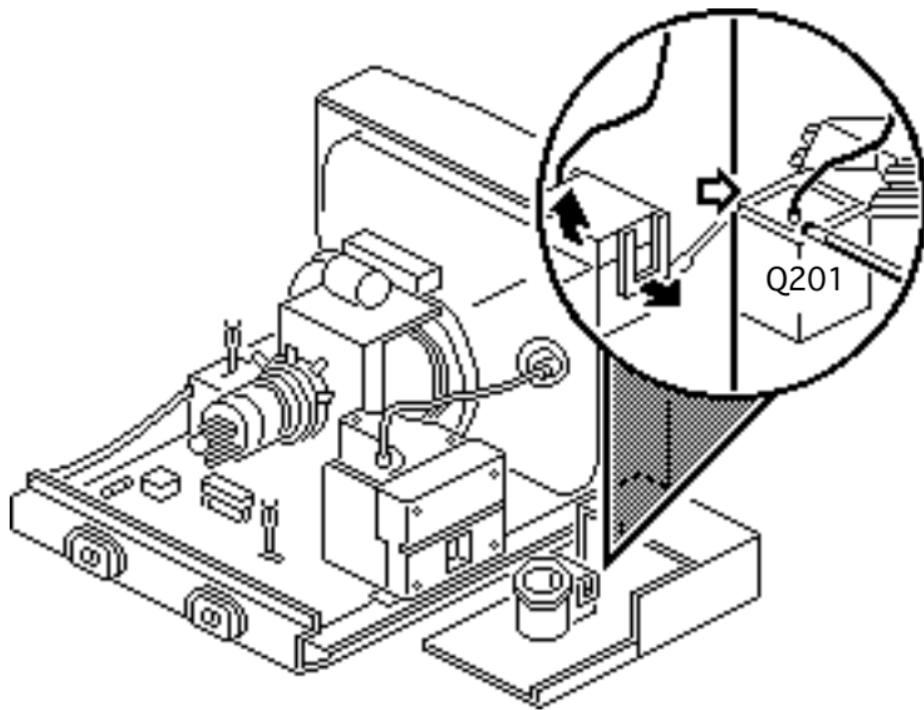




**Note:** To remove the CRT/video board over the rear metal chassis, tilt the CRT assembly slightly.

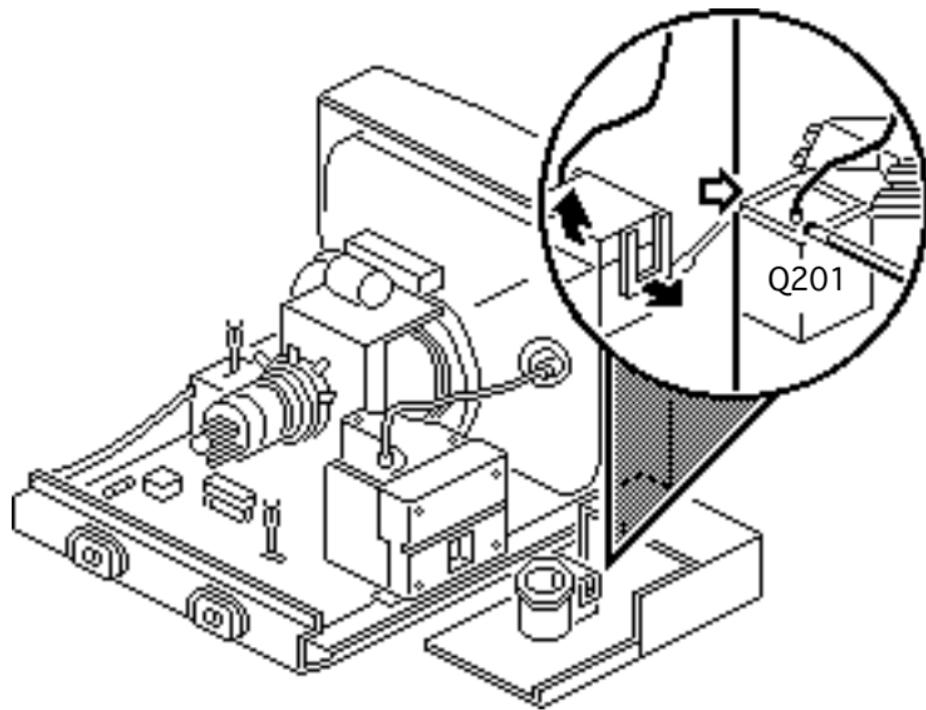
- 7 Grasp the back of the CRT/video board with both hands and pull the board straight back off the neck of the CRT. Note that a cable still connects the CRT/video board to the flyback transformer.





- 8 Place the CRT/video board on the protective mat next to the flyback transformer.
- 9 Unfasten the two side tabs and open the white plastic cover over connector Q201. You may need to use a small flat-blade screwdriver to open the tabs.





10 **Caution:** To avoid damaging the CRT/video board, use a low-wattage soldering iron. Touch only the connector Q201 terminal with the soldering iron.

Desolder the flyback transformer cable from connector Q201.





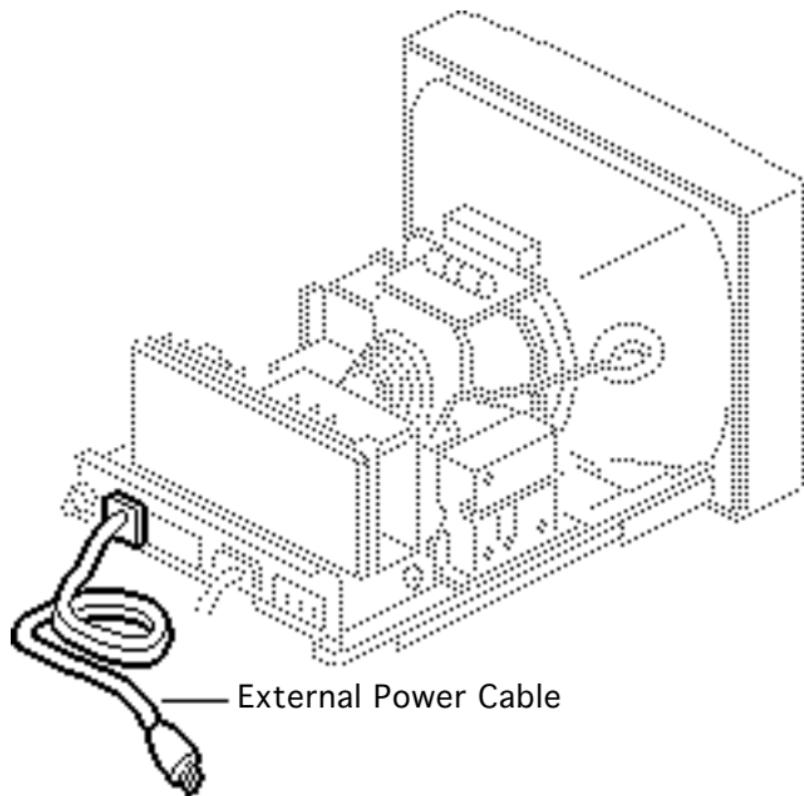
## External Power Cable

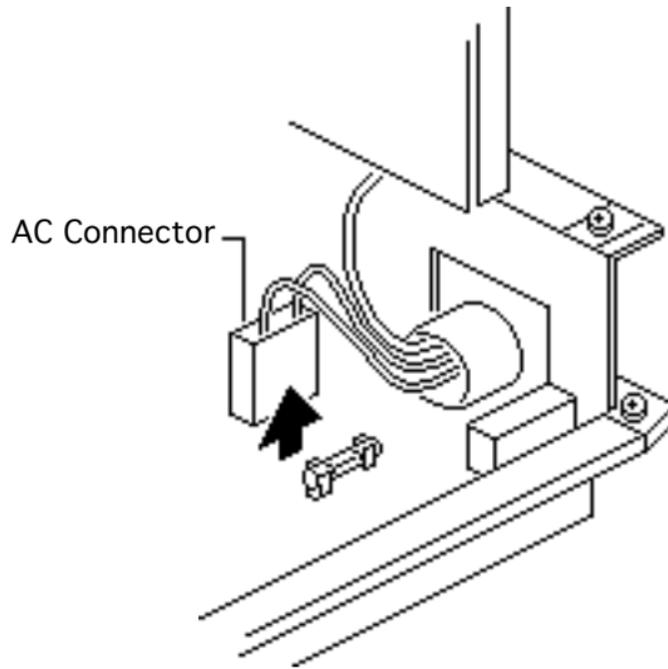
Before you begin,

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

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





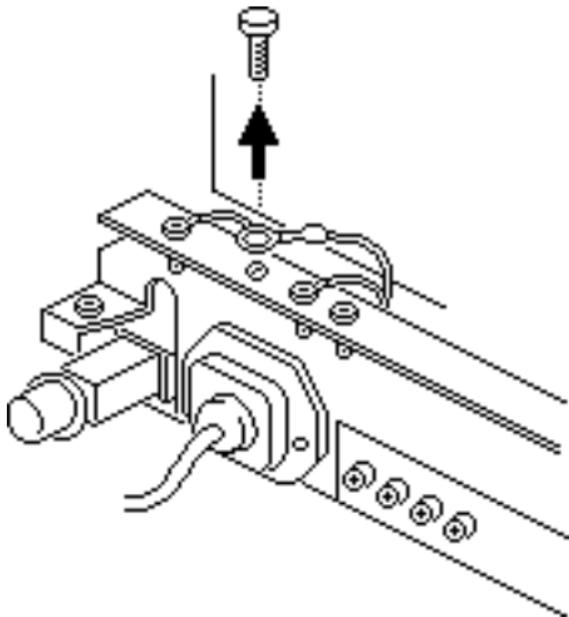
**Note:** The international version of the 12" RGB display has a detachable external power cable.

- 1 Disconnect the two-wire, three-pin power connector from the AC connector on the main deflection board.



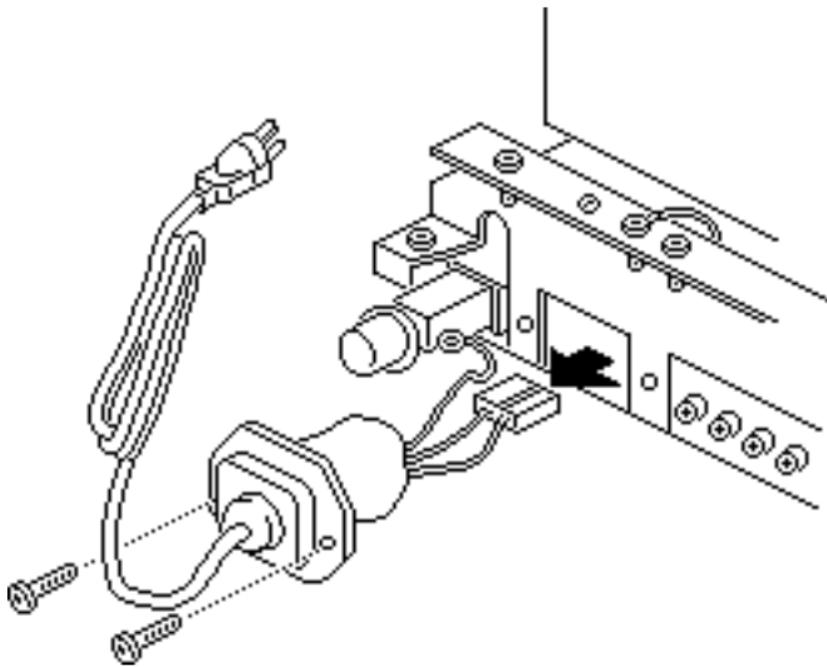


- 2 Using a 9/32-inch hex driver or a small adjustable wrench, remove the hex screw that secures the AC ground cable to the rear of the metal chassis.





- 3 Remove the two screws that secure the power cable to the metal chassis.
- 4 Remove the power cable.





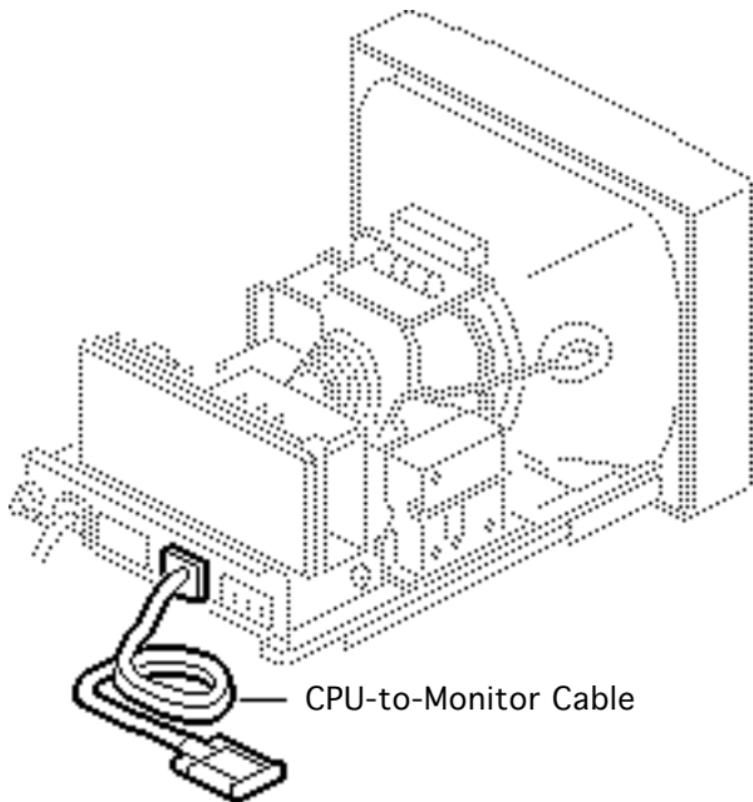
## CPU-to-Monitor Cable

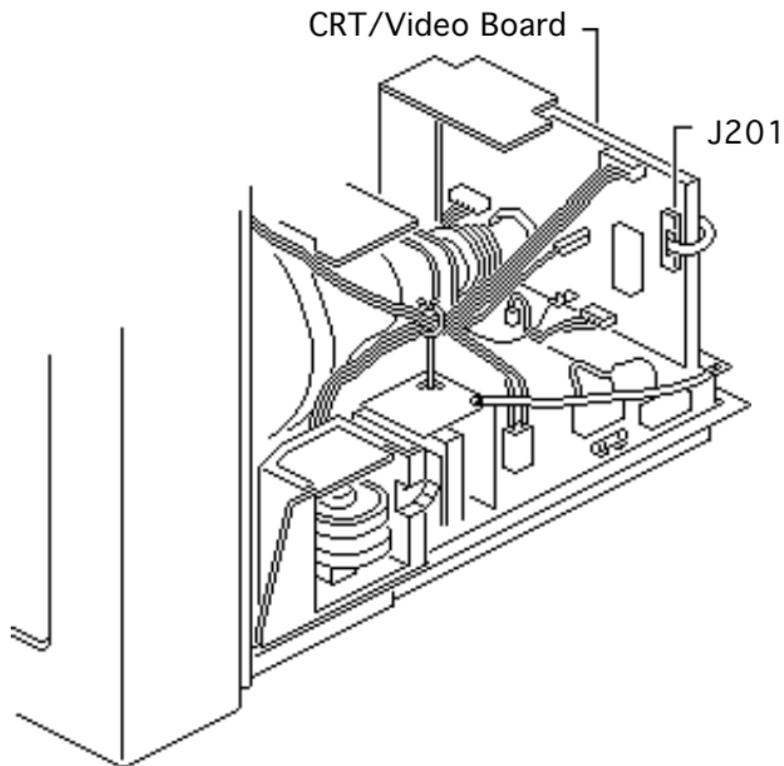
Before you begin,

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

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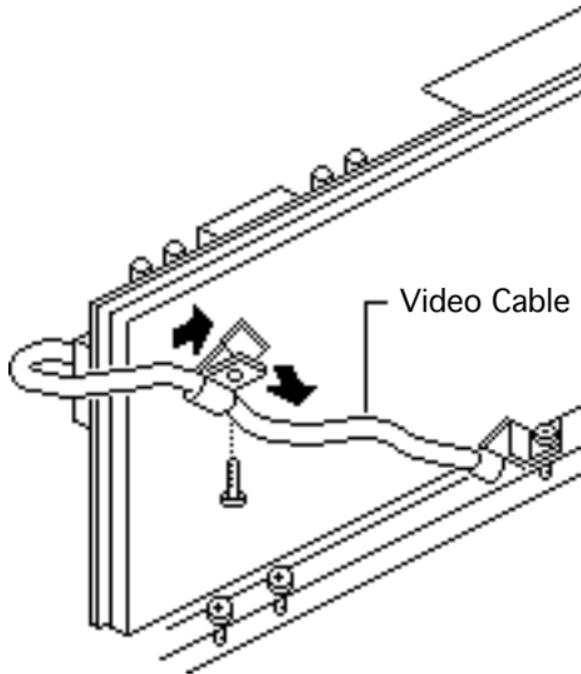
- 1 Disconnect the eight-wire video connector from connector J201 on the CRT/video board.

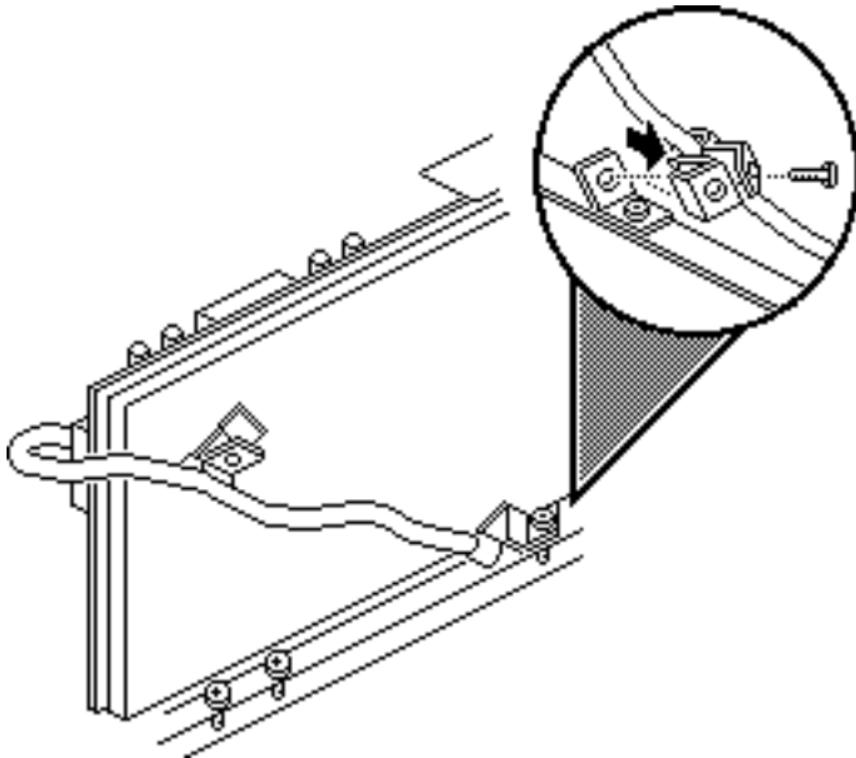




- 2 Remove the screw that secures the video cable to the back of the CRT/video board.

