



Macintosh 12 Monochrome Display





Specifications

Macintosh 12" Monochrome
Display





Characteristics

Picture Tube

12-in. diagonal screen
Combination phosphor EIA Type P104 and P193 (white),
provides “page-white” phosphor screen
High-contrast, antiglare surface; dark glass

Screen Resolution

640x480; 76 dpi
Displays up to 256 grays simultaneously

Scan Rates

Vertical refresh rate: 66.75 Hz
Horizontal scan rate: 35.0 kHz
Rise and fall time: 16 ns maximum





**Active Video
Display Area**

8.35 in. by 6.26 in. (212 mm by 159 mm)

Input Signal

Video: analog; RS-343 standard





Controls

User Controls

Rear panel: power switch

Right side: brightness and contrast controls





Physical and Electrical

Power Supply

Universal power supply

Voltage: 90-132 and 190-270 VAC

Frequency: 47-63 Hz

Power: 30 W maximum

Size and Weight

Height: 12.2 in. (310 mm)

Width: 14.4 in. (365 mm)

Depth: 10.2 in. (259 mm)

Weight: 16 lb. (7.3 kg)





Operating Environment

Temperature	50°F–104°F (10°C–40°C)
Humidity	95% maximum, noncondensing
Altitude	10,000 ft. (3,048 m) maximum





Troubleshooting

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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 Verify that power cord is connected.
- 3 Check internal power connections.
- 4 Replace blown fuse.
- 5 Replace main 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 brightness and contrast knobs.
- 3 Adjust sub-brightness control.
- 4 Replace main board.
- 5 Replace contrast/brightness assembly.
- 6 Replace CRT.





Geometry

Cannot center raster

- 1 Verify that distortion is not due to environmental conditions.
Move monitor to different location.
- 2 Replace main board.

Raster stretched or
compressed on side or
top of screen

- 1 Verify that distortion is not due to environmental conditions.
Move monitor to different location.
- 2 Replace main board.
- 3 Replace CRT.





Synchronization

Picture breaks into diagonal lines

- 1 Connect another monitor and verify that video signal is coming from computer.
- 2 Replace main board.

Picture rolls vertically

- 1 Verify that video card in computer is working properly.
- 2 Replace main board.

One horizontal or vertical line appears on screen

- 1 Check yoke connectors.
- 2 Replace main board.
- 3 Replace CRT.





Video

Flashing lines appear on screen

- 1 Verify connection of video board to neck of CRT.
- 2 Replace contrast/brightness assembly.
- 3 Replace main board.

Picture is too dark or too bright

- 1 Adjust brightness knob.
- 2 Verify that video card in computer is working properly.
- 3 Adjust sub-brightness control.
- 4 Replace main board.
- 5 Replace CRT.

Cannot adjust brightness

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





Video (Continued)

Out of focus

- 1 Perform focus adjustments.
- 2 Replace main board.
- 3 Replace CRT.





Miscellaneous

Picture jitters

- 1 Verify that grounding cables are attached to chassis.
- 2 Verify that adjacent computer equipment is properly grounded. Move electrical devices away from monitor. Temporarily shut off all fluorescent lights in area.
- 3 Replace main board.

Black spots on screen
(burnt phosphors)

Replace CRT.





Take Apart

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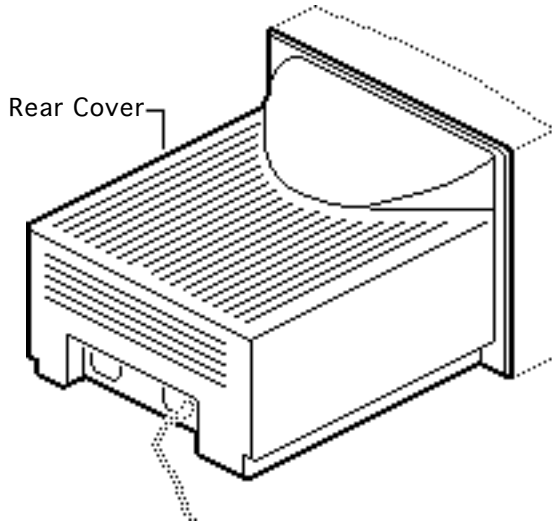


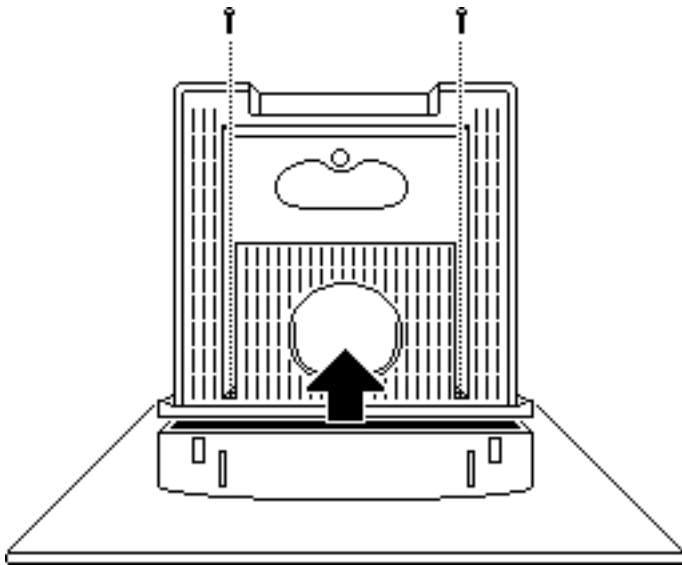


Rear Cover

No preliminary steps are required before you begin this procedure.

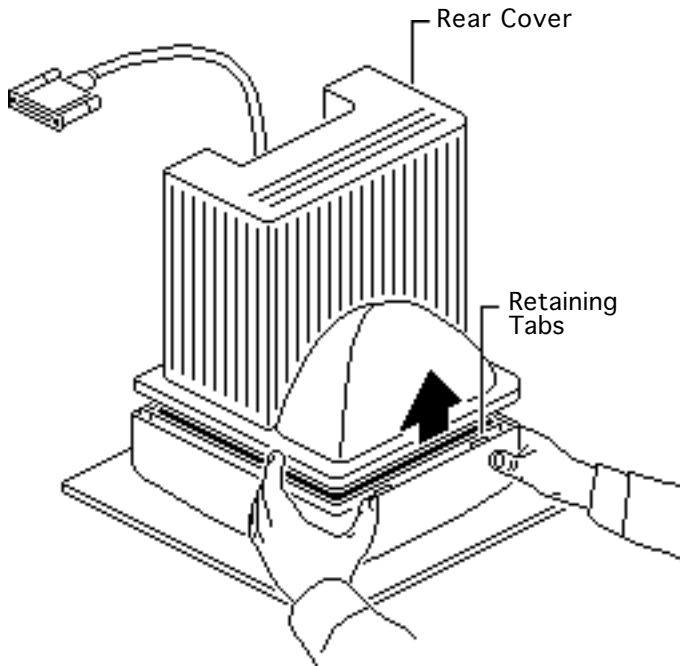
⚠ Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.





- 1 Using a Torx screwdriver, remove the two case screws.
- 2 Separate the bottom of the rear cover from the bezel.





