

30Video HC Supplement

The follow pages contain detailed procedures for the analog board and CRT removal from a compact mac as excerpts from period service documents. The full documents are also available here:

<https://github.com/ZigZagJoe/30Video-Support>



Please take care: I am not responsible if you injure yourself or cause damage to your computer during the installation process.

You will be working with parts potentially charged with tens of thousands of volts and you can be seriously injured if you touch a charged component.

If you are at all uncomfortable with these procedures, please seek a qualified individual to assist you with the installation process.

Safety

Warnings



WARNING: The compact Macintosh computers contain high voltage and a high-vacuum picture tube. To prevent serious personal injury and property damage, make sure you read and understand the safety precautions on the following pages.



WARNING: Voltage and video adjustments are performed with the power on. Review the following cathode-ray tube (CRT) safety and live adjustment rules before performing these adjustments.



WARNING: Failure to follow the rules for safe CRT discharge could result in serious injury or property damage. For compact Macintoshes, the CRT must be discharged to the ground lug to prevent damage to the logic board.



WARNING: Make sure that you are *not* grounded when:

- You are working on plugged-in equipment
- You are discharging a CRT
- You are working on an unplugged CRT that has not yet been discharged
- You are performing live adjustments



WARNING: Electrostatic discharge (ESD) can cause severe damage to sensitive microcircuits. Macintosh circuit boards contain CMOS components, among the most sensitive chips in use today. CMOS chips, ROMs, and SIMMs are very susceptible to ESD and skin acid damage. To prevent damage to these components, handle them only by the edges.



WARNING: Pulling a disk forcefully from a drive may damage the mechanism. If a disk does not fully eject, refer to "Disk Ejection Problems" in the General Information section.



WARNING: A "dead" lithium battery is considered hazardous waste and has some potential for explosion if improperly handled. Mark the battery "Dead," place it in a zip-lock wrapper and the packaging used to ship the replacement battery, and return the dead battery to Apple, where it will be disposed of following EPA guidelines. Exception: If the battery is physically damaged, do not return it to Apple; dispose of the battery locally according to local ordinances.



Safety

CRT Safety

Ten Rules to CRT Safety

1. **Do not work on a monitor alone.** In case of an accident, having someone nearby—and having someone trained in CPR—could save your life.
2. **Remove all jewelry before performing repairs on a CRT.** Removing these conductors reduces the possibility of electric shock.
3. **Never use a grounding wriststrap or heelstrap or work on a grounded workbench mat when discharging a monitor or when performing live adjustments.** Grounding straps and mats are used to protect sensitive components from ESD damage and should be used only when working on "dead" (un-charged) equipment.
4. **Wear safety goggles when working with a CRT.** The CRT contains a high vacuum. If cracked or broken, the CRT can implode (collapse into itself). To protect your eyes, always wear safety goggles.
5. **Before working inside a monitor, turn off the power and disconnect the AC power cord.** Certain parts of a monitor chassis are hot (electrified) when the monitor is under power. Never work on a monitor under power except when making live adjustments.
6. **Keep one hand in your pocket or behind your back when working on a live monitor.** This reduces the risk of current passing through your body, should you accidentally contact high voltage.
7. **Always discharge the anode before touching anything inside the monitor.** High voltage (up to 12,000 volts DC) can be present on the anode (see Figure) and other components—even when power is off.
8. **Never touch the anode connector or the anode aperture.** When a CRT is replaced, the anode connector is removed, exposing the anode. The anode can retain a charge of several thousand volts even when power is off and can regain some charge even after being discharged.
9. **Do not pick up or handle a CRT by its neck (see Figure).** To prevent an implosion, take every precaution against breaking the tube. Be especially careful with the neck, where the tube is thinnest.
10. **In addition, never touch the following components (see Figure) when adjusting a live Macintosh CRT:**
 - The back of the power switch
 - The yoke wires
 - The anode connector
 - The anode wire
 - The flyback transformer