Remove the video cable from the cable clamp.





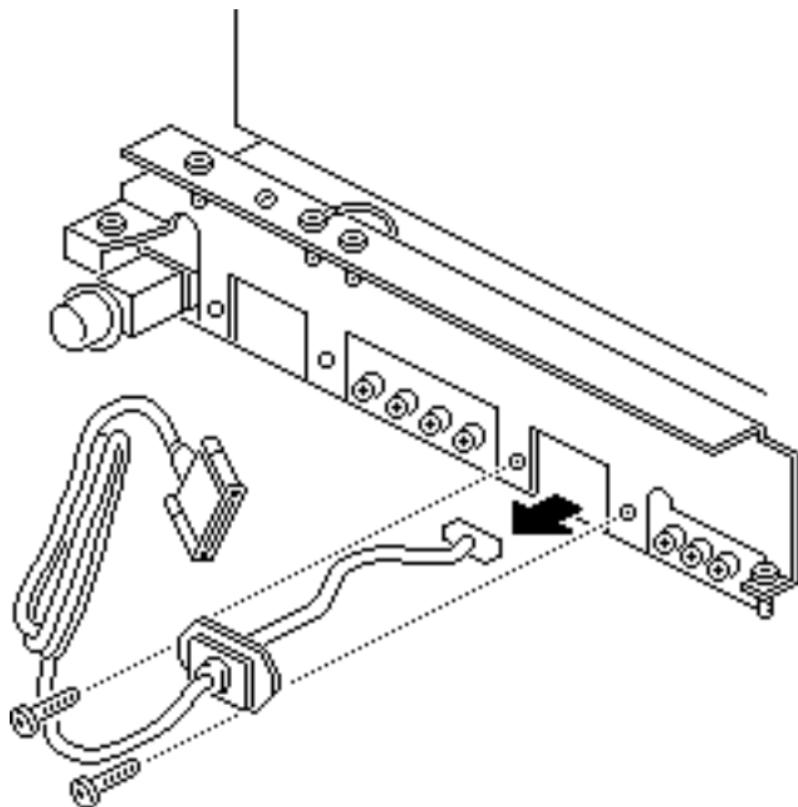
- 3 Remove the screw that secures the video cable to the mounting bracket on the rear chassis.

Remove the video cable from the cable clamp.





- 4 Remove the two screws that secure the video cable to the metal chassis.
- 5 Remove the video cable from the chassis.

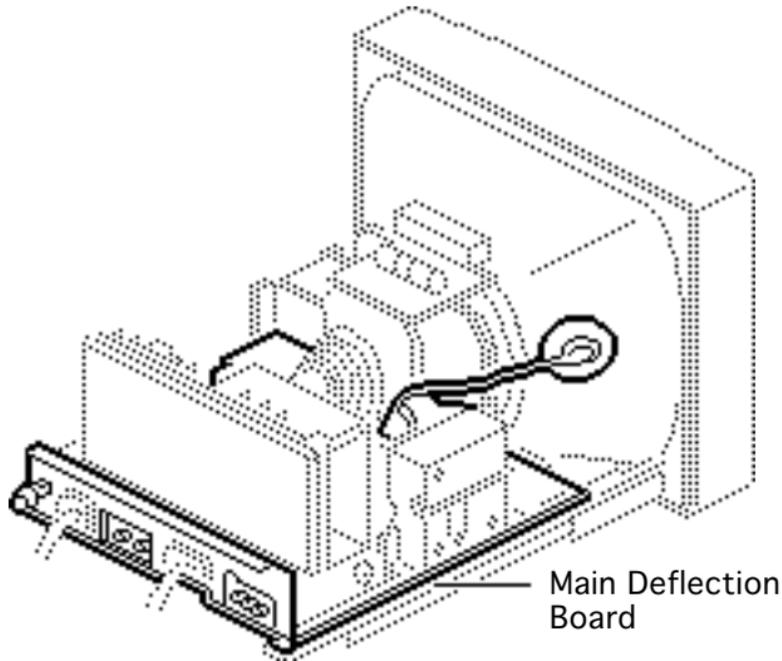




## Main Deflection Board

Before you begin,

- Remove the rear cover
- Discharge the CRT
- Remove the anode cap
- Remove the CRT/video board
- Remove the external power cable
- Remove the CPU-to-monitor cable

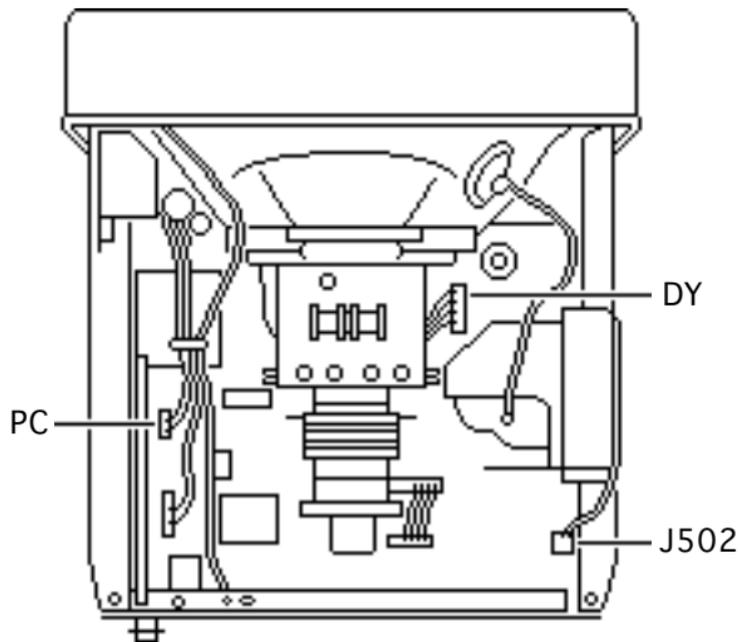




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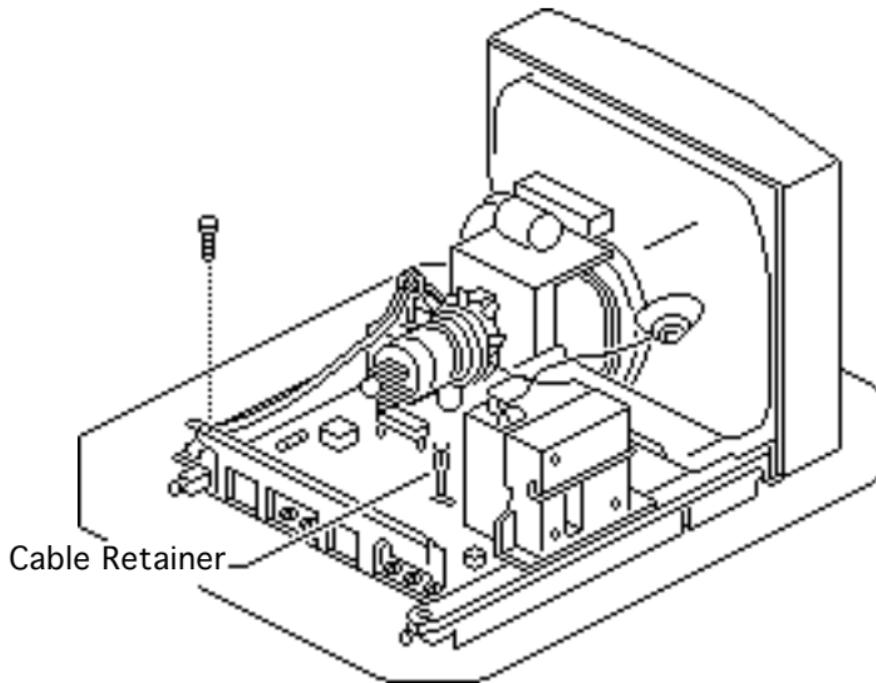
**⚠ Warning:** Never use a grounding wriststrap until after discharging the CRT.





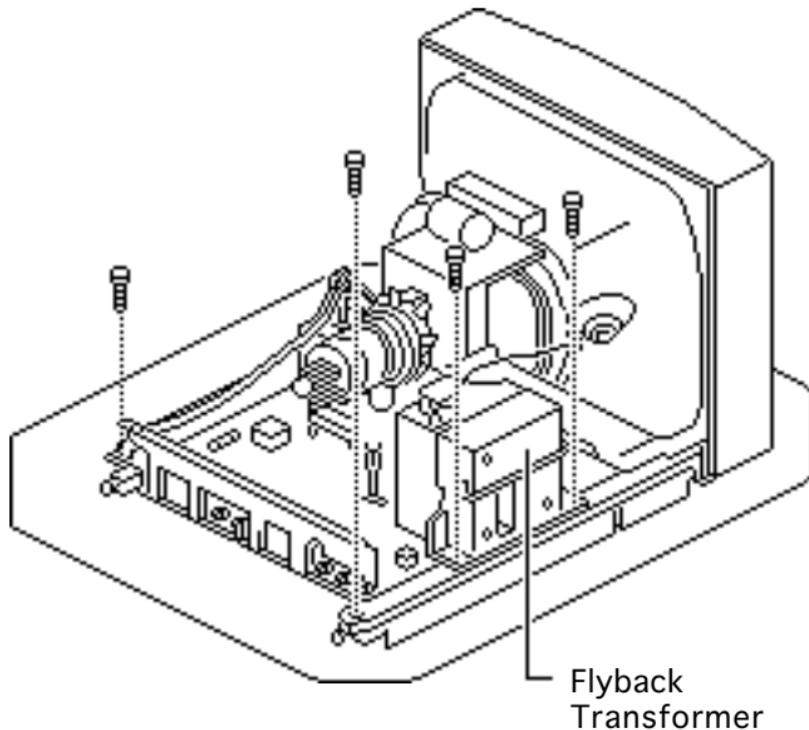
- 1 Disconnect the following cable connectors from the main deflection board:
  - 2-wire cable from PC
  - 2-wire LED cable from J502 (Detach the LED cable from the back of the flyback transformer.)
  - 4-wire yoke cable from DY





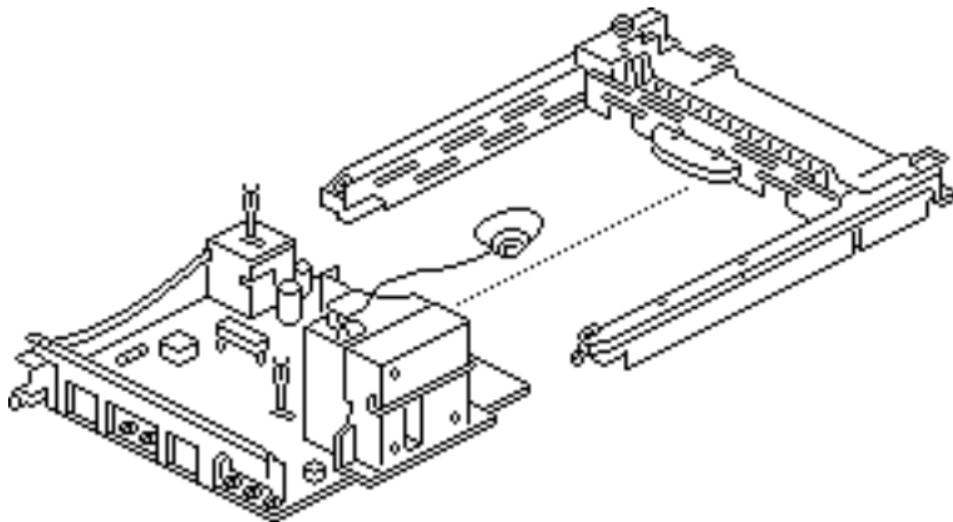
- 2 Remove the screw that secures the two internal ground cables to the metal chassis.
- 3 Remove all cables from the cable retainer on the main deflection board.





- 4 Remove the two screws that secure the flyback transformer to the right stem of the plastic main deflection board holder.
- 5 Remove the two screws that secure the rear chassis to the end of both stems of the plastic main deflection board holder.

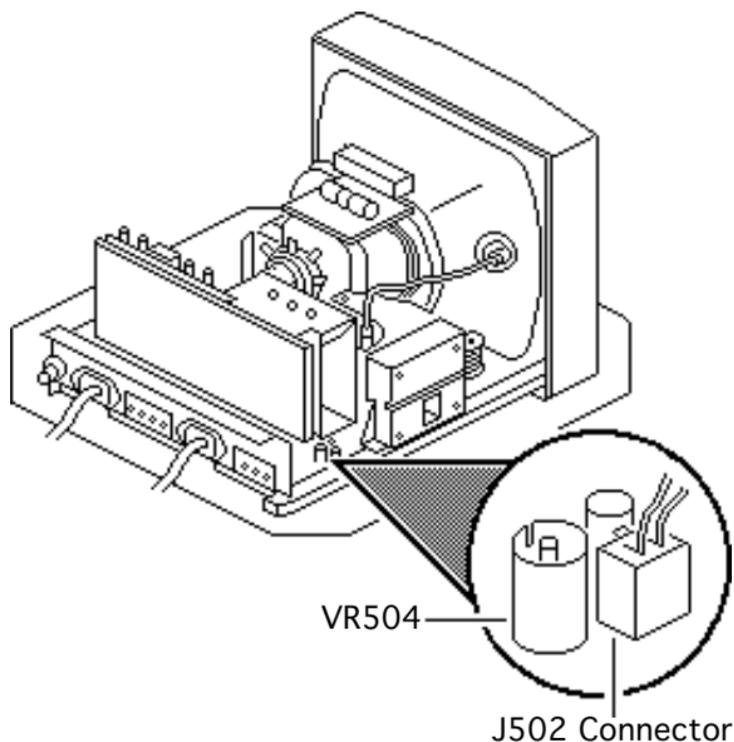




- 6 Pull the main deflection board straight out of the channels in the plastic main deflection board holder.

**Replacement Note:** Rev. A and Rev. B versions of the main deflection board are not interchangeable and must be replaced like-for-like.





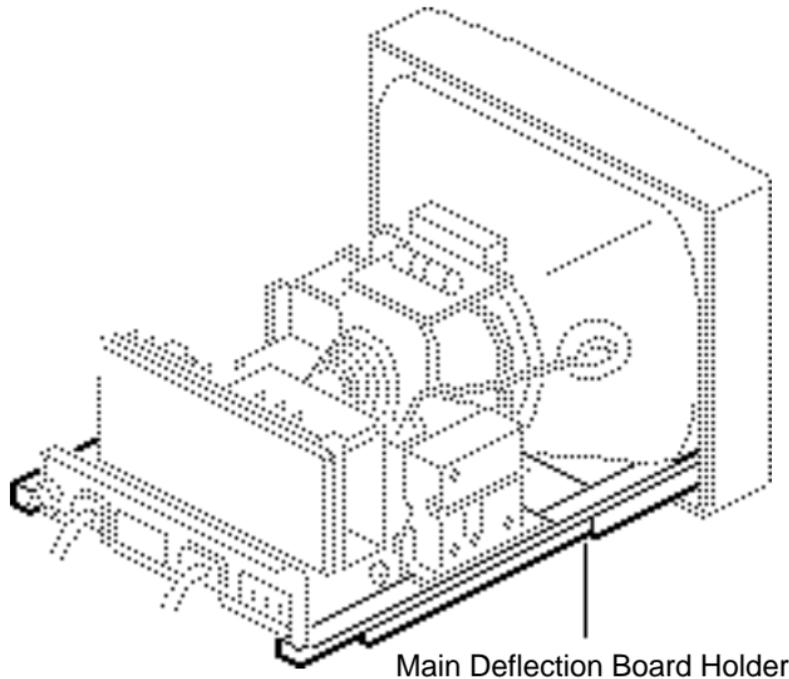
To differentiate between versions, look for a gray coil (VR504) next to connector J502 and do the following:

- If the bad board does not have coil VR504, order a Rev. A main deflection board.
- If the bad board has coil VR504, order a Rev. B main deflection board.





## Main Deflection Board Holder

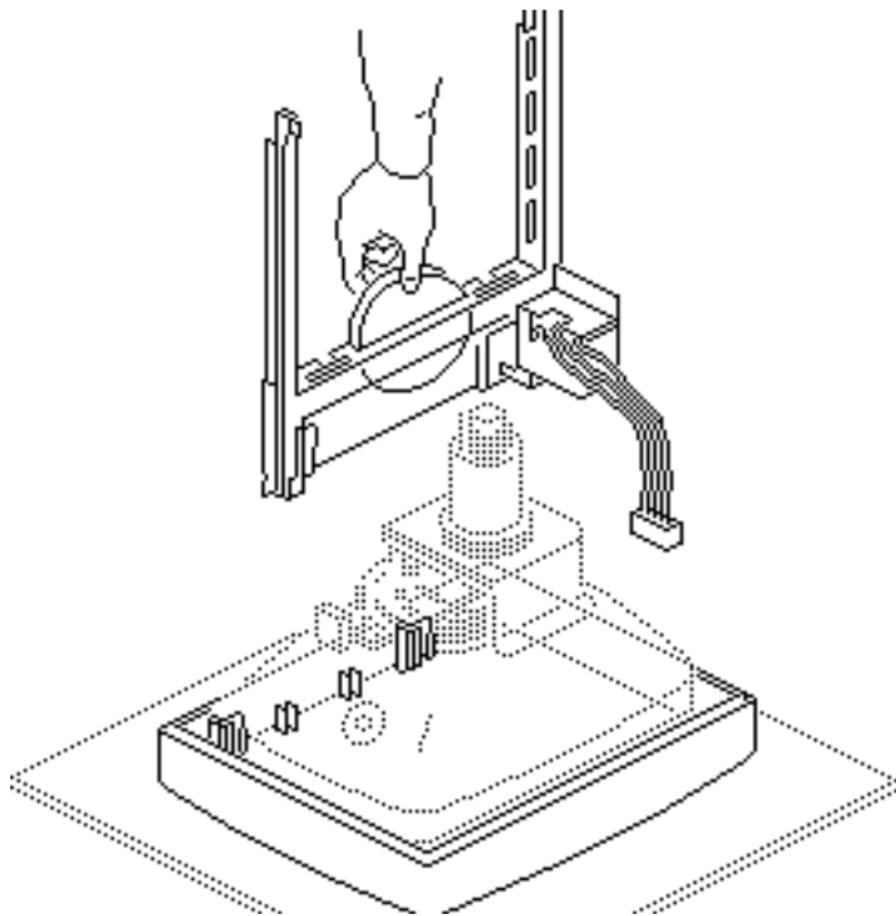


Before you begin,

- Remove the rear cover
- Discharge the CRT
- Remove the anode cap
- 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, review CRT safety in Bulletins/Safety.