- 3 Press on the rear edge of the bezel and at the same time press up on the rear cover. This will release the two retaining tabs on the top front of the rear cover.
- 4 Lift the rear cover off the front bezel and feed the attached video cable through its opening in the cover.





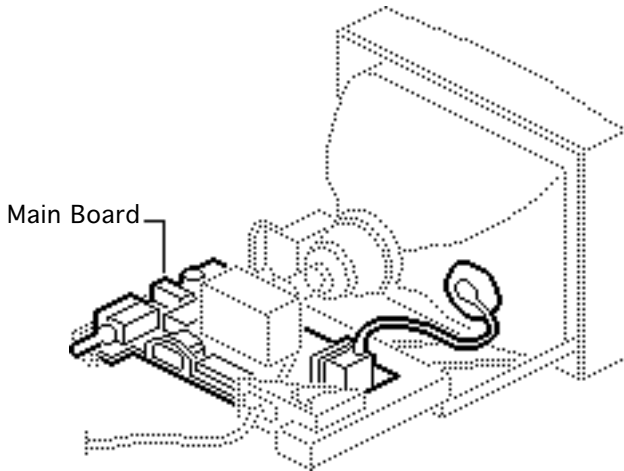
Main Board

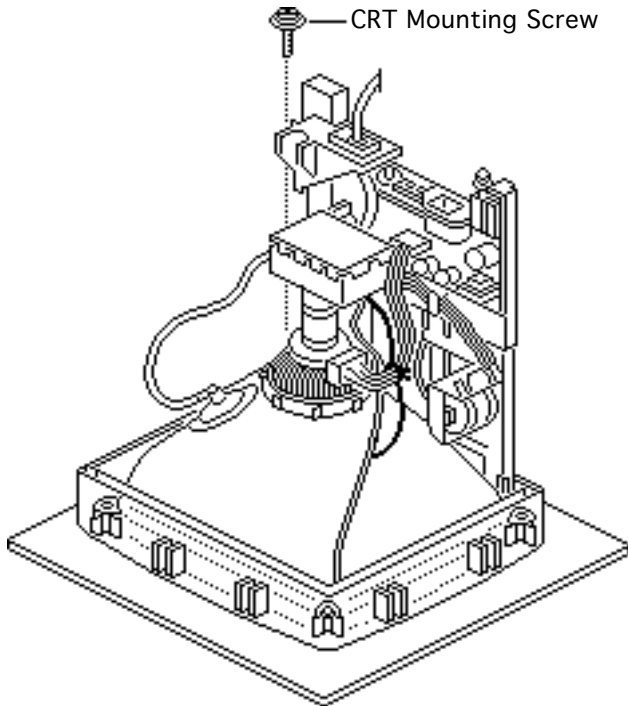
Before you begin,

- 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.

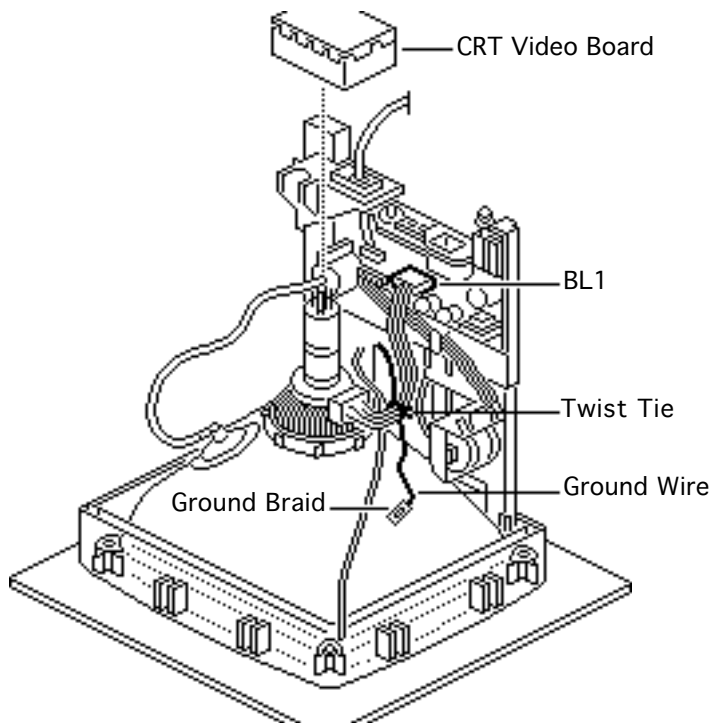
⚠ Warning: Never use a grounding wriststrap until after discharging the CRT.





- 1 Using a Phillips screwdriver, remove the CRT mounting screw shown. Loosen but do not remove the other three CRT mounting screws.



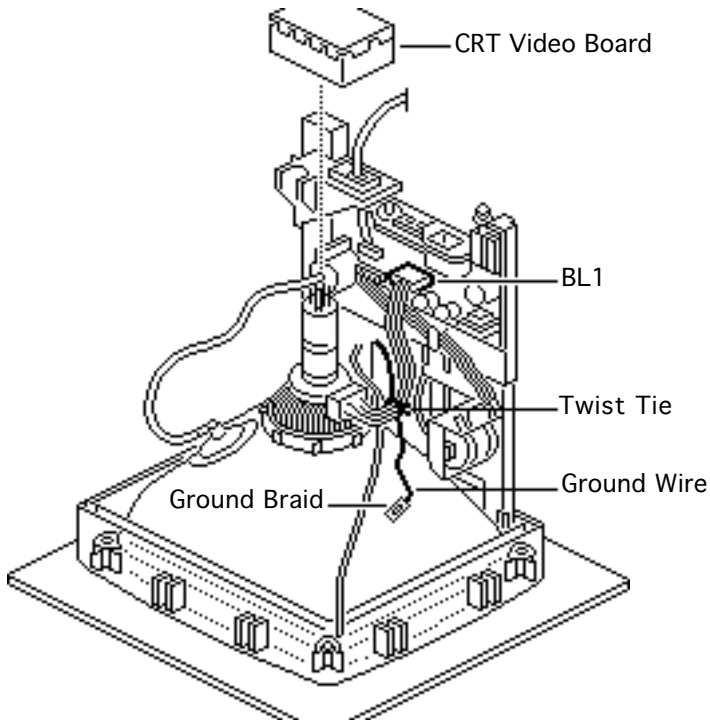


- 2 Caution:** The neck of the CRT is easily damaged. Use caution when removing the CRT video board from the CRT neck. The cables between the board and the neck are very short.

Grasp the sides of the CRT video board and pull the board straight up to remove it from the neck of the CRT.