Safety

CRT Safety

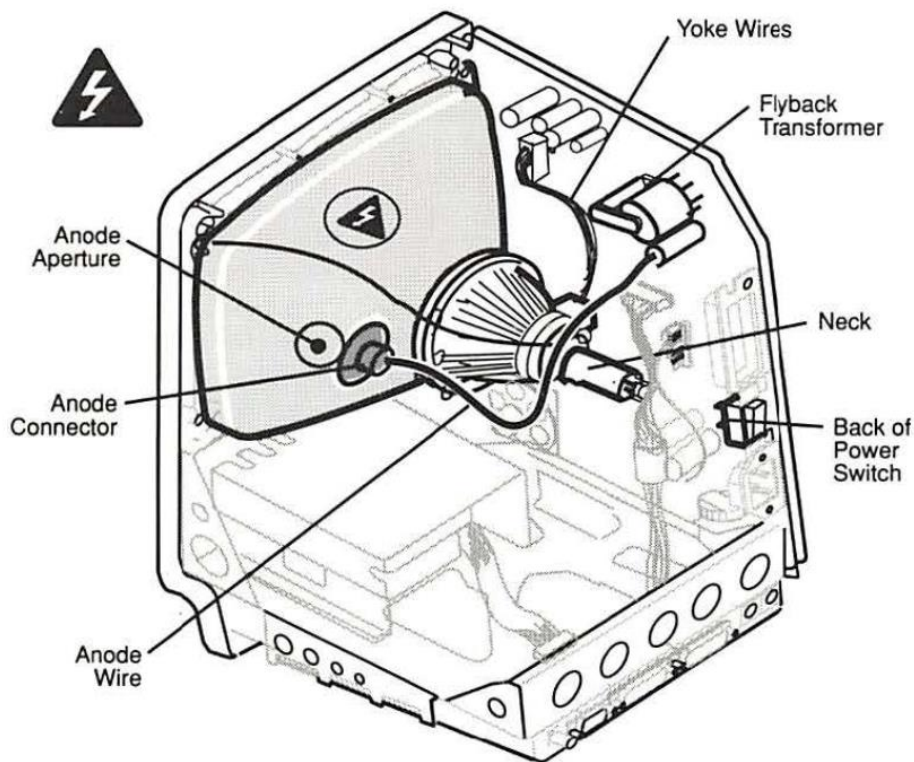


Figure: CRT High-Voltage Areas

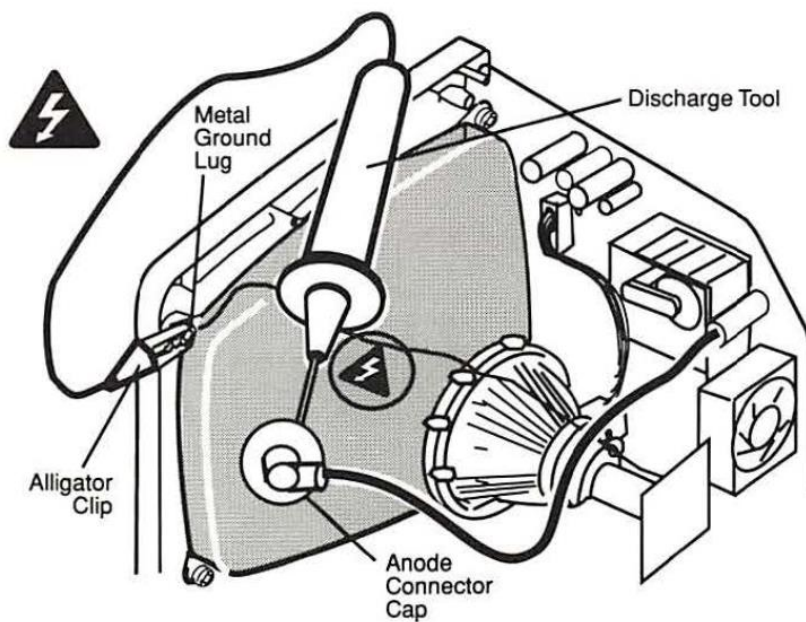


Figure: Discharging the CRT



Safety

Discharging & Devacuuming the CRT

Use the following procedure to discharge high voltage (12,000 volts) from the picture tube of a compact Macintosh. This procedure and the CRT discharge tool (see "**Special Tools Index**" in the **General Information** section) can be used to discharge any Macintosh monitor.



WARNING: Discharge the anode to the metal ground lug (see Figure on the previous page). Failure to do so will damage the logic board.

Discharge Procedure

1. Remove your grounding wriststrap and jewelry, and put on safety goggles.
2. Attach the alligator clip on the CRT discharge tool to the metal part of the ground lug (see **Figure on the previous page**).
3. Put one hand in your pocket or behind your back. With your other hand, insert the tip of the CRT discharge tool under the anode cap (see **Figure on the previous page**) until it touches the anode ring.
4. Remove the CRT discharge tool. To be sure the CRT is discharged, repeat the discharge procedure (you may want to repeat the procedure using a flat-blade screwdriver with an insulated handle).

Note: The anode can build up voltage over time. To drain off any residual charges, establish an ongoing ground. Fasten one end of an alligator lead to the ground lug and the other end to the anode aperture.