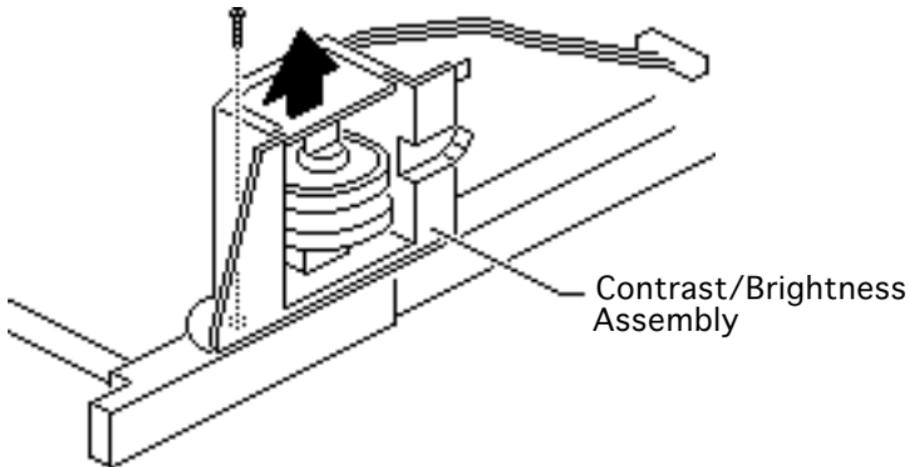
**⚠ Warning:** Never use a grounding wriststrap until after discharging the CRT.

- 1 With the monitor face-down on a protective pad, lift and pull the left and right front edges of the main deflection board holder to remove it from the bezel.





- 2 Remove the mounting screw and the contrast/brightness assembly from the main deflection board holder.

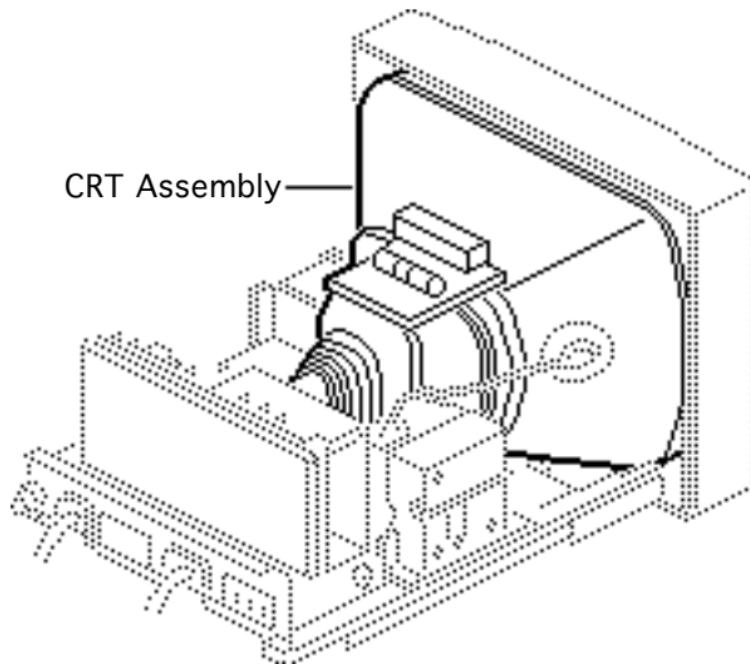




## CRT Assembly

Before you begin,

- Remove the rear cover
- Discharge the CRT
- Remove the anode cap
- Remove the CRT/video board
- Remove the main deflection board
- Remove the main board holder

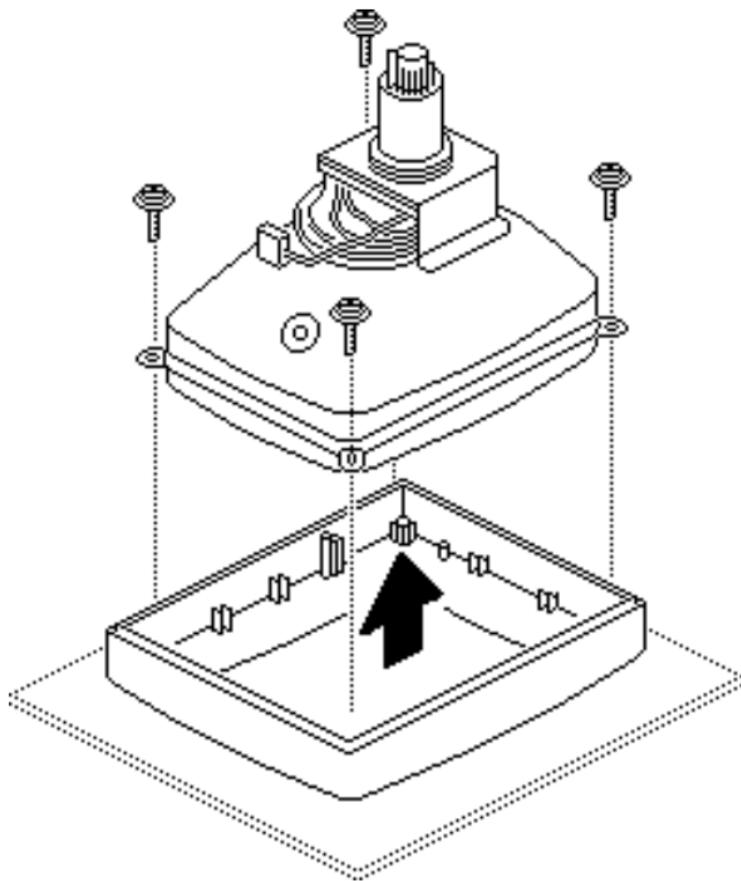




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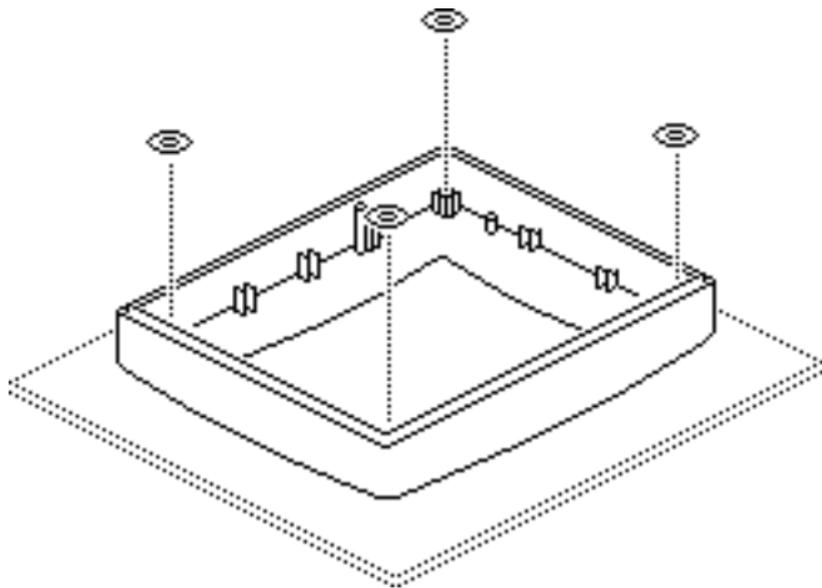


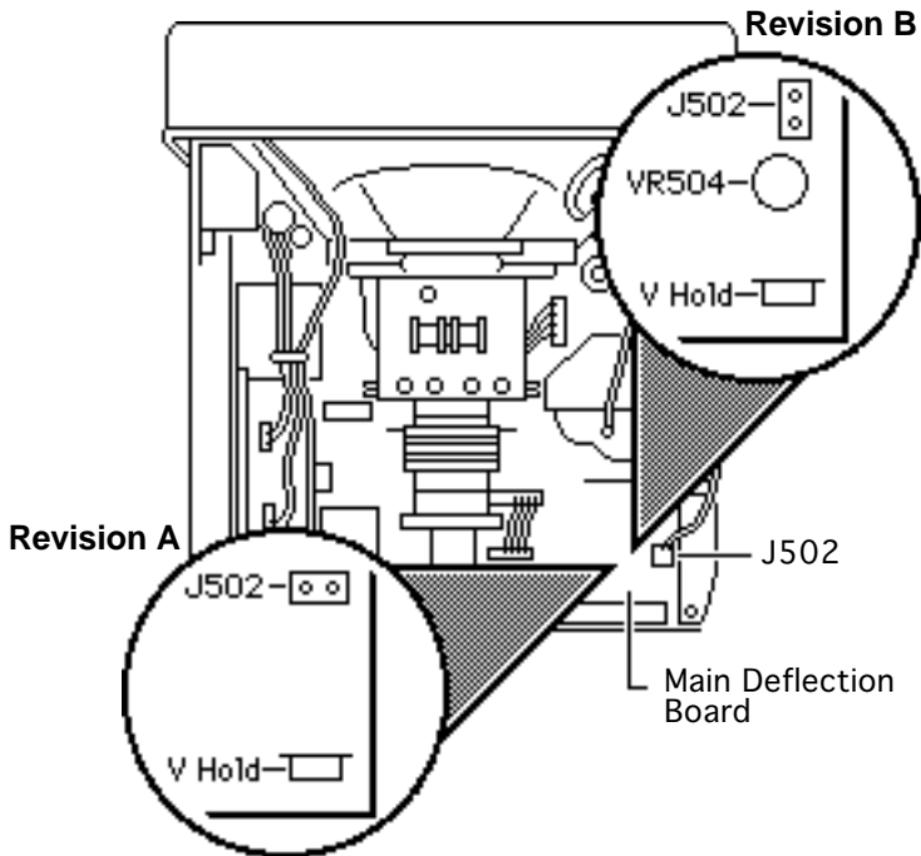
- 1 **Caution:** The neck of the CRT is easily damaged. Do not grab the neck of the CRT to remove it from the bezel.  
  
Remove the four mounting screws and carefully lift the CRT from the bezel. Place the CRT face-down on the protective pad.





- 2 Remove the four spacers from the plastic standoffs at the corners of the bezel.



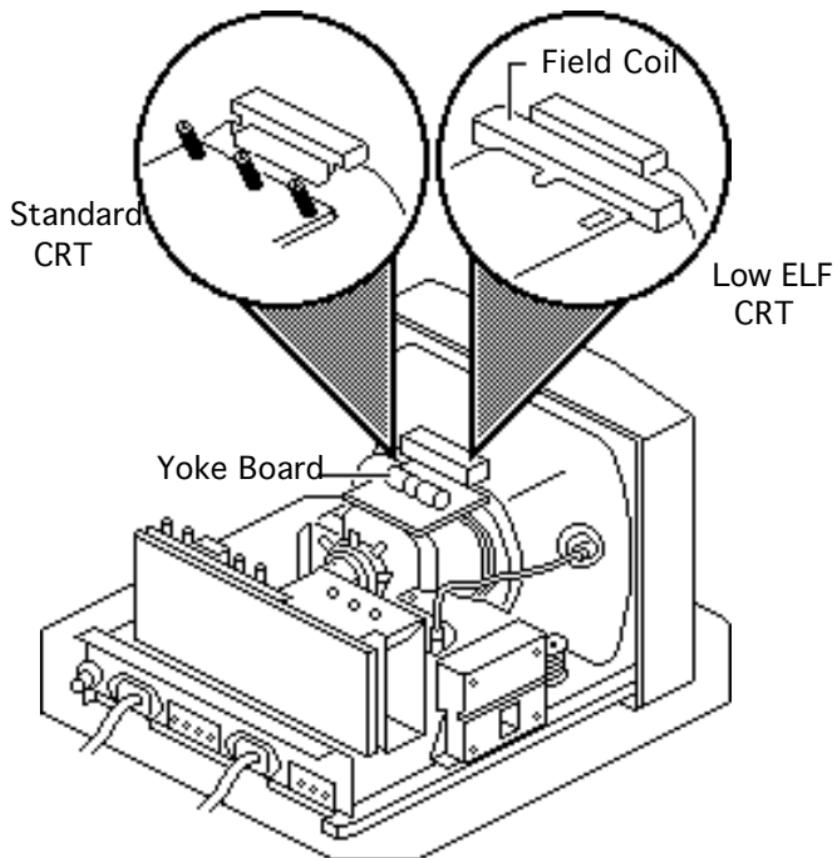


**Replacement Note:** If you are replacing the CRT, you must order a replacement CRT that is compatible with the main deflection board in the customer's system.

Check the main deflection board for resistor VR504.

- If VR504 is not present, you have a Rev. A main board. Order Standard CRT 076-0384.
- If VR504 is present, you have a Rev. B main board. Order Low ELF CRT 076-0395.





**Replacement Note:** CRTs ship in Standard and Low ELF versions. Yoke boards come in many variations. To determine whether the CRT is a Standard or Low ELF CRT, check for field coils. The Low ELF CRT has two field coils, one on top and one on the bottom of the CRT. The Standard CRT does not have field coils.

**Replacement Note:** After replacing a defective CRT, perform the voltage adjustment procedure (see Adjustments).

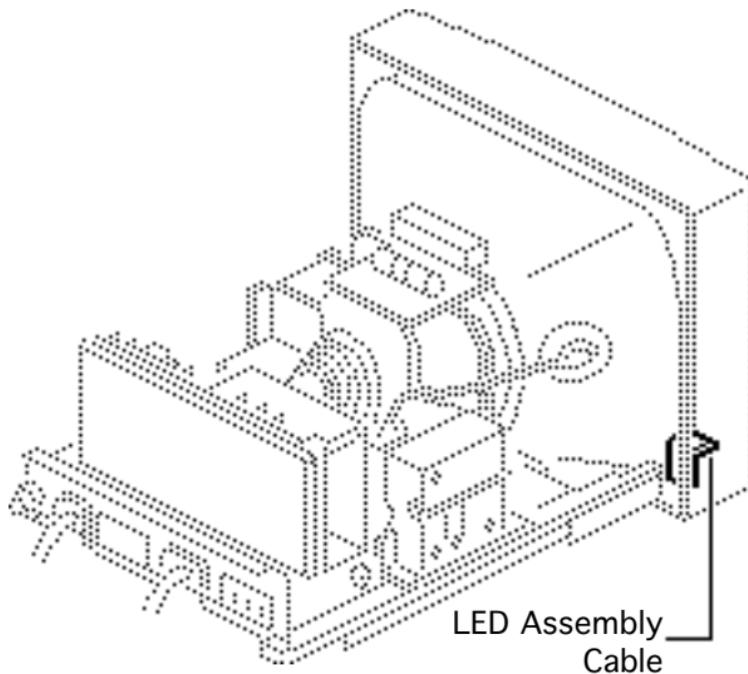


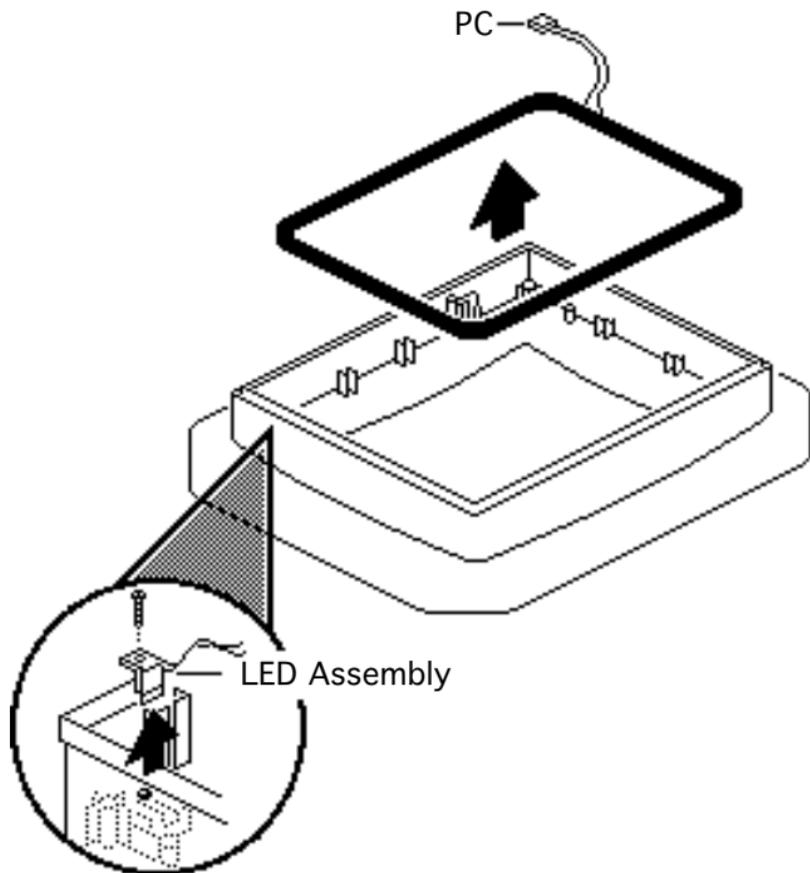


## LED Assembly Cable

Before you begin,

- Remove the rear cover
- Discharge the CRT
- Remove the anode cap
- Remove the CRT/video board
- Remove the main deflection board
- Remove the main board holder
- Remove the CRT assembly





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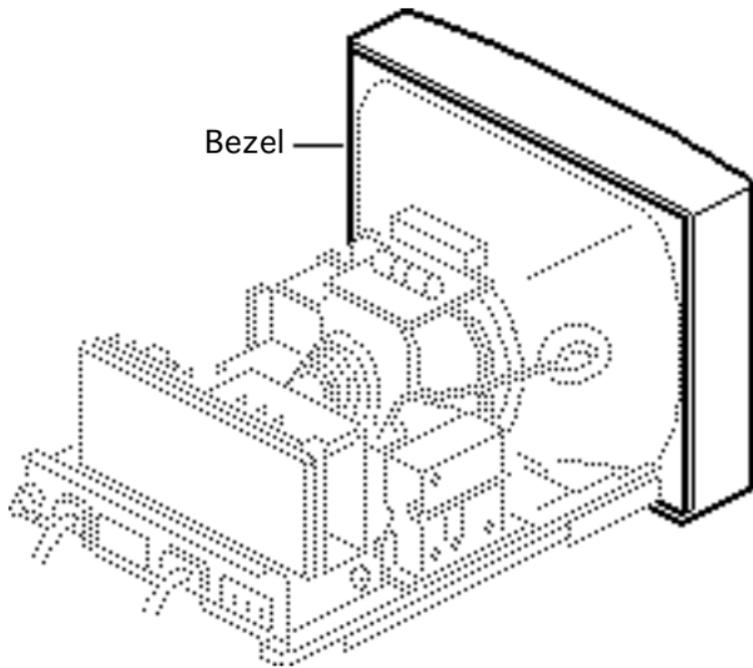
**⚠ Warning:** Never use a grounding wriststrap until after discharging the CRT.

- 1 Remove the black degauss cable from the bezel. Connector PC is attached to the cable.
- 2 Remove the mounting screw and the LED assembly from the bezel.