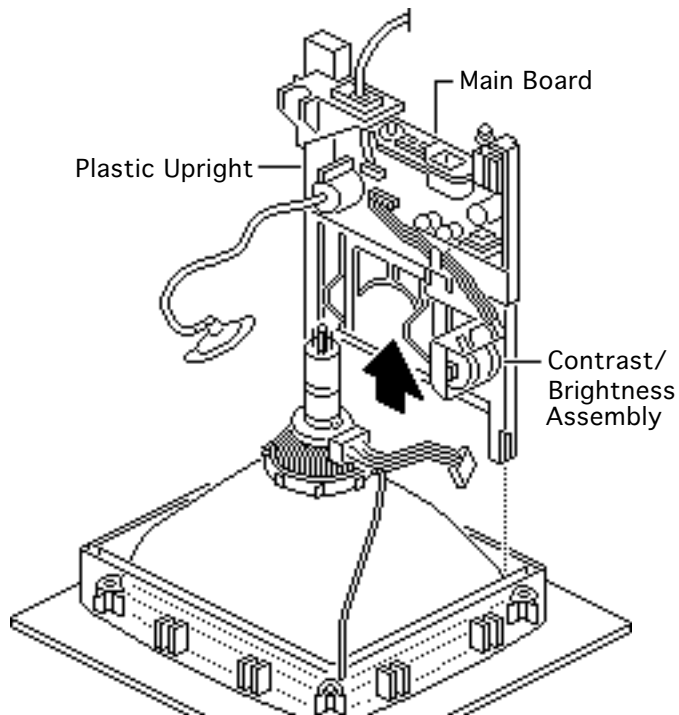
- 3** Carefully disconnect connector BL1 from the main board.





- 4 Remove the twist tie that holds the cable to the ground (black) wire.
- 5 Disconnect the black ground wire from the silver ground braid.





- 6 Grasp the contrast/brightness assembly with one hand and the plastic upright on the left. Pull straight up and remove the main board.

Replacement Note: If you replace the main board, perform the geometry and video adjustment procedures. See “Geometry” and “Video” in Adjustments.

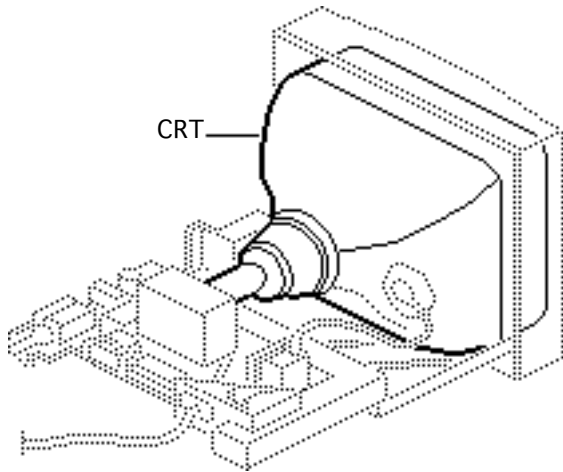




CRT

Before you begin,

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



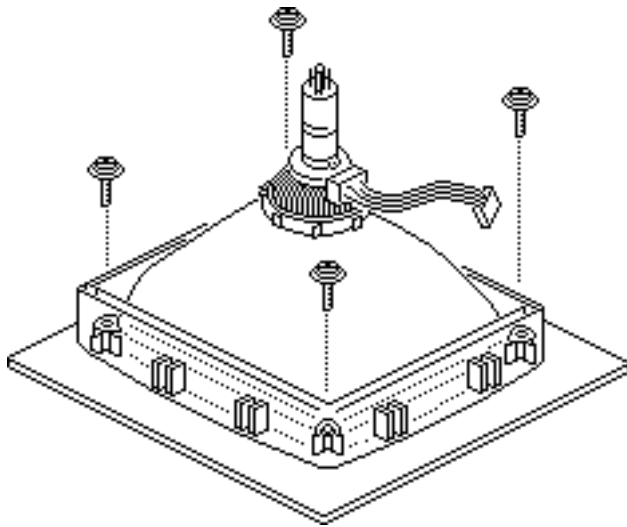
⚠ Warning: This product contains high voltage and a high-vacuum picture tube. To prevent serious injury, review CRT safety in Bulletins/Safety.

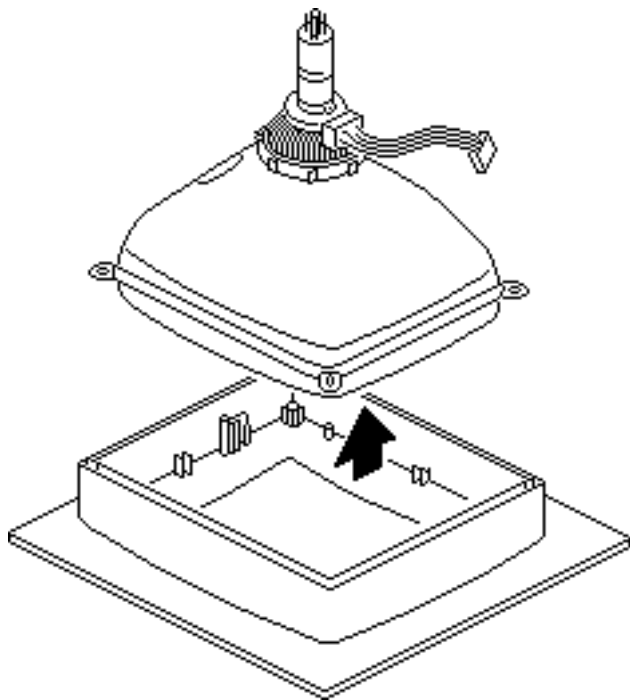
⚠ Warning: Never use a grounding wriststrap until after discharging the CRT.





- 1 Remove the four screws that hold the CRT to the front bezel.





- 2 **Caution:** The neck of the CRT is easily damaged. Do not grab the neck of the CRT to remove it from the bezel. If necessary, have a helper hold down the bezel while you hold the CRT by its edges and remove it.

Lift the CRT out of the bezel.

Note: If you intend to dispose of the CRT, review the CRT disposal instructions in Bulletins/Safety.



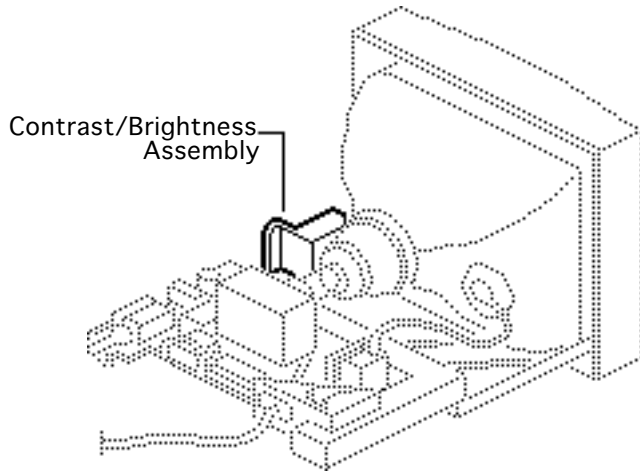


Replacement Note: If you replace the CRT, perform the video adjustment procedure. See “Video” in Adjustments.