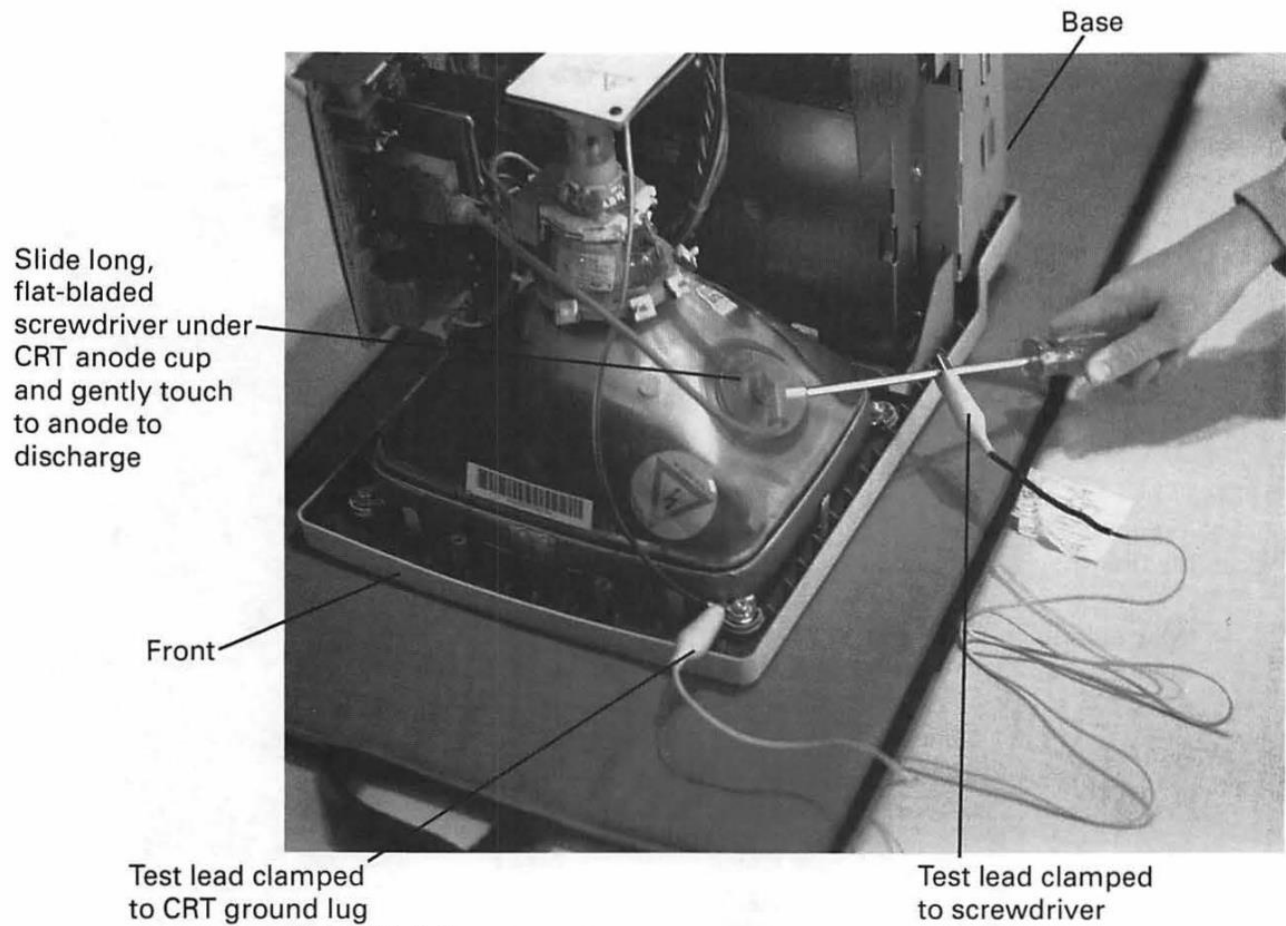
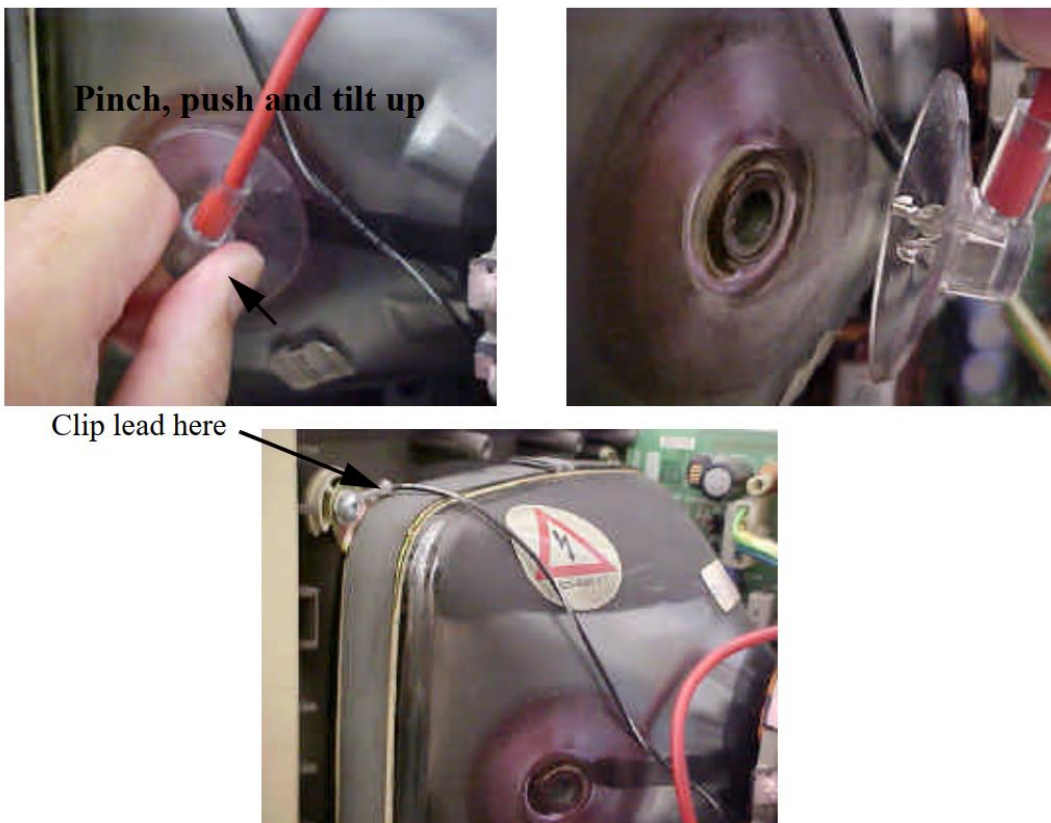


FIGURE 3.8: Grounding the CRT anode

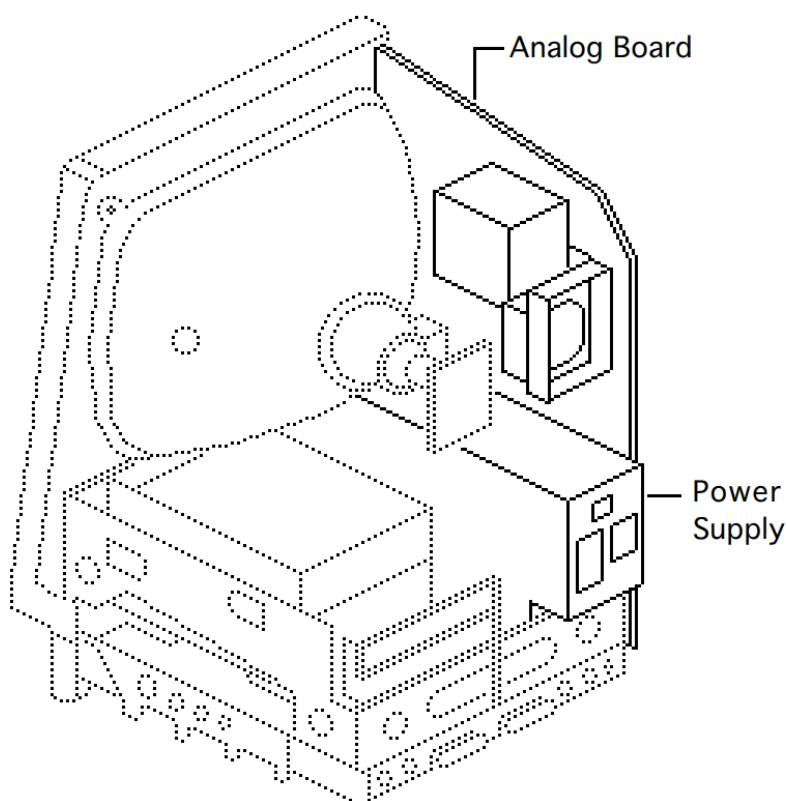
FIGURE 8. Anode cap, anode receptacle (“button”), and grounded CRT mounting band



To discharge, first clip a wire onto the terminal that connects directly to the protective band around the CRT, as shown above, to make the grounded connection. Next, grab the anode cap and tilt it to open up a small gap in which to insert the other end of the grounded lead. You may also carefully slide a thin (and grounded) tool underneath the cap without tilting, in case you are working overtime to avoid even the remote possibility of getting zapped. Some online advice tells you to use a resistor in series with the grounded clip to limit peak currents. However, you need physically long (inches long) resistors, or else the HV will just arc across the resistor. For a compact Mac, a resistor is completely unnecessary, so don't waste your time locating a true HV resistor and connecting one up.

