



# Macintosh 128K Teardown

Torn down on January 21, 2014, in honor of the 30th anniversary of the Macintosh computer.

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## INTRODUCTION

Join us as we live the time-traveler's dream—the deep, lucid, [Orwellian vision](#) of hope, fear, and nostalgia that is 1984. Just in time for its 30th anniversary, we laid hands on an '84 original: the Macintosh 128K. And, you guessed it—we're tearing it down like it's the Berlin Wall.

Today's blast from the past is brought to you with some awesome help from [Cult of Mac](#) and [The Vintage Mac Museum](#). Cult of Mac will have us note that no vintage Macinti were harmed in the making of this guide. Our 128K had already passed beyond the veil before its noble sacrifice.

Fire up the flux capacitors and find our [Facebook](#), track our timely [Tweets](#), and get a dose of nostalgia from our filter-friendly [Instagram](#).

Want some sweet Mac 128K wallpapers? [Come get some!](#)

[video: <http://www.youtube.com/watch?v=Zz90MkUcho8>]

## TOOLS:

- [T15 Torx Screwdriver](#) (1)
- [Phillips #1 Screwdriver](#) (1)
- [Flathead Screwdriver](#) (1)
- [Spudger](#) (1)

## Step 1 — Macintosh 128K Teardown



- The original Mac retailed for \$2,495—that's \$5,594.11 in [today's dollars](#). So what did you get for all that coin?
  - 8 MHz Motorola 68000 processor
  - 128 KB DRAM
  - 9" black-and-white CRT display running at 512 x 342 (72 dpi)
  - 400 KB total storage via a single-sided 3.5-inch floppy disk drive
  - Single-button mouse and hefty keyboard
- ⓘ Inflation notwithstanding, this [treasure of the '80s](#) didn't cost us a cent. A big thanks to our friends at the [Vintage Mac Museum](#) for lending us this Mac, and to [Cult of Mac](#) for injecting some extra '80s flavor into the teardown!

## Step 2



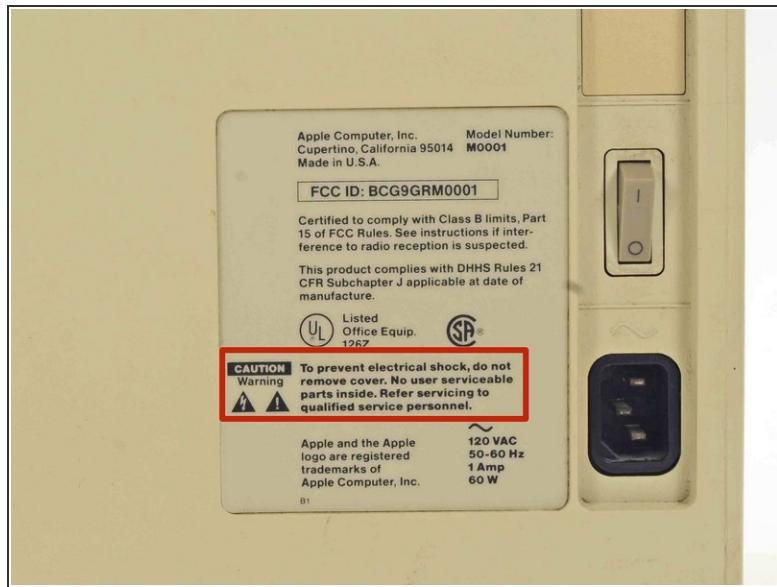
- Before we crack open this time capsule (no, not [these Time Capsules](#)), let's take a moment to see just how far we've come in three decades.
- First up, displays. 1984's Mac 128K featured a 9" CRT with 512 x 342 resolution and support for two colors: black, and white. On the right, our lovely comparison [Late 2013 iMac](#) has a 21.5" 1920 x 1080 pixel display with millions of colors. Oh, and the *original* iPhone had a 480 x 320 pixel screen at 163 ppi.
- As Apple works to popularize [Thunderbolt](#), a 20 Gb/s IO interface, let's reflect back on the high-speed Serial port, sporting speeds measured in thousands of bps, rather than billions.
- But hey, at least the AC plug is the same.

## Step 3



- Thirty years of progress yields some impressive changes to input peripherals. Keyboards and mice are now wireless, thinner, and comprised mainly of sturdy, non-yellow metal.
- And we now have arrow keys! In typical Apple fashion, they ditched the arrows on the original Mac to force people to use the mouse, a [strange new accessory](#) at the time.
- ***(i) Cult of Mac adds:*** *This trend-setting streak continued. Apple jettisoned SCSI and serial