

S.E.R. FAQ **NotTaR of Television Sets** : [Safe discharging of capacitors in TVs an..](#)

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## Safe discharging of capacitors in TVs and video monitors

It is essential - for your safety and to prevent damage to the device under test as well as your test equipment - that large or high voltage capacitors be fully discharged before measurements are made, soldering is attempted, or the circuitry is touched in any way. Some of the large filter capacitors commonly found in line operated equipment store a potentially lethal charge.

This doesn't mean that every one of the 250 capacitors in your TV need to be discharged every time you power off and want to make a measurement. However, the large main filter capacitors and other capacitors in the power supplies should be checked and discharged if any significant voltage is found after powering off (or before any testing - the CRT capacitance in a TV or video monitor, for example, can retain a dangerous or at least painful charge for days or longer!)

The technique I recommend is to use a high wattage resistor of about 5 to 50 ohms/V of the working voltage of the capacitor. This isn't critical - a bit more or less will be fine but will affect the time it takes to fully discharge the capacitor. The use of a current limiting resistor will prevent the arc-welding associated with screwdriver discharge but will have a short enough time constant so that the capacitor will drop to a low voltage in at most a few seconds (dependent of course on the RC time constant and its original voltage).

Then check with a voltmeter to be double sure. Better yet, monitor while discharging (not needed for the CRT - discharge is nearly instantaneous even with multi-M ohm resistor).

Obviously, make sure that you are well insulated!

- For the main capacitors in a TV or monitor power supply which might be 400 uF at 200 V, this would mean a 5K, 10W resistor.  $RC = 2$  seconds.  $5RC = 10$  seconds. A lower wattage resistor can be used since the total energy is not that great. If you want to be more high tech, you can build the capacitor discharge circuit outlined in the companion document: [Capacitor Testing, Safe Discharging, and Other Related Information](#). This provides a visible indication of remaining charge and polarity.
- For the CRT, use a several M ohm resistor good for 30 kV or more (or a string of lower value resistors to obtain this voltage rating). A 1/4 watt job will just arc over! Discharge to the chassis ground connected to the outside of the CRT - NOT SIGNAL GROUND ON THE MAIN BOARD as you may damage sensitive circuitry. The time constant is very short - a ms or so. However, repeat a few times to be sure, then use a shorting clip as these capacitors have a way of recovering a painful charge if left alone - there have been too many stories of painful

experiences from charge developing for whatever reasons ready to bite when the HV lead is reconnected.

Note that if you are touching the little board on the neck of the CRT, you may want to discharge the HV even if you are not disconnecting the fat red wire - the focus and screen (G2) voltages on that board are derived from the CRT HV.

**WARNING:** Most common resistors - even 5 W jobs - are rated for only a few hundred volts and are not suitable for the 25 kV or more found in modern TVs and monitors. Alternatives to a long string of regular resistors are a high voltage probe or a known good focus/screen divider network. However, note that the discharge time constant with these may be a few seconds. Also see the section: [Additional information on discharging CRTs](#).

If you are not going to be removing the CRT anode connection, replacing the flyback, or going near the components on the little board on the neck of the CRT, I would just stay away from the fat red wire and what it is connected to including the focus and screen wires. Repeatedly shoving a screwdriver under the anode cap risks scratching the CRT envelope which is something you really do not want to do.

Again, always double check with a reliable voltmeter!

Reasons to use a resistor and not a screwdriver to discharge capacitors:

1. It will not destroy screwdrivers and capacitor terminals.
2. It will not damage the capacitor (due to the current pulse).
3. It will reduce your spouse's stress level in not having to hear those scary snaps and crackles.

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