



Macintosh Portrait Display





Basics

Macintosh Portrait Display





International “Series B”

Apple produced domestic and international versions of the Portrait Display. The troubleshooting and repair procedures differ for each version of the monitor. This manual covers the domestic version only. For documentation on the Portrait Display “Series B,” refer to the international manual.





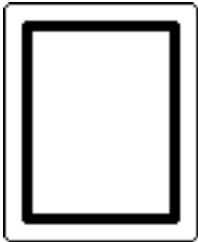
Monitor Distortion

Overview

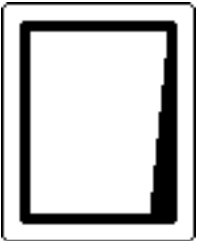
All large-screen monitors are susceptible to distortions caused by environmental conditions. These distortions are usually not visible on monitors with smaller screens.

Important: Even monitors set to factory specifications may appear distorted when set up in a new environment.

Common environmentally-caused distortions are shown on this and the following pages. Always check first for environmental causes before attempting to repair or adjust a monitor with a distorted raster.



Ideal Raster



Right Edge
Not Straight

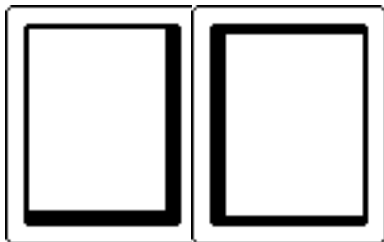




Environmental Influences

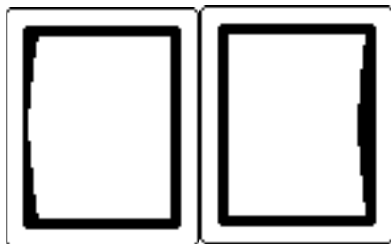
The following environmental conditions may distort the raster of a Portrait Display:

- Proximity to metal objects, such as metal desks, file cabinets, and bookshelves. Metal objects affect the earth's magnetic field. Earth magnetism usually distorts only the edges of the screen.
- Fluorescent lights, other monitors, or electronic appliances such as coffee makers and copy machines. These objects cause dynamic raster distortion, that is, movement or jitter of the image.



Raster Shifted
Up and Left

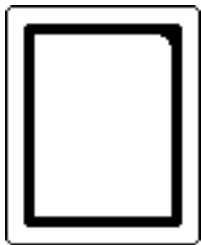
Raster Shifted
Right



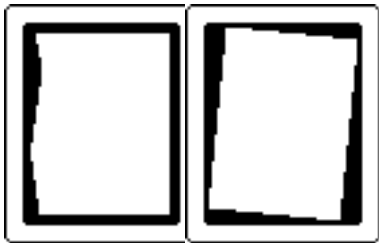
Left Side
Bowed Out

Right Side
Bowed In





Upper-Right Corner
Rounded



S-Shaped
Left Edge

Raster Tilted
Right

Troubleshooting

Important: Module swapping cannot fix a monitor with environmental distortion problems, and adjusting a monitor with such problems alters the factory settings.

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

Before adjusting a monitor with a distorted raster, try the following:

- Swivel or move the monitor, or
- Remove the monitor from the building and recheck it in another location.





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 remove the distortion-causing object.

If the display does not change when you move it to another location, continue troubleshooting the problem (refer to Troubleshooting/Symptom Charts).





Specifications

Macintosh Portrait Display





Characteristics

Picture Tube

15-in. diagonal screen
Phosphor EIA Type P4 (white)
Flat, square, high-contrast, antiglare surface

Screen Resolution

640x870; 80 dpi
Analog 1-, 2-, 4-, or 8-bit pixel depth; permits 256 grays at
8 bits/pixel

Scan Rates

Vertical refresh rate: 75 Hz
Horizontal scan rate: 68.85 kHz
Dot clock: 52 MHz





Active Video Display Area

8 in. by 10.87 in. (203 mm by 276 mm)

Input Signal

Video: analog; RS-343 standard





Controls and Ports

User Controls

Rear panel: power switch

Right side: brightness and contrast controls

I/O Ports

Three Apple Desktop Bus (ADB) connectors





Physical and Electrical

Power Supply

Universal power supply

Voltage: 90–270 VAC, self-configuring

Frequency: 47–63 Hz

Power: 75 W maximum

Size and Weight

Height: 13.1 in. (332 mm)

Width: 11.5 in. (292 mm)

Depth: 14.9 in. (379 mm)

Weight: 35 lb. (16 kg)





Operating Environment

Temperature

50°F–95°F (10°C–35°C)

Humidity

90% maximum, noncondensing

Altitude

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





Troubleshooting

Macintosh Portrait 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 connections.
- 3 Check internal power connections.
- 4 Replace blown fuse.
- 5 Replace power/sweep board.
- 6 Replace video board.





No Raster (Continued)

No raster, LED on

- 1 Ensure monitor's video cable is connected to the computer or the video card in the computer.
- 2 Adjust brightness and contrast knobs.
- 3 Verify that video card in computer is working properly.
- 4 Perform video adjustments.
- 5 Check internal power connections.
- 6 Replace power/sweep board.
- 7 Replace CRT board.
- 8 Replace video board.
- 9 Replace CRT.





Geometry

- | | |
|---------------------------------------|---|
| Raster not centered | <ol style="list-style-type: none">1 Verify that distortion is not due to environmental conditions.
Move monitor to another location.2 Perform horizontal or vertical center adjustments.3 Replace power/sweep board.4 Replace CRT. |
| Raster bulges along top of screen | <ol style="list-style-type: none">1 Verify that distortion is not due to environmental conditions.
Move monitor to another location.2 Replace CRT. |
| Raster stretched or compressed at top | <ol style="list-style-type: none">1 Verify that distortion is not due to environmental conditions.
Move monitor to another location.2 Perform vertical-linearity adjustment.3 Replace power/sweep board.4 Replace CRT. |





Geometry (Continued)

Raster short (less than 10 7/8 in. high)

- 1 Perform vertical-height adjustment.
- 2 Replace power/sweep board.
- 3 Replace CRT.

Raster narrow (less than 8 in. wide)

- 1 Perform horizontal-size adjustment.
- 2 Replace power/sweep board.
- 3 Replace CRT.

Raster bowed or barrel-shaped

- 1 Verify that distortion is not due to environmental conditions.
Move monitor to another location.
- 2 Perform video adjustment.
- 3 Replace power/sweep board.
- 4 Replace CRT.





Geometry (Continued)

Raster pyramid
shaped (or inverted
pyramid)

Replace CRT.





Video Display

Picture is too dark or too bright

- 1 Adjust contrast and brightness knobs.
- 2 Verify that video card in computer is working properly.
- 3 Perform video adjustments.
- 4 Replace CRT board.
- 5 Replace video board.
- 6 Replace contrast/brightness board.
- 7 Replace CRT.

Out of focus

- 1 Perform focus adjustments.
- 2 Replace power/sweep board.
- 3 Replace CRT.





Synchronization

- | | | |
|---|---|--|
| Picture rolls vertically | 1 | Verify that video card in computer is working properly. |
| | 2 | Replace power/sweep board. |
| One thin, bright, horizontal line appears on screen | 1 | Replace power/sweep board. |
| | 2 | Replace CRT. |
| Picture breaks into diagonal lines | 1 | Connect another monitor to computer and verify video signal. |
| | 2 | Replace power/sweep board. |





Miscellaneous

Black spots on screen
(burnt phosphors)

Replace CRT.

Picture jitters or
flashes

- 1 Check all ground cable connections.
- 2 Verify that adjacent computer equipment is properly grounded. Move electrical devices away from monitor and shut off fluorescent lights in area.
- 3 Replace power/sweep board.

Intermittently shuts
down

- 1 Ensure monitor's video cable is connected to the computer or the video card in the computer.
- 2 Replace power/sweep board.





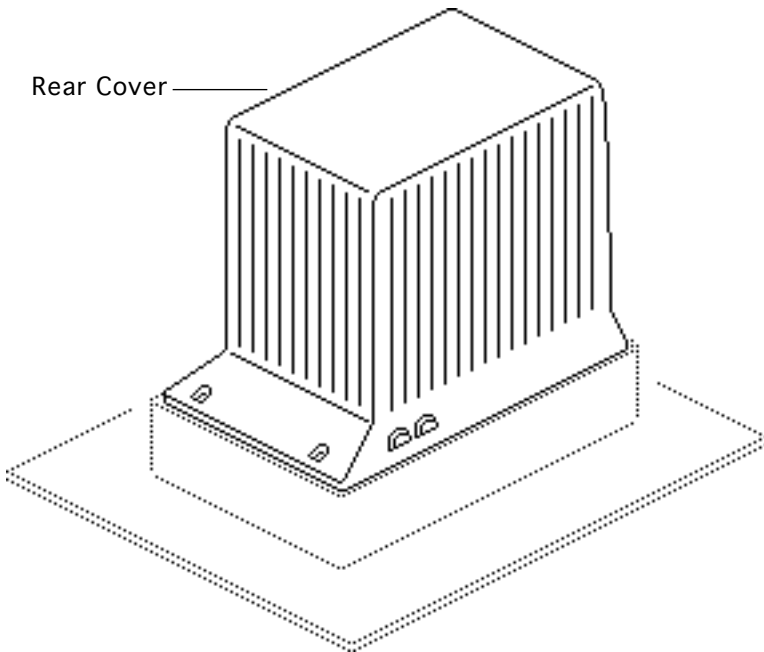
Take Apart

Macintosh Portrait Display





Rear Cover

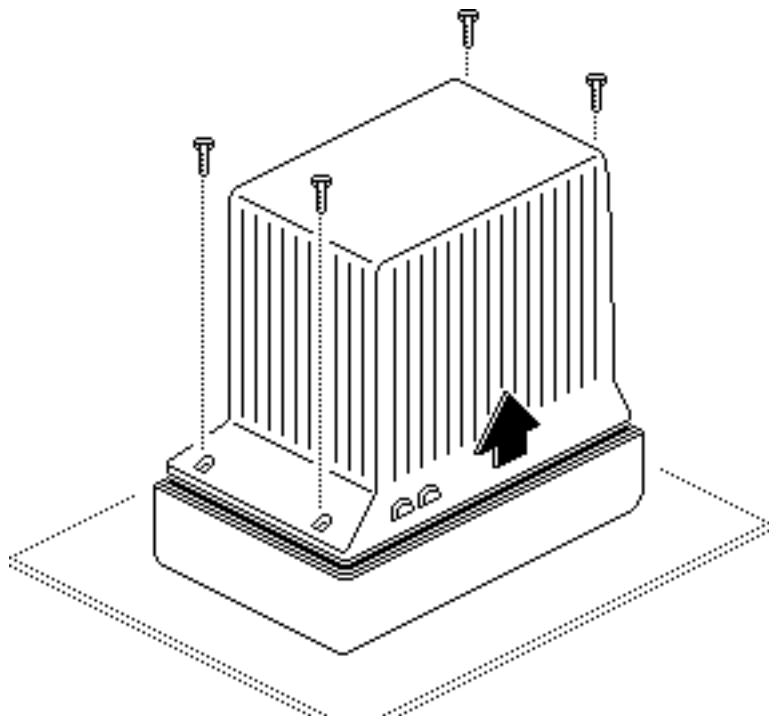


Rear Cover

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.





Remove the four case screws and lift the rear cover off the bezel.



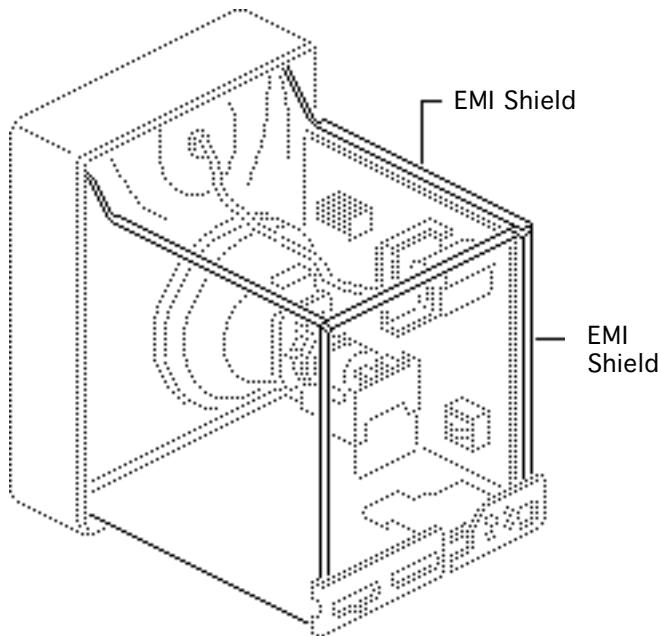


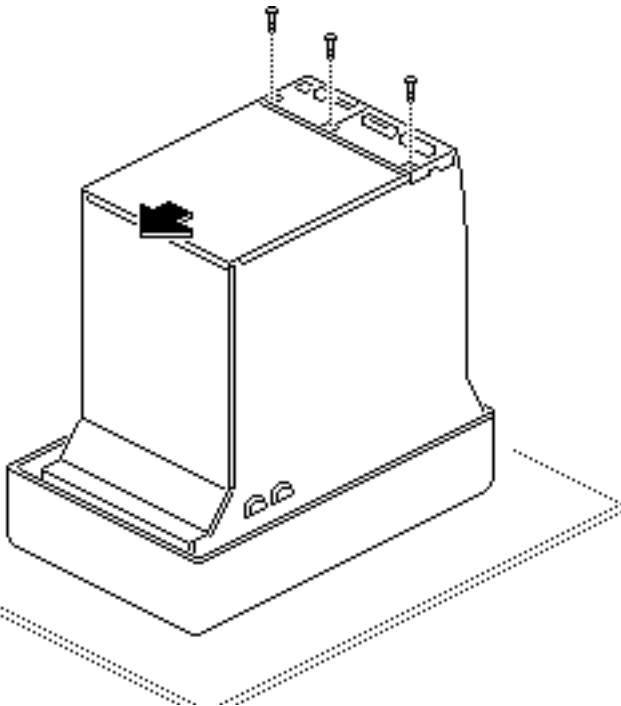
EMI Shield

Before you begin, remove the rear cover.

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

Note: The EMI shield includes two metal panels at the top and rear of the monitor chassis. To repair the monitor, remove both panels.



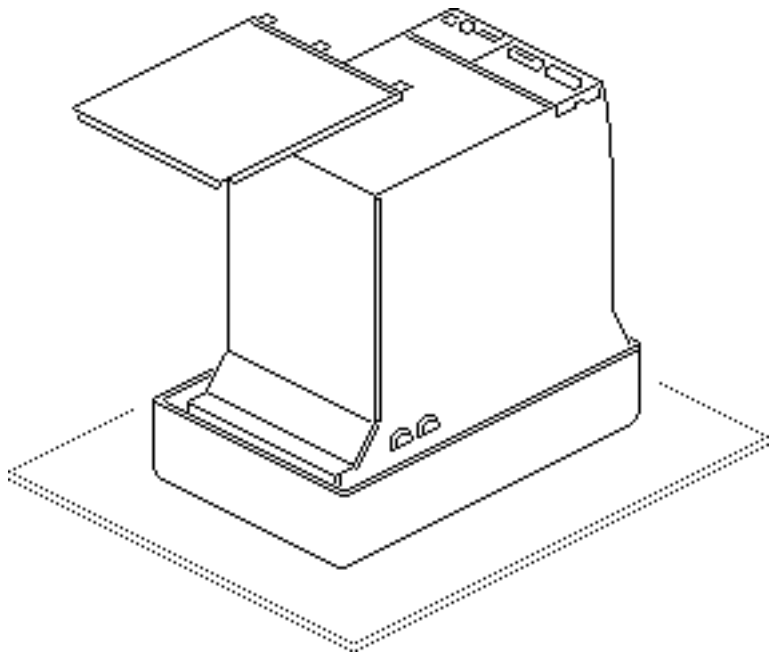


- 1 Remove the three screws from the rear panel of the EMI shield.
- 2 Slide the rear panel forward; then lift the rear panel off the chassis.





- 3 Pull up and remove the top panel from the chassis.