## Bezel



To remove the bezel,

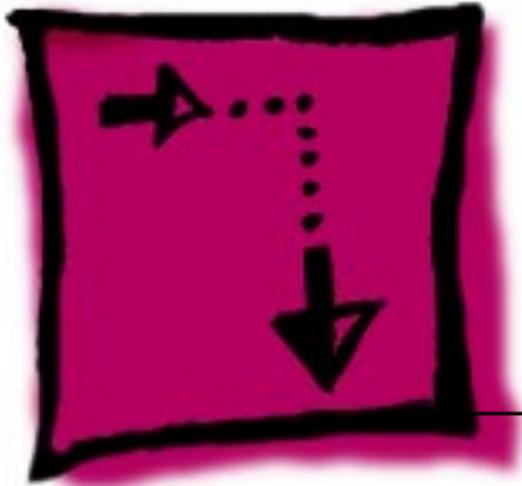
- Remove the rear cover
- Discharge the CRT
- Remove the anode cap
- Remove the CRT/video board
- Remove the main deflection board
- Remove the main board holder
- Remove the CRT assembly
- Remove the LED assembly





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





## Adjustments

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Macintosh 12 RGB Display

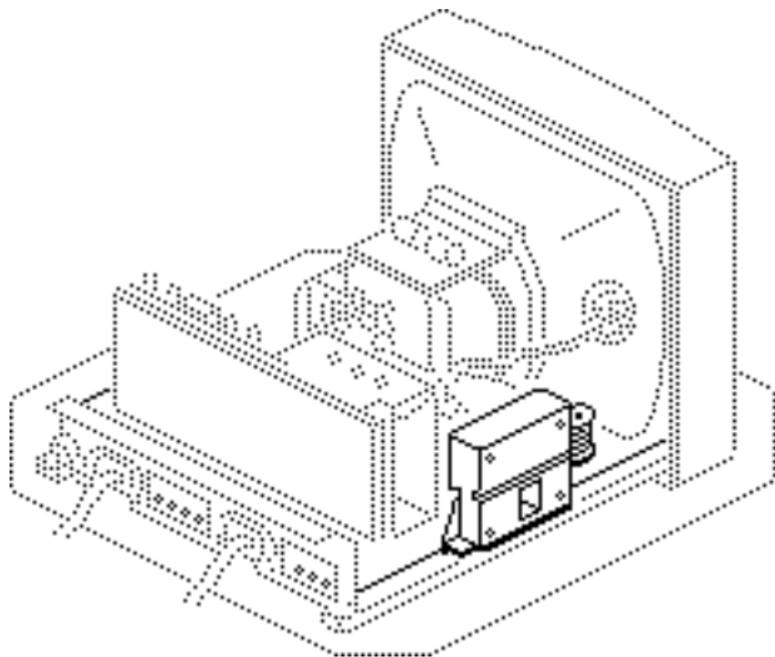




## Screen Voltage

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.

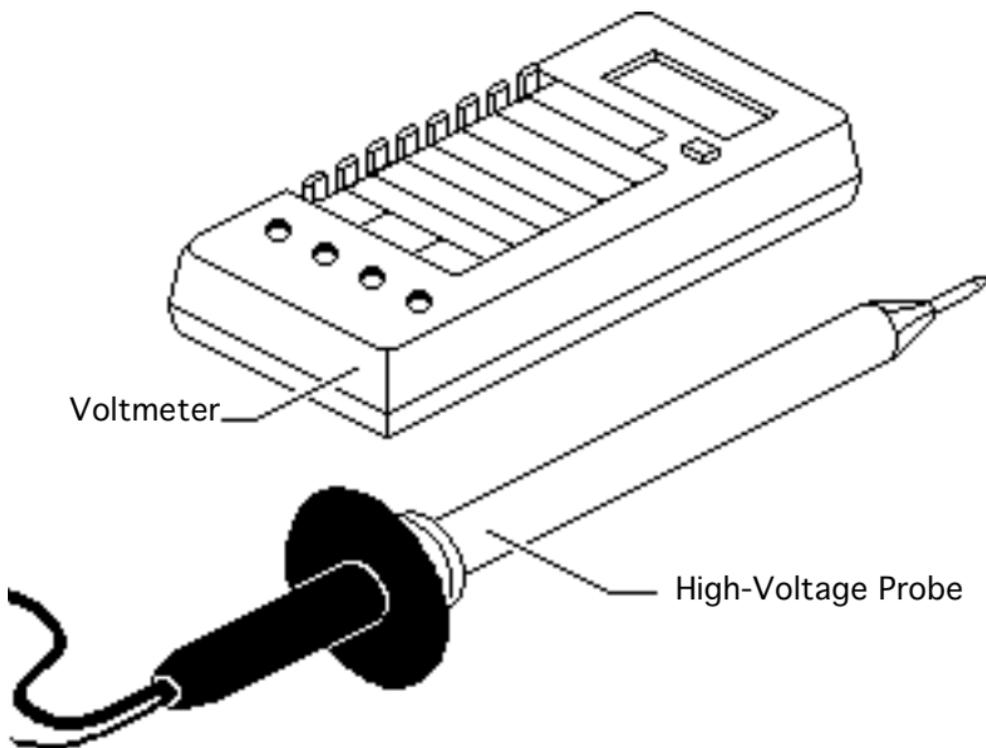




**⚠ Warning:** Because adjustments are made from the rear of the computer, position a mirror to view the computer screen. Do not reach around the computer to adjust the controls.

**Note:** If you have replaced the main deflection board, you must perform the screen adjustments prior to performing other adjustments. If you have not replaced the main deflection board, go to the Geometry adjustments.





**Note:** The look and operation of buttons and jacks on voltmeters vary.

**Note:** Perform the screen voltage adjustment only if one or more of the following conditions apply:

- You have replaced the main deflection board.
- You have inadvertently altered the screen adjustment.
- You have replaced the CRT/yoke assembly with a different revision CRT/yoke assembly.





**Note:** Performing the screen voltage adjustment requires a voltmeter and a high-voltage probe (Apple service part number 076-0392).

- 1 **Caution:** Using a high-voltage probe other than Apple part number 076-0392 could damage the monitor.

Use only a high-voltage probe that meets these specifications:

- 40 KV (VDC) rating
- Input impedance of 1000 megohms

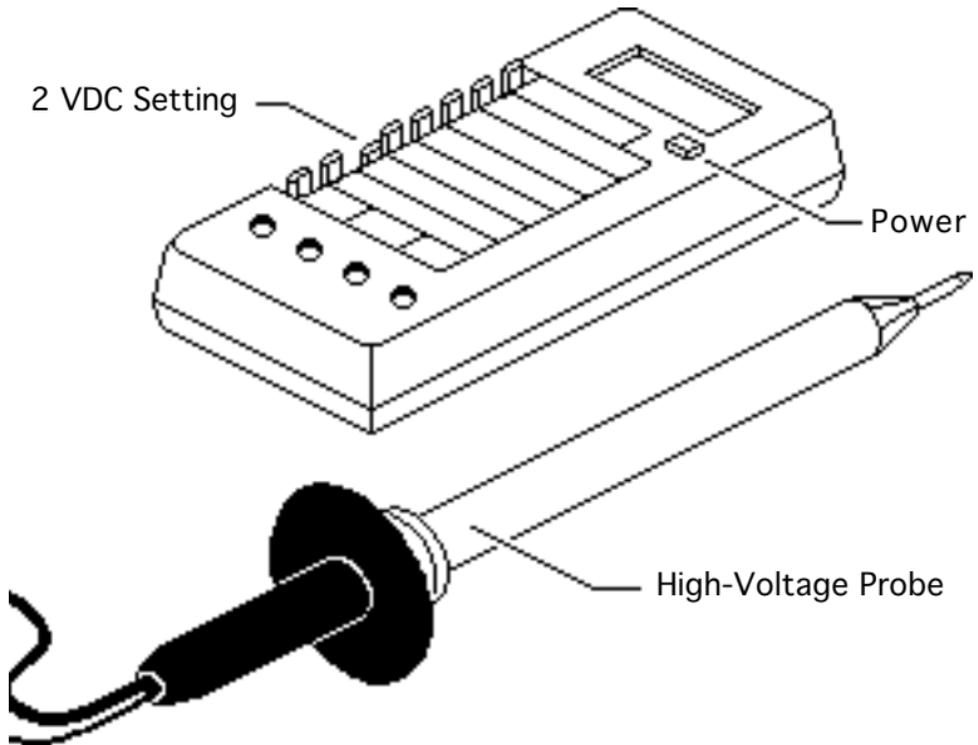




2 VDC Setting

Power

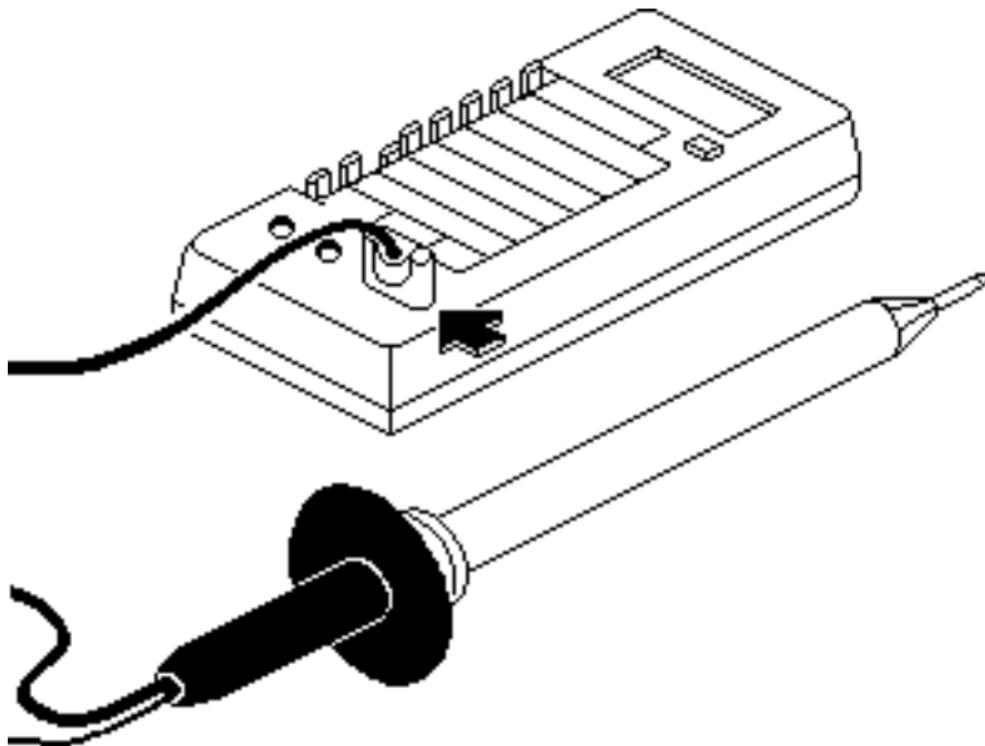
High-Voltage Probe



- Banana clips to plug into a voltmeter
- Alligator clip to connect to ground

2 Switch on the voltmeter power and set the voltmeter to the 2 VDC (or lowest) setting.

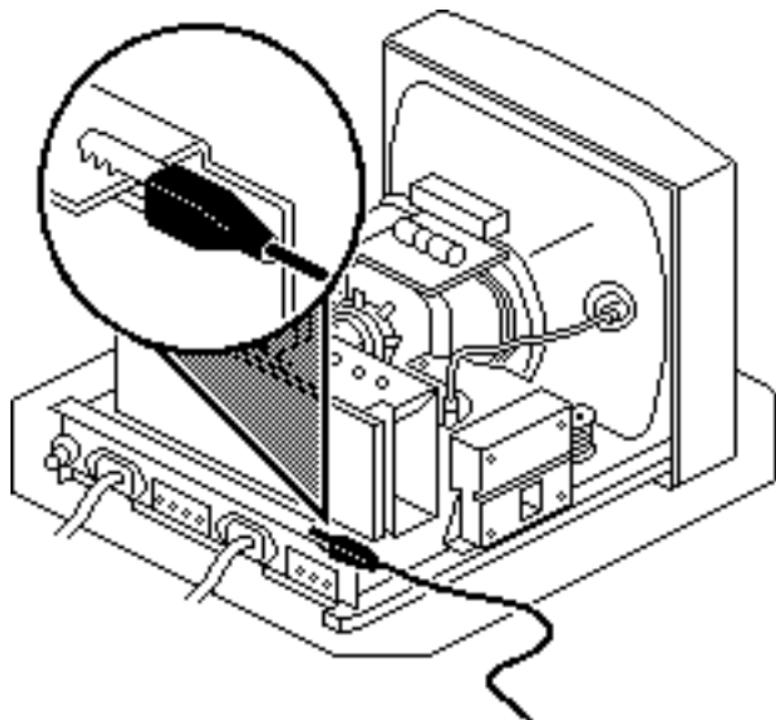




- 3 Connect the high-voltage probe two-pronged connector to the ground and voltage receptacles on the voltmeter.

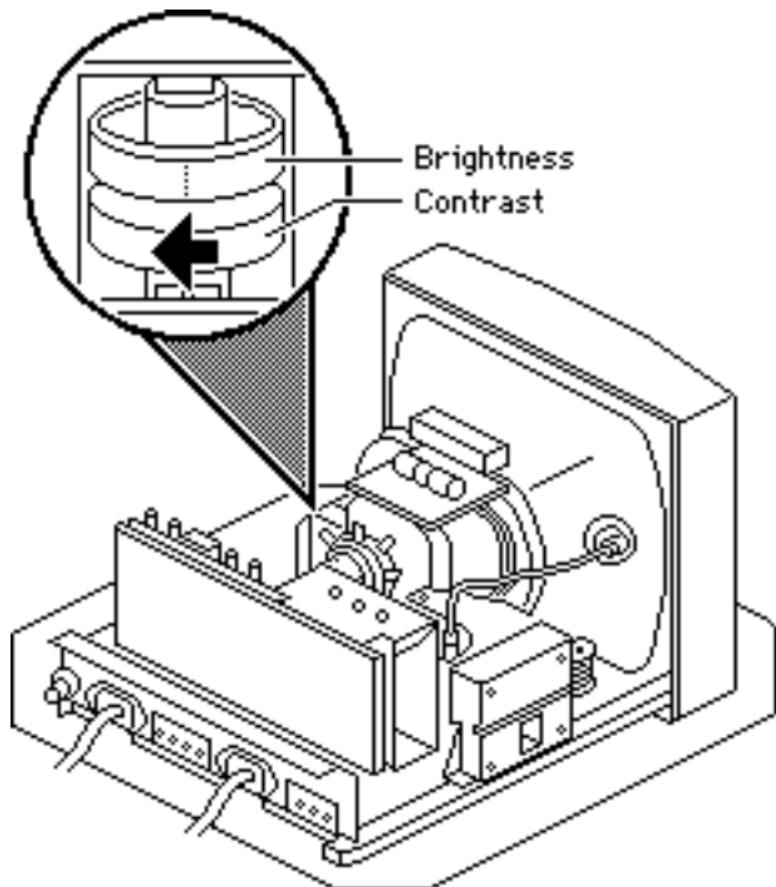
Make sure the prong with the ground tab is in the ground receptacle.





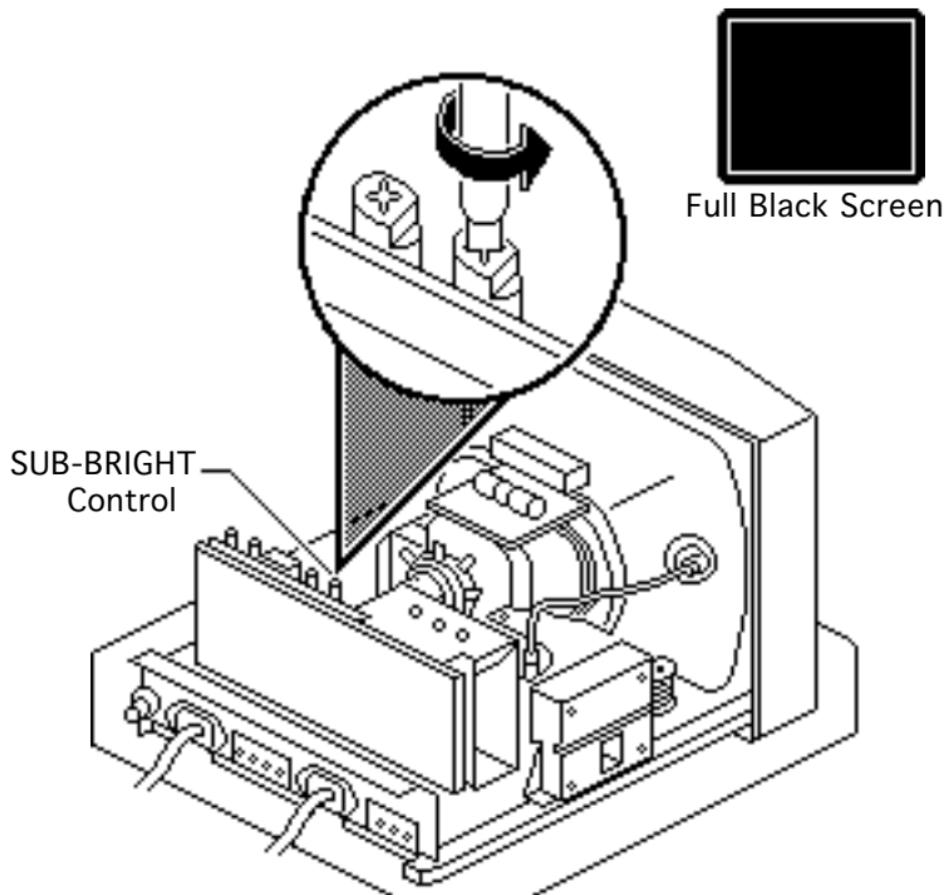
- 4 Switch on the monitor and let it warm up for at least 10 minutes.
- 5 Attach the ground clip from the high-voltage probe to the metal chassis.





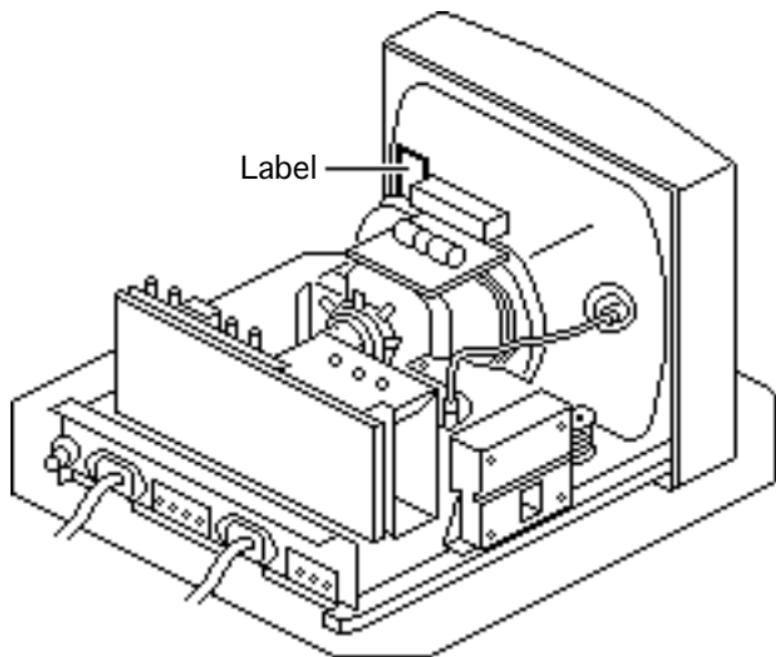
- 6 Set the contrast knob to maximum and the brightness knob to the center (detent) position.