Contrast/ Brightness Assembly

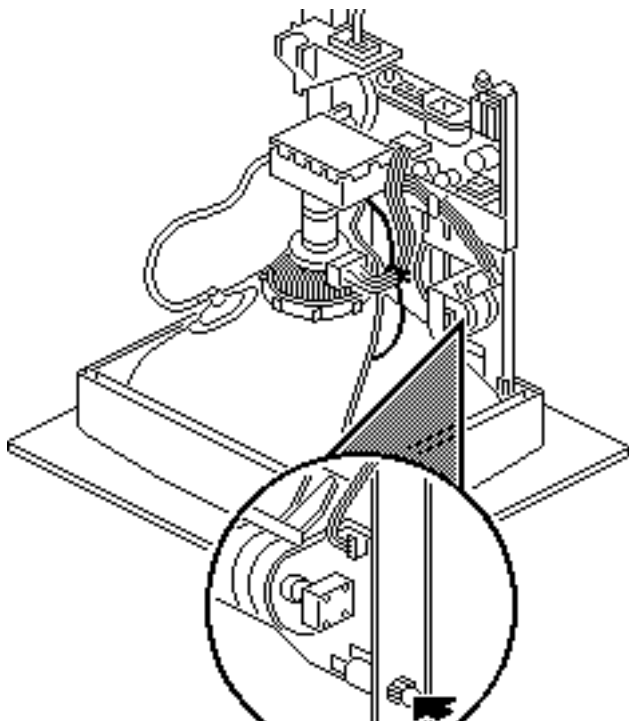


Before you begin,

- Remove the rear cover
- Discharge the CRT

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

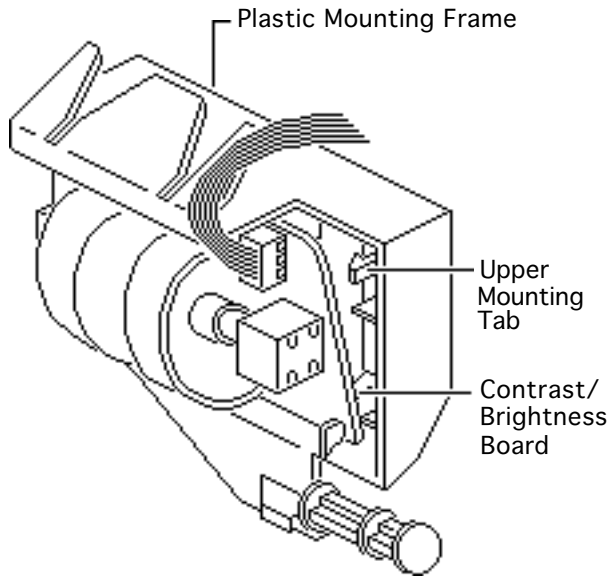




⚠ Warning: Never use a grounding wriststrap until after discharging the CRT.

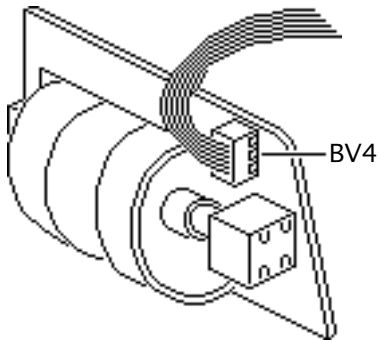
- 1 Push up on the plastic mounting post (see detail) and remove the contrast/brightness assembly from the deflection board. (The post will snap out of the deflection board mounting frame.)





- 2 Push out on the upper mounting tabs, pull up on the cable, and remove the contrast/brightness board from the plastic mounting frame.





- 3 Caution:** To avoid damaging the contrast/brightness board, be sure to contact only connector BV4 cable wires with the soldering iron. Desolder one wire at a time, and remove as much solder as possible after desoldering each wire.

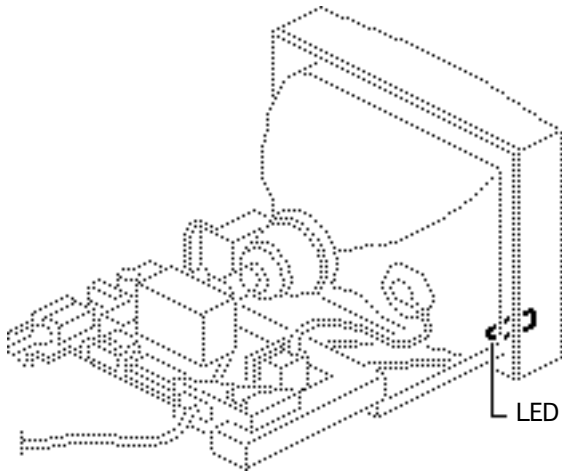
Desolder the six cable wires from BV4 at the back of the contrast/brightness board.





- 4 Pull the six cable wires loose from the board.
Using a desoldering tool, remove all remaining solder from the holes in the board.





LED

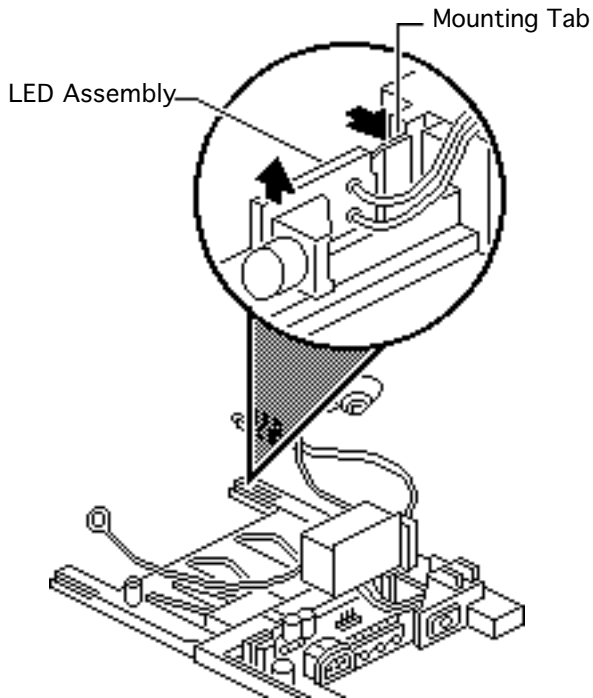
Before you begin,

- Remove the rear cover
- Discharge the CRT
- Remove the main board

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



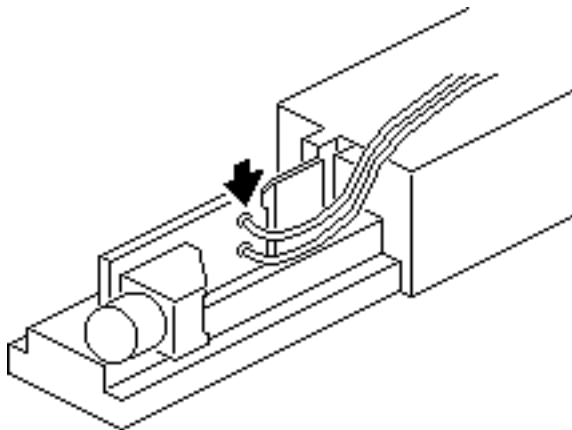


- 1 Push the mounting tab and pull up on the LED assembly to remove it.
- 2 Remove the two-wire cable from under the routing tab on the main board mounting frame.





- 3 Desolder the two wires from the back of the LED board. Using a desoldering tool, remove all solder from the mounting holes in the board.