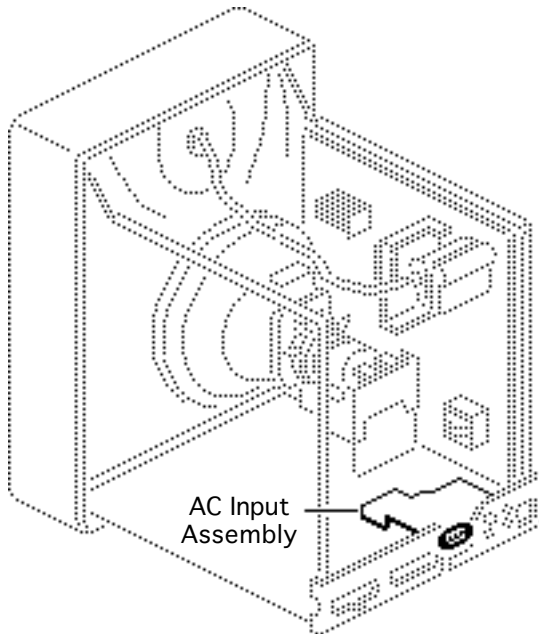


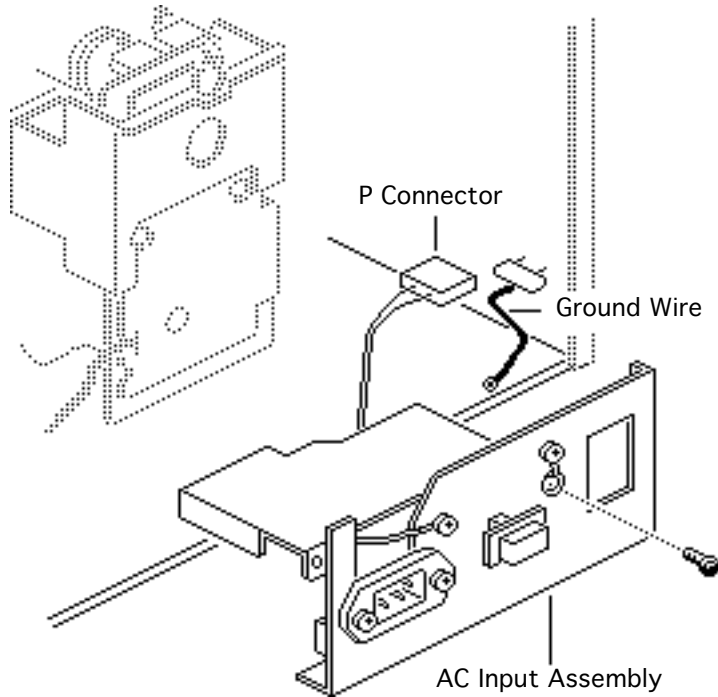
AC Input Assembly

Before you begin,

- Remove rear cover
- Remove EMI shield
- Discharge CRT

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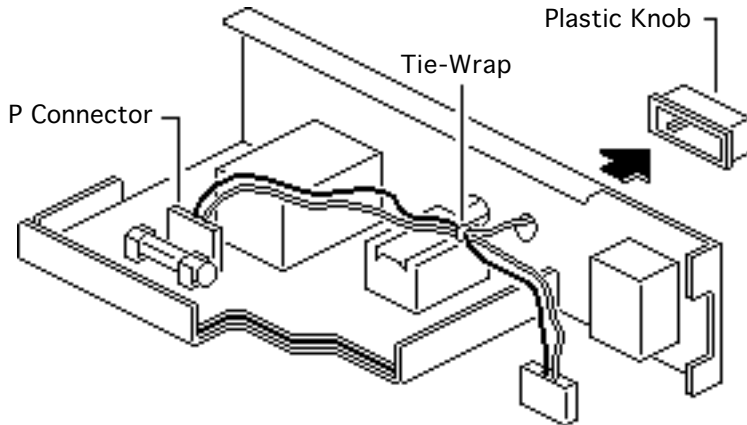




- 1 Remove the screw that secures the black ground wire to the AC input assembly mounting bracket. Push the ground wire through the hole in the mounting bracket.
- 2 Lift the AC input assembly from the chassis and disconnect the P connector from the power/sweep board.

Note: Stop here if you are removing the AC input assembly to access another component.





- 3 Cut the tie-wrap and remove the P connector from the AC input assembly. Keep the P connector.
- 4 Pull the plastic knob off the On/Off switch. Keep the knob.

Replacement Note: When returning a defective AC input assembly, remove and keep the plastic On/Off knob, the P connector, and the fuse. Install these items on the replacement assembly.



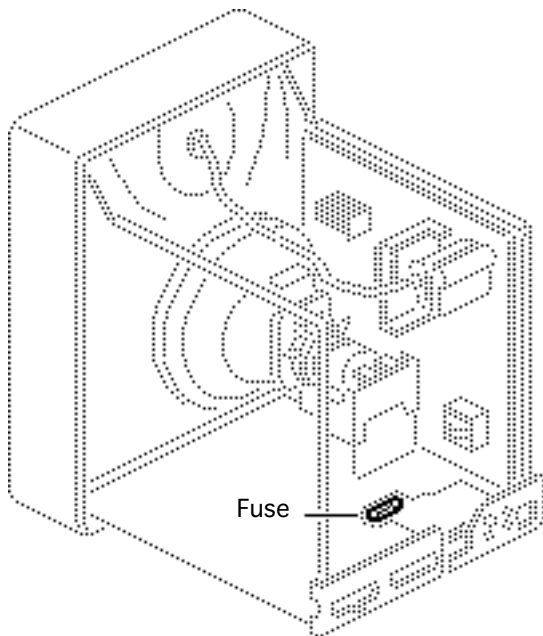


Fuse

Before you begin,

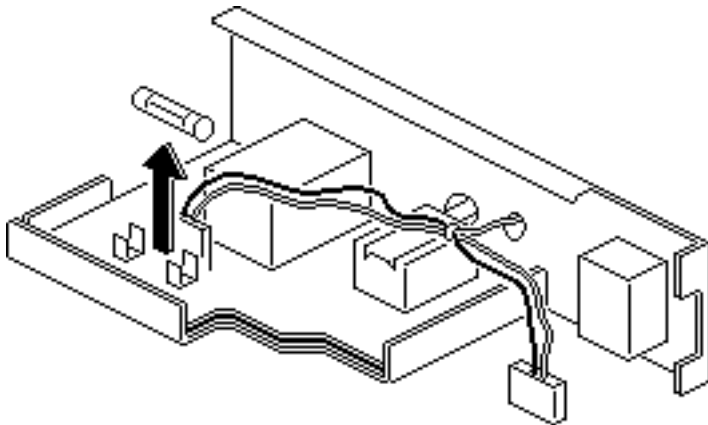
- Remove rear cover
- Remove EMI shield
- Discharge CRT
- Remove AC input assembly

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





Using your fingers or a flat-blade screwdriver, gently pry up one end of the fuse and lift out the fuse.



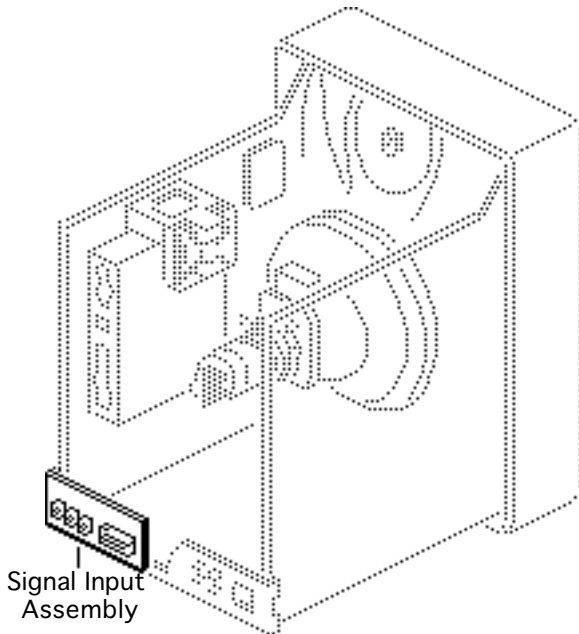


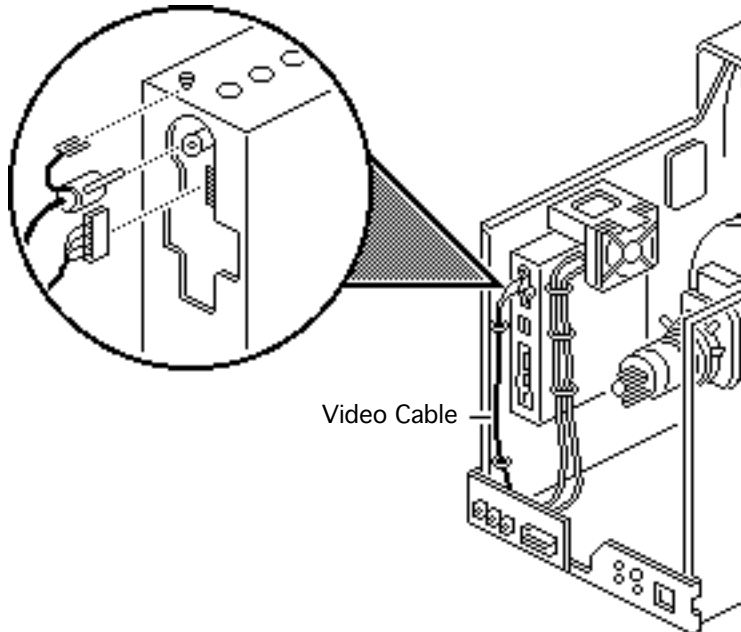
Signal Input Assembly

Before you begin,

- Remove rear cover
- Remove EMI shield
- Discharge CRT

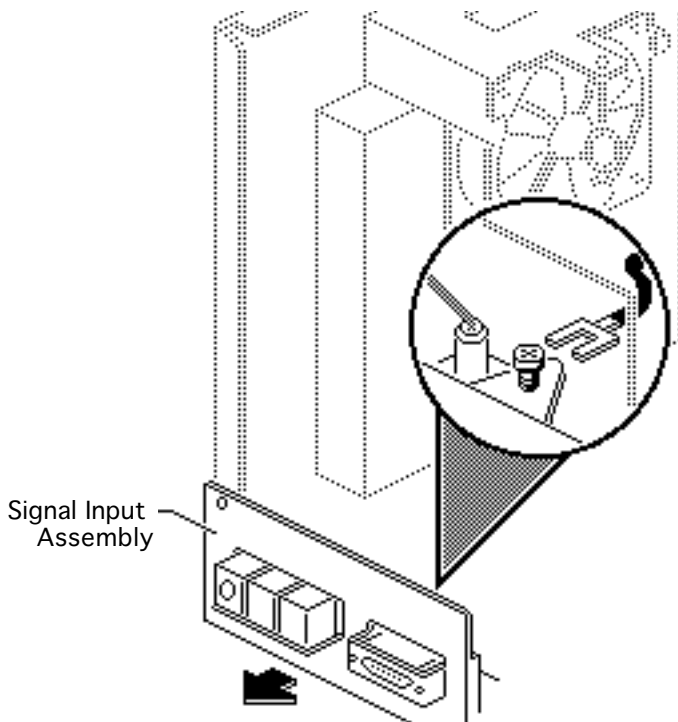
Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.





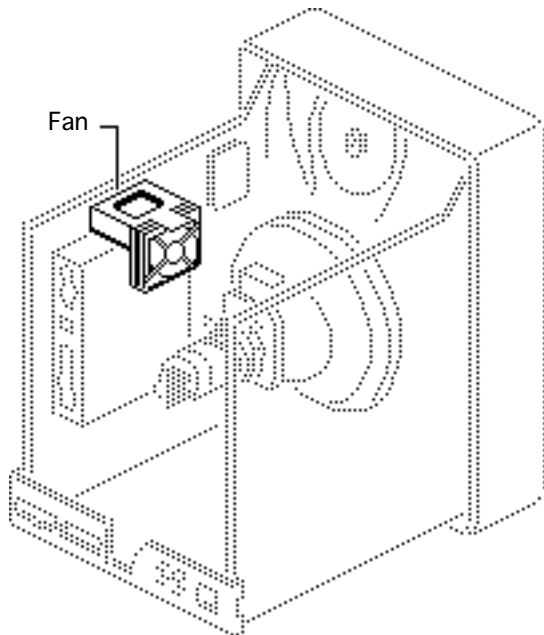
- 1 Loosen the screw at the upper corner of the video board assembly and remove the black ground cable.
- 2 Disconnect the black video cable (with the attached ground cable) and the 4-wire cable from the video board.
- 3 Remove the video cable and the 4-wire cable from the two cable clamps.





- 4 Loosen the screw on the signal input assembly mounting bracket and remove the black ground cable.
- 5 Remove the signal input assembly from the chassis.





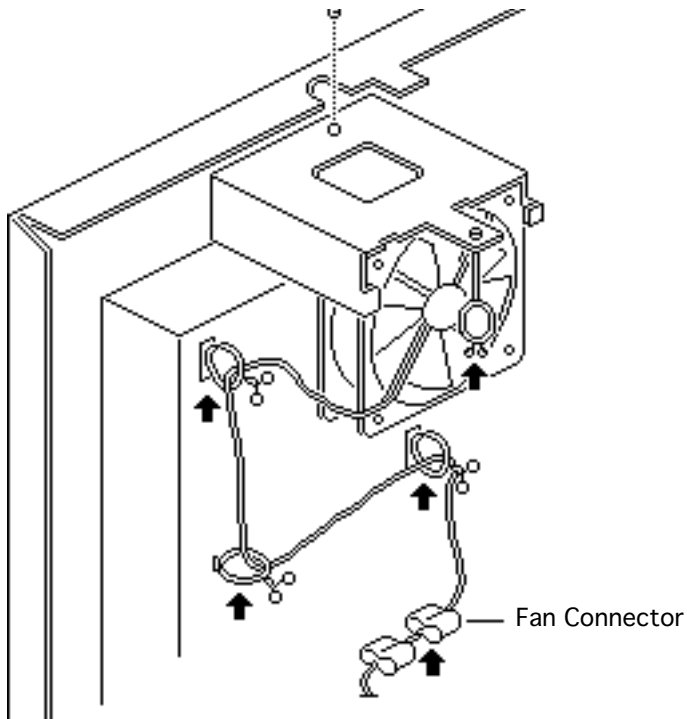
Fan

Before you begin,

- Remove rear cover
- Remove EMI shield
- Discharge CRT

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

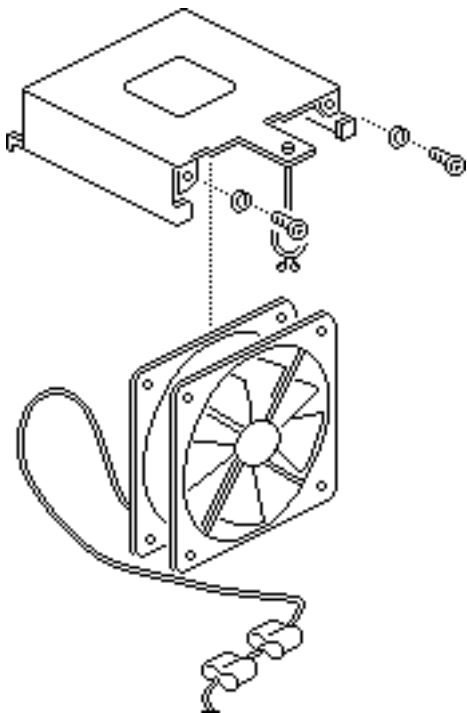




- 1 Open the four cable clamps.
- 2 Remove the screw that secures the fan mounting bracket to the chassis. Remove the mounting bracket, fan, and wire.
- 3 Disconnect the fan wires at the fan connector and remove the fan from the mounting bracket.

Note: Stop here if you are removing the fan assembly to access another component.



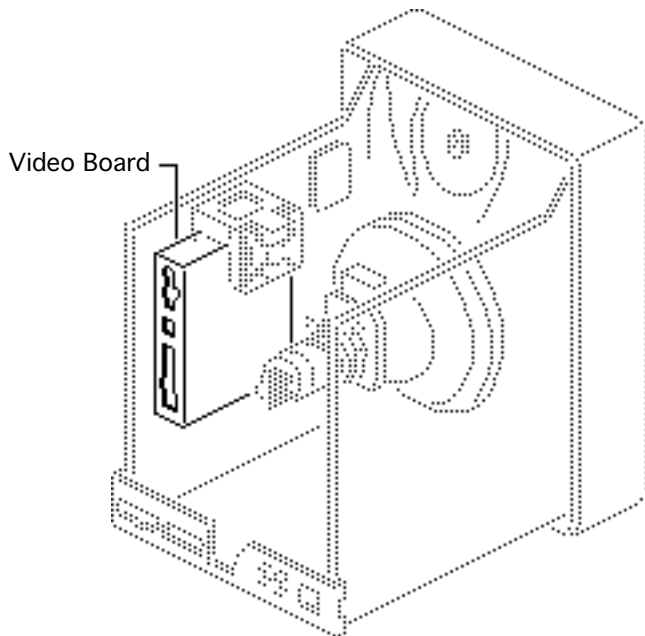


- 4 Remove the two screws and lockwashers that secure the fan to the mounting bracket.
- 5 Remove the fan from the mounting bracket.