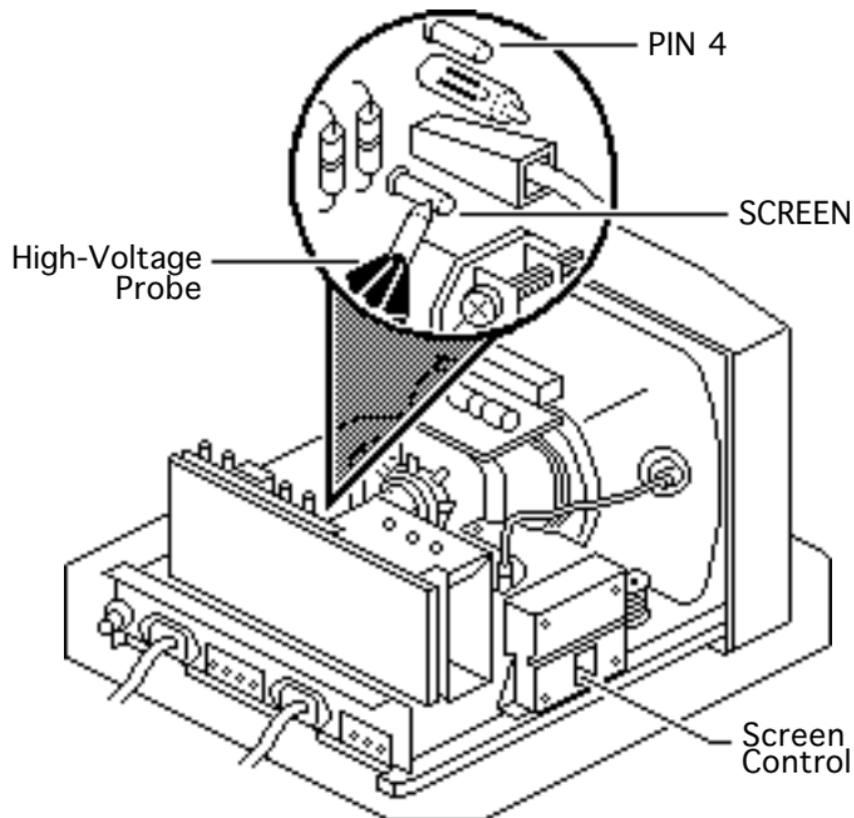
- 7 Use Display Service Utility to display the Full Black Screen test pattern.
- 8 Turn the SUB-BRIGHT control (VR202) all the way down (counterclockwise).





- 9 To set the screen voltage, first check the label on the side of the CRT to determine the type: CRT type AT12A9SL or CRT type M29JMN097X13.
- 10 **⚠ Warning:** Because you must measure voltages in excess of 500 volts DC, make sure the high-voltage probe is grounded to the metal monitor chassis. Do not short the probe between the test point and adjacent components.



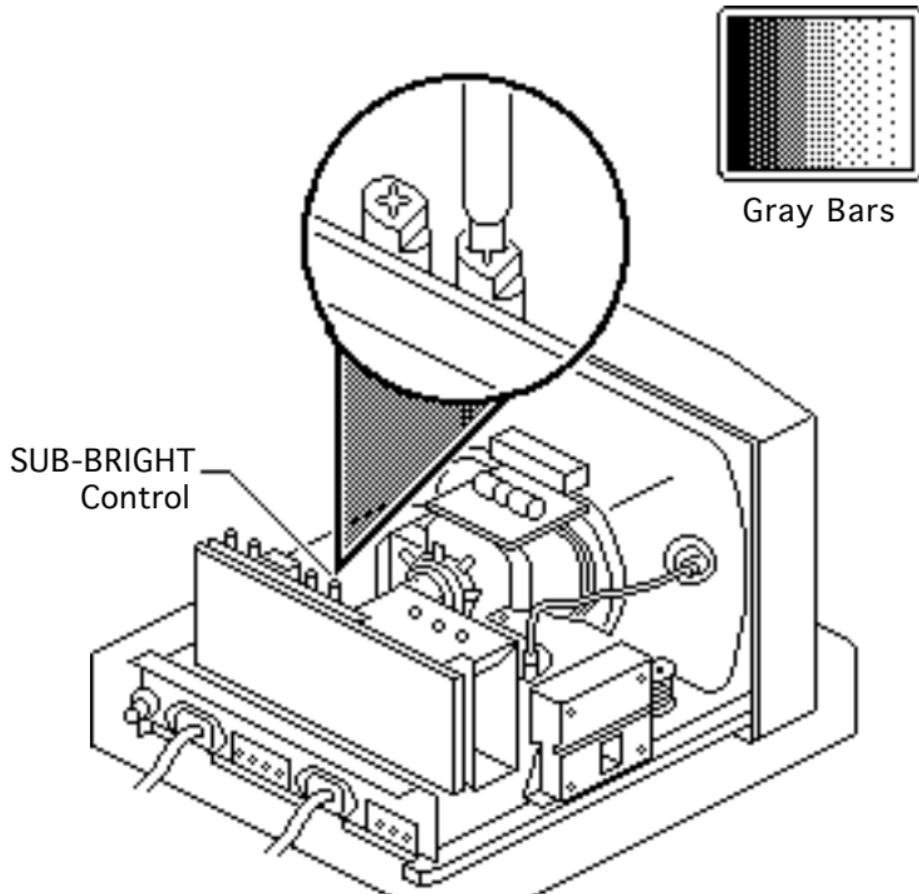


Touch the high-voltage probe to the voltage test point labeled SCREEN (U.S. version) or PIN 4 (international version).

11 Adjust the screen control until the voltmeter reads:

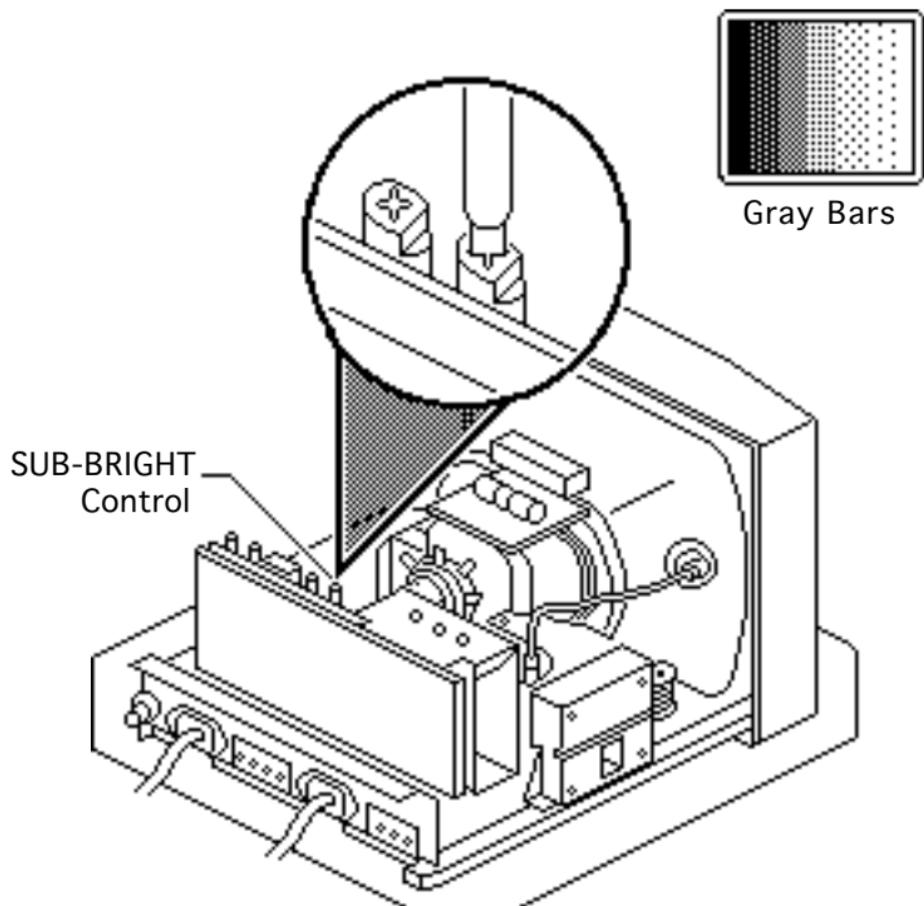
- 500 V ( $\pm .005$  V) for CRT AT12A9SLB
- 400 V ( $\pm .004$  V) for CRT M29JMN097X13





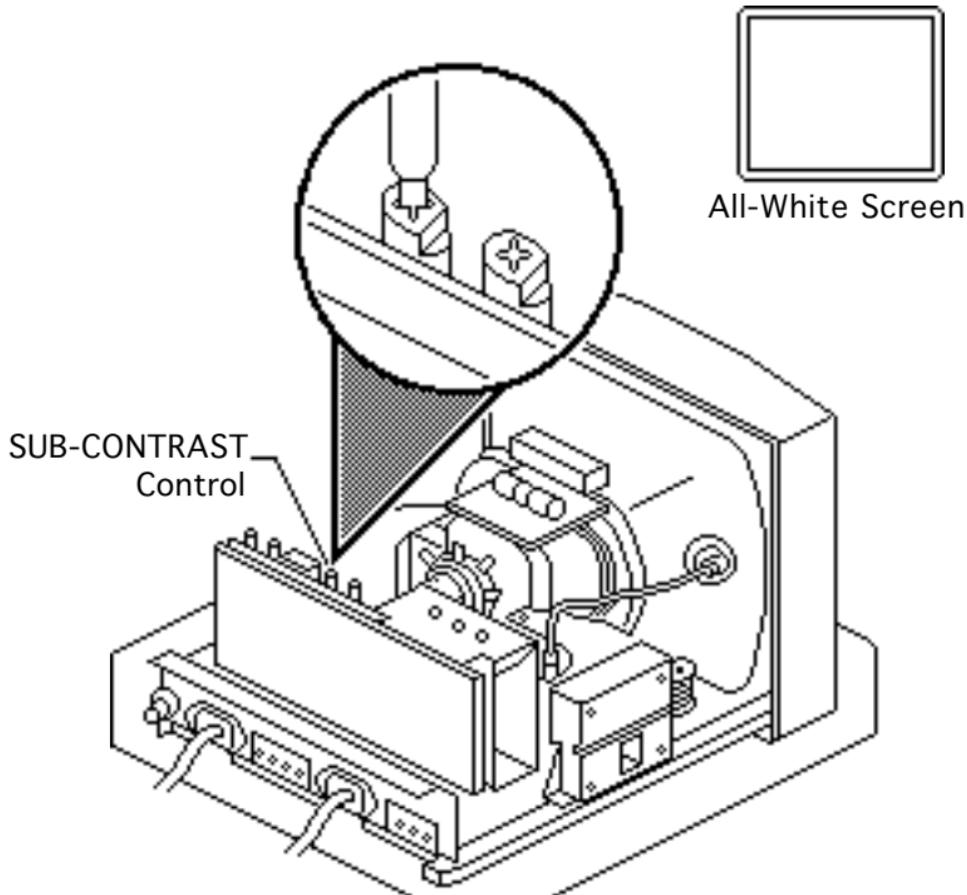
- 12 Disconnect the high-voltage probe from the monitor.
- 13 Press the space bar or click the mouse to advance to the next test pattern. Turn the SUB-BRIGHT control (VR202) until the raster is visible.
- 14 Use Display Service Utility to display the Gray Bars test pattern.





- 15 Adjust the SUB-BRIGHT control until the first bar is black and the second bar is barely visible.

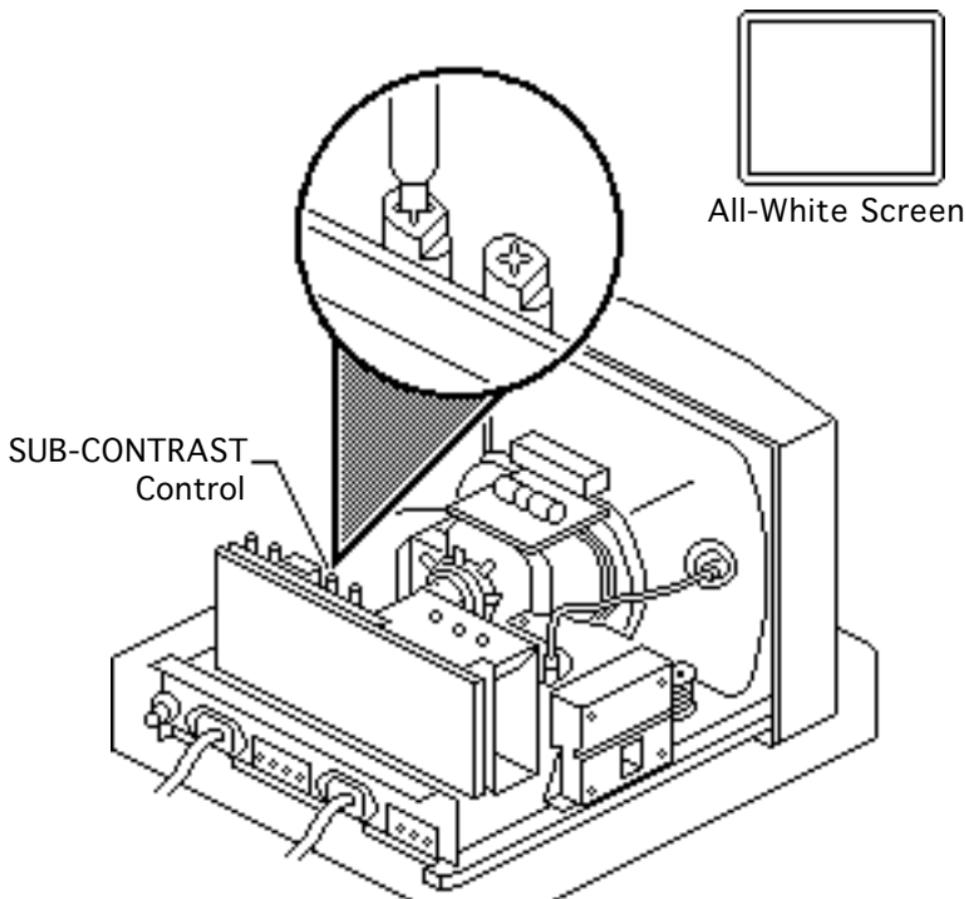




**Important:** Readings from light meter model L-248 and L-246 differ. Please note which meter you are using before making adjustments. (See “Light Meter Setup.”)

- 16 Using Display Service Utility, display the All-White Screen test pattern.
- 17 Using the light meter and a two-inch plastic screwdriver, adjust the SUB-CONTRAST control (VR201) until you get the following:





- Model 248: top of the 10 scale
- Model 246: 30 ft. lamberts ( $\pm$  3 ft. lamberts)

**Note:** If you are unable to adjust the SUB-CONTRAST control to get the correct reading, perform the White Balance video adjustment.



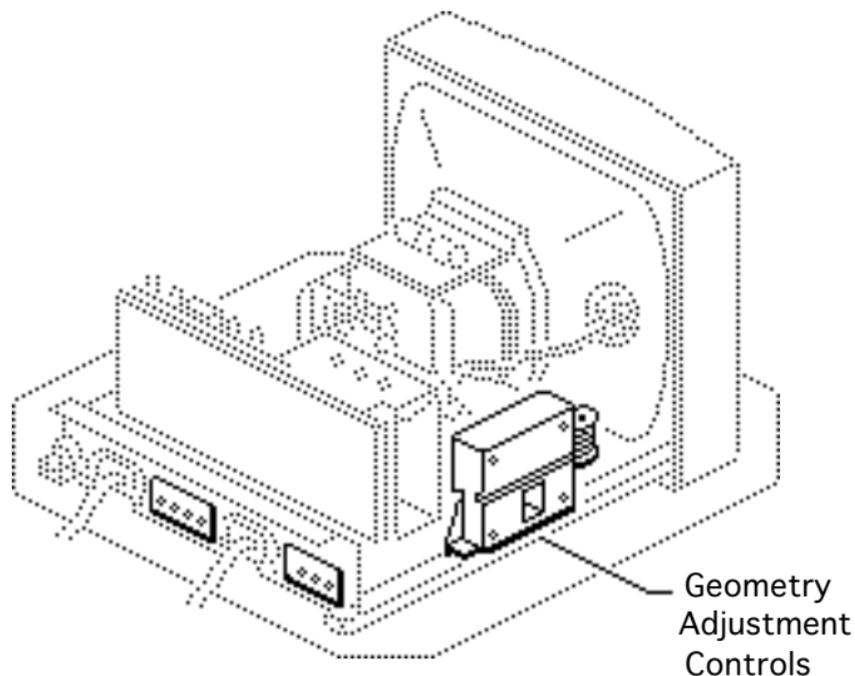


## Geometry

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 adjustments are made from the rear of the computer, position a mirror to view the computer screen. Do not



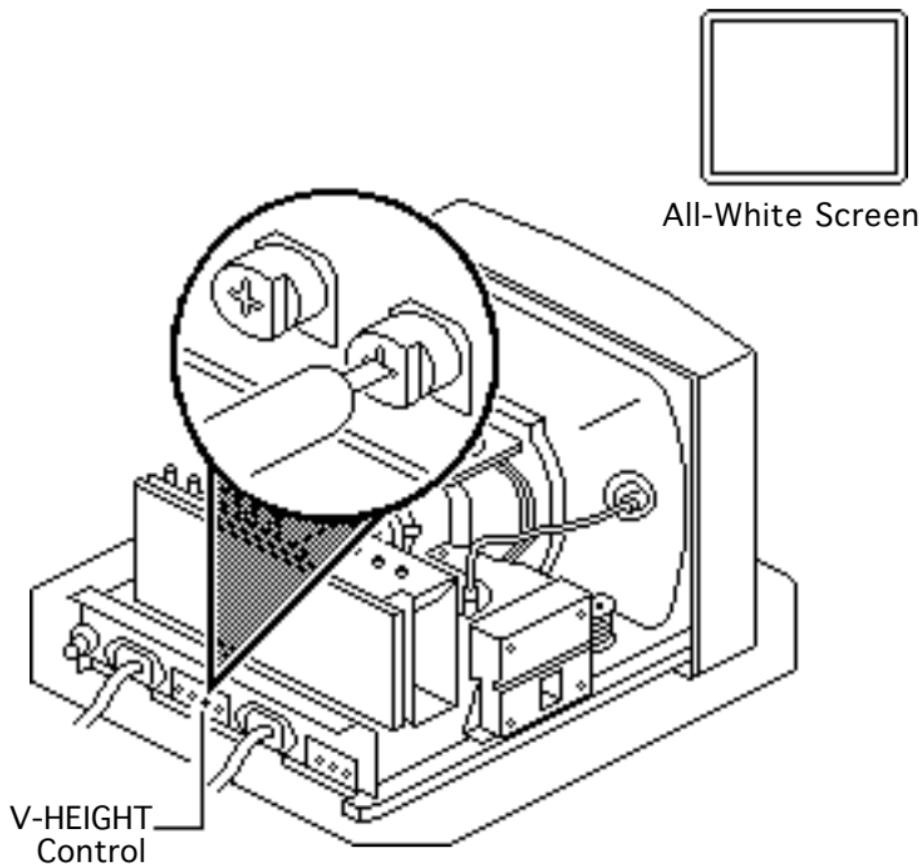


reach around the computer to adjust the yoke.