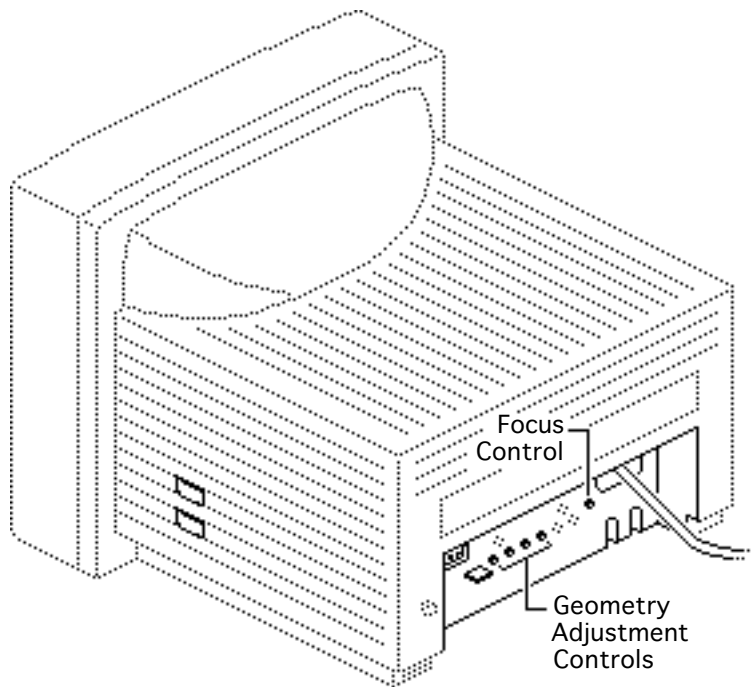




Adjustments

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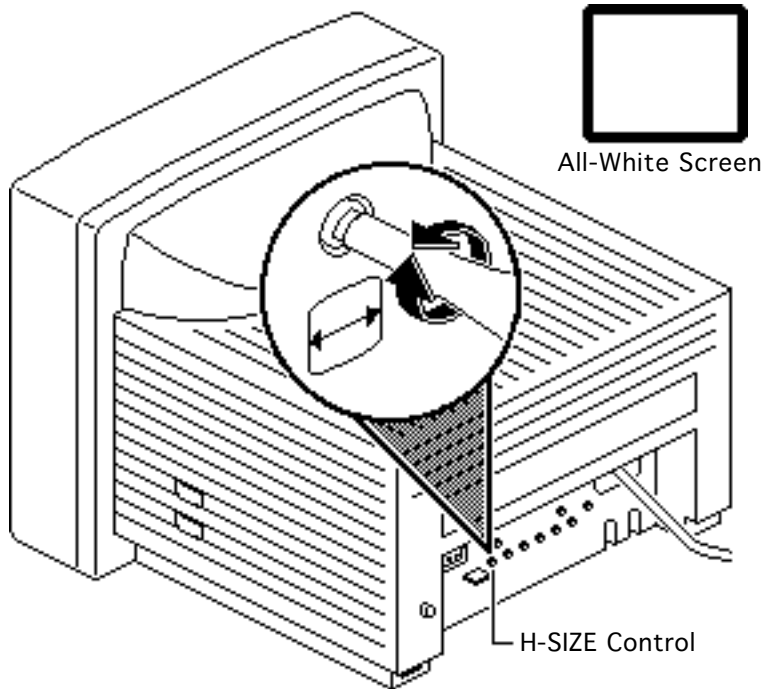
Geometry

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.

Caution: Do not attempt yoke adjustments on this display. The manufacturer performs all such adjustments.





Note: Perform geometry adjustments whenever you replace the main board.

Horizontal Size

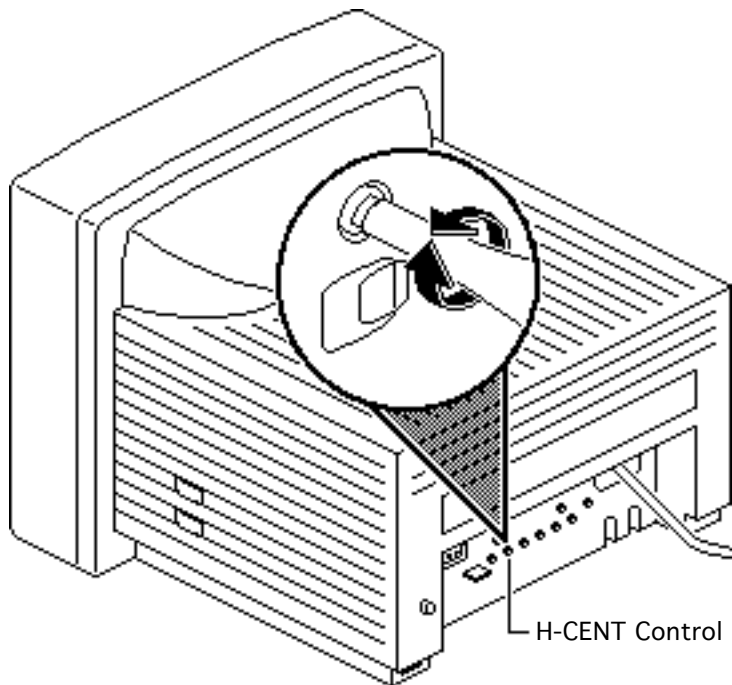
- 1 Use Display Service Utility to display the All-White Screen or Crosshatch II test pattern.
- 2 Using a plastic screwdriver, adjust the H-SIZE control until the raster is $8 \frac{7}{16}$ in. ($\pm 1/8$ in.) or 213.5 mm (± 2 mm) wide.





Horizontal Center

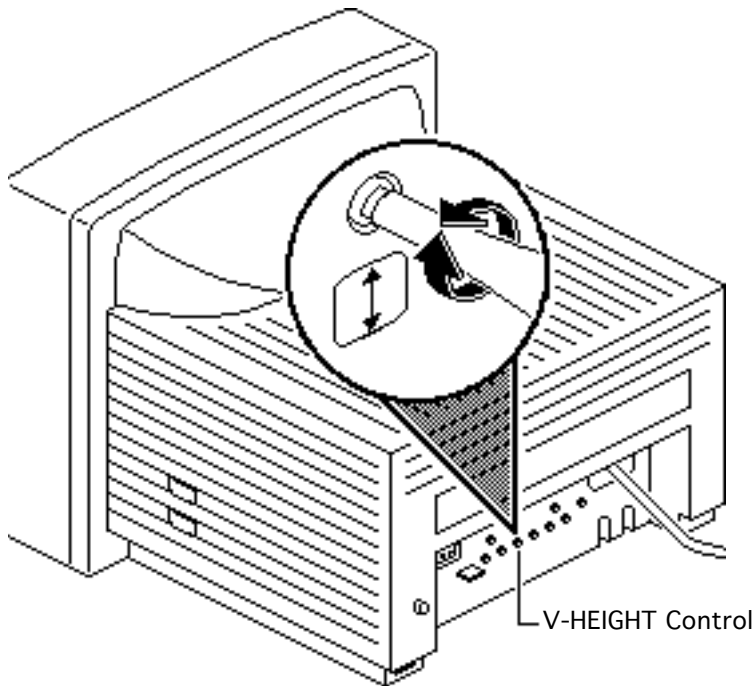
Using a plastic screwdriver, adjust the H-CENT control until the raster is positioned in the approximate center of the screen.

