

AppleCare Service Training CD



CRT Discharge

Topics covered in this section are:

- [CRT discharge procedure](#)
- [Live adjustment rules](#)

- [Section Overview](#)
- [Inside the CRT](#)
- [CRT Safety Rules](#)
- [CRT Discharge](#)
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Upon completion of this section, you will be able to discharge the high voltage from a cathode-ray tube (CRT). Discharging the tube before working on it minimizes your chance of receiving an electric shock.

Newer Apple displays are equipped with a bleeder resistor that automatically drains the charge from the CRT when the power is shut off. However, if the resistor fails, the anode may retain a charge.

The Apple discharge procedure is a precautionary measure to confirm that the CRT has been discharged prior to working on it.

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What You'll Need

Here's what you'll need to discharge a CRT:

- safety goggles
- ungrounded foam pad
- needlenose pliers
- alligator lead with clips at both ends
- CRT discharge tool (part #076-0381)

Discharging a CRT

To ensure your safety, you should follow the Apple-recommended CRT discharge procedures. **Important:** Before you do anything (including discharging a CRT), turn the monitor off and unplug it.

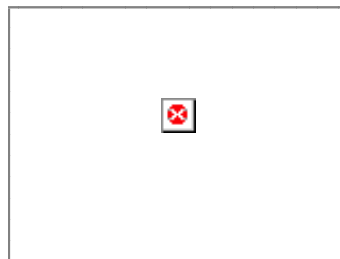
1. Set up a CRT-safe electrical area and follow the Apple-recommended [CRT safety rules](#).
2. Remove the housing.



Note: Refer to the Take Apart chapter in the service manual for each display for Take Apart instructions.

3. Put one hand behind your back.

Putting one hand in your pocket or behind your back helps to prevent current from passing through your heart if you touch a high-voltage area.



4. Using the Apple CRT discharge tool (part #076-0381) as shown below, connect the alligator clip from the lead to the ground lug on all-in-one systems, such as the iMac, or to any metal part of the chassis on all standard monitors.





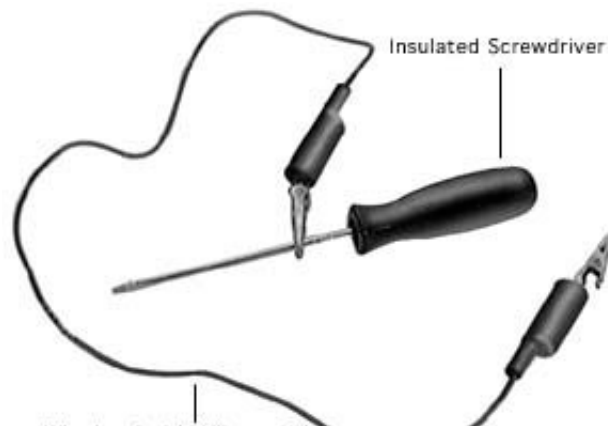
CRT Discharge Tool
Connected to the
Ground Lug

When using this tool to discharge a CRT, you might hear and see an electric crackle. This does not happen every time.

Notice the protective hand guard. The hand guard helps to prevent you from accidentally touching parts inside the monitor.

Important: When discharging a CRT, use only the ground lug to make your ground connection on a Macintosh to prevent damage to the logic board. Any high voltage that may be present is safely discharged to ground circuits (on the power/sweep assembly), which are designed to handle such voltage.

Note: If you do not have a discharge tool, you can use an insulated screwdriver attached to a wire lead with alligator clips on both ends as shown in the following graphic.



Wire Lead with Alligator Clips 

5. Slide the discharge tool probe under the anode cap and into the anode aperture.



Click Play Movie to view the CRT discharge procedure.

[Play Movie](#)

Important: If a discharged CRT must remain exposed for any length of time, establish an ongoing lead between the anode and ground.

Exercise: CRT Discharge

Now, let's practice discharging a CRT. Print out the [CRT Discharge Checklist](#) and give it to your manager or colleague. To pass this exercise, you'll need to do the following:

- correctly select the proper tools to discharge the CRT
 - demonstrate the Apple-recommended CRT discharge procedure
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Live Adjustment Rules

There are several types of Apple monitors: AppleVision, ColorSync, and Studio Display. Adjustments vary depending on the monitor; however, the following basic adjustment rules apply to all monitors:

- If the monitor isn't broken, don't fix it.
- Unless screen size or alignment is seriously off, don't adjust it.
- If color values are not seriously out of line, don't adjust them.
- Use a mirror so you can see the screen image while you adjust internal controls from the rear of the unit. It will be easier to keep away from danger areas.

Note: Not all displays have internal controls. Refer to the Service Manual on Service Source for the specific display for adjustment procedures.

If the display you are servicing requires live internal adjustments, follow these adjustment rules:

1. Before working on any live equipment, make sure the equipment is properly connected and grounded, and that your building's electrical outlets are properly wired and grounded.
2. Make sure you are grounded.
3. Always use a grounded (three-hole) outlet.



Warning: Don't use two-prong adapters. Using a two-prong adapter to make a three-prong plug fit in a two-hole outlet could reverse the two power lines of the current going into the system, causing the hot line to be fed into the circuit intended for the neutral line. Plug the cord in the wrong way and the entire monitor chassis is hot.

Note: Apple equipment comes with three-prong electrical plugs.

4. Use a polarity tester to test the outlets in your service area.
A polarity tester tests that the hot, neutral, and ground lines are wired into the plug properly.



Ground Polarity Tester

Note: If you don't have a polarity tester, you can find them at most electronics stores.

5. Use an isolation transformer.



Isolation Transformer

The isolation transformer:

- decreases a possible shock hazard from the incoming power of your wall outlet
- runs interference between your equipment and the wall outlet
- cuts off the power company's circuits if you accidentally contact high voltage and an earth ground at the same time
- functions as a protection circuit from a ground and hot lead that may be reversed. This can cause a condition where the frame of the monitor, which would be grounded normally, is hot. If you contact the hot frame and a true ground, you will get a severe electric shock.
- insulates the technician from being grounded to a hot lead and suffering a shock
- creates a floating source for the voltage, which ties the voltage coming into the transformer to earth ground. As a result, the technician cannot come between the power source and ground, and complete the circuit.

Click Play Movie to see how an isolation transformer works..

Play Movie

Note: Isolation transformers are available at most electronics stores.



For additional safety information, refer to the CRT Safety chapter in Service Source. We have linked to the Service Source [CRT Safety](#)

[PDF document](#) for your convenience.

Review the following sections:

- Discharging the CRT, pages 22-40

You'll find the most up-to-date [safety information](#) on Service Source Online.

Next, you can:

- proceed to the [next section](#)
- return to the [beginning of this section](#)

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