**Note:** Geometry adjustments may be necessary whenever you replace the main deflection board, CRT, or video board.

**Note:** Do not attempt yoke adjustments on this monitor. The factory settings require no adjustment.



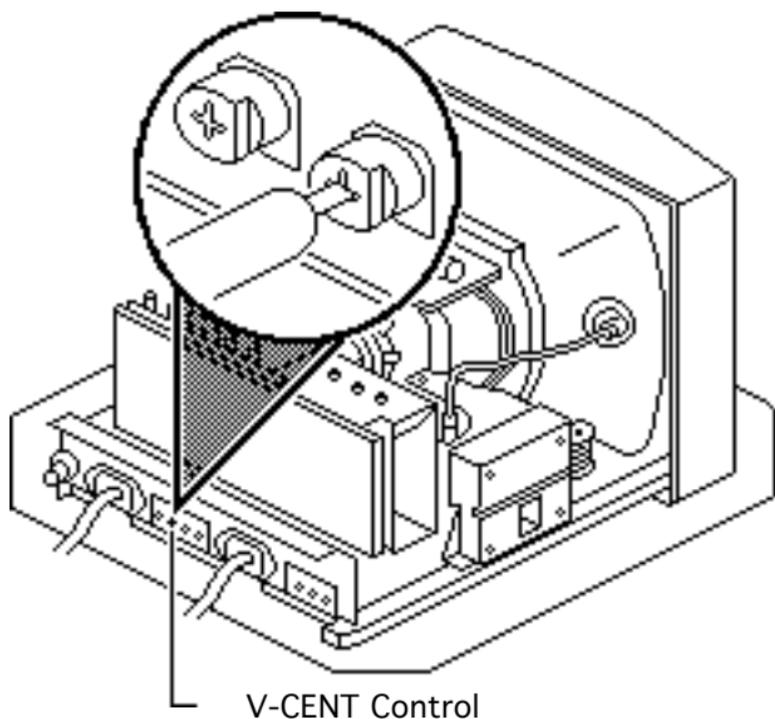


## Vertical Size

**Note:** Vertical size, vertical center, and horizontal center adjustments can be performed without removing the rear cover.

- 1 Use Display Service Utility to display the All-White Screen test pattern.
- 2 Adjust the V-HEIGHT control (VR404) with a plastic screwdriver until the raster height is 153 mm ( $\pm 2$  mm) or 6 1/16 in. ( $\pm 1/16$  in.).





## Vertical Center

- 1 Using a plastic screwdriver, adjust the V-CENT control (VR403) until the raster is centered (top to bottom) in the display area.
- 2 Verify that the raster height is  $6 \frac{1}{16}$  in. ( $\pm \frac{1}{16}$  in.) or 153 mm ( $\pm 2$  mm). If it is not, repeat the Vertical Size adjustment and, if necessary, the Vertical Center adjustment.

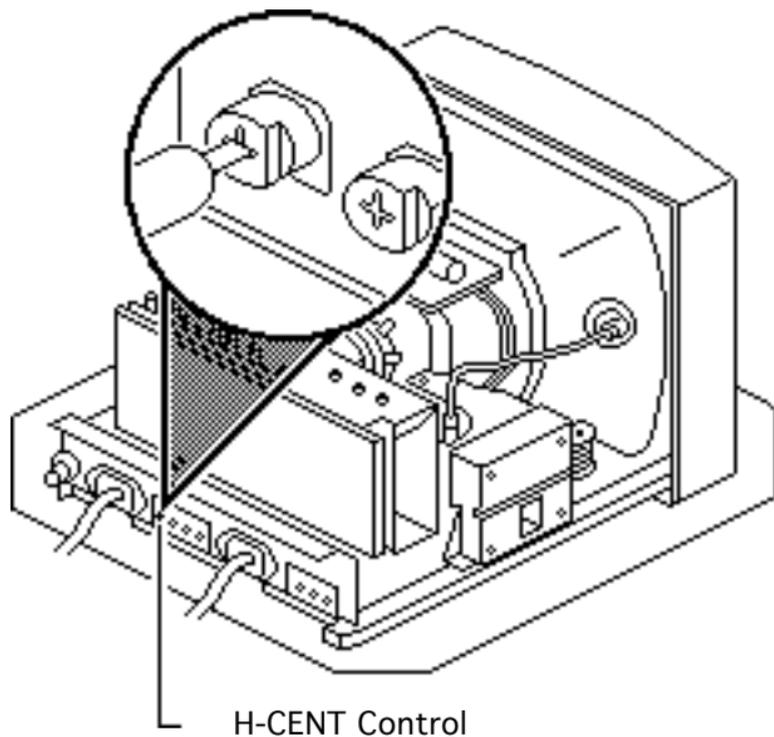


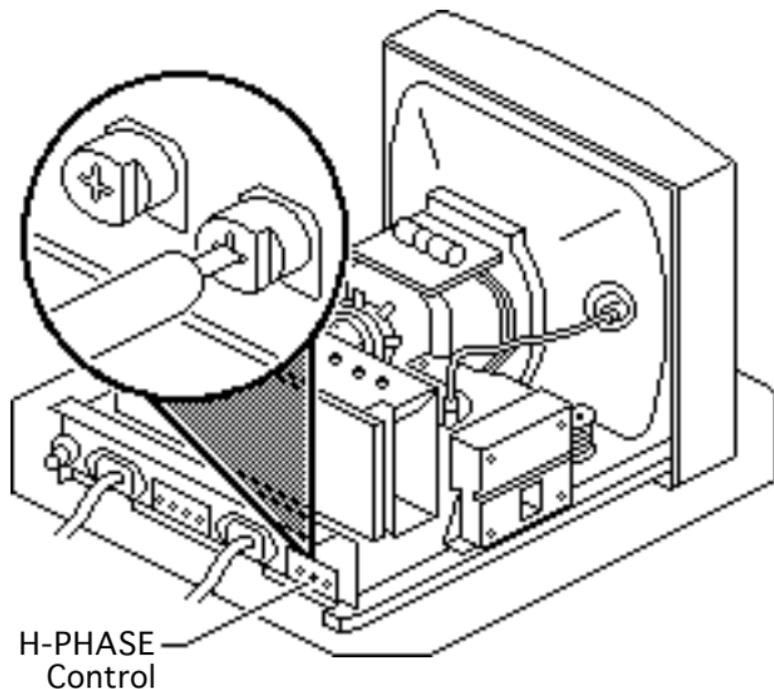


## Horizontal Center

Using the plastic screwdriver, adjust the H-CENT control (VR503) until the raster is centered (side to side) in the display area.

**Note:** If you cannot center the raster, set the H-CENT control at midrange and perform the following steps.

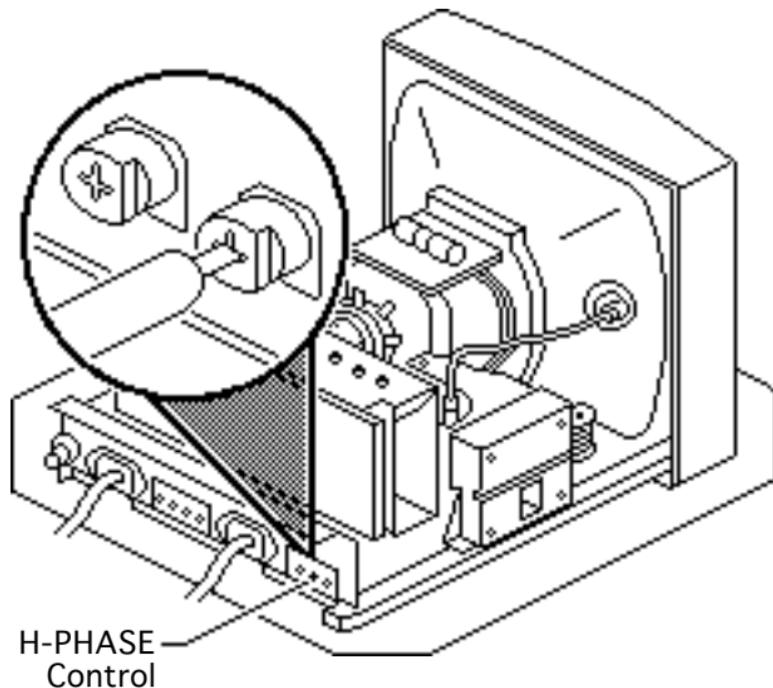




**Note:** Perform the following steps only if you could not center the raster using the V-CENT and H-CENT controls.

- 1 Switch off the monitor and remove the rear cover. See “Rear Cover” in the Take Apart chapter.
- 2 Switch on the monitor.





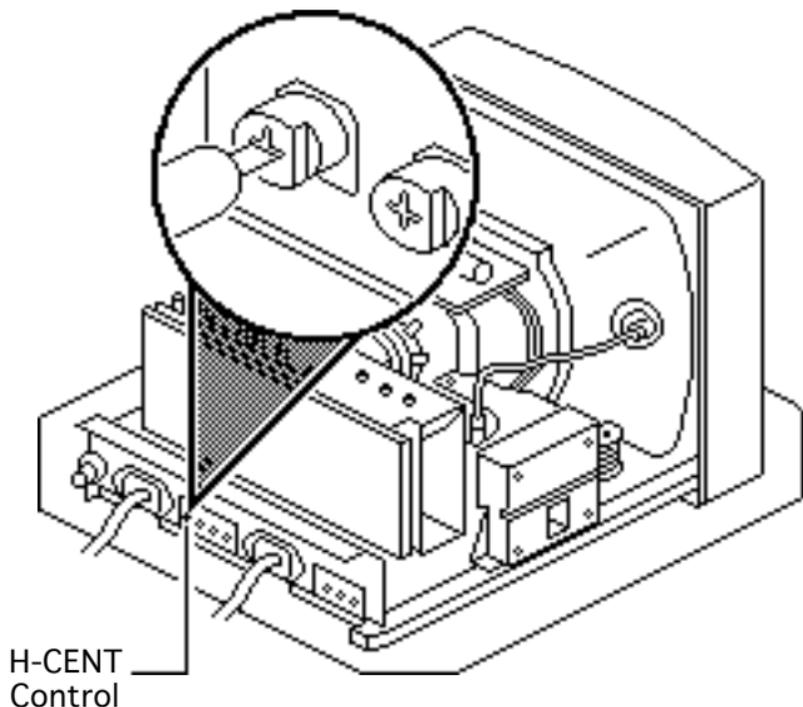
- 3 Using the plastic screwdriver, adjust the H-PHASE control (VR501) until the raster is positioned at the visual midpoint of the range of the H-PHASE control.

**Note:** You may need to check the limits of the H-PHASE control to find its midpoint.





- 4 Using the plastic screwdriver, adjust the H-CENT control (VR503) until the raster is in the approximate center of the screen.

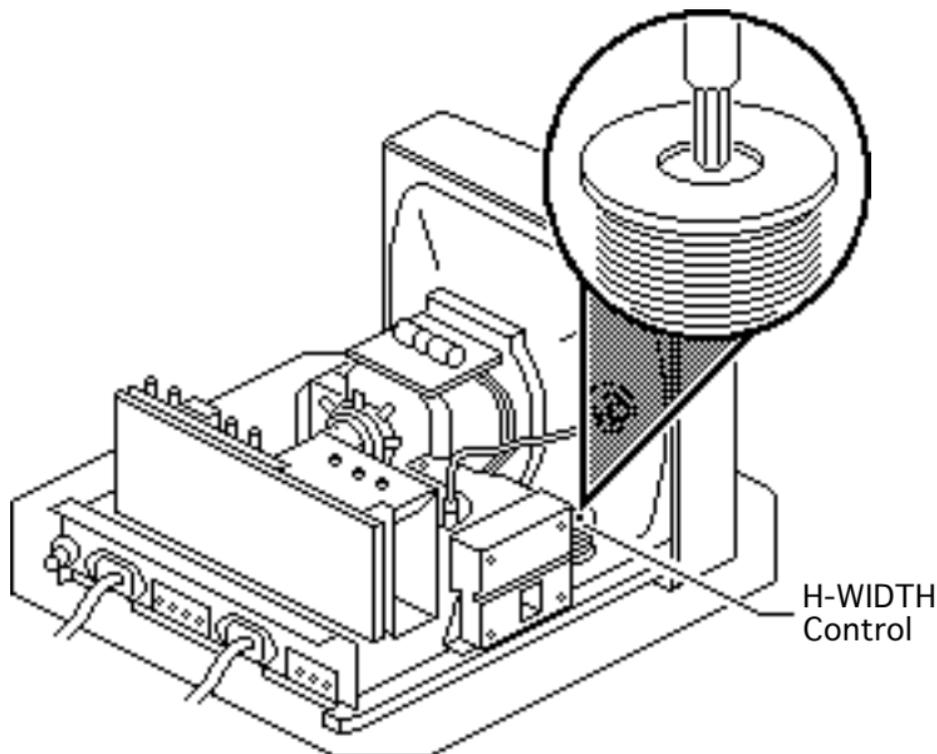




## Horizontal Size

Before you begin, remove the rear cover.

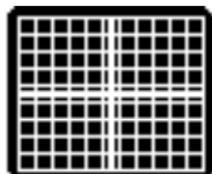
Using the hex-head insulated adjustment tool, adjust the H-WIDTH control (L501) until the raster is 205 mm ( $\pm 2$  mm) or 8  $\frac{3}{32}$  in. ( $\pm \frac{1}{16}$  in.) wide.



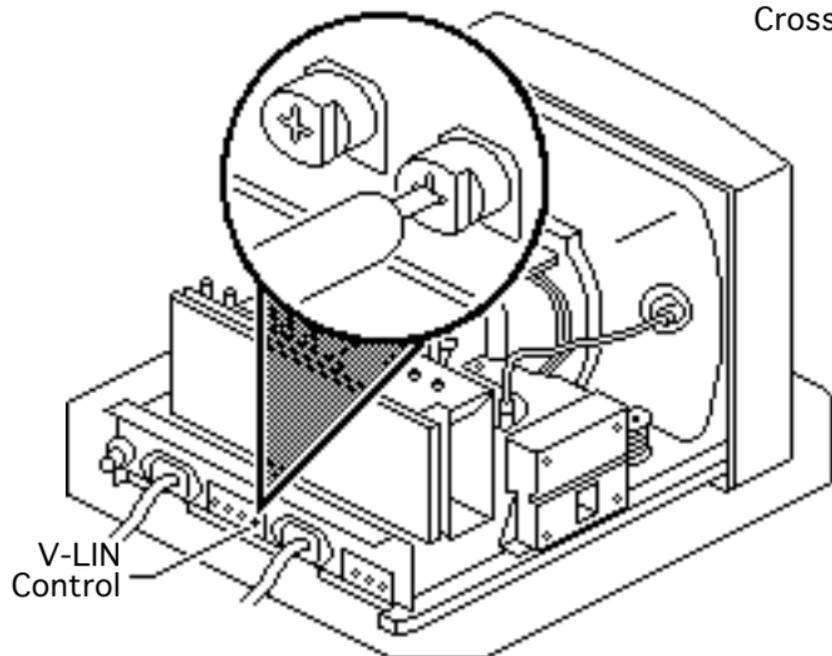


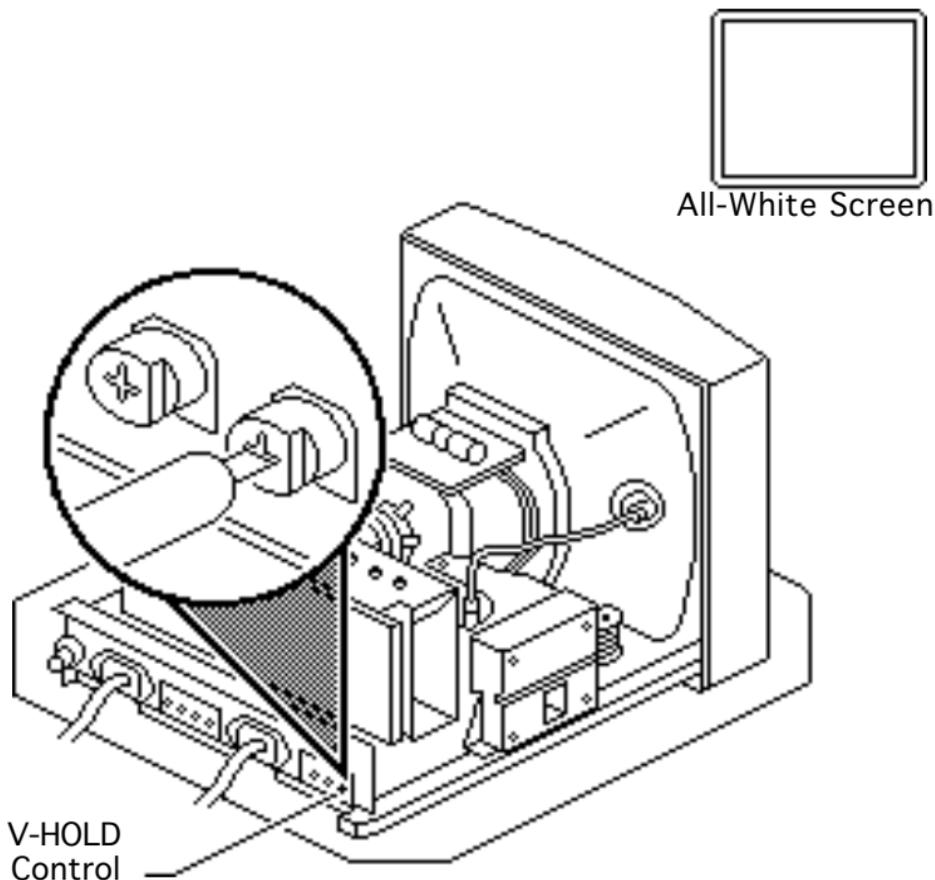
## Vertical Linearity

- 1 Use Display Service Utility to display the Crosshatch I test pattern.
- 2 Using a plastic screwdriver, adjust the V-LIN control until the distance between the horizontal lines is the same at the top and bottom of the screen.