When you discharge a charged-up CRT successfully, you'll hear a little *snap*. Leave the connection in place for a solid minute if you want to discharge the CRT more fully.

To remove the anode cap altogether, first pinch **hard** with thumb and index finger, as shown in the first picture above. Use of pliers or similar tool is *not* recommended -- its jaws may damage the insulation. While pinching, push with your thumb toward your index finger, and simultaneously tilt upward with the same thumb. That should release one of the two fork-like clips that holds the cap inside the anode cavity (see the second photo above). Then slide the cap in the opposite direction to release the other clip, and pull out.



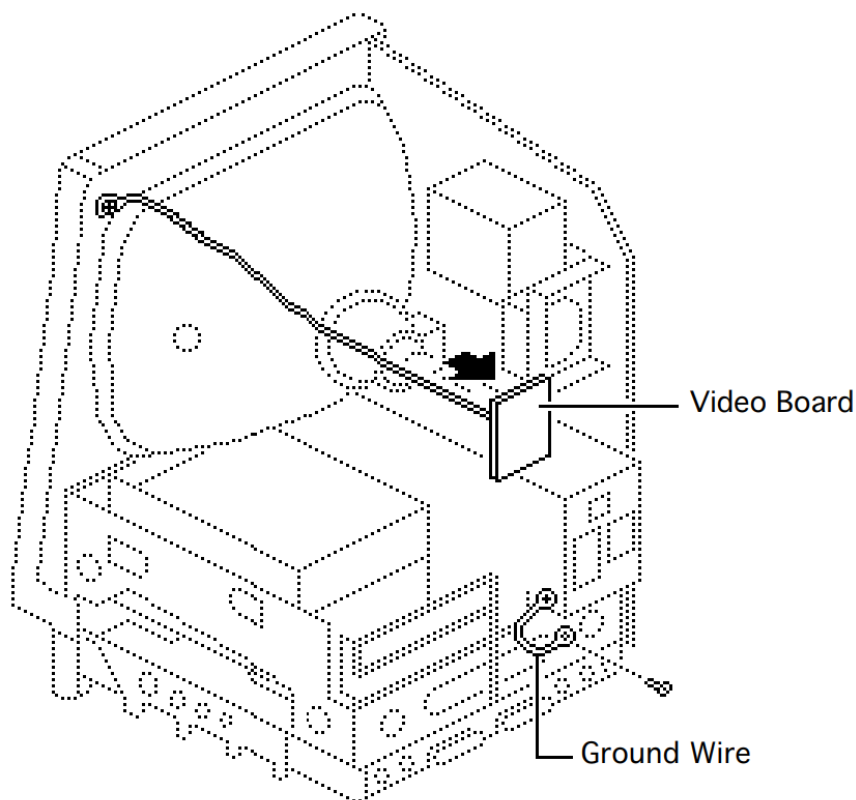
Analog Board & Power Supply

Before you begin,

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

Caution: Be sure to discharge the CRT to the ground lug. Failure to do so could damage the logic board or the analog board.

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



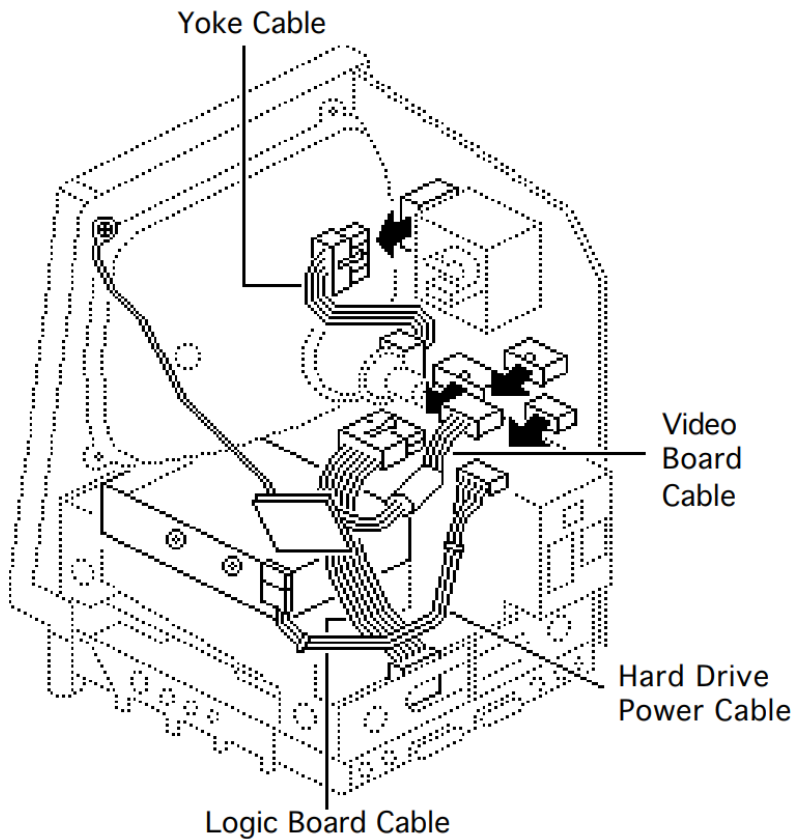
- 1 Carefully pull the video board straight off the neck of the CRT.
- 2 Remove the screw that secures the power supply ground wire to the chassis.