Video Board

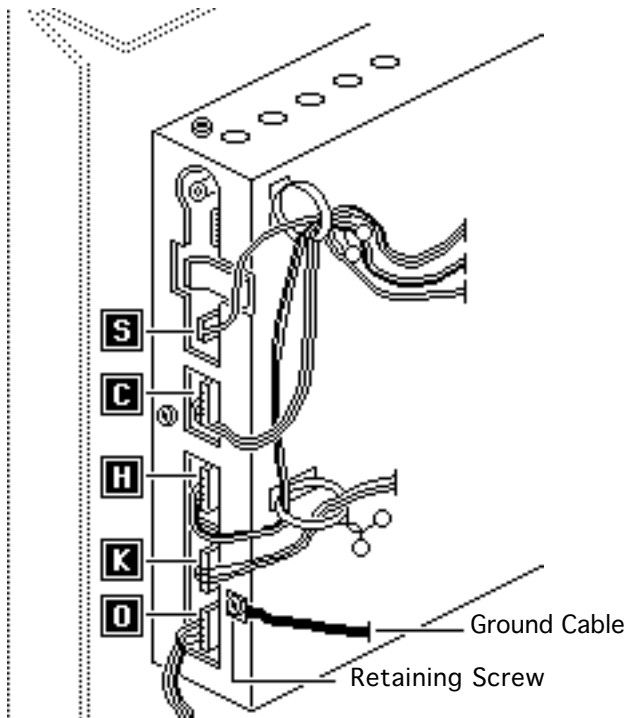


Before you begin,

- Remove rear cover
- Remove EMI shield
- Discharge CRT
- Remove signal input assembly
- Remove fan

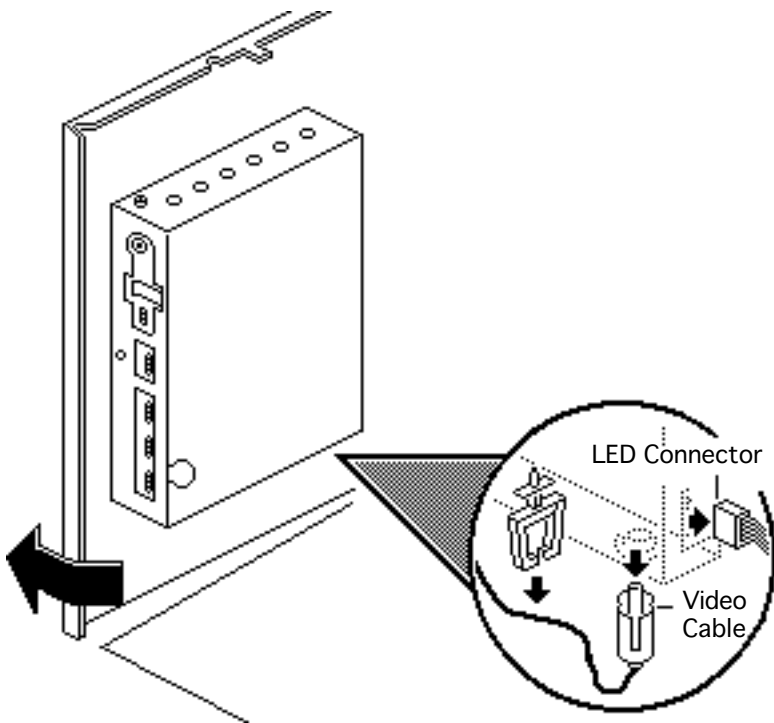
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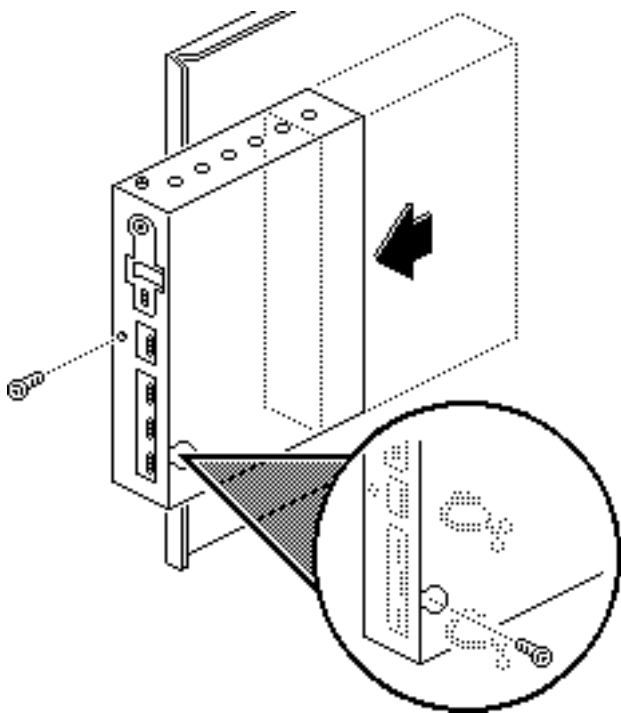
- 1 Remove these connectors from the video board:
 - 3-wire connector S
 - 5-wire connector H
 - 4-wire connector O
 - 6-wire connector C
 - 3-wire connector K
- 2 Remove all connector wires from cable clamps.
- 3 Loosen the retaining screw on the video board case and remove the black ground cable.





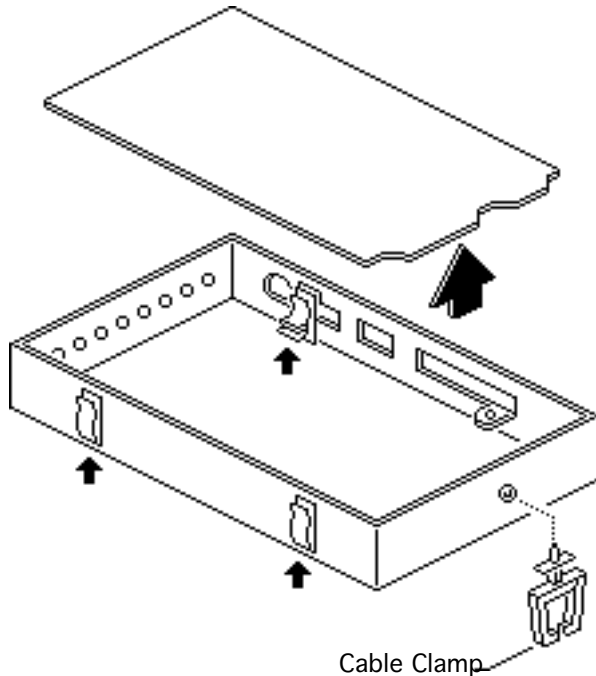
- 4 Pull open the left chassis panel to access the two cables at the bottom of the video board.
- 5 Remove the video cable from the cable clamp beneath the video board case and disconnect the cable from the video board.
- 6 Disconnect the small LED connector from the video board.





- 7 Remove the mounting screw and the video board case from the chassis.
- 8 Remove the video board mounting screw through the back of the video board case.





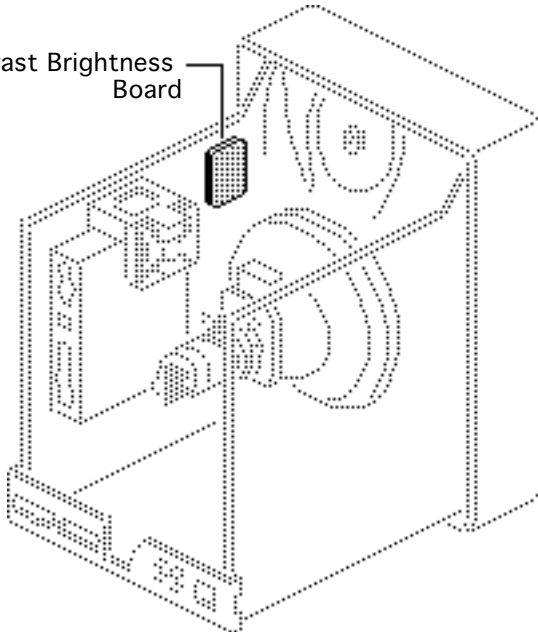
- 9 Remove the plastic cable clamp from the bottom of the video board case.
- 10 Depress the three plastic clips and lift the video board out of the case.





Contrast Brightness Board

Contrast Brightness
Board

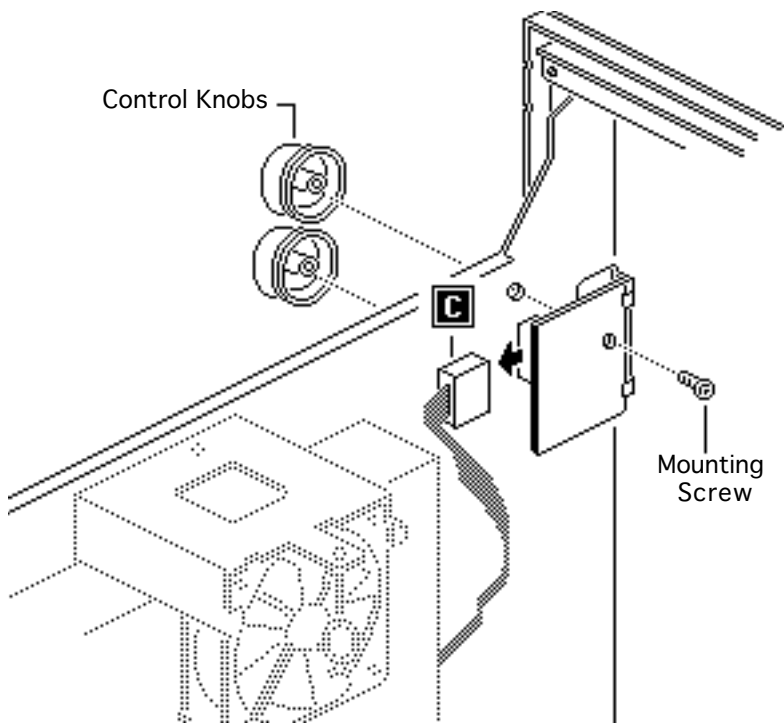


Before you begin,

- Remove rear cover
- Remove EMI shield
- Discharge CRT

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





- 1 Disconnect the C connector from the contrast brightness board.
- 2 Remove the mounting screw from the contrast brightness board.
- 3 Pull off the two control knobs and remove the contrast brightness board. Keep the knobs to install on the replacement board.

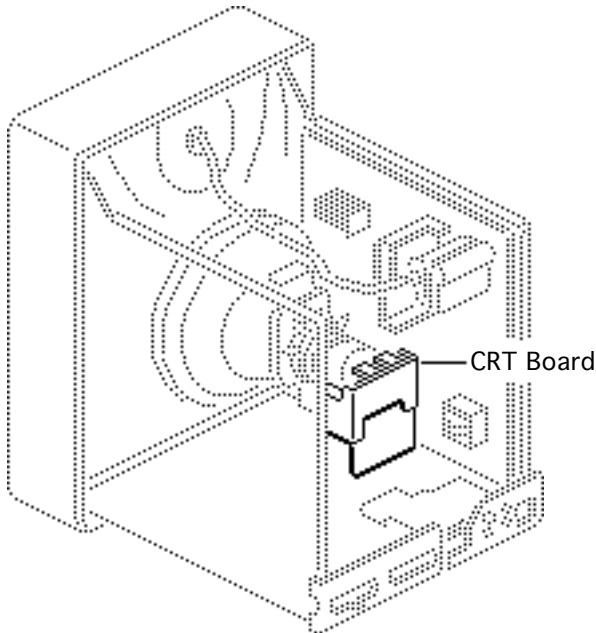




CRT Board

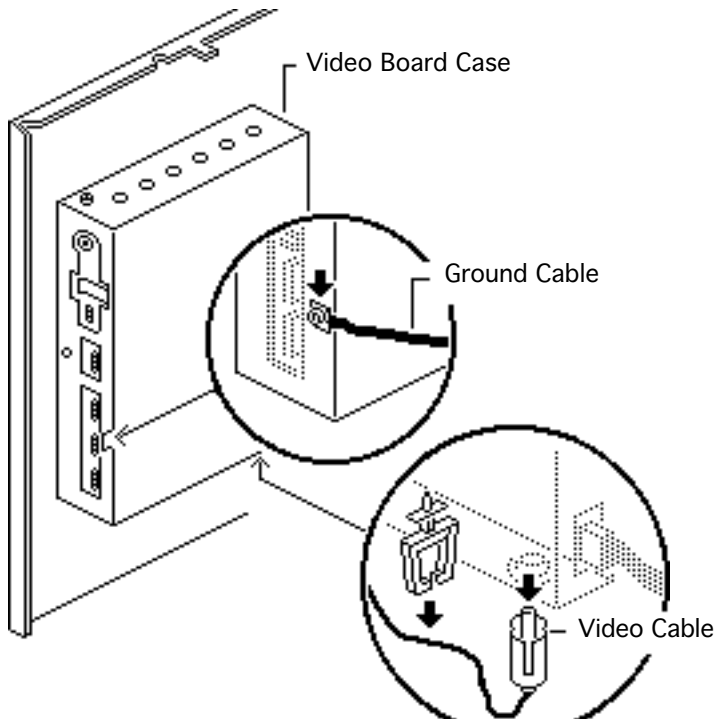
Before you begin,

- Remove rear cover
- Remove EMI shield
- Discharge CRT
- Remove AC input assembly
- Remove signal input assembly



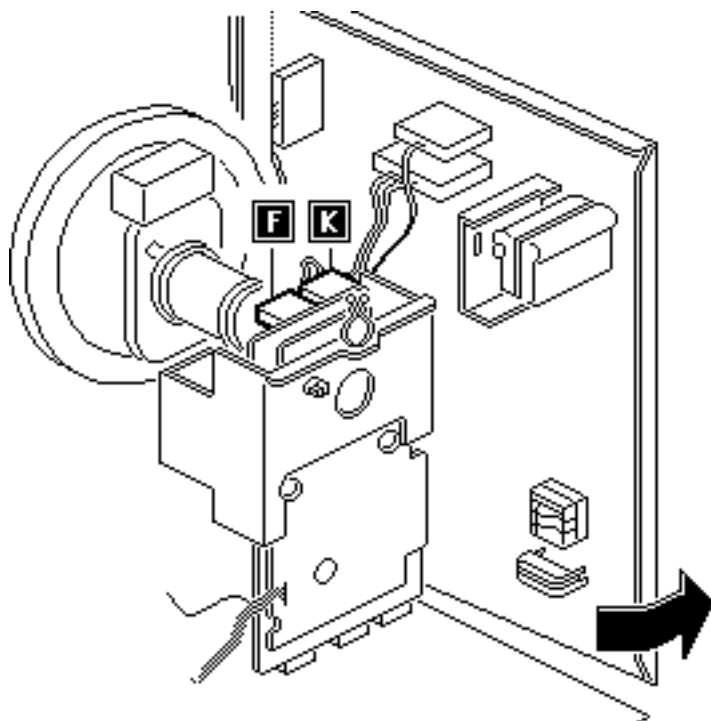
Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.





- 1 Loosen the screw on the video board case and remove the black ground cable.
- 2 Remove the video cable from the cable clamp beneath the video board case and disconnect the cable from the video board.

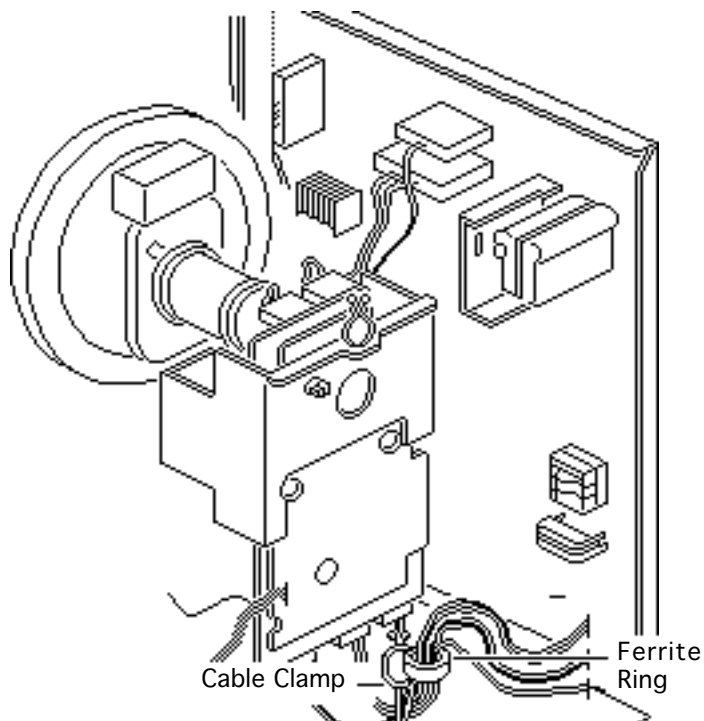




- 3 Pull open the right chassis panel enough to gain access to the upper connectors on the CRT board.
- 4 **Caution:** The neck of the CRT is easily damaged. Do not apply force to the neck of the CRT when removing connectors from the CRT board.