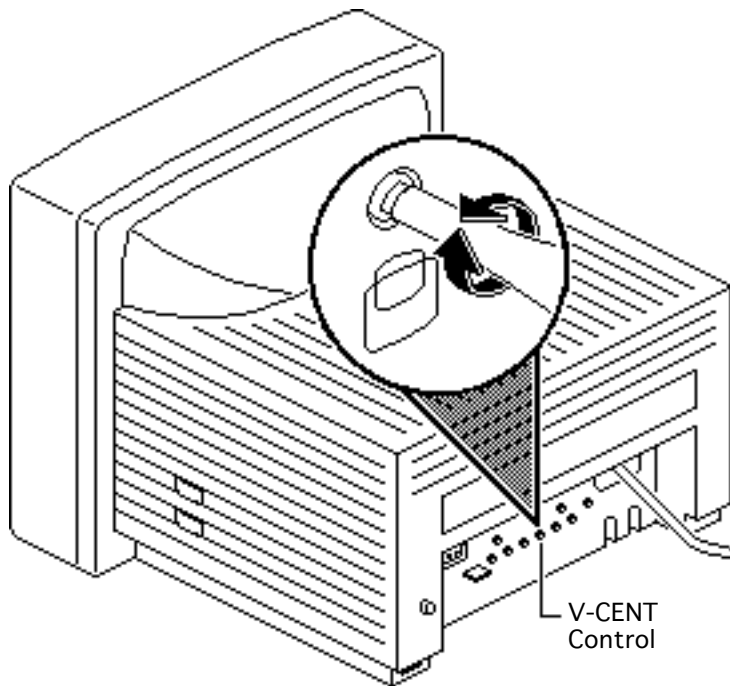




Vertical Size

Using the plastic screwdriver, adjust the V-HEIGHT control until the raster is $6 \frac{5}{16}$ in. ($\pm 1/8$ in.) or 159.5 mm (± 2 mm) high.





Vertical Center

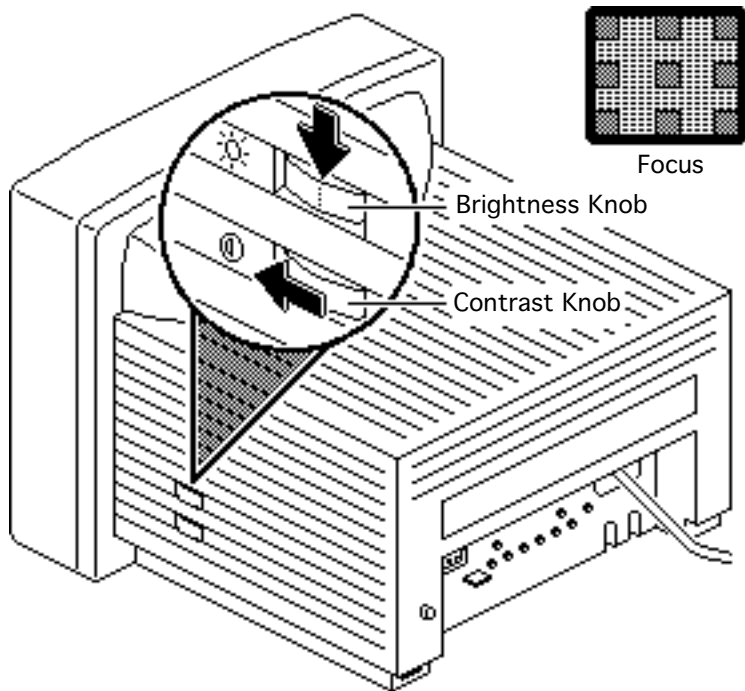
- 1 Using the plastic screwdriver, adjust the V-CENT control until the raster is positioned in the approximate center of the screen.
- 2 Verify that the raster height is $6 \frac{5}{16}$ in. ($\pm 1/8$ in.) or 159.5 mm (± 2 mm) high. If not, repeat the vertical size and vertical center adjustments.





Note: Vertical height and horizontal size affect each other. Recheck the horizontal and vertical specifications and, if necessary, repeat the adjustments.

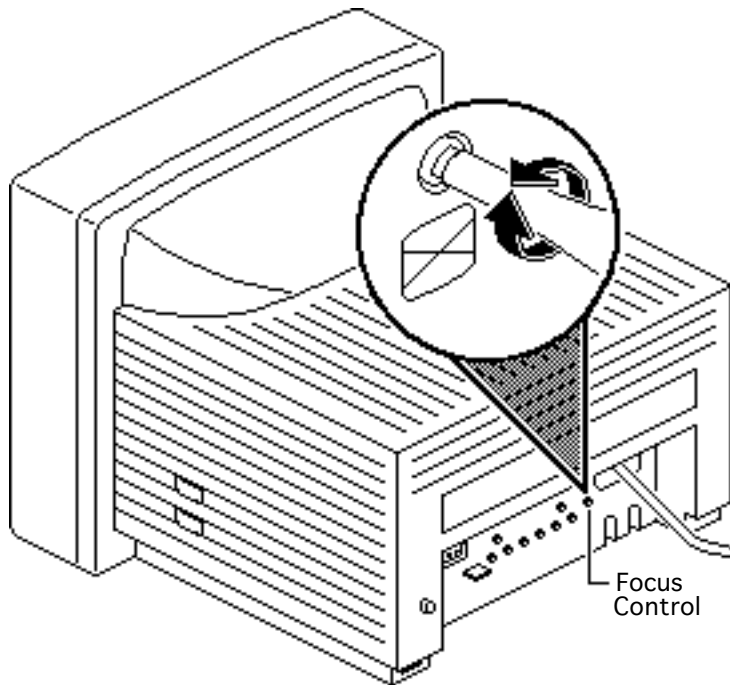




Focus

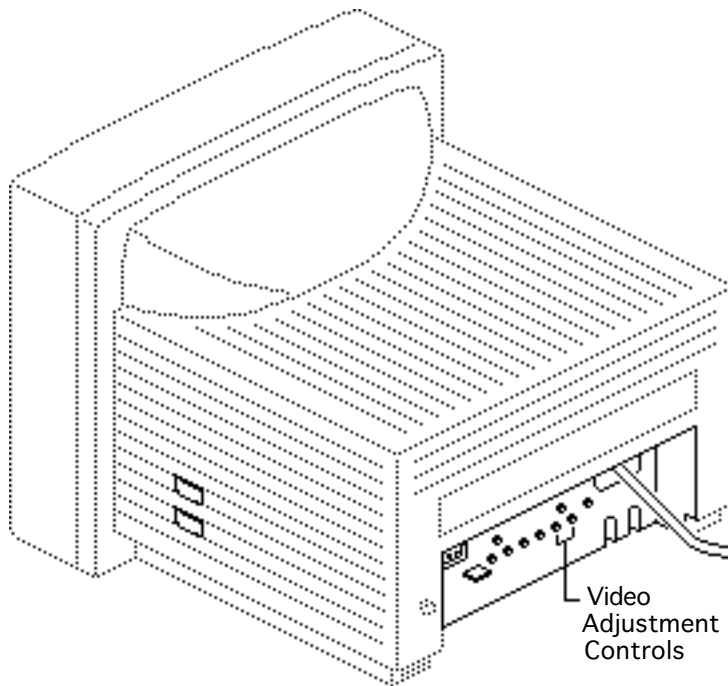
- 1 Use Display Service Utility to display the Focus test pattern.
- 2 Set the contrast knob to maximum and the brightness knob to the center (detent) position.





- 3 Using a plastic screwdriver, adjust the focus control until the Focus test pattern is as clear as possible.





Video

No preliminary steps are required before you begin this procedure.