Take Apart

Analog Board & Power Supply - 6

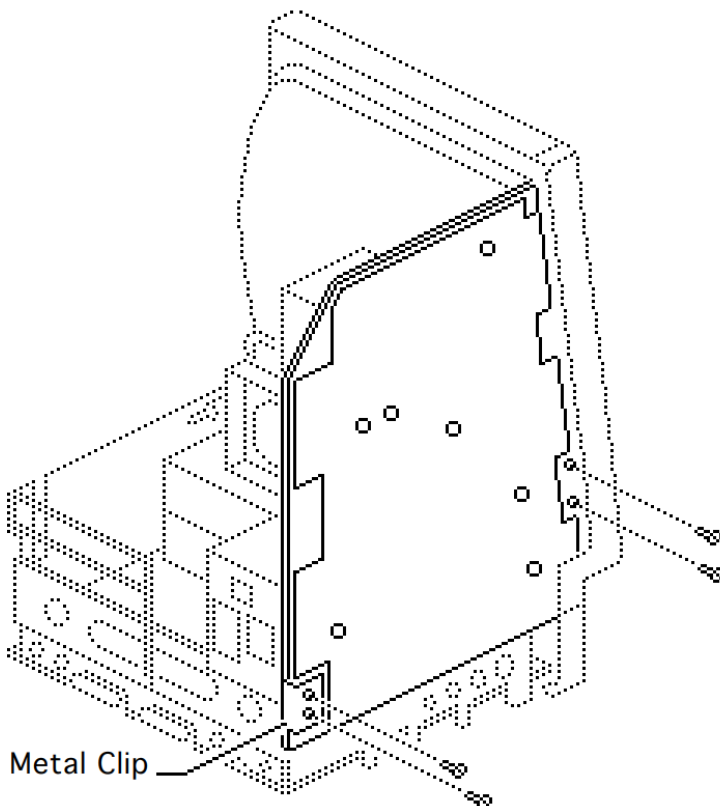


- 3 Disconnect these cable connectors from the analog board:
 - Yoke cable (First depress the tab.)
 - Logic board cable
 - Video board cable
 - Hard drive power cable



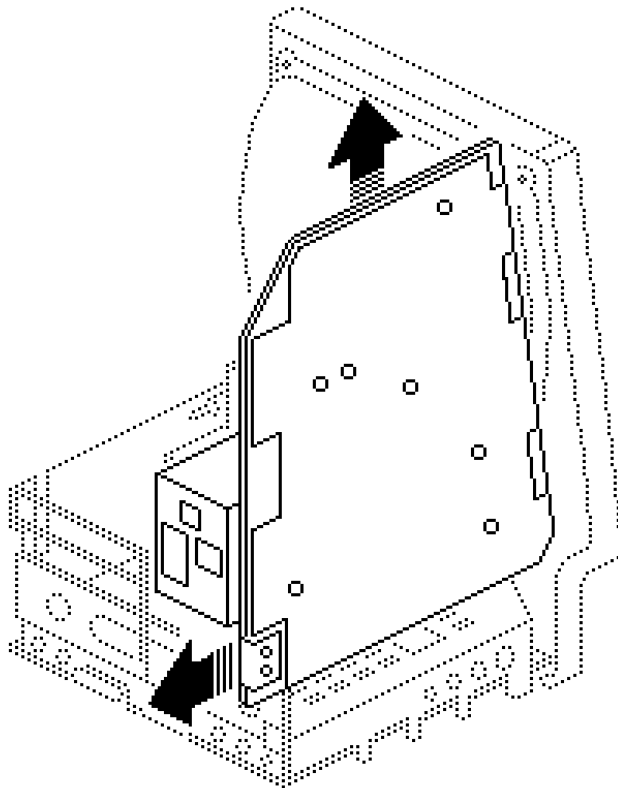
Take Apart

Analog Board & Power Supply - 7



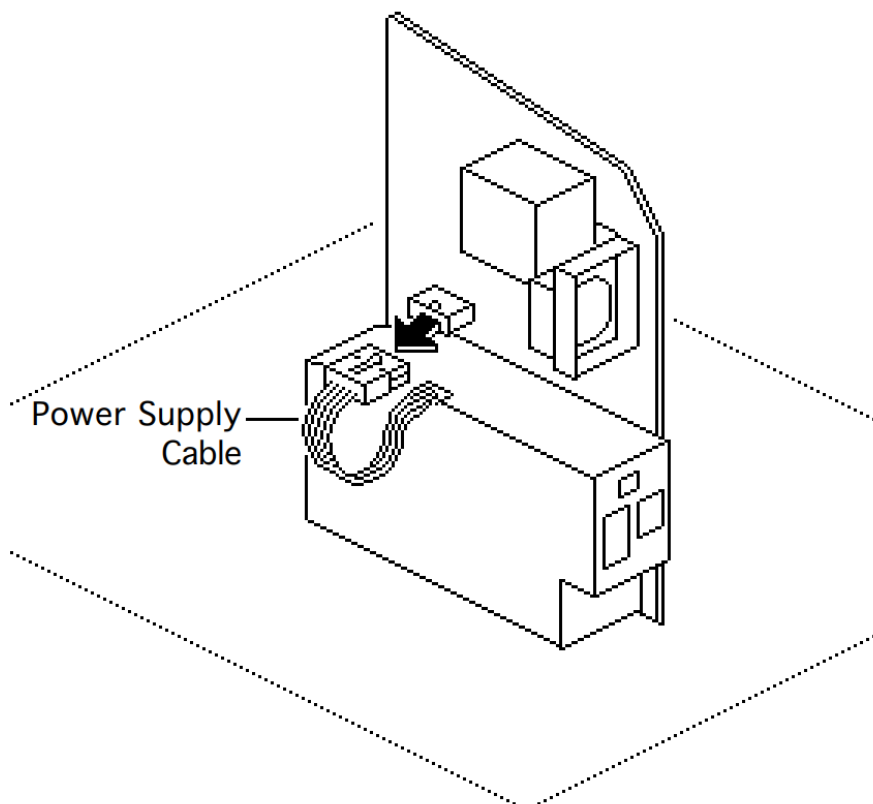
- 4 Remove the four screws that secure the analog board to the chassis.
- 5 Remove the metal clip from the corner of the board.





