# Capacitor Replacement

Small electrolytic capacitors, often called *caps*, in all old Macs, probably up until the mid 1990s, have begun to leak. We guarantee it. Without fixing this problem, your Mac unfortunately won't live long, and in fact many have probably already died. But fear not! Even a dead Mac can be brought back to life by replacing its small electrolytic capacitors.

## Directions

The first thing you have to do is open your Mac and remove the logic board. If you are unsure how to do this, search with Google to find some good directions, so you don't break something in your precious artifact of a Macintosh.

Next you want to inspect the board. Hold it up to a light source so you can see the light reflecting off of the board. Now focus on the areas around the small silver cylinders sticking up out of the board (the electrolytic caps). You will notice that the board isn't as shiny around these capacitors. This is some electrolyte that used to be inside of the capacitor. It has leaked out somewhat.

### Order Replacement Capacitors

Promptly purchase a set of replacement capacitors, preferably in “tantalum” form. These are solid and will not ever leak.

### Remove the Old Capacitors

While every Mac is different, take a moment to read through the basic instructions quoted below.

> In my experience, the easiest way to remove the old caps is to use two soldering pencils at one time. That way you do not put mechanical stress on the circuit board (as you do when you heat one side at a time). A grounded 15 watt soldering pencil is available from Radio Shack for under $10. So, if you already have one soldering pencil, go pick up a second one and make this job easy for yourself.
>
> If you try to use just one pencil, by the time you can heat the second pad, the first will have cooled. With the one-pencil-method you are forced to either get the entire cap and board so hot that the solder will stay melted while you move the pencil from side to side, or you end up bending the cold solder on one side, while lifting the other side. That over-heating and/or bending is what typically leads to lifted pads on the circuit board.
>
> With the two pencil method, you just apply a pencil to each end of the cap to be removed and wait until you can gently lift the cap with little to no resistance. It's useful to have a damp sponge on hand, as sometimes the cap sticks to one pencil tip or the other and it can be wiped off on the sponge. *trag, 68kMLA Trading Post thread*

You may find that a pair of 15 watt pencils takes a while to melt the solder. If you have (or can afford) 25 watt pencils, these may be a better choice. If you are using 15 watt pencils, be **patient**. Whatever you do, do not forcibly press the pencil tip into the board nor twist the tip around in a grinding motion trying to get faster heat transfer. If you believe that the pencil is not heating the solder, then apply more liquid flux to the pad and re-tin (apply a little solder to) the tip of your pencils.

Many of the capacitors which need replacement are “decoupling” capacitors which means they sit between the ground and power connections on the board. Most printed circuit boards (PCB) have interior layers just for the ground plane and the power plane. These interior layers are nearly solid copper. The decoupling capacitors are connected to these copper planes by thick traces and vias, so a lot of heat may be conducted away from the capacitor pad before it finally gets hot enough to melt solder.

Be sure to practice on garbage circuit boards if you are unsure of your soldering skills. Also note that on some boards, there is a small dot of glue in the center of the capacitor holding it to the board. So if you're fairly sure you have both solder pads heated up, you may need to give the cap a bit of a tap or pry to pop it off.



**What happens if you DO lift a pad?** We've all done it lots of times. It happens. Don't panic. Often times it's as simple as applying a tiny amount of super glue underneath to reattach the pad. If the pad has completely come off and is no longer electrically attached, follow the trace on the circuit board that it used to be connected to until you find a place where you can solder a bodge wire. Cut the wire to length and solder the other end to your new cap. Good as new!

## Clean the Board

Before soldering on your new caps, be very sure to thoroughly clean the board. Many people have put the logic board into the dishwasher and run it without detergent. This seems to work particularly well. Taking it to the sink or tub of water with a toothbrush has also proven to be a good way to do it. Several days later, when the logic board is thoroughly dry, it's time to solder on your new capacitors.

## Solder On the New Capacitors

Again, practice on garbage boards if you are unsure of yourself. When soldering new caps back on, pay special attention to the polarity of the capacitor and the markings on the logic board. Often there will be a positive (+) symbol printed on the board. The side of the tantalum capacitor that has a stripe is positive (+), so face that side of the capacitor toward the (+) symbol. With surface-mount tantalums, it helps to apply some solder to both sides of the new capacitor first. Then line the cap up on your logic board and simply heat both sides to make a connection.