Crosshatch I





## Vertical Hold

- 1 Use Display Service Utility to display the All-White Screen test pattern.
- 2 Using a plastic screwdriver, adjust the V-HOLD control (VR401) until the raster stabilizes.

To check the adjustment, switch the monitor off and on. If the raster stabilizes immediately, V-HOLD is correctly set.

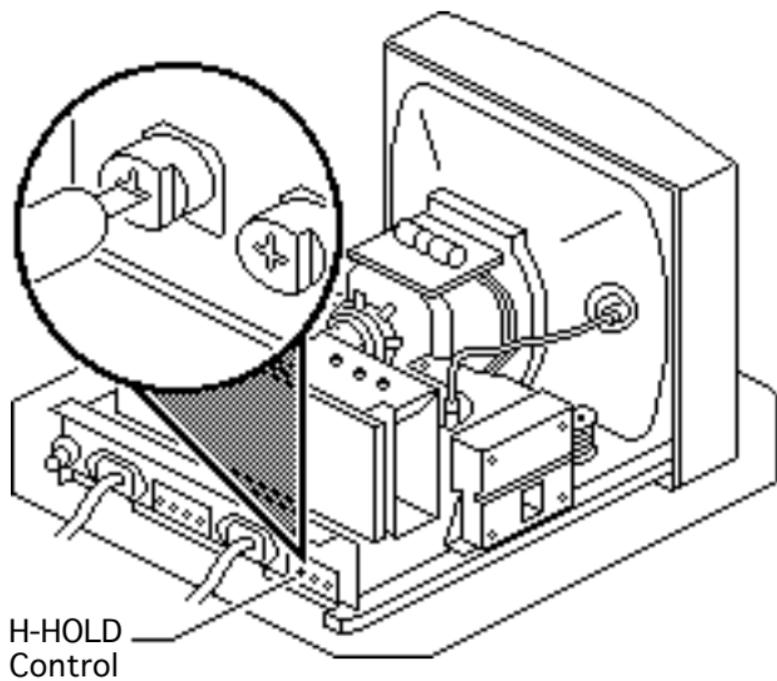


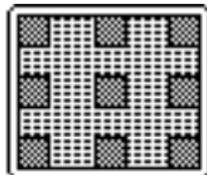


## Horizontal Hold

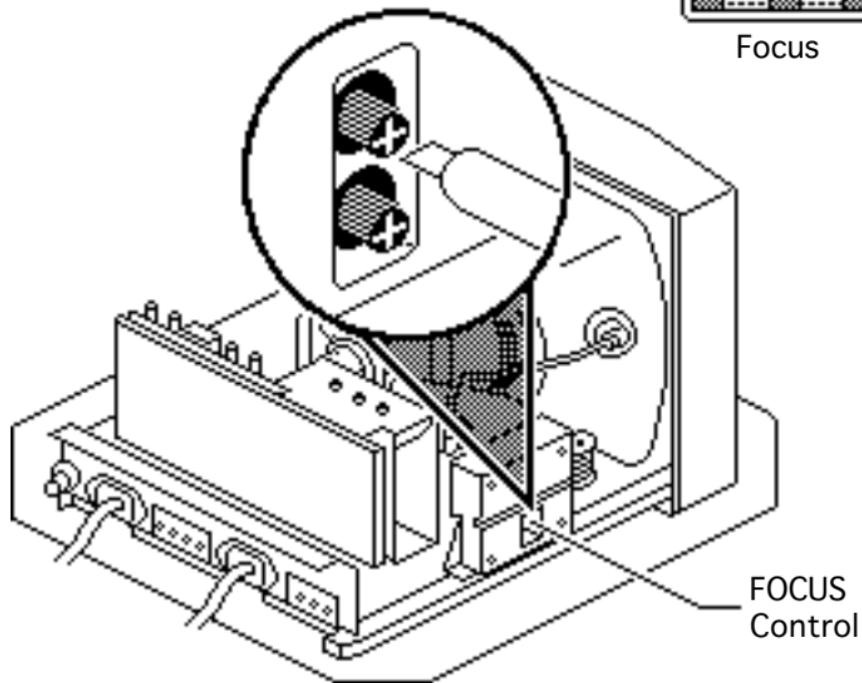
Using the plastic screwdriver, adjust the H-HOLD control (VR502) until the raster stabilizes.

To check the adjustment, switch the monitor off and on. If the raster stabilizes immediately, H-HOLD is correctly set.





Focus



## Focus

- 1 Use Display Service Utility to display the Focus test pattern.
- 2 Using a plastic screwdriver, adjust the FOCUS control until the Focus test pattern is as clear as possible.



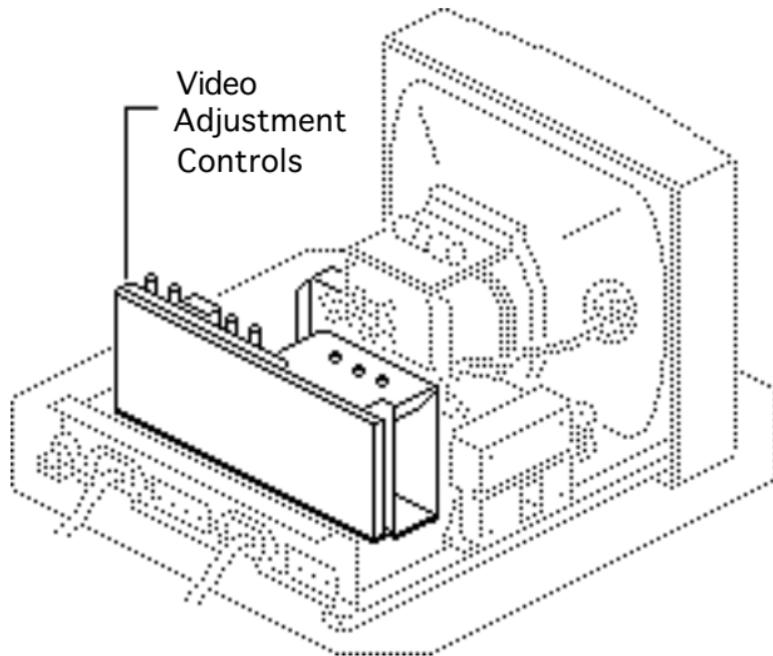


## Video

Before you begin,

- Remove the cover
- Remove the EMI shield
- Remove the video board shield

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

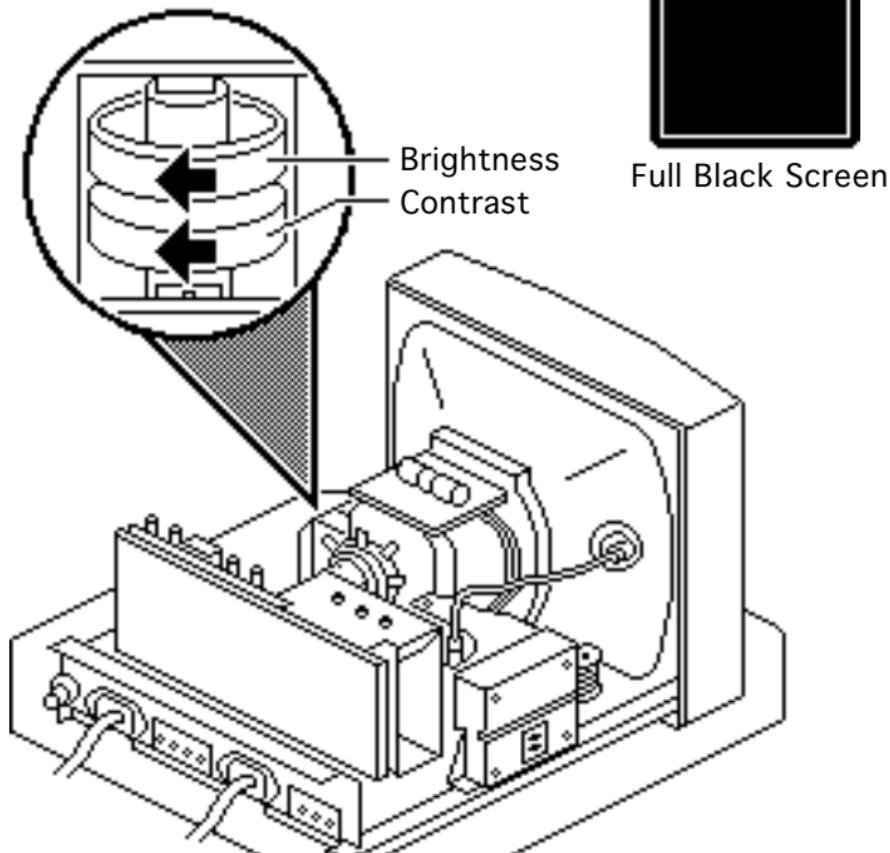




**Caution:** Because adjustments are made from the rear of the computer, position a mirror to view the computer screen. Do not reach around the computer to adjust the controls.

**Note:** Perform video adjustments only if the color quality is unacceptable.



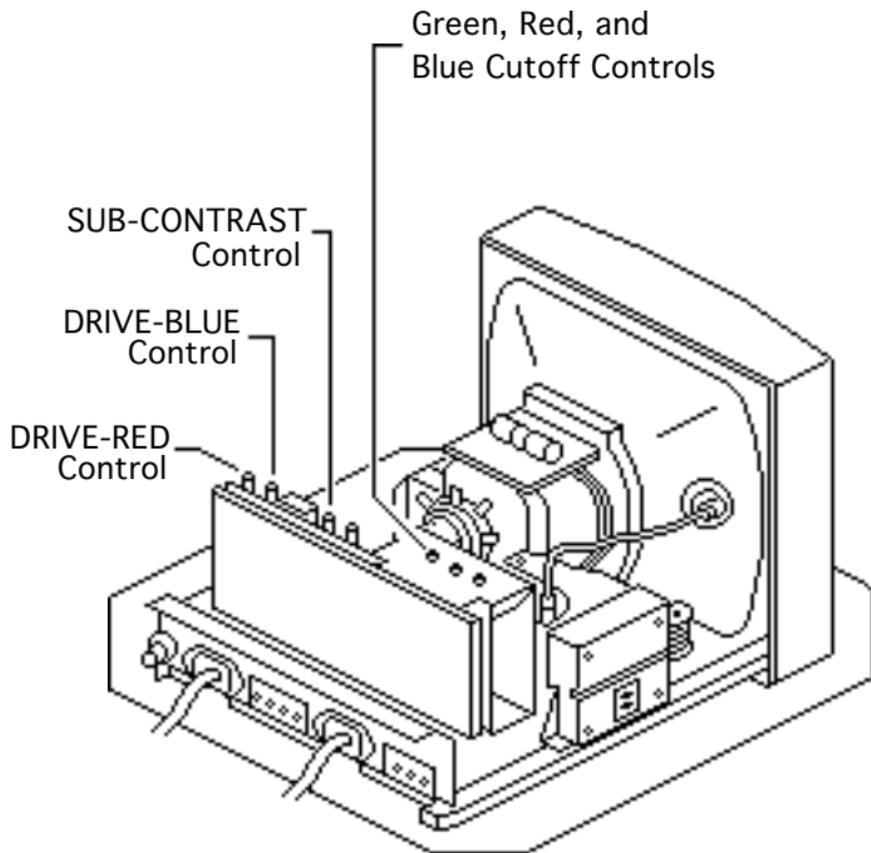


## White Balance

**Note:** Complete any necessary geometry adjustments before performing the white balance adjustments.

- 1 Turn on monitor power and let the monitor warm up for at least 10 minutes.
- 2 Use Display Service Utility to display the Full Black Screen.
- 3 Set the brightness control and the contrast control to maximum.

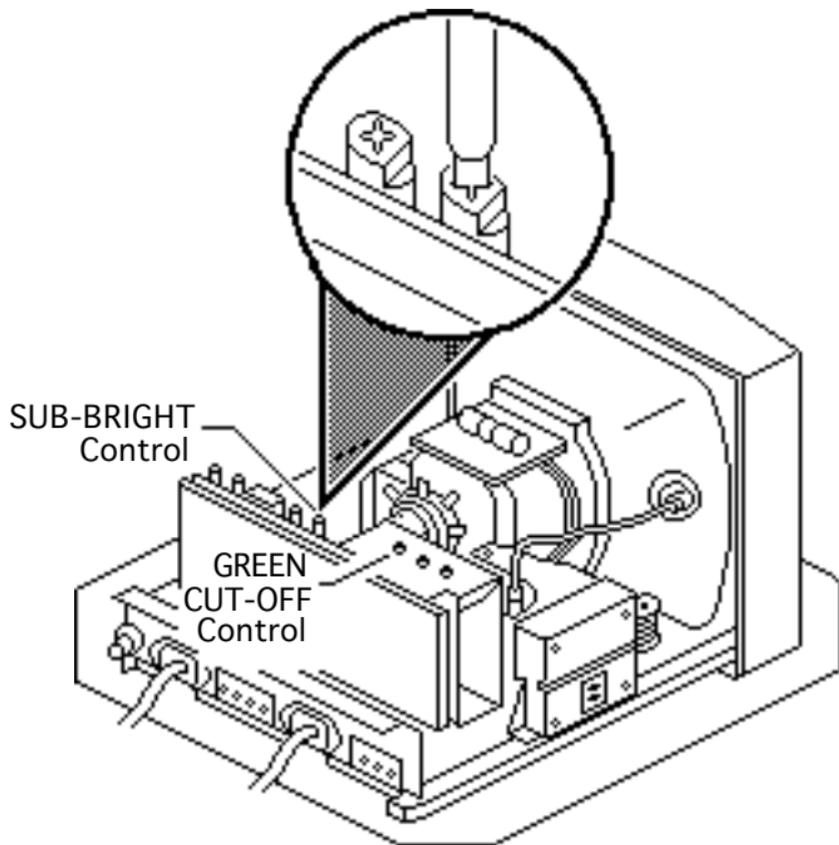




#### 4 Preset these adjustment controls:

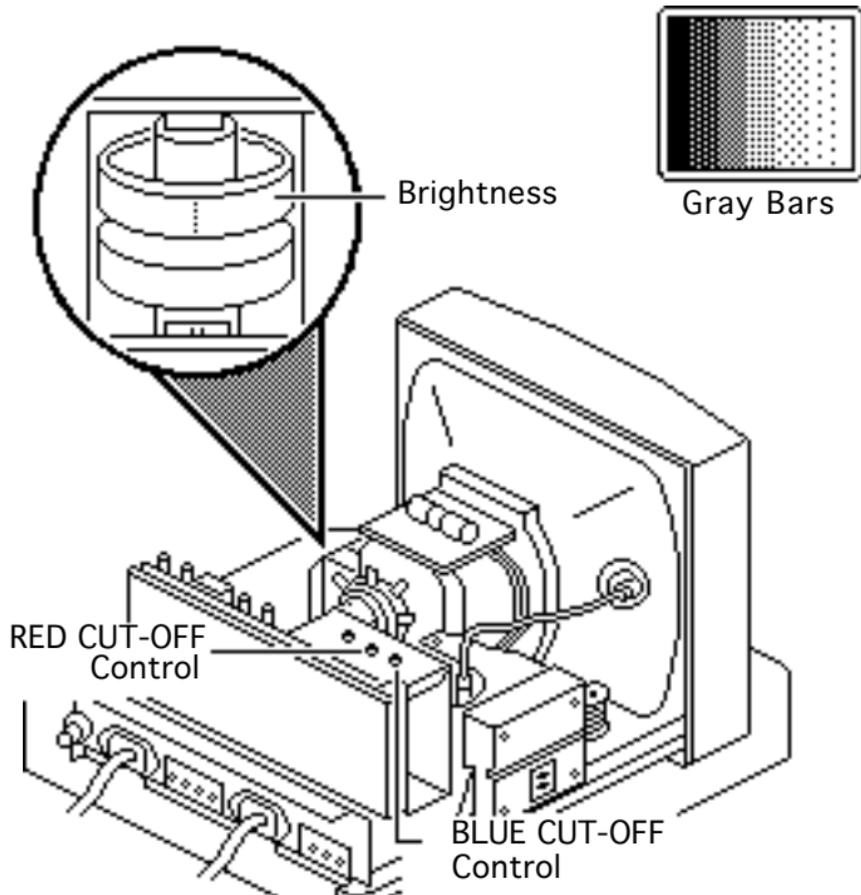
- GREEN, RED, and BLUE CUTOFF controls to minimum.
- DRIVE-RED and DRIVE-BLUE controls to midrange.
- SUB-CONTRAST control (VR201) to midrange.





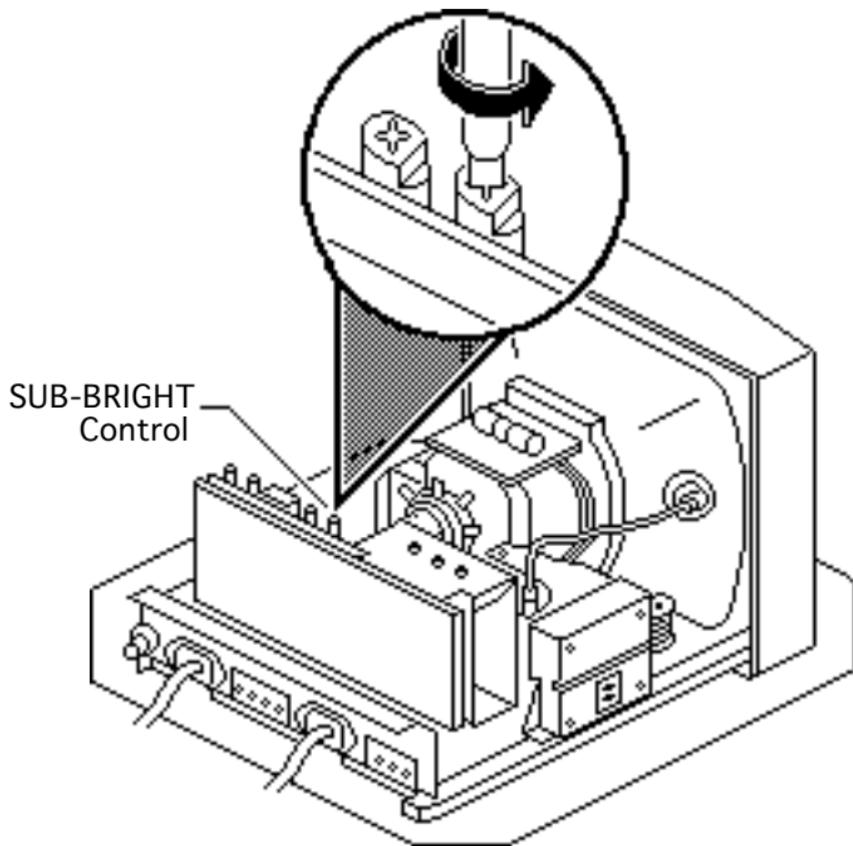
- 5 Adjust the SUB-BRIGHT control (VR202) until you cannot see the raster, then turn up the SUB-BRIGHT control until the raster is visible.
  - 6 Adjust the GREEN CUT-OFF control until green is the predominant color.
- Note:** The screen should be dark, but with an obvious green tint.