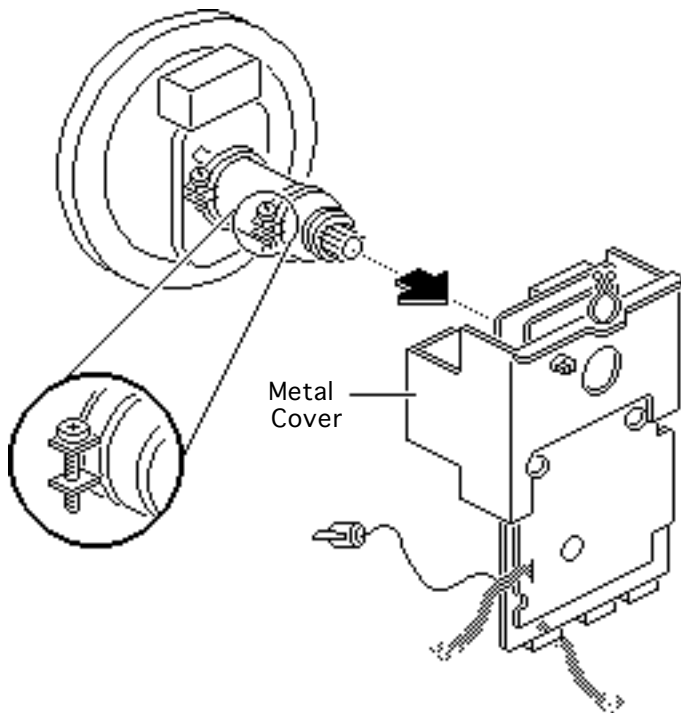
Support the CRT board with one hand and disconnect the 2-wire 4-pin connector F, and the 3-wire connector K.





- 5 Remove the cables and the ferrite ring from the cable clamp beneath the CRT board.

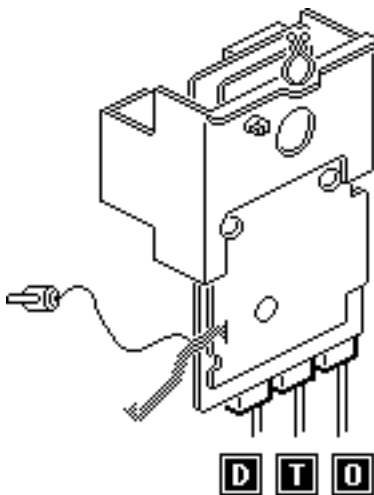




- 6 Loosen the screw on the ring clamp that secures the CRT board to the neck of the CRT.
- 7 **Caution:** Twisting, bending, or applying force to the CRT board could damage the neck of the CRT. Pull the CRT board straight off the neck of the CRT.

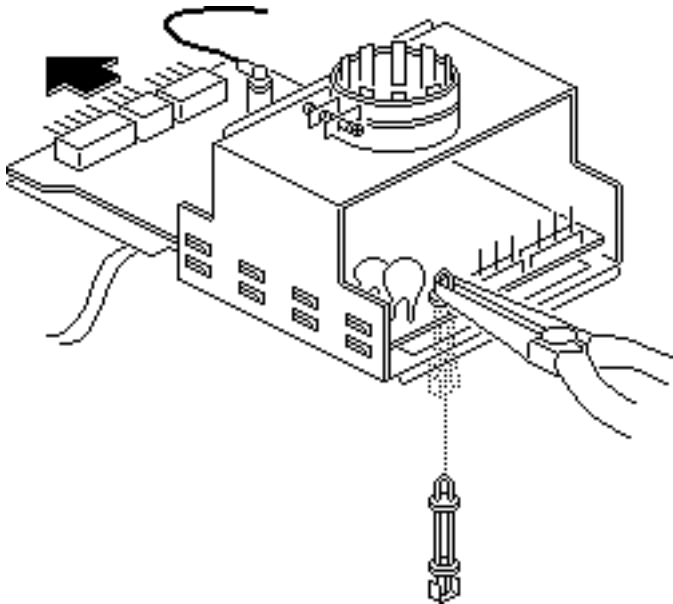
Grasp the metal cover that protects the CRT board and carefully pull the board straight off the CRT.





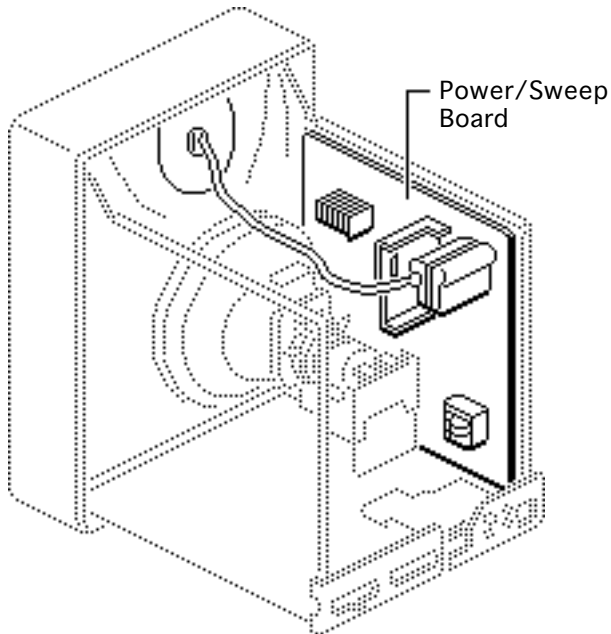
- 8 Disconnect the following cable connectors from the bottom of the CRT board:
- 4-wire connector O
 - 4-wire connector T
 - 5-wire connector D





- 9 Using needlenose pliers, remove the plastic standoff from the bottom of the metal cover. Keep the standoff and use it to install the replacement CRT board.
- 10 Slide the CRT board out of the metal cover. Keep the cover for installation on the replacement CRT board.





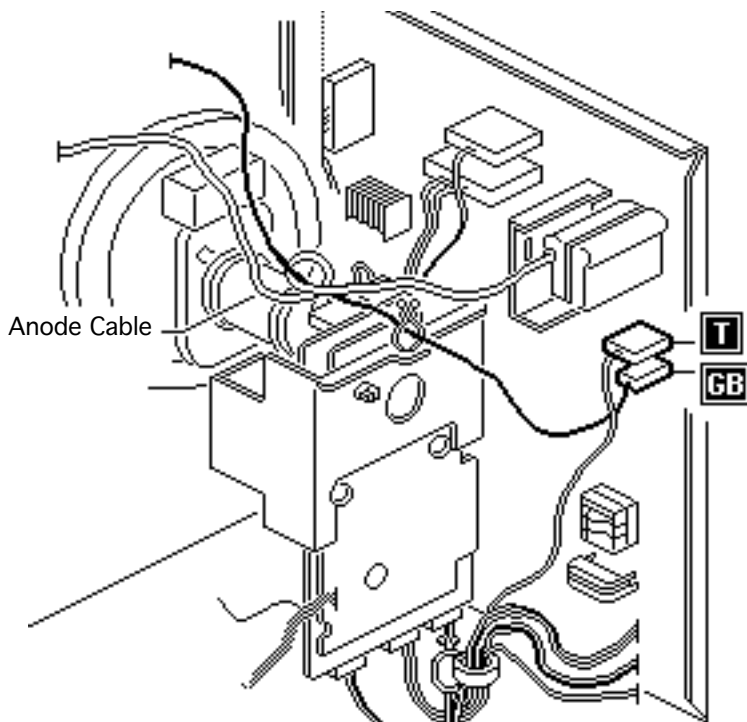
Power/Sweep Board

Before you begin,

- Remove rear cover
- Remove EMI shield
- Discharge CRT
- Disconnect anode cap
- Remove AC input assembly

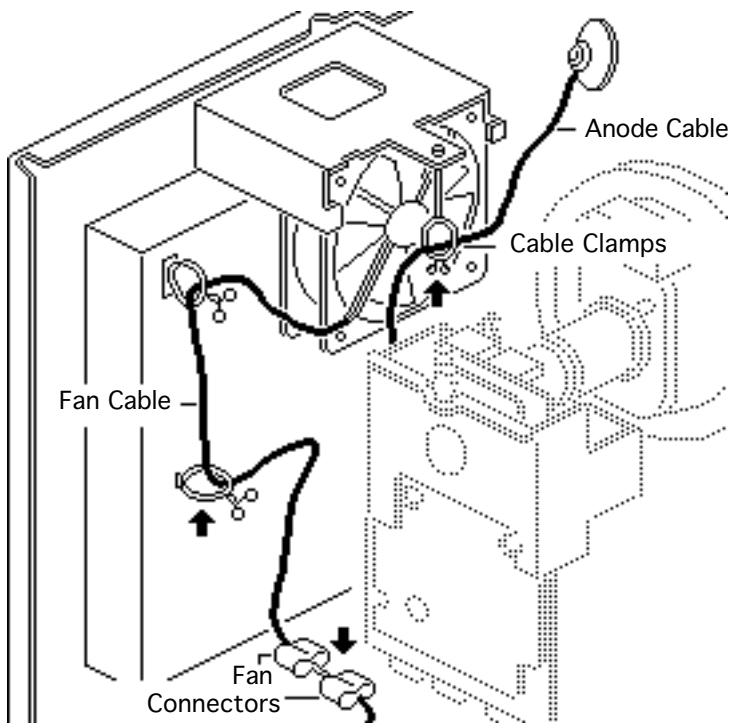
Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.





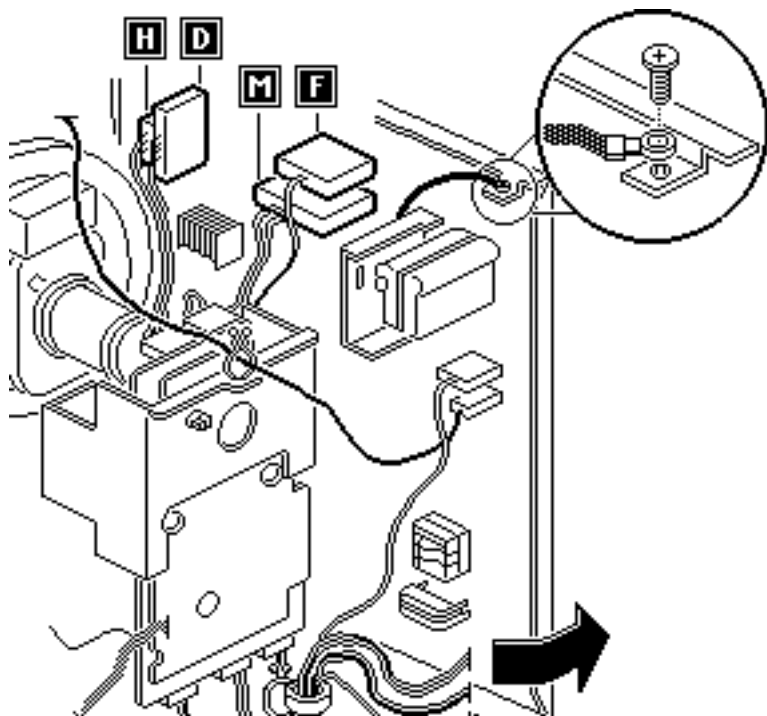
- 1 Disconnect the following connectors from the power/sweep board:
 - 2-wire connector T
 - Single connector GB
- 2 Unravel the GB connector cable from the large red anode cable.





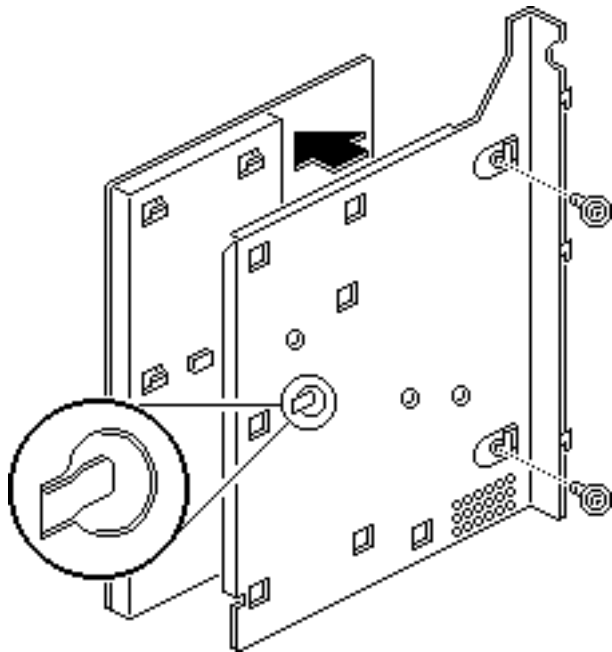
- 3 Disconnect the fan cable at the fan connectors.
- 4 Remove the fan cable and the large red anode cable from the three cable clamps.





- 5 Pull open the right chassis panel.
- 6 Disconnect the following connectors from the power/sweep board:
 - 8-wire connector H
 - 5-wire connector D
 - 2-wire connector F
 - 4-wire connector M
- 7 Remove the screw that secures the black ground cable to the top of the chassis.

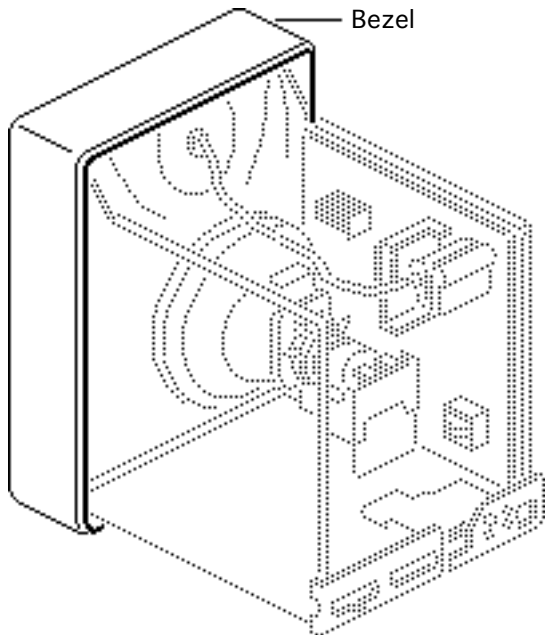




- 8 Remove the two screws with captive lockwashers from the outside of the right chassis panel.
- 9 **Note:** Do not attempt to remove the power/sweep board from its plastic cover. When returning a defective power/sweep board to Apple, return the board and cover as a unit.

Depress the release latch and pull the power/sweep board off the chassis.





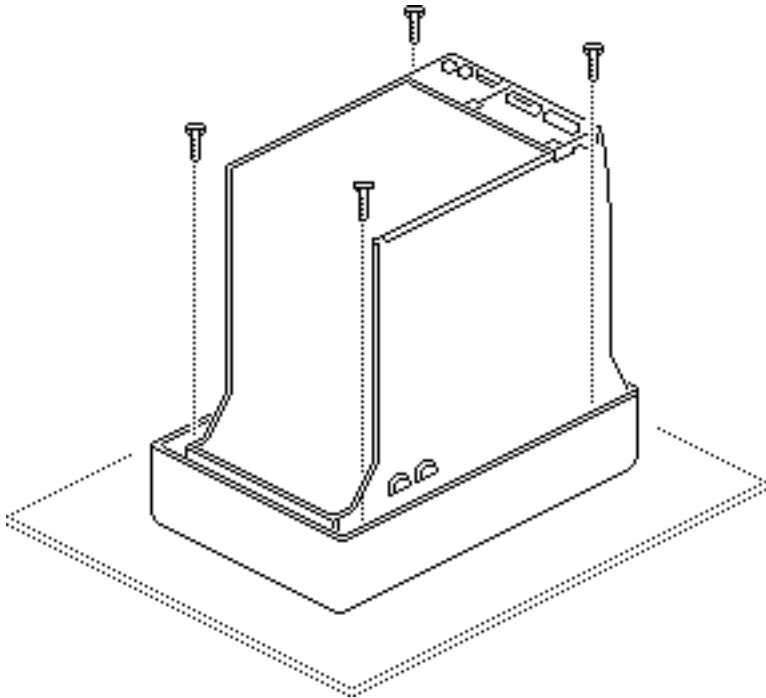
Bezel

Before you begin,

- Remove rear cover
- Remove EMI shield
- Discharge CRT

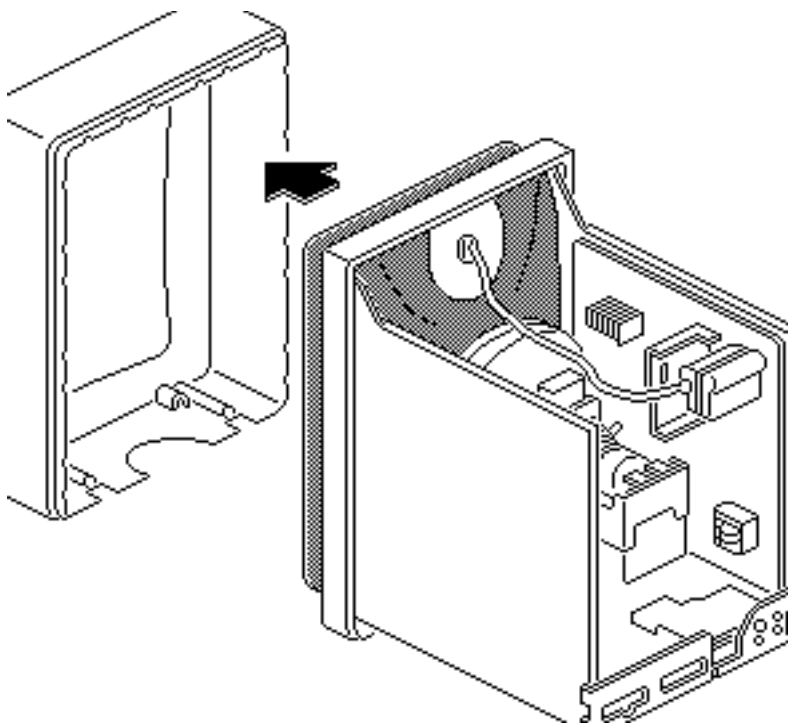
Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.