# Capacitor Quantity and Type for Macintosh Models

Some logic board revisions may have a different number of capacitors, so make sure to look first and verify this information. If yours is different, please create an account here and add it to the page by clicking the edit button up on top. Note that these numbers include capacitors only on the logic board and not, for example, in the power supply. Post on the 68kMLA Forums if you suspect you have bad caps in your power supply and would like help.

Also note that when replacing your capacitors, it is okay to exceed the voltage rating of the old capacitors. You should not go lower than the original voltage rating, but exceeding it will generally make no difference. Using a capacitor with a higher voltage rating tends to extend the life of the new capacitor, but going TOO high can alter the characteristics a bit. It's best to exceed the original voltage by just a step or two if you desire. It is also good to choose a capacitor rated for 105°C as such will typically last longer than 85°C rated capacitors, especially in a warm environment.

## Macintosh SE/30 (630-4198-11)

Replace with Tantalum:

- 10x 47µF (16V) - C1, C3, C4, C5, C7, C8, C9, C10, C12, C13
- 1x 1µF (50V) - C6

Replace with Axial Electrolytic:

- 1x 220µF (16V) - C11
- 1x 470µF (16V) - C2

Gallery:

## Macintosh IIci (820-0242-A)

Replace with Tantalum:

- 8x 47µF (16V)
- 2x 10µF (16V)

Replace with Electrolytic:

- 3x 470µF (16V)
- 1x 220µF (16V)

## Macintosh IIci (another revision)

Replace with Tantalum:

- 11x 47µF (25V)
- 2x 10µF (16V)

Replace with Electrolytic:

- 3x 470µF (16V)
- 1x 220µF (16V)

## Macintosh IIsi (820-0301-A)

Replace with Tantalum:

- 11x 47µF (16V)

Replace with Axial Electrolytic:

- 2x 220µF (16V)

## Macintosh Classic II, Performa 200

Replace with Tantalum:

- 3x 47µF (16V)
- 2x 1µF (50V)
- 8 to 11x 10µF (16V)

## Macintosh Color Classic

Replace with Tantalum:

- 6x 47µF (16V)
- 2x 100µF (6.3V)
- 1x 10µF (16V)

## Macintosh LC (630-0309-)

Replace with Tantalum:

- 5x 47µF (16V)
- 1x 1µF (50V)
- 1x 100µF (6.3V)
- 8x 10µF (16V)

## Macintosh Performa 400, LC II (820-0327-A)

Replace with Tantalum:

- 5x 47µF (16V)
- 1x 1µF (50V)
- 1x 100µF (6V)

- 10x 10µF (16V)

## Macintosh LC III, Performa 450 (820-0650-B, Rev. D)

Replace with Tantalum:

- 5x 47µF (16V)
- 5x 10µF (16V)
- 1x 100µF (6.3V)

## Macintosh LC III, Performa 450 (820-0650-A)

Replace with Tantalum:

- 5x 47µF (16V) - C8, C19, C20, C21, C22
- 5x 10µF (16V) - C2, C4, C5, C7, C18
- 1x 100uF (6V) - C13

Gallery:

## Macintosh Quadra 605, Performa 475, LC 475 (820-0364-A)

Replace with Tantalum:

- 9x 47µF (16V)
- 2x 100µF (6.3V)

## Macintosh Portable (820-0219-A)

Replace with Tantalum:

- 4x 1µF (50V) - C4, C5, C15, C24
- 9x 47µF (16V) - C9, C10, C11, C17, C22, C25, C26, C27, C28
- 2x 10µF (16V) - C14, C116

Replace with Radial Lead Electrolytic:

- 4x 100µF (25V) - C2, C6, C18, C19
- 1x 220µF (25V) - C3

Replace with Axial Lead Electrolytic:

- 3x 470µF (25V) - C8, C16, C20

Gallery:

## Macintosh Quadra 840AV (820-0382-10)

Replace with Tantalum:

- 2x 10µF (16V) - C1, C35
- 13x 47µF (16V) - C2, C27, C48, C53, C56, C59, C60, C62, C63, C64, C69, C75, C76

Gallery:

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