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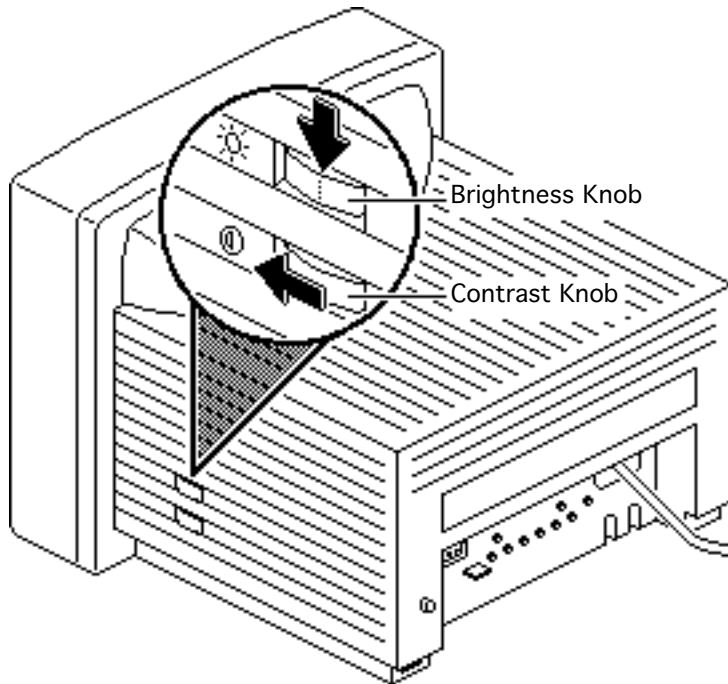




⚠ Warning: Because adjustments are made from the rear of the computer, position a mirror to view the computer screen. Do not reach around the computer to adjust the controls.

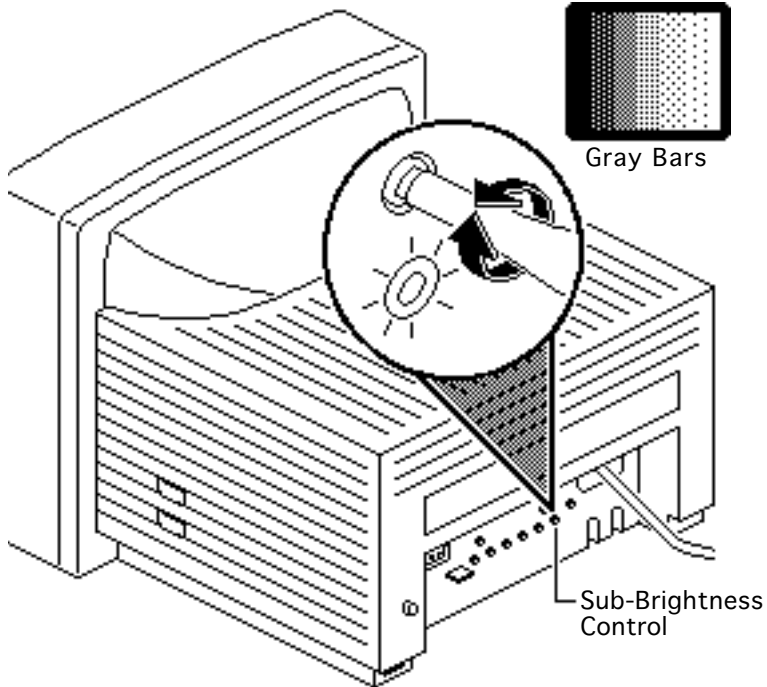
Note: Perform video adjustments whenever you replace the CRT or video board. You may need to perform video adjustments when you replace other modules.





- 1 Set the Control Panel to display 16 grays on the monitor.
- 2 Set the external (user) contrast knob to maximum and the external brightness knob to the center (detent) position.





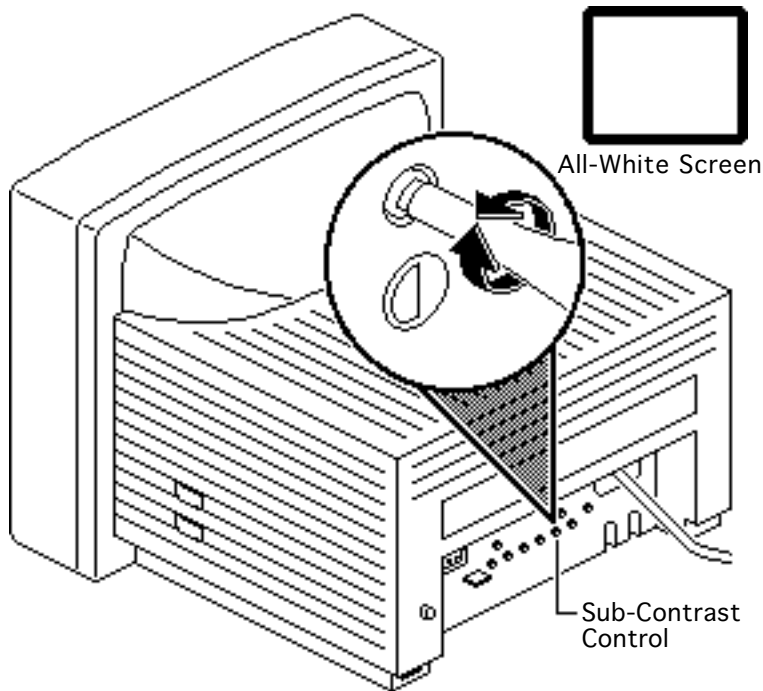
- 3 Use Display Service Utility to display the Gray Bars Screen test pattern.
- 4 Adjust the sub-brightness control until the left bar is black and the next bar is barely distinguishable from the black bar.





Note: If you adjust the sub-brightness control too high, the edges of the bars will appear dashed or irregular. To correct this problem, adjust the sub-brightness control down about a quarter-turn and then perform the sub-brightness adjustment.

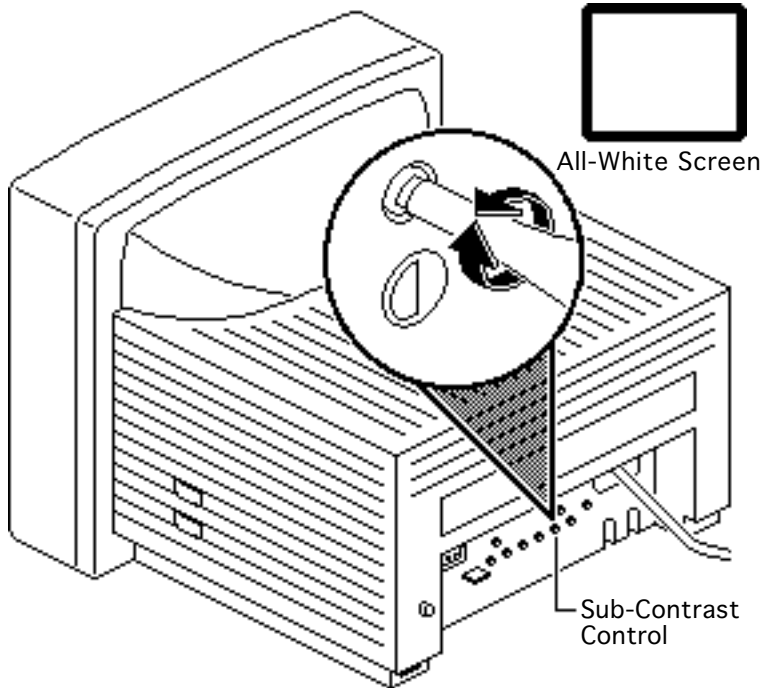




Important: Readings from light meter models R77, L-248, and 246 differ. Please note which meter you are using before making adjustments. (See “Light Meter Setup.”)