- 1 With the monitor face-down on a protective pad, remove the four screws that secure the bezel to the chassis.





- 2 Set the monitor upright on a protective pad.
- 3 Slightly lift the chassis and pull off the top and then the bottom of the bezel.



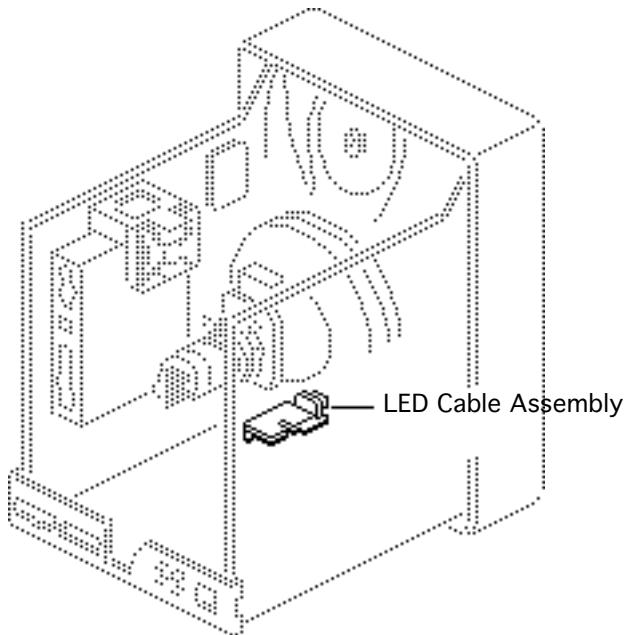


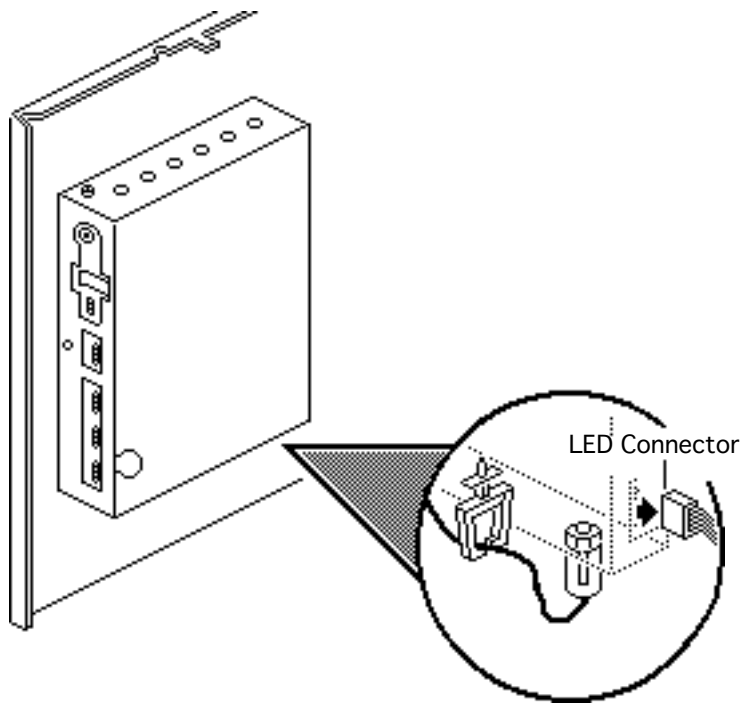
LED Cable Assembly

Before you begin,

- Remove rear cover
- Remove EMI shield
- Discharge CRT
- Remove bezel

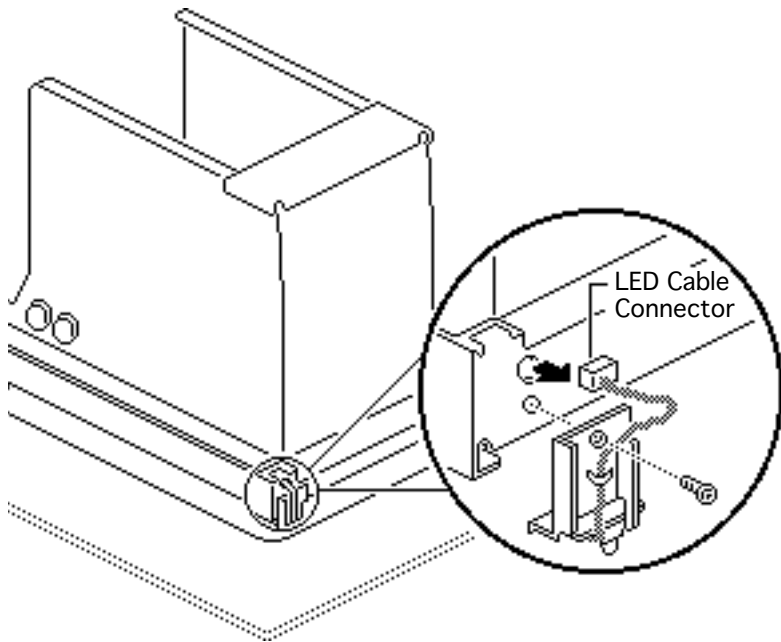
Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.





- 1 Disconnect the small LED connector from the bottom of the video board. Remove the LED cable from the cable clamp.



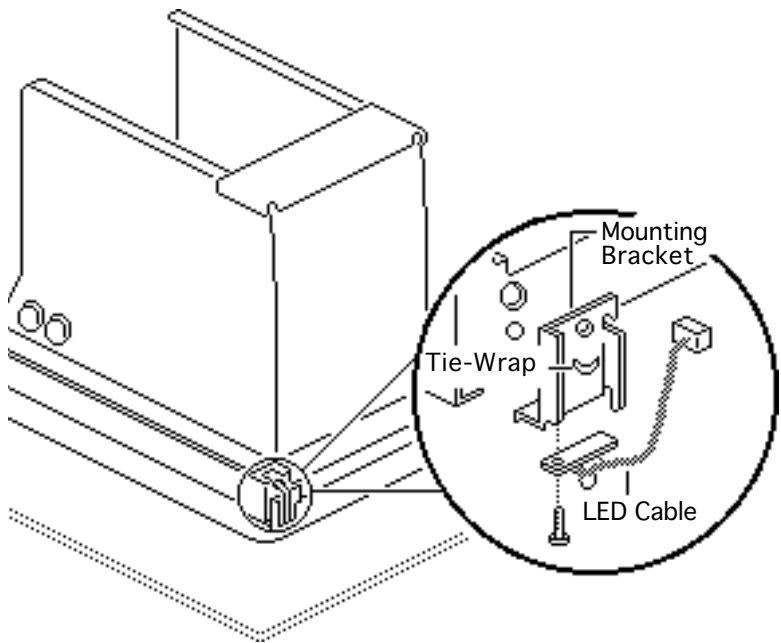


- 2 With the monitor face-down on a protective pad, pull the small LED cable connector from the chassis access hole.
- 3 Remove the screw that secures the LED mounting bracket to the chassis.





- 4 Remove the screw from the LED board.
- 5 Cut the tie-wrap and remove the LED cable assembly from the mounting bracket.

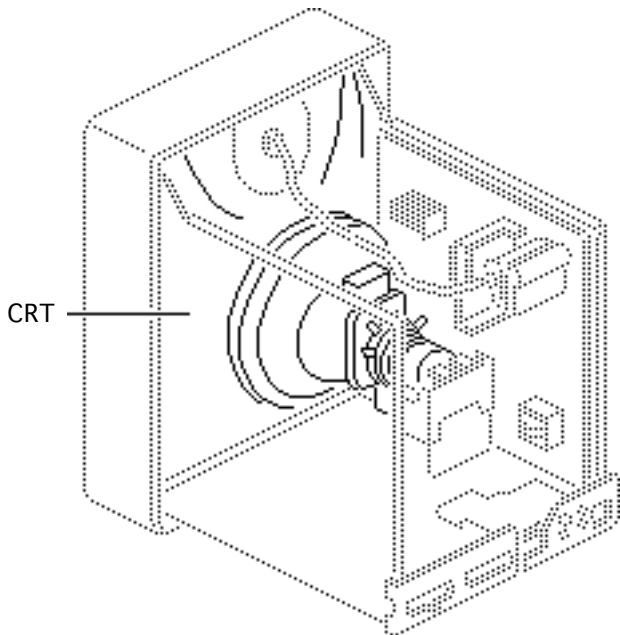


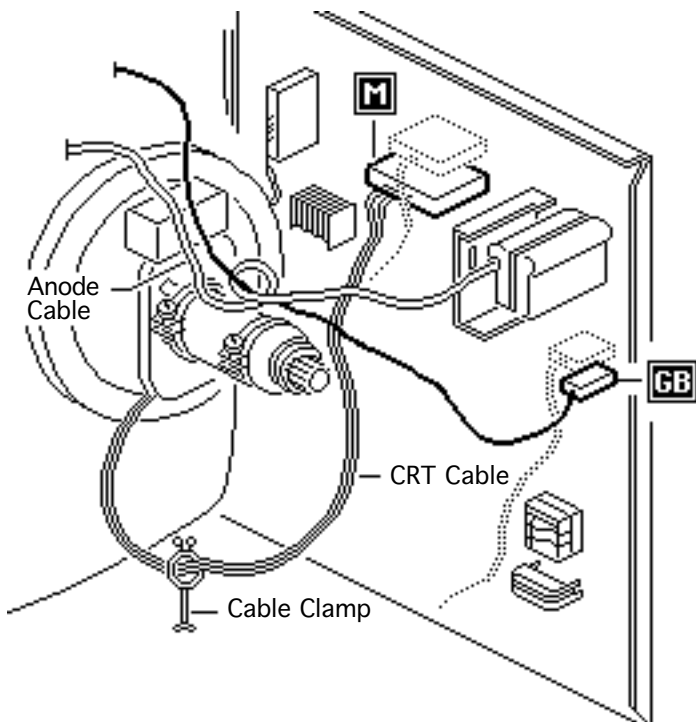


CRT

Before you begin,

- Remove rear cover
- Remove EMI shield
- Discharge CRT
- Remove anode cap
- Remove AC input assembly
- Remove signal input assembly
- Remove CRT board
- Remove bezel
- Remove LED assembly

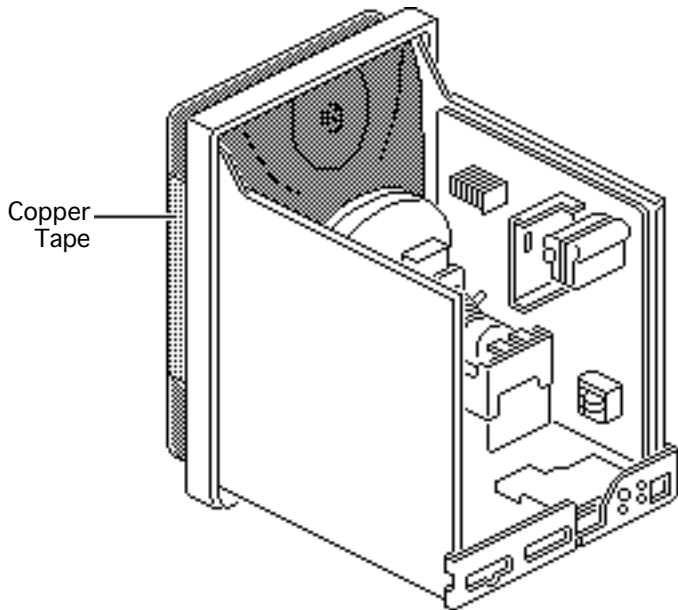




Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.

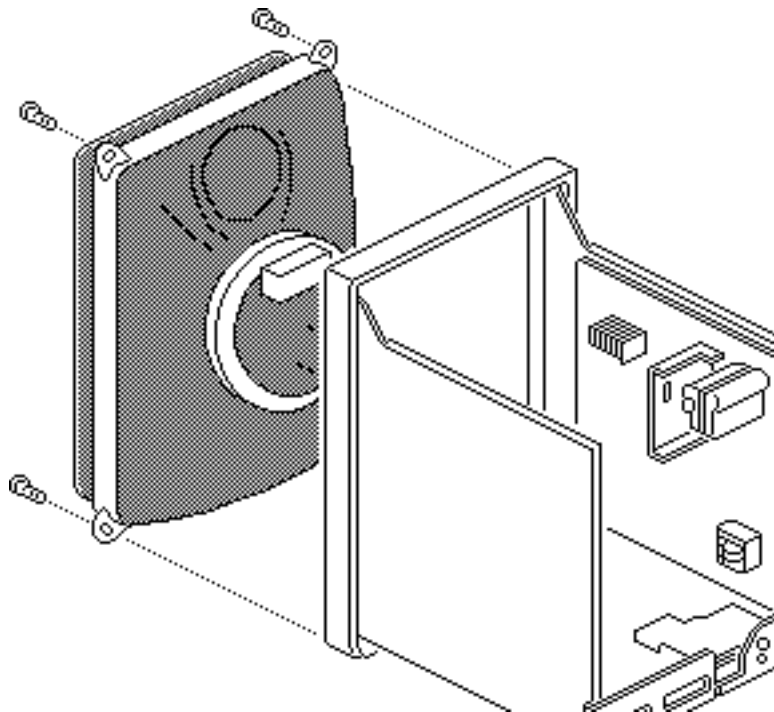
- 1 Disconnect the 4-wire CRT connector M, and the single-wire connector GB from the power/sweep board.
- 2 Remove the CRT cable from the cable clamp at the bottom of the chassis and unwrap the GB cable.





- 3 Remove and discard the copper tape from both sides of the CRT and chassis. (Two new strips of copper tape ship with the replacement CRT.)





- 4 Remove the four mounting screws from the CRT.
- 5 **Caution:** The neck of the CRT is easily damaged. Do not grab the neck of the CRT to remove it from the bezel.

Carefully grasp and pull the sides of the CRT from the chassis.





Adjustments

Macintosh Portrait Display





Monitor Safety

When adjusting this monitor, be sure to follow all CRT safety instructions outlined in Bulletins/Safety. Make sure you are familiar with these warnings and cautions:

Warning: The Portrait Display contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.

Warning: Adjustments are made from the rear of the monitor. Position a mirror to view the screen. Do not reach around the monitor to adjust the controls.

Caution: When measuring voltage, avoid a possible short. Switch off the monitor before connecting and disconnecting the alligator clips to/from the test points.





Light Meter Setup

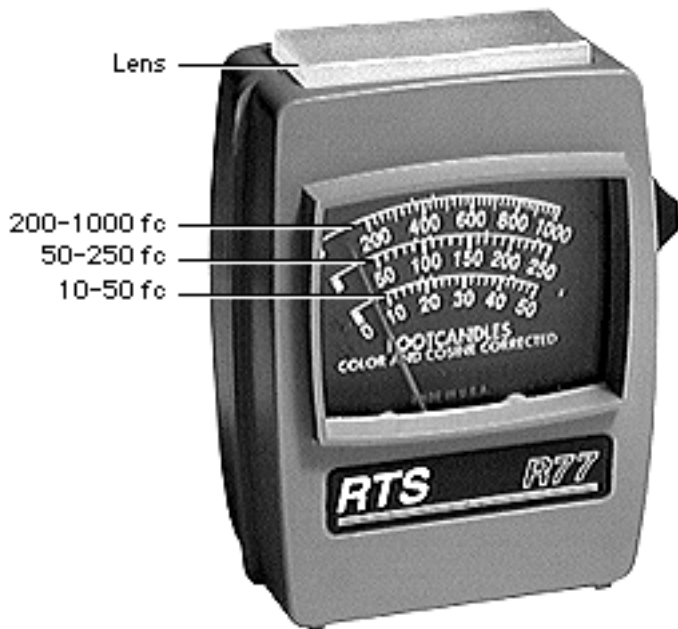
This topic covers setup for three light meter models: R77, L-248, and 246. Model R77 (Apple part number 076-0310) is the newest model available.