- 6 **Caution:** When removing the analog board, be careful not to catch the brightness control knob on the chassis and not to bump the neck of the CRT.

Grasp the analog board by its edges and pull the board up and out of the chassis.



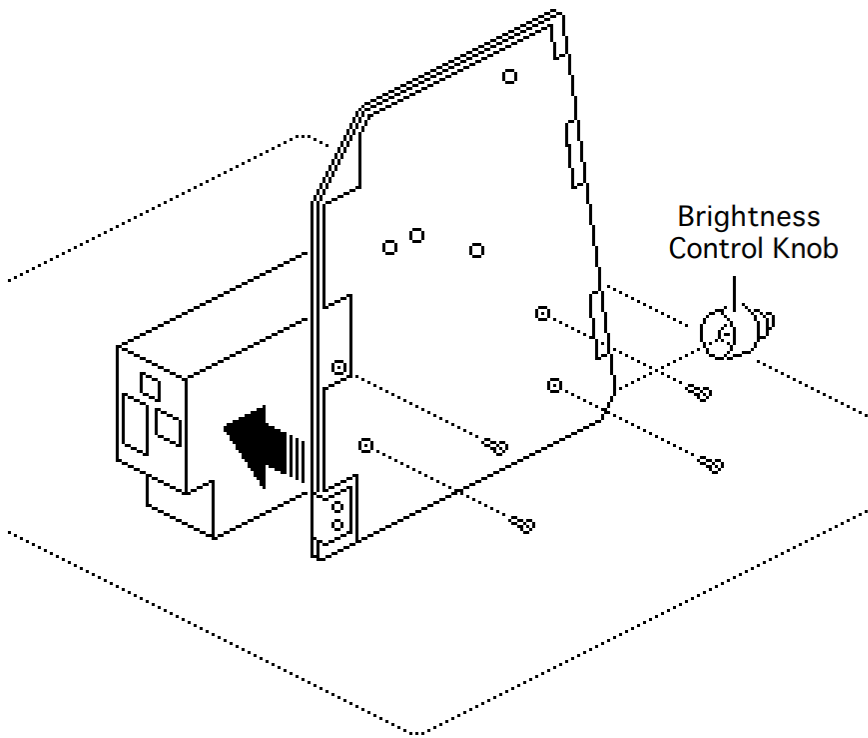
- 7 Place the analog board on a protective pad and disconnect the power supply cable.





Take Apart

Analog Board & Power Supply - 10



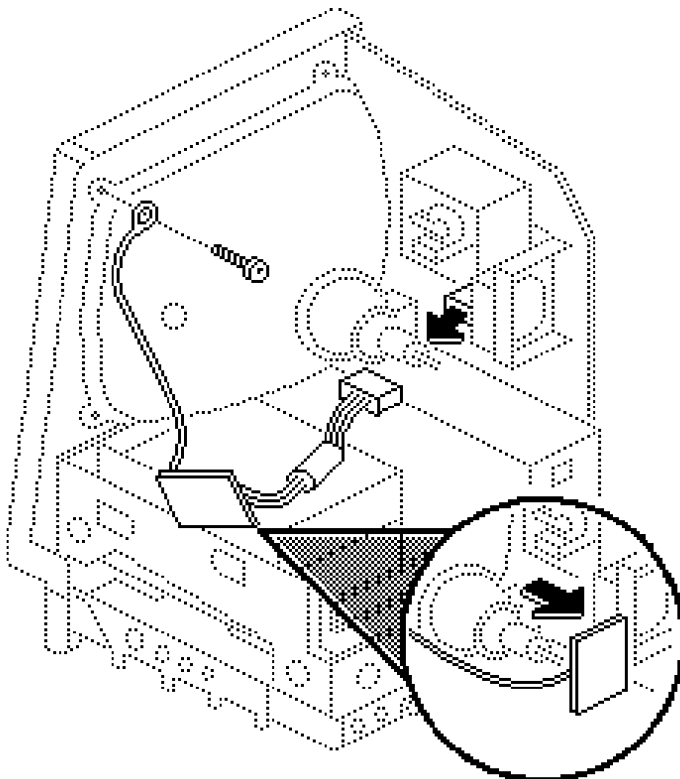
- 8 Remove the four screws and separate the power supply from the analog board.

Replacement Note: If you are replacing a defective analog board, remove and keep the brightness control knob.



Take Apart

Video Board - 17



- 1 Carefully pull the video board straight off the neck of the CRT.
- 2 Disconnect the video board connector from the analog board.
- 3 Remove the Torx screw and video ground wire from the upper-left CRT mounting bracket.

Replacement Note: If you replace the video board, perform the video adjustment procedure. See "Video" in Adjustments.

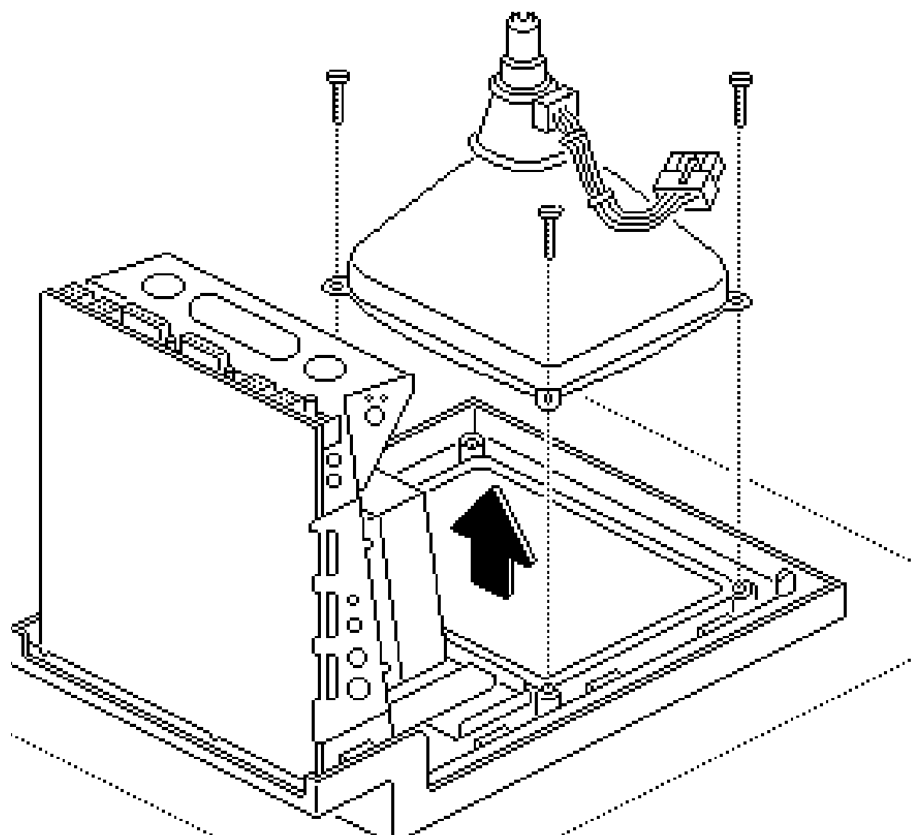
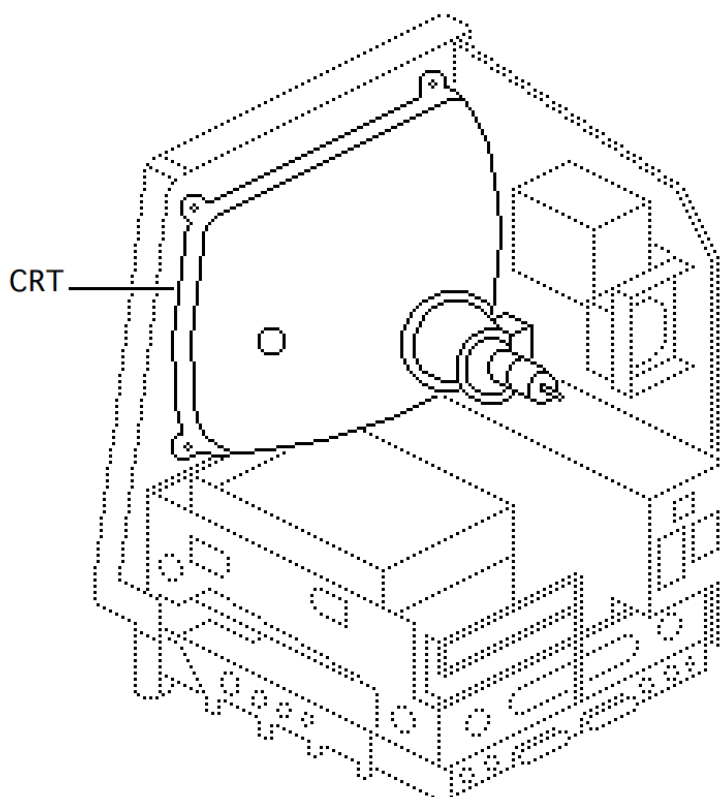




CRT

Before you begin,

- Remove the cover
- Discharge the CRT
- Remove the anode cap
- Remove the video board
- Remove the analog board (only)



- 1 With the CRT face-down on a protective pad, use a Torx screwdriver to remove the three remaining CRT mounting screws.
- 2 Lift the CRT off the bezel.

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

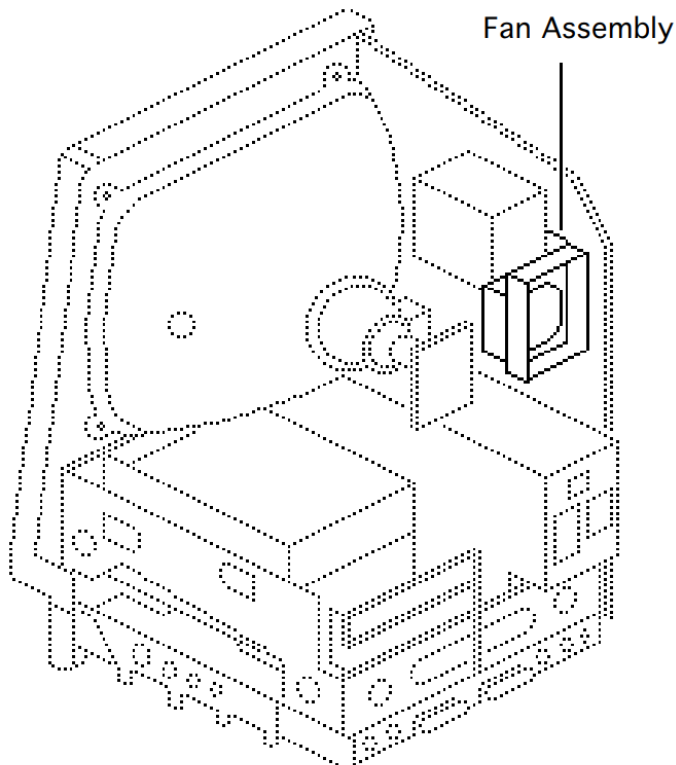




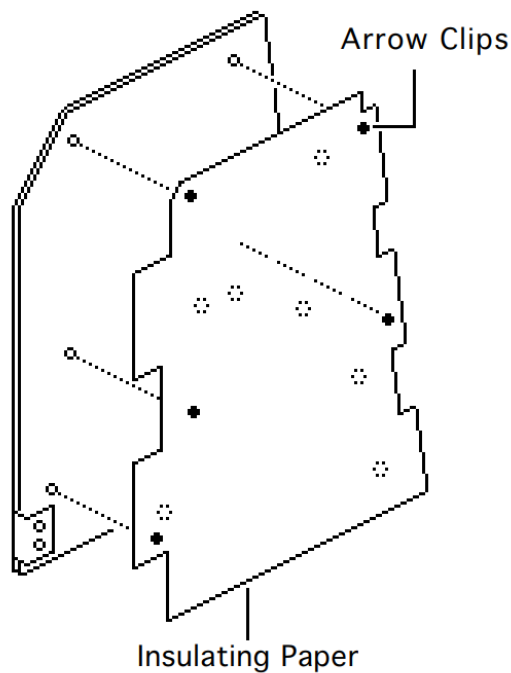
Fan Assembly

Before you begin,

- Remove the cover
- Discharge the CRT
- Remove the video board
- Remove the analog board and power supply.



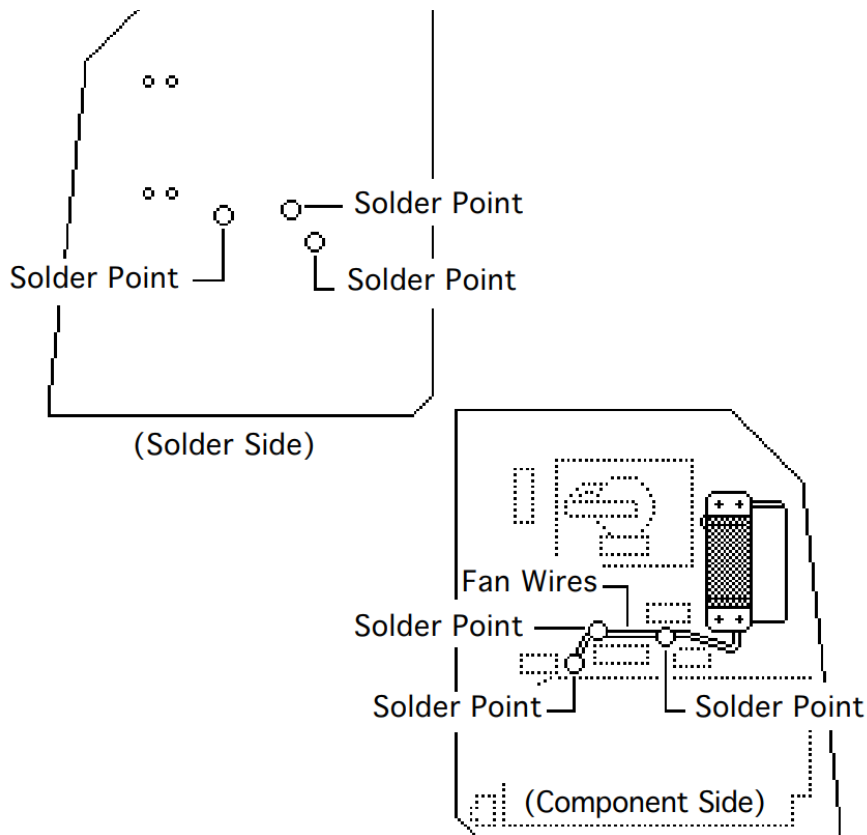
- 1 Compress the arrow clips and remove the insulating paper from the analog board.





Take Apart

Fan Assembly - 34

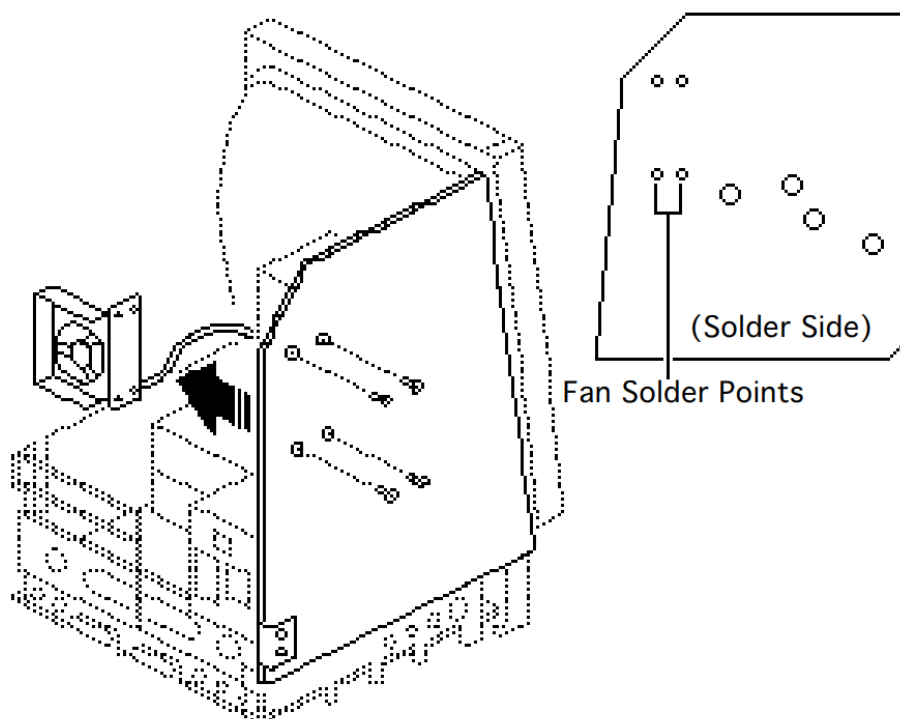


- 2 Check the front and back of the analog board for wires connecting the fan to the board. Desolder these wires at their solder points at the back of the analog board. Using a matte knife, cut away any excess solder.



Take Apart

Fan Assembly - 35



- 3 Remove the four mounting screws and lockwashers and remove the fan assembly from the analog board.

Note: On earlier versions of the analog board you may have to desolder the fan itself from the analog board at the solder points shown.