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





- 6 Using the light meter and a plastic screwdriver, adjust the sub-contrast control until you get 33 foot lamberts (± 3 foot lamberts), which on the light meter is
- Model R77: 25 on the bottom scale
 - Model L-248: middle of the 10 scale
 - Model 246: 25 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

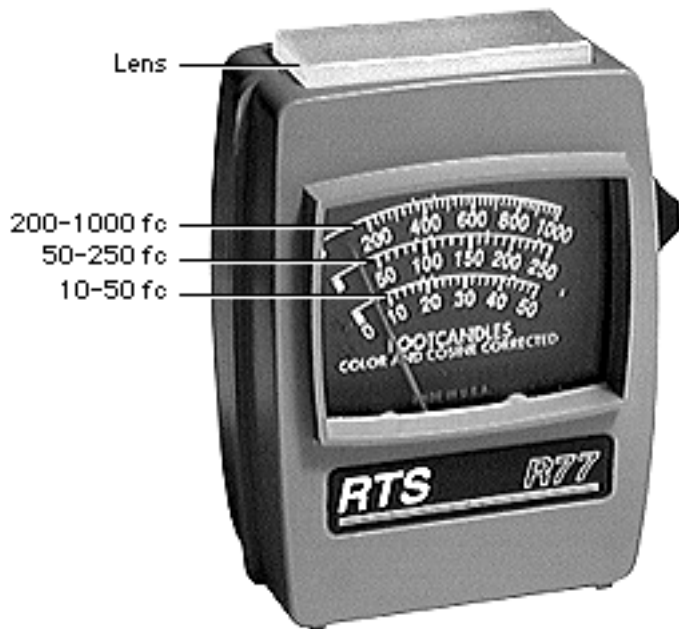
This topic covers setup for three light meter models: R77, L-248, and 246. Model R77 (Apple part number 076-0310) is the newest model available.

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





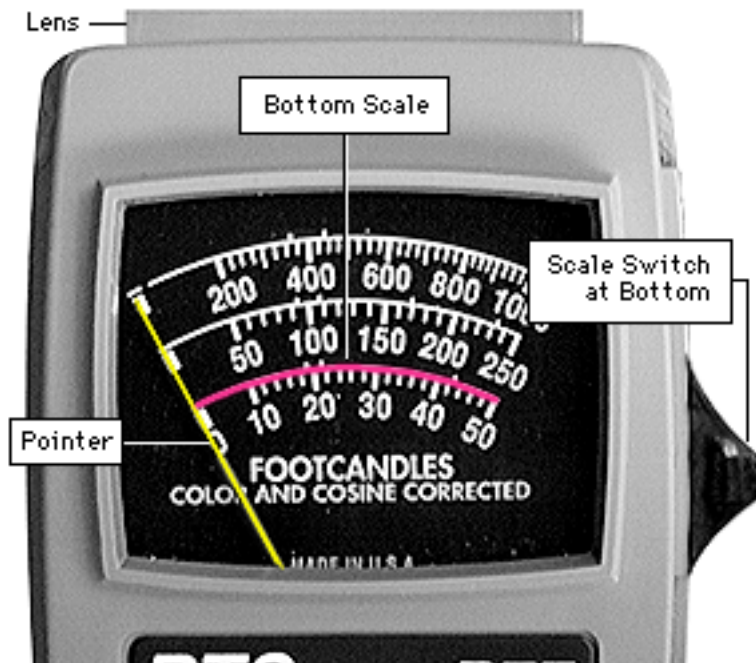
from the lens.

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

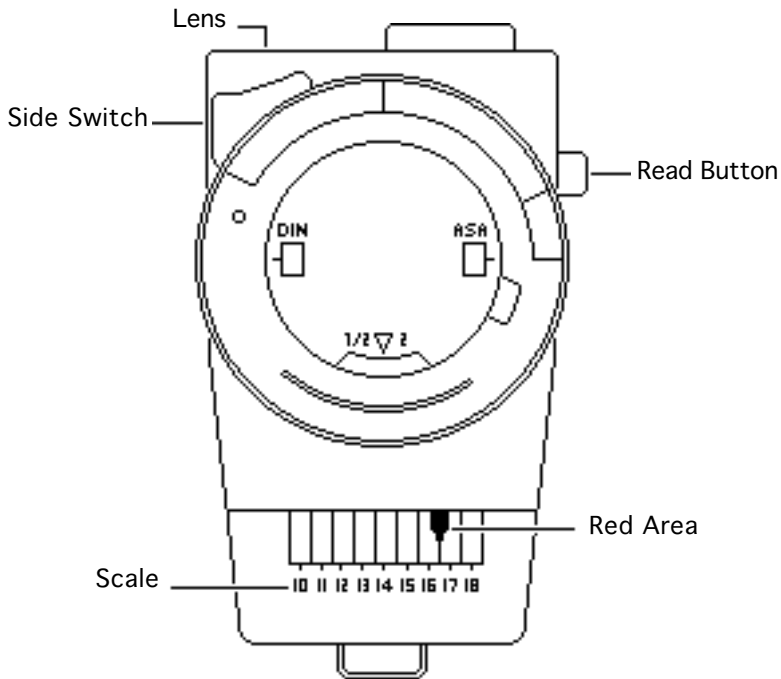




readings, verify the readings with a known-good light meter or photometer. Also check the age of the R77 light meter by its four-digit manufacturing date stamp (such as 0398 for March 1998).

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

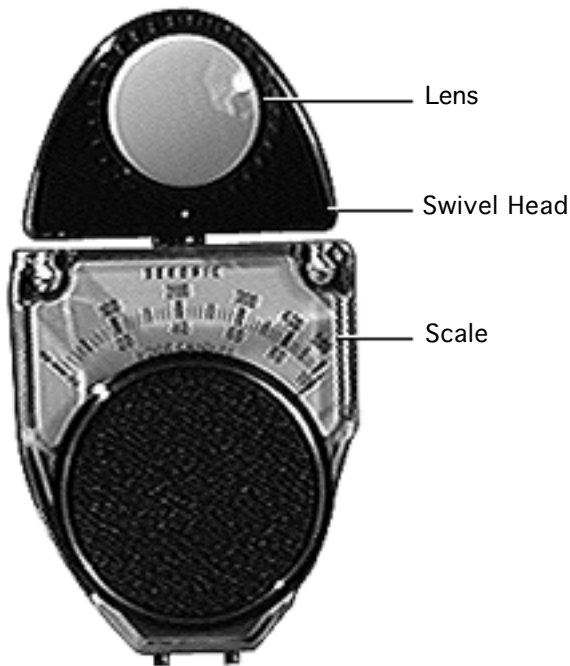




Model L-248

- 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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