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





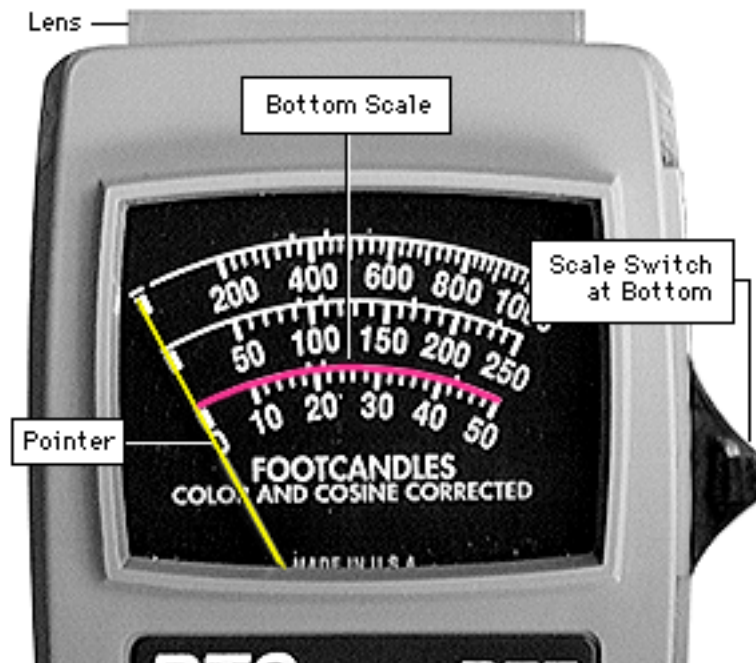
from the lens.

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.





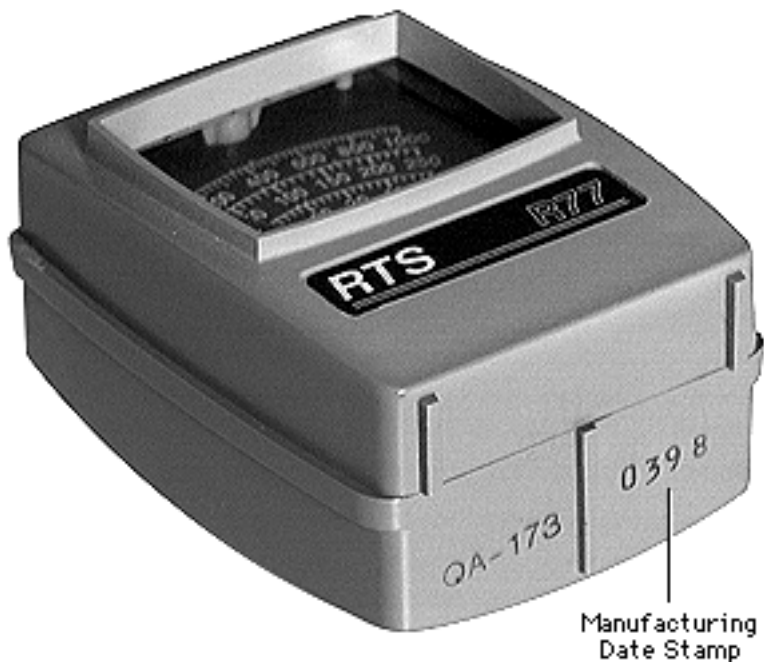
To measure a display screen's luminance,

- 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

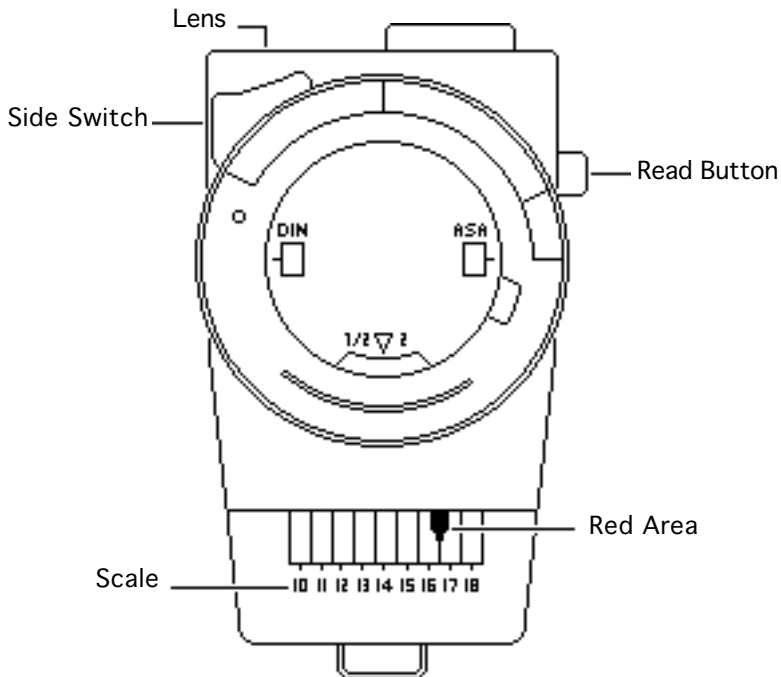




readings, verify the readings with a known-good light meter or photometer. Also check the age of the R77 light meter by its four-digit manufacturing date stamp (such as 0398 for March 1998).

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

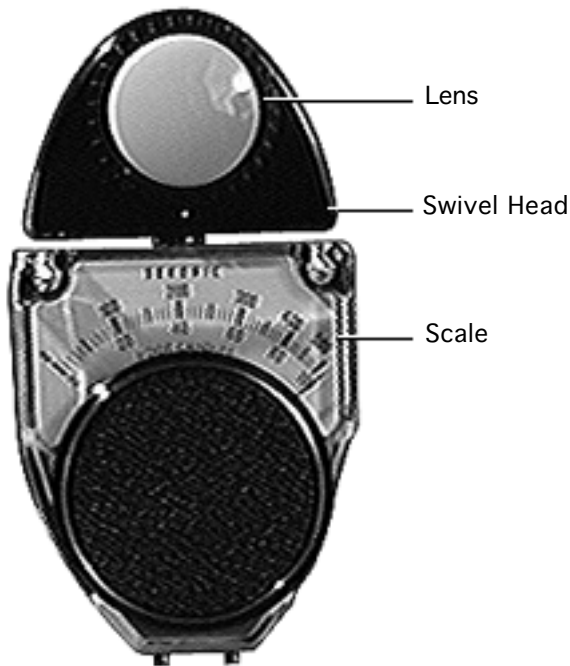




Model L-248

- 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.



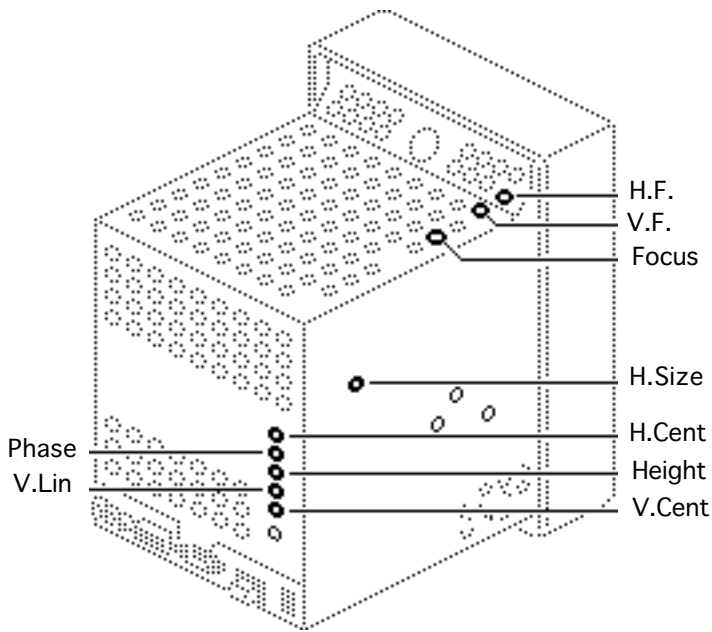


Model 246

- 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.

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





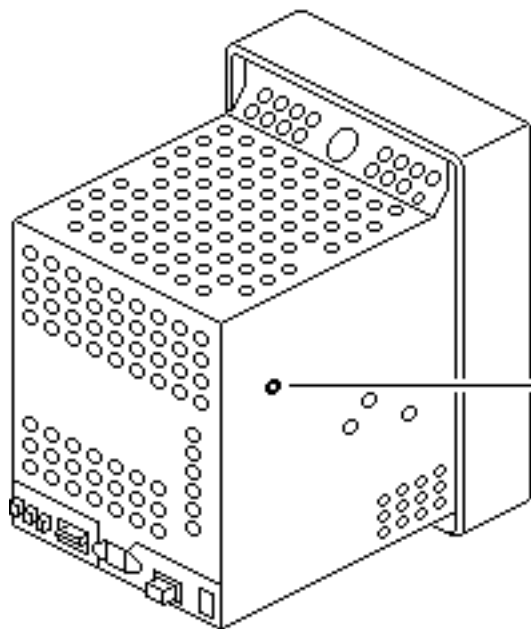
Geometry

Before you begin, remove the rear cover.

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

Note: Geometry adjustments may be necessary whenever you replace the power/sweep board.



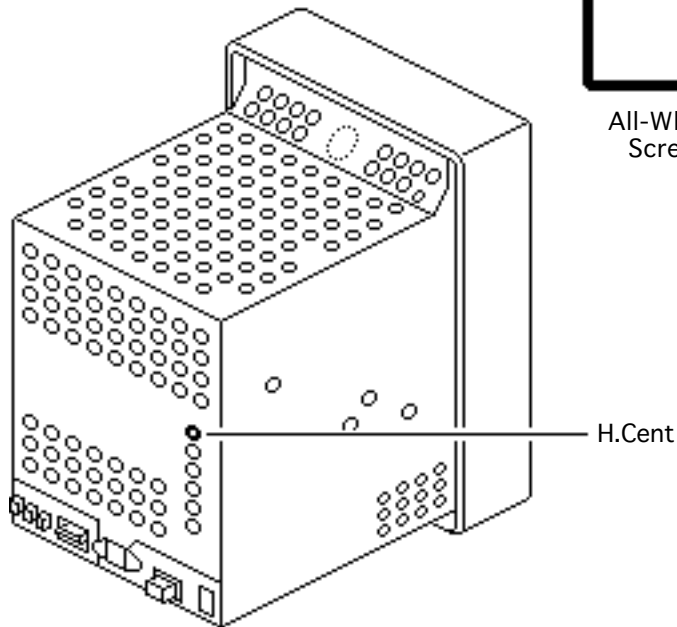
All-White
Screen

H.Size

Horizontal Size

- 1 Use Display Service Utility to display the All-White Screen test pattern.
- 2 Using the plastic screwdriver, adjust the horizontal size (H.Size) control until the raster width is 8 inches ($\pm 1/8$ inch) or 203 mm (± 2 mm).



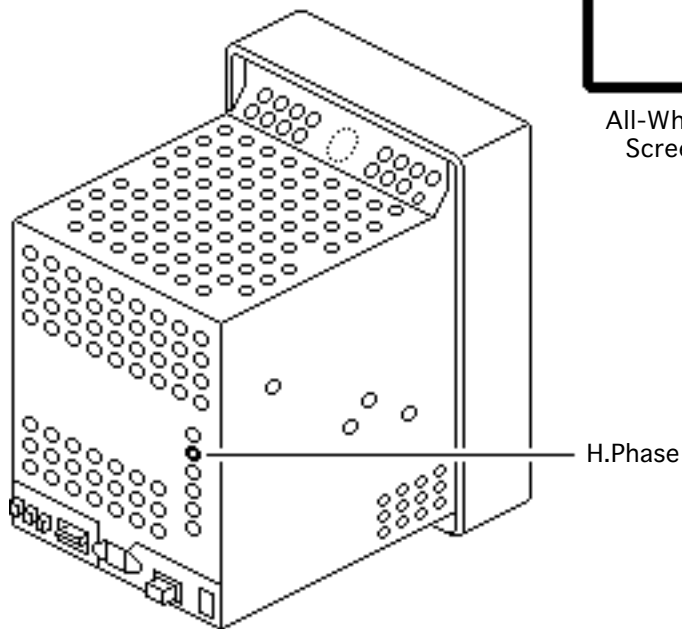


All-White
Screen

Horizontal Center

- 1 Using the plastic screwdriver, adjust the horizontal center (H.Cent) control until the raster is centered (left to right) in the display area.
- 2 Verify that the raster width is 8 inches ($\pm 1/8$ inch) or 203 mm (± 2 mm) wide. If it is not, repeat the horizontal size and horizontal center adjustments.

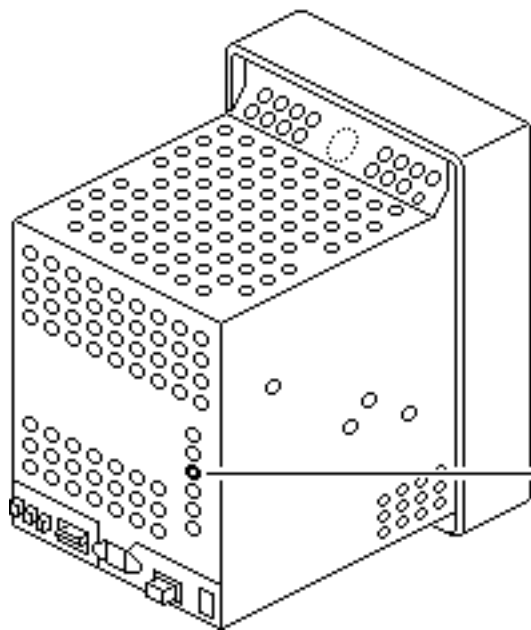




Horizontal Phase

- 1 Measure the black margin on the right side of the display. The black margin should measure 1/4 inch or 7 to 8 mm from the right edge of the white raster to the edge of the plastic bezel.
- 2 If necessary, use the plastic screwdriver to adjust the horizontal phase (H.Phase) control until the black margin is 1/4 inch or 7 to 8 mm wide.



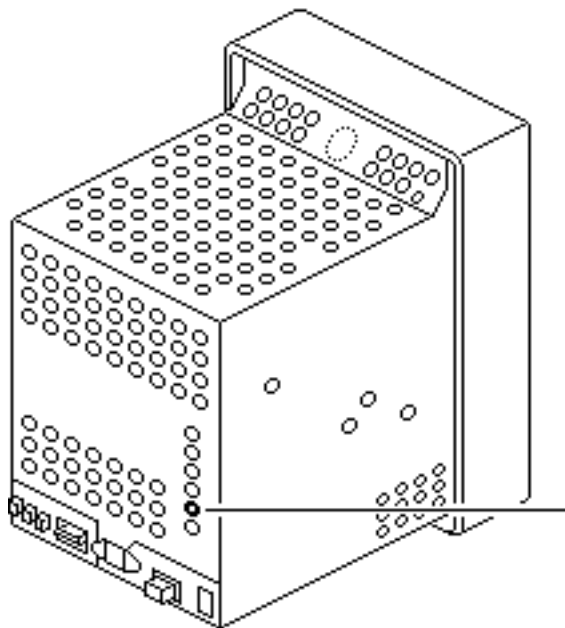
All-White
Screen

Height

Using a plastic screwdriver, adjust the height control until the raster height is 10 7/8 inches ($\pm 1/8$ inch) or 276 mm (± 2 mm).

Height



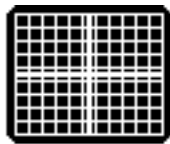
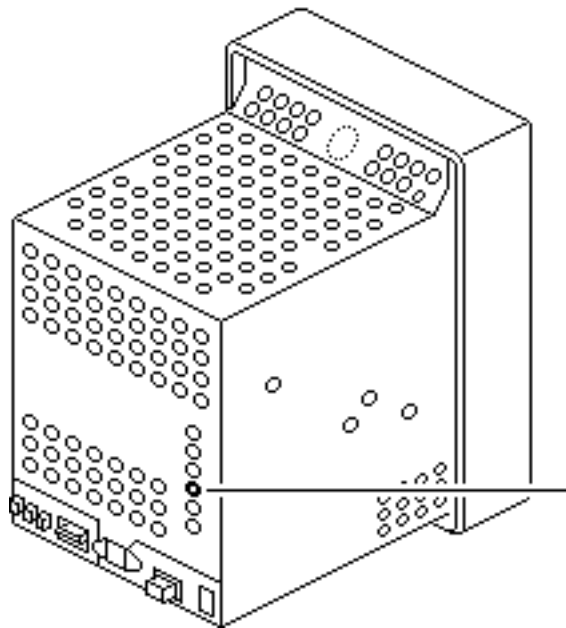


All-White
Screen

Vertical Center

- 1 Using the plastic screwdriver, adjust the vertical center (V.Cent) control until the raster is centered (top to bottom) in the display area.
- 2 Verify that the raster height is 10 7/8 inches ($\pm 1/8$ inch) or 276 mm (± 2 mm). If it is not, repeat the height and vertical center adjustments.