- 7 Use Display Service Utility to display the Gray Bars test pattern.
- 8 Set the brightness knob to the center (detent) position.
- 9 Alternately adjust the RED and BLUE CUT-OFF controls until there is no predominant color in the left three bars.

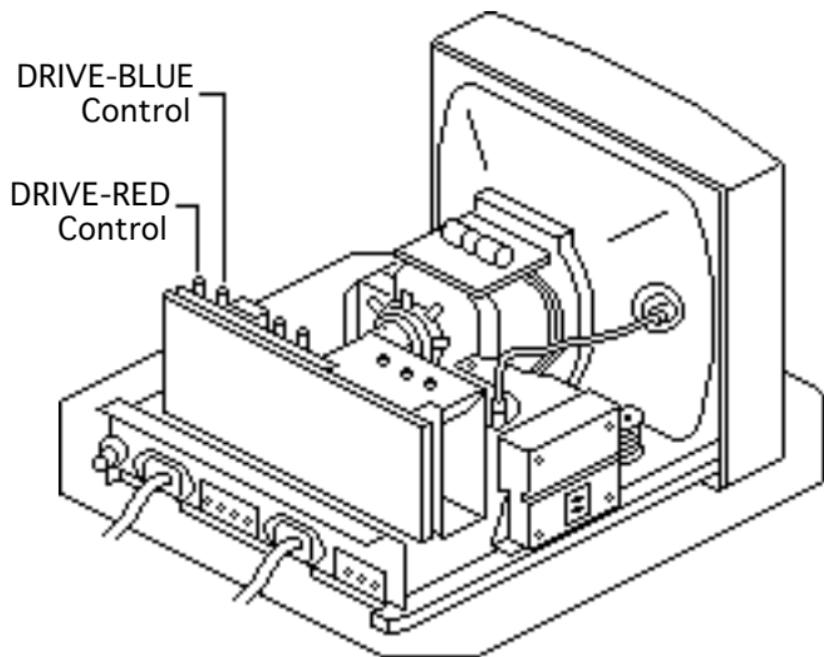




10 **Note:** If the SUB-BRIGHT control cannot be set properly, repair the monitor.

Check that the leftmost bar is black. If not, turn the SUB-BRIGHT control counterclockwise until the leftmost bar is as black as the screen border.





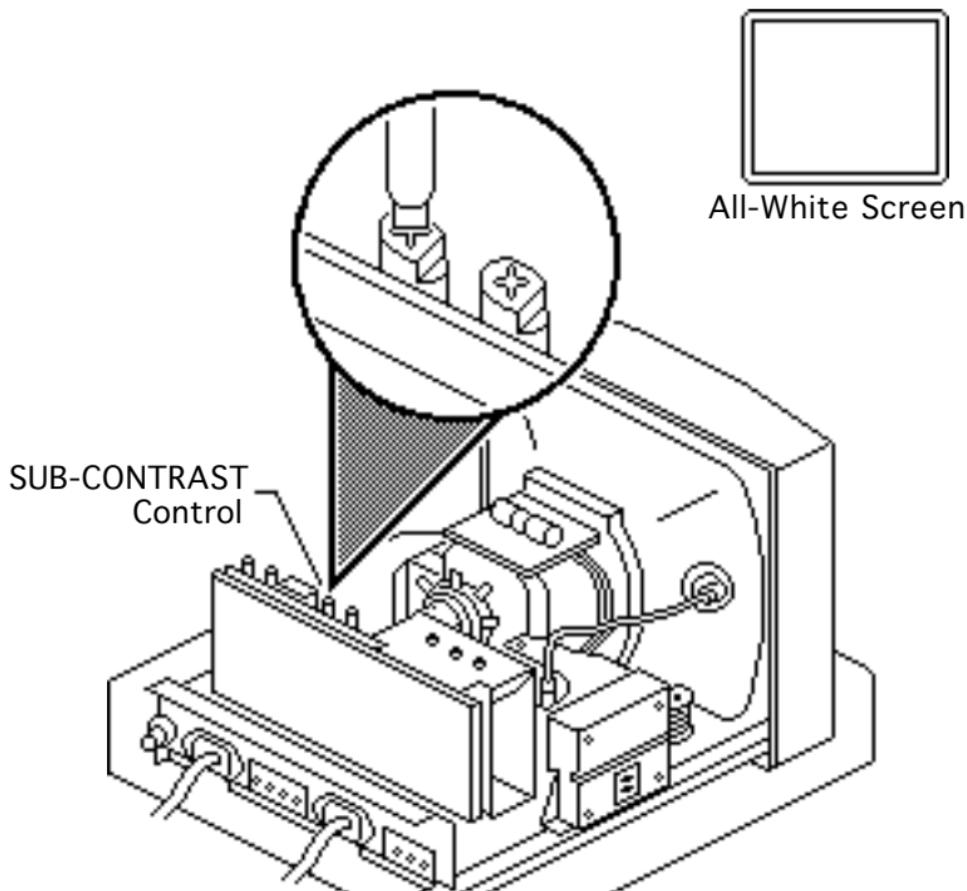
- 11 If there is no predominant color in the right gray bars, set screen luminance. See the following procedure.
- 12 If you see a predominant color in the right three bars, alternately adjust the DRIVE-RED and DRIVE-BLUE controls until you see no predominant color in the bars.





13 If there is now a predominant color in the left three bars, repeat the White Balance adjustment.





## Screen Luminance

**Important:** Readings from light meter models R77, L-248 and 246 differ. Please note which meter you are using before making adjustments. (See "Light Meter Setup.")

- 1 Using Display Service Utility, display the All-White Screen.
- 2 Using the light meter and a two-inch plastic screwdriver, adjust the SUB-CONTRAST control (VR201) until you get





30 foot lamberts ( $\pm 3$  foot lamberts), which on the light meter is

- Model R77: 23 on the bottom scale
- Model L-248: middle of the 10 scale
- Model 246: 23 on the red scale

**Important:** Over time, light meter tolerances can vary. If you doubt your meter's accuracy, verify the readings with a known-good light meter or photometer.





## Light Meter Setup

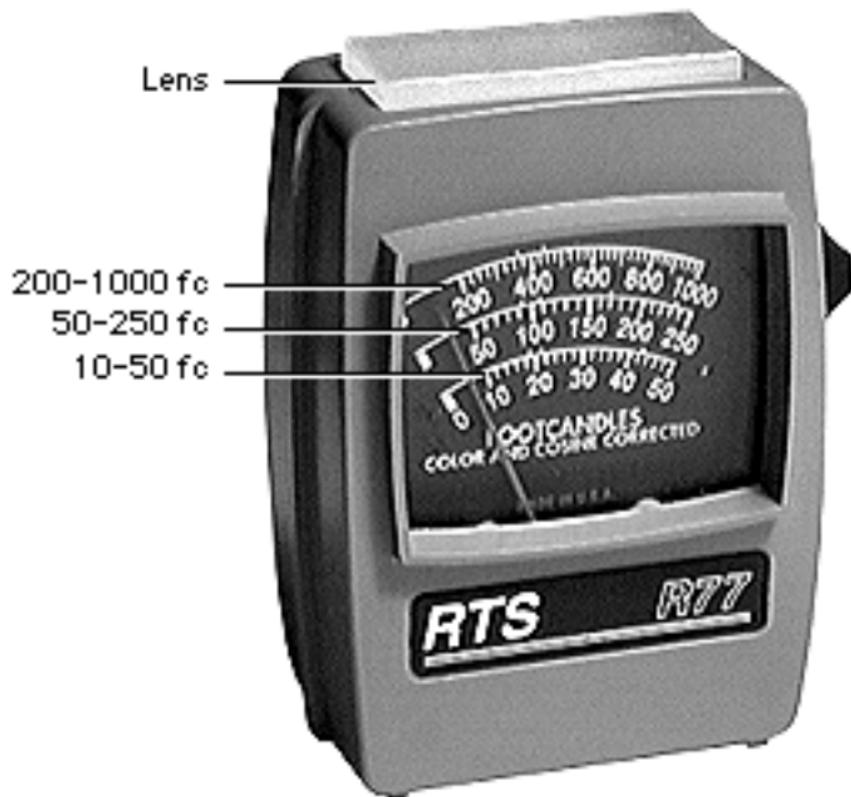
This topic covers setup for three light meter models: R77, L-248, and 246. Model R77 (Apple part number 076-0310) is the newest model available.

### 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





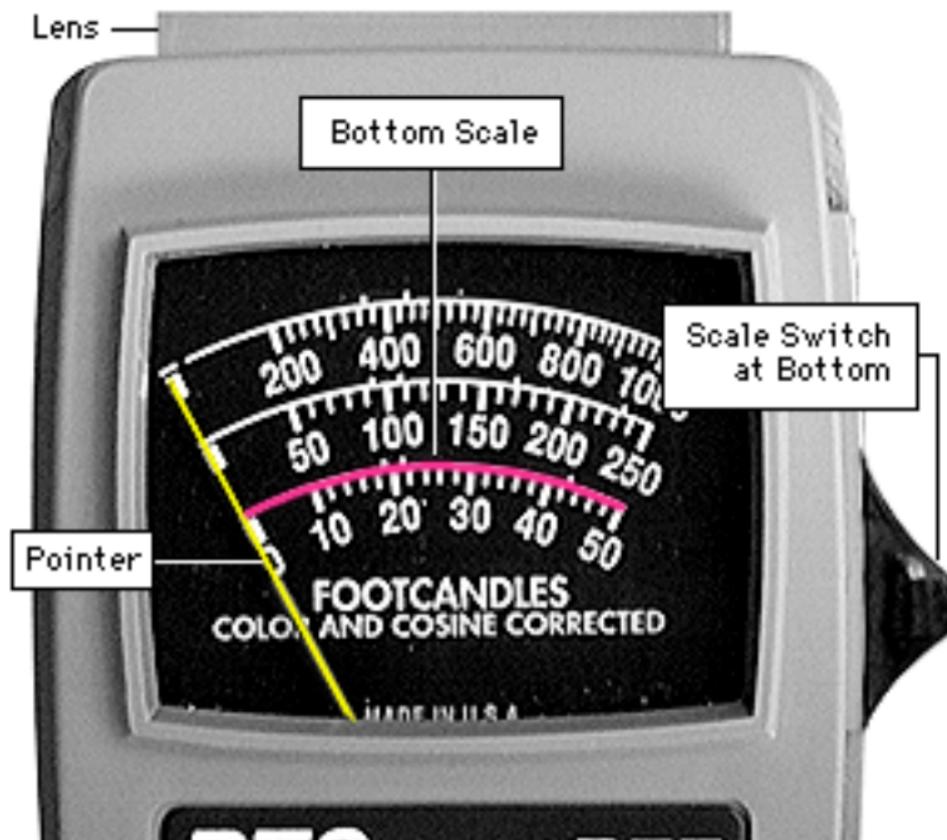
from the lens.

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.





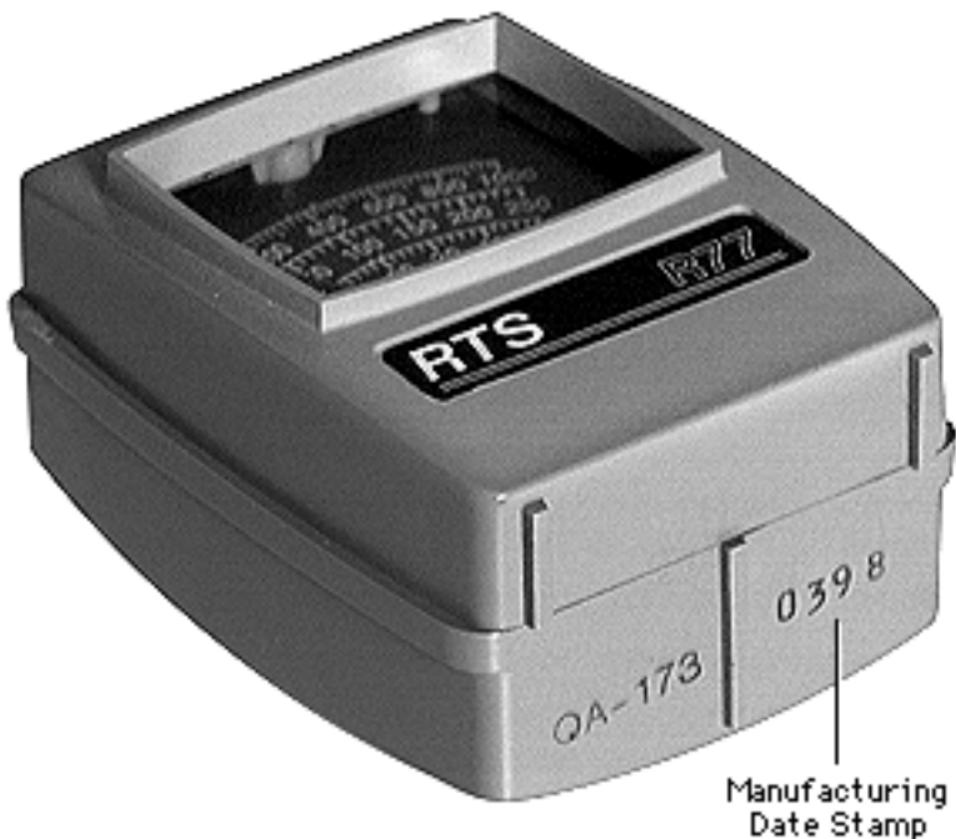
To measure a display screen's luminance,

- 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

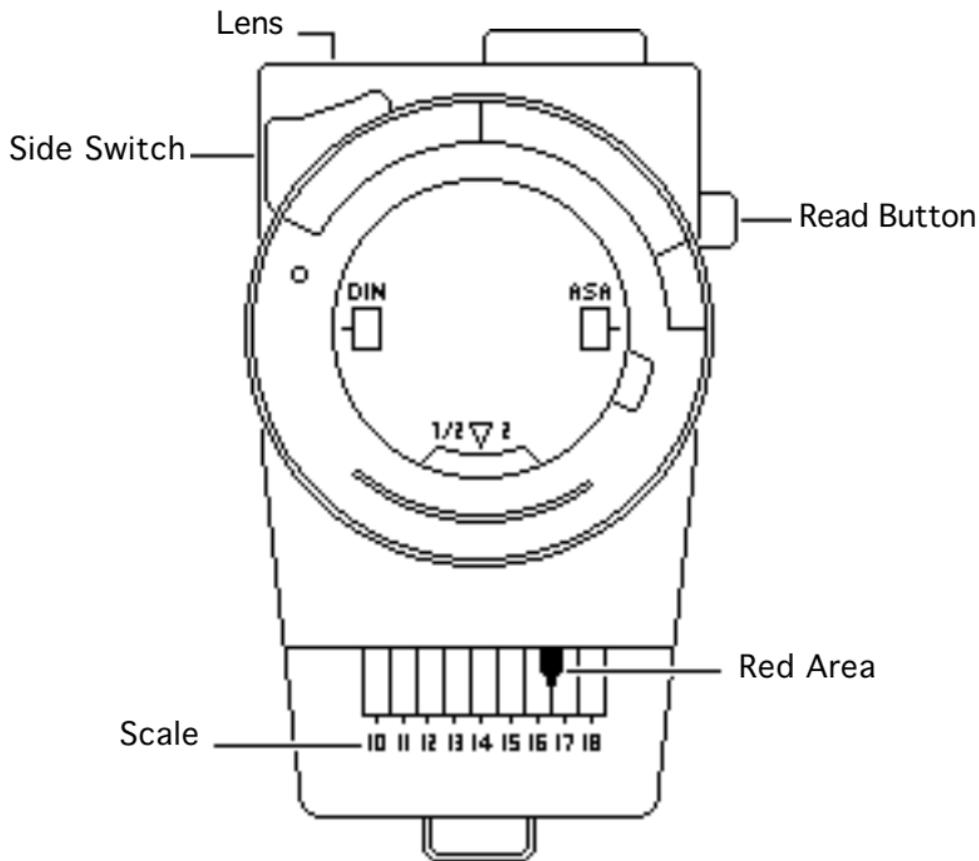




readings, verify the readings with a known-good light meter or photometer. Also check the age of the R77 light meter by its four-digit manufacturing date stamp (such as 0398 for March 1998).

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

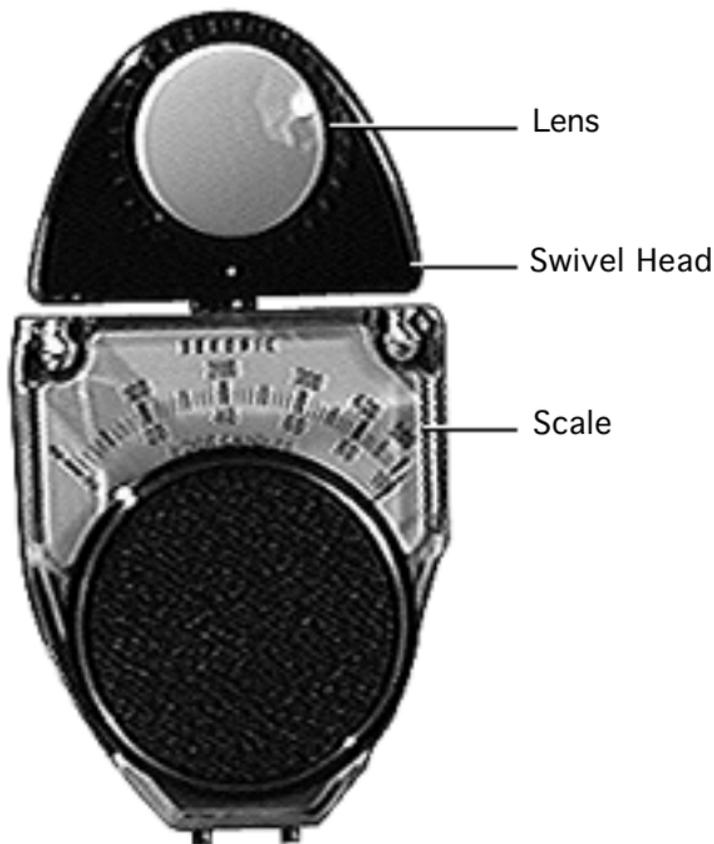




## Model L-248

- 1 Press the red button on the back of the light meter. If the reading is out of the red area, replace the battery.
- 2 Move the side switch to its upper position so that the scale reads 10 through 18.
- 3 Uncover the lens of the meter.
- 4 Place the lens against the middle of the screen and press the read button to read the 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.
- 4 Place the lens against the middle of the screen and read the scale.





Exploded View

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Macintosh 12 RGB Display