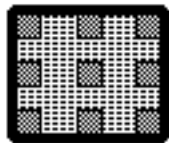
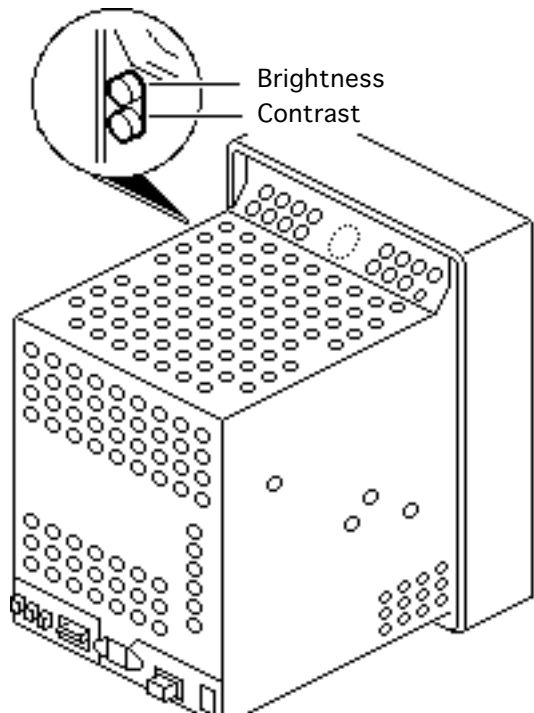


Crosshatch

Vertical Linearity

- 1 Use Display Service Utility to display the Crosshatch test pattern.
- 2 Using a plastic screwdriver, adjust the vertical linearity (V.Lin) control until the boxes at the top of the display are the same size as those at the bottom.



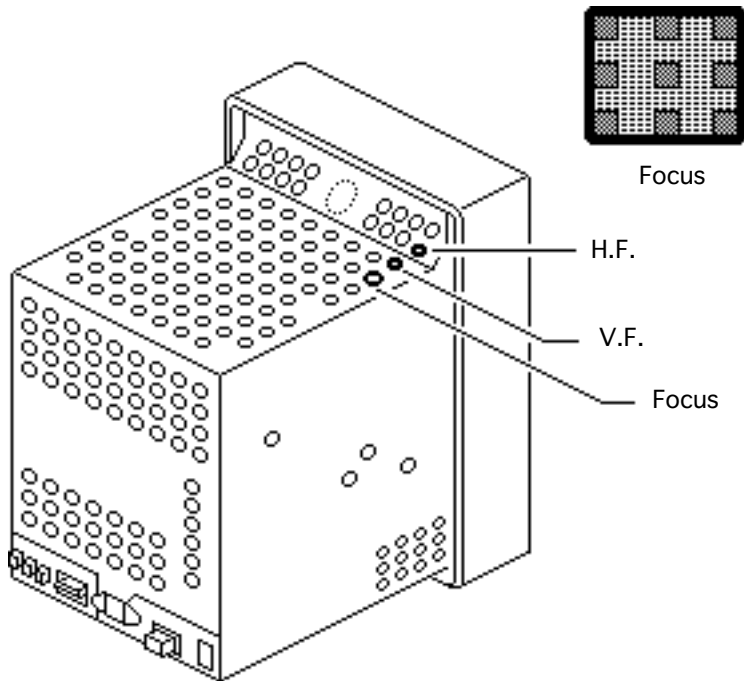


Focus

Focus

- 1 Use Display Service Utility to display the Focus test pattern.
- 2 Set the external contrast control to maximum (turn fully clockwise) and the external brightness control to the center (detent) position.





- 3 Using a plastic screwdriver, adjust the focus controls as follows:
- Adjust the focus control for the best overall focus
 - Adjust the H.F. control for the best focus along the left and right edges of the display
 - Adjust the V.F. control for the best focus at the top and bottom
 - Repeat the adjustments until you have attained the best focus possible





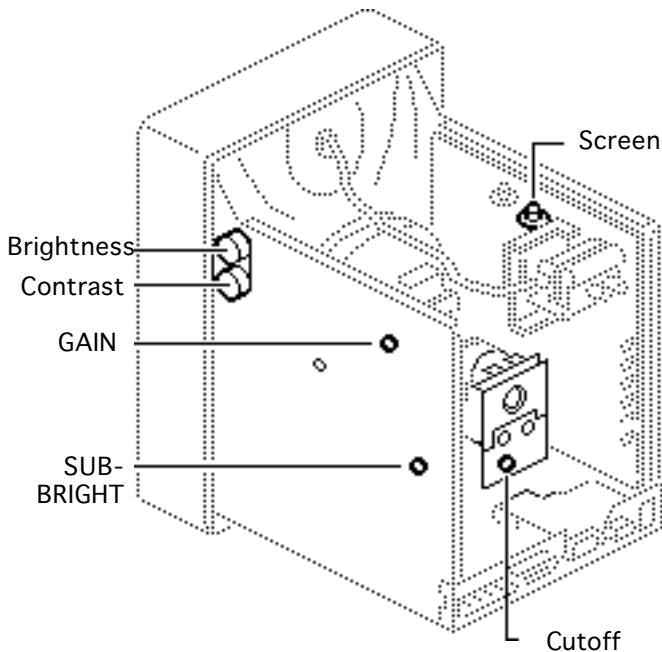
Video With Screen Control

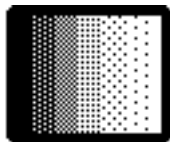
Before you begin, remove the following:

- Rear cover
- EMI shield

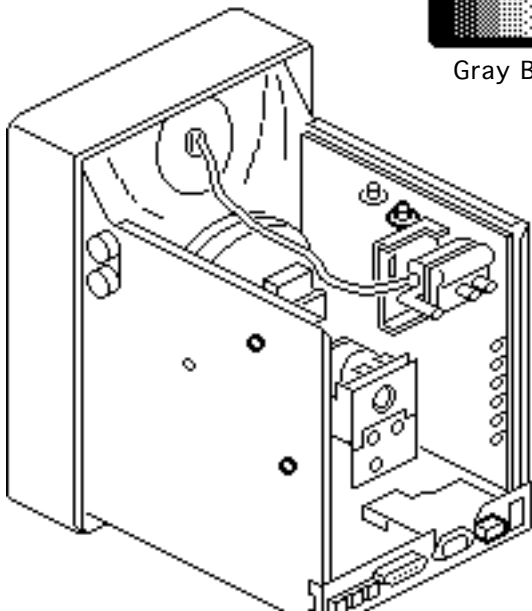
If the monitor doesn't have a screen control, go to "Video Without Screen Control."

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





Gray Bars

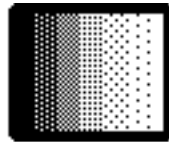


Caution: To prevent damaging the monitor, reinstall the signal input board with the two mounting screws.

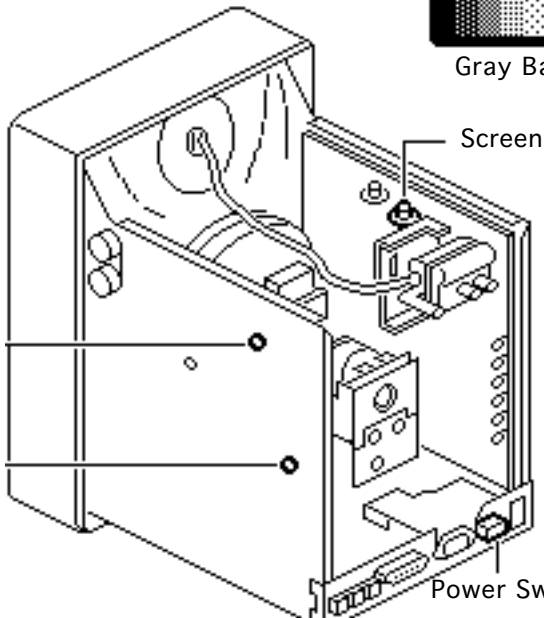
Note: Perform the video adjustments whenever the CRT or video board has been replaced or the display appears to be maladjusted.

- 1 Switch on the monitor and let it warm up for at least 10 minutes.
- 2 Use Display Service Utility to display the Gray Bars test pattern.



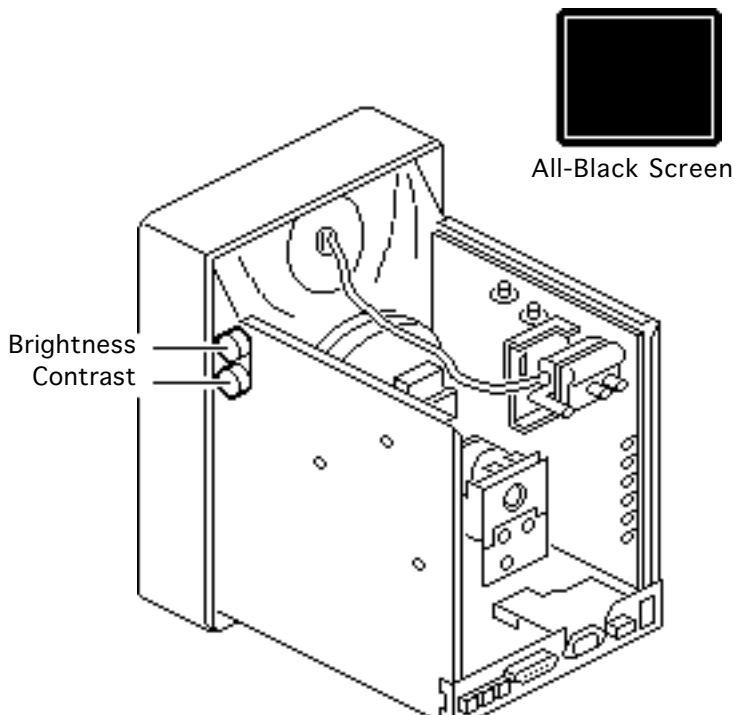


Gray Bars



- 3 Using a plastic screwdriver, preset the following controls:
- Screen control to maximum (turn fully clockwise)
 - GAIN control to its midpoint
 - SUB-BRIGHT control to maximum (turn fully clockwise)

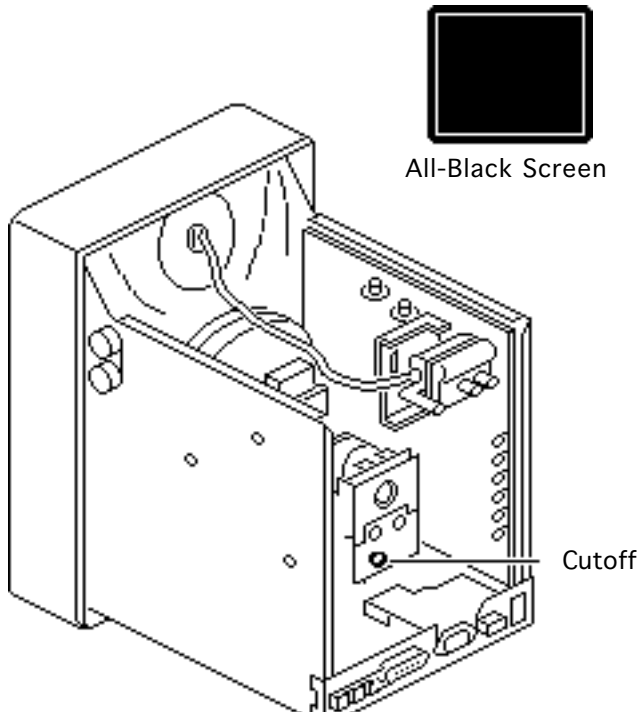




Cutoff

- 1 Use Display Service Utility to display the All-Black Screen test pattern.
- 2 Set the contrast control and the brightness control to maximum (turn fully clockwise).

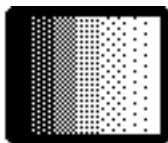




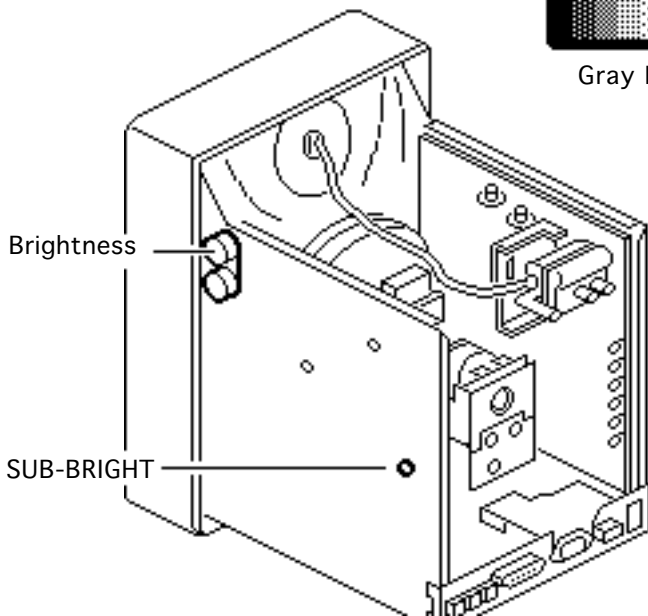
Note: If you turn the cutoff control up (clockwise) too far, the monitor may shut down. If this happens, switch off the monitor, turn the cutoff control all the way down, and wait 30 seconds. Then resume the adjustment.

- 3 Using the plastic screwdriver, adjust the cutoff control clockwise until retrace lines are just visible.
- 4 Then turn the cutoff control counterclockwise until the retrace lines just disappear.





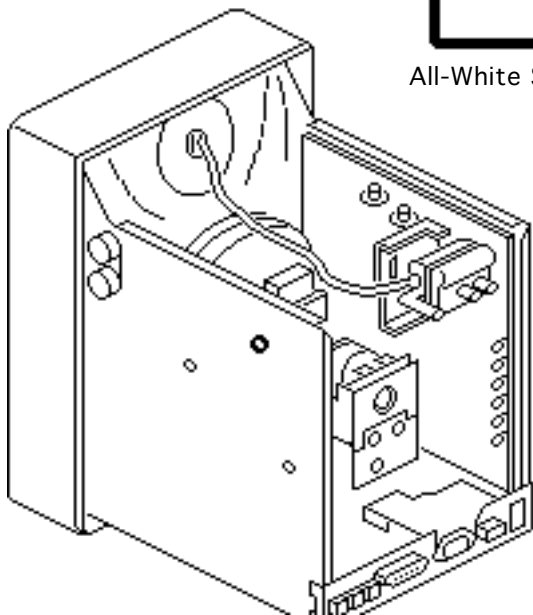
Gray Bars



Sub-Brightness

- 1 Use Display Service Utility to display the Gray Bars test pattern.
- 2 Set the brightness control to the center (detent) position.
- 3 Set the SUB-BRIGHT control so that the leftmost bar is completely black.





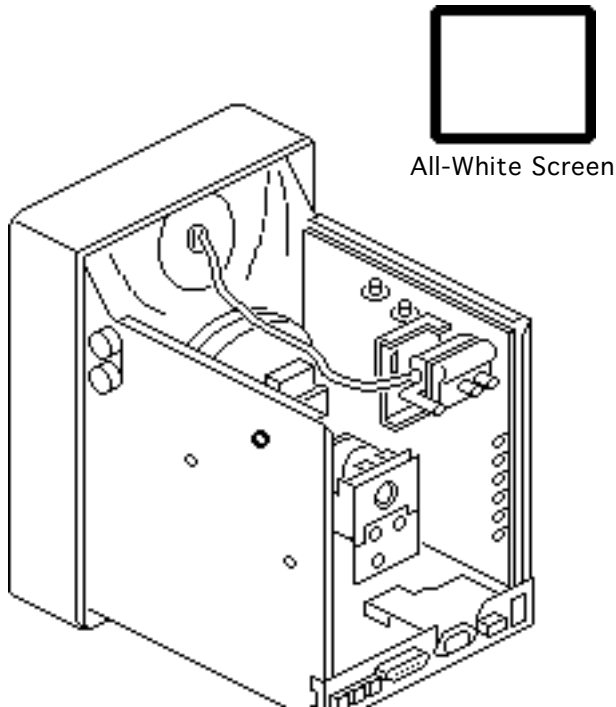
All-White Screen

Screen Luminance

- 1 Use Display Service Utility to display the All-White Screen test pattern.

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” in this chapter.)

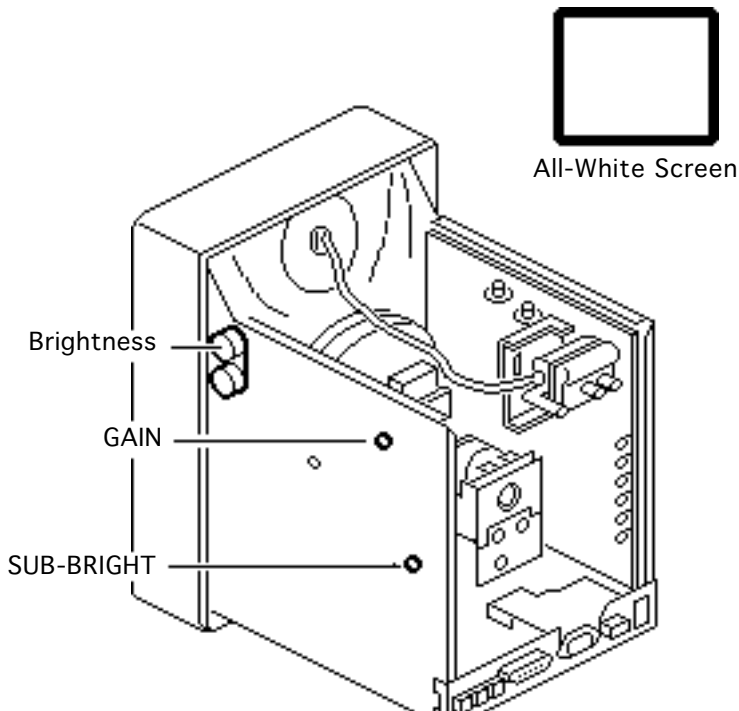




- 2 Measure screen luminance with the light meter. You should get 40 foot lamberts (± 3 foot lamberts), which on the light meter is
- Model R77: 29 on the bottom scale
 - Model L-248: 10 to 11 on the 10-18 scale
 - Model 246: 29 on the red scale

Important: Over time, light meter tolerances can vary. If in doubt, verify the readings with a known-good light meter or photometer.





- 3 Set the brightness control to the center position, and recheck the screen luminance. The reading should not go beyond 60 fL, which on the light meter is
 - Model R77: 40 on the bottom scale
 - Model L-248: 11 to 12 on the 10-18 scale
 - Model 246: 40 on the red scale
- 4 If necessary, repeat the SUB-BRIGHT and GAIN adjustments until you obtain a correct reading.



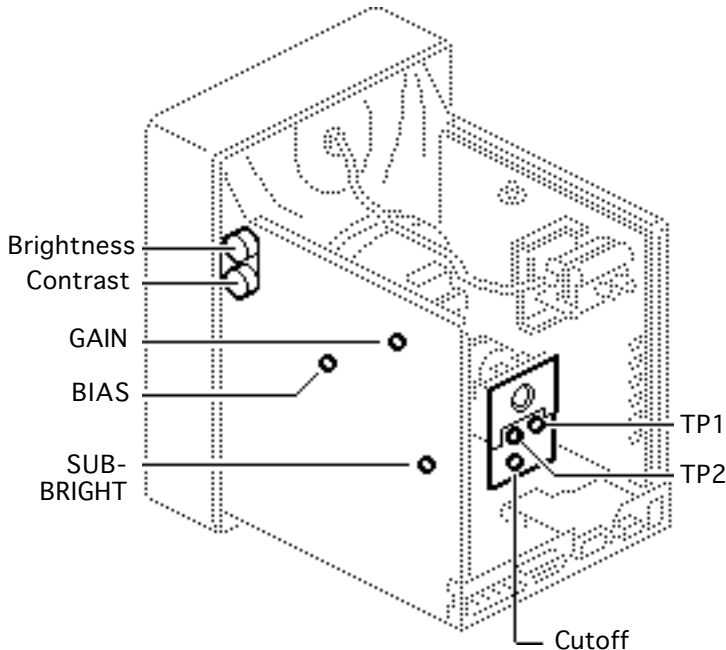


Video Without Screen Control

Before you begin, remove the following:

- Rear cover
- EMI shield

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

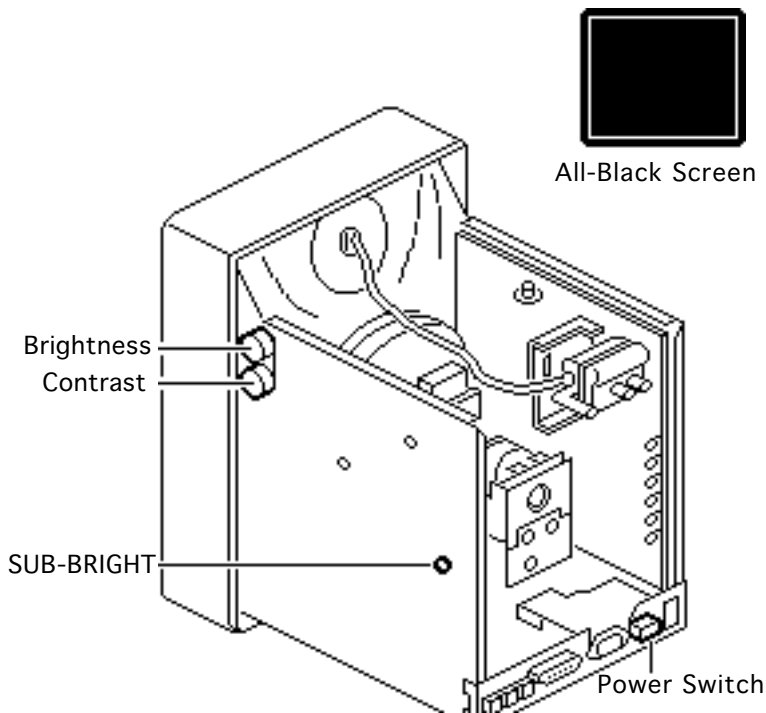




Caution: To prevent damaging the monitor, reinstall the signal input board with the two mounting screws.

Note: Perform the video adjustments whenever the CRT or video board has been replaced or the display appears to be maladjusted.

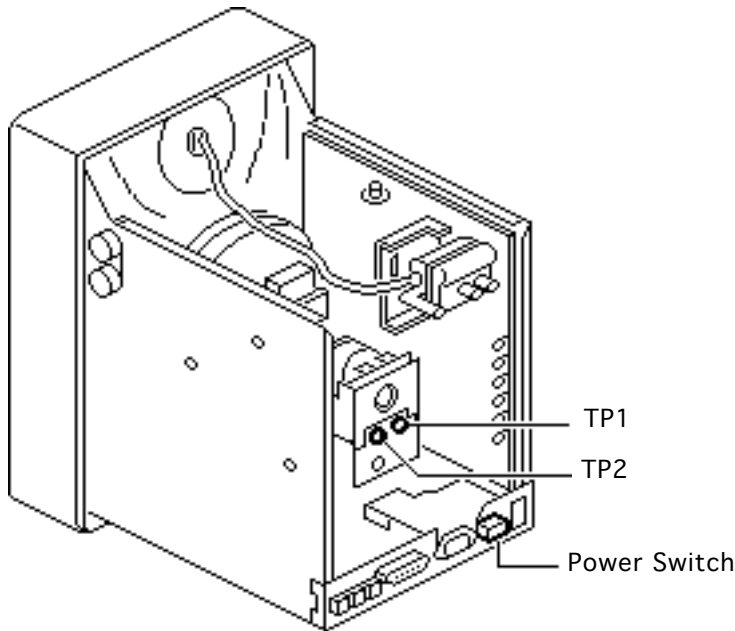




Bias

- 1 Switch on the monitor and let it warm up for at least 10 minutes.
- 2 Preset the SUB-BRIGHT control to minimum (fully counterclockwise).
- 3 Use Display Service Utility to display the All-Black Screen.
- 4 Set the brightness control and contrast control to minimum (turn fully counterclockwise).



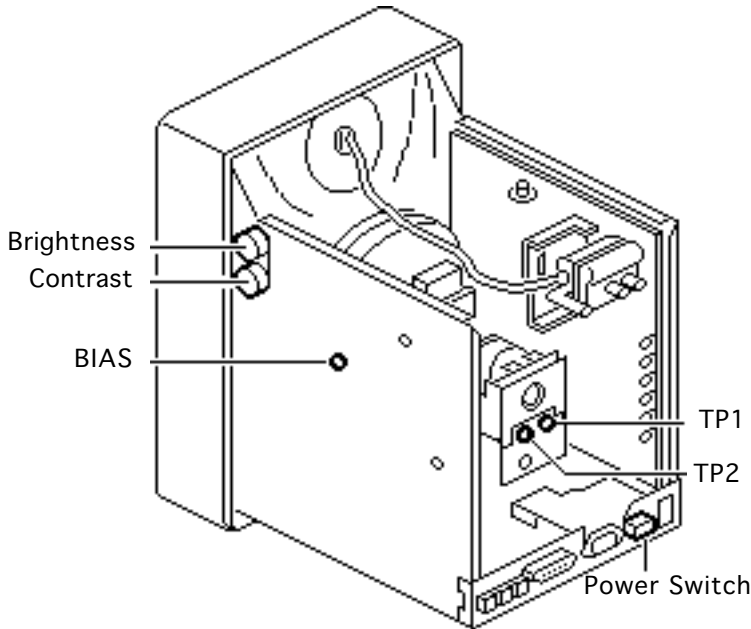


Note: For accurate voltage measurements, use two shielded alligator clip leads and a high quality DC voltmeter.

Caution: To avoid a short, switch off the monitor before connecting the alligator clips.

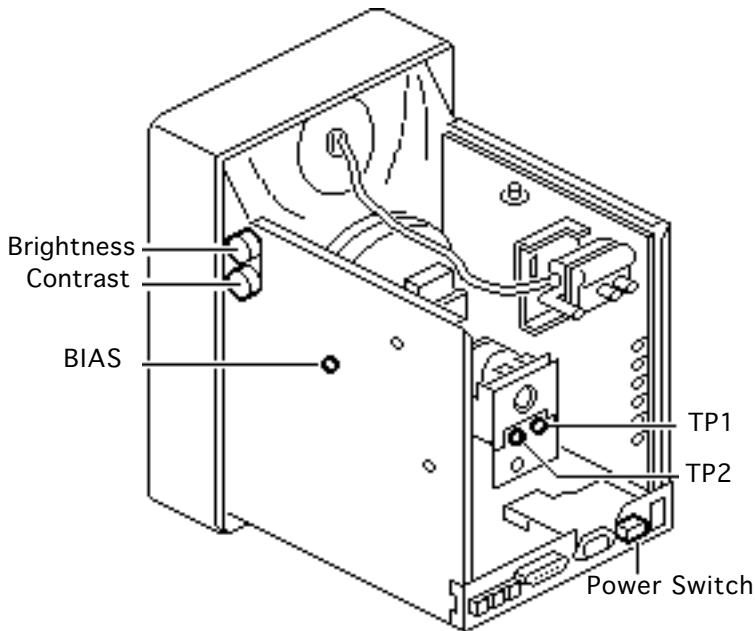
- 5 Switch off the monitor.
- 6 Connect one end of a shielded alligator clip lead to TP1 on the CRT board. Connect the other end to the positive probe of a DC voltmeter.





- 7 Connect one end of a second shielded alligator clip lead to TP2 on the CRT board. Connect the other end to the negative probe of the DC voltmeter.
- 8 Switch on the monitor.
- 9 Adjust the BIAS control with a plastic screwdriver until the voltmeter measures 55 volts DC \pm 1.0 volt.

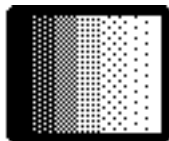




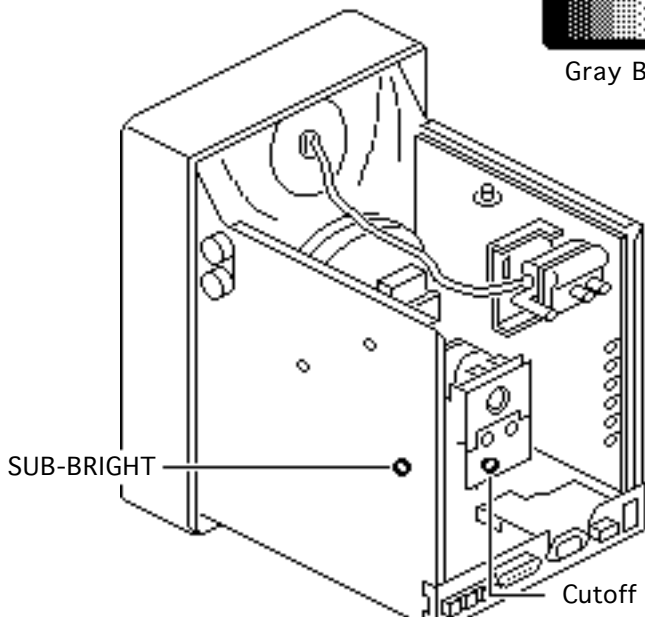
Caution: To avoid a short, switch off the monitor before disconnecting the alligator clips.

- 10 Switch off the monitor.
- 11 Disconnect the alligator clips from TP1 and TP2.
- 12 Switch on the monitor.
- 13 Set the brightness control and contrast control to maximum (turn fully clockwise).





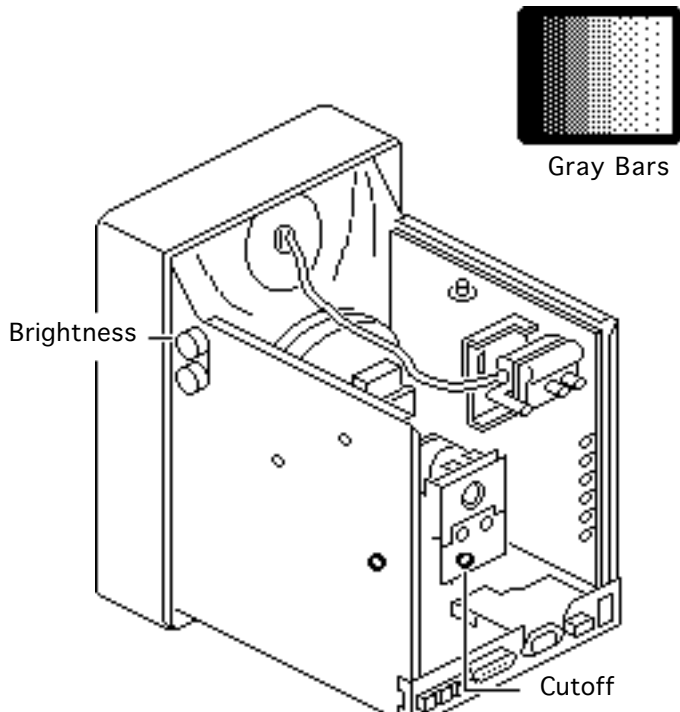
Gray Bars



Cutoff

- 1 Set the SUB-BRIGHT control to the midpoint.
- 2 Use Display Service Utility to display the Gray Bars test pattern (16 shades of gray).





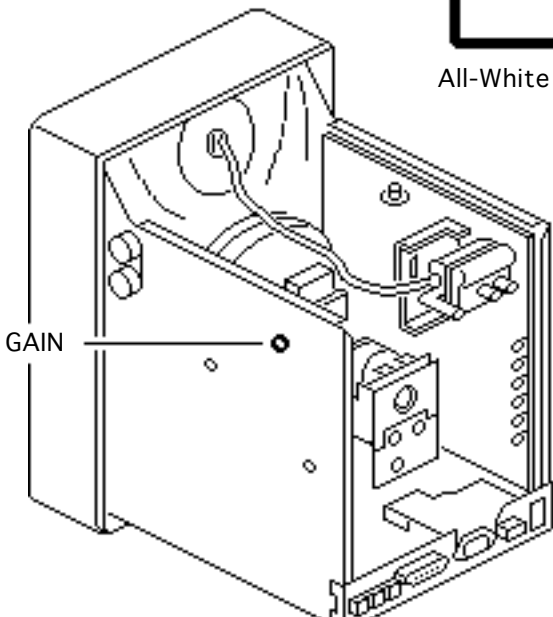
Note: If you turn the cutoff control up (clockwise) too far, the monitor may shut down. If this happens, switch off the monitor, turn the cutoff control all the way down, and wait 30 seconds. Then resume the adjustment.

- 3 Using the plastic screwdriver, adjust the cutoff control until the leftmost gray bar turns completely black.
- 4 Set the brightness control to the center (detent) position.





All-White Screen

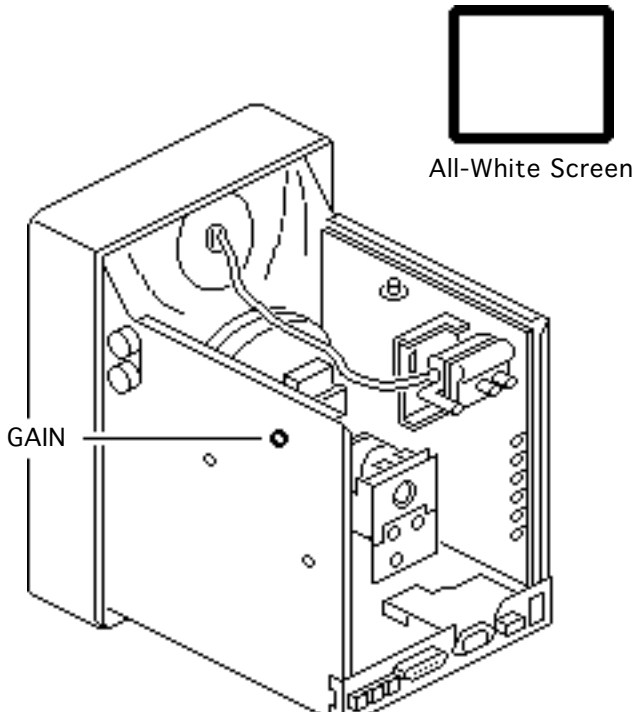


Screen Luminance

- 1 Using Display Service Utility, display the All-White Screen test pattern.

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.”)





- Using a plastic screwdriver, adjust the GAIN control until you get 40 fL, which on the light meter is
 - Model R77: 29 on the bottom scale
 - Model L-248: 10 to 11 on the 10-18 scale
 - Model 246: 29 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.





Exploded View

Macintosh Portrait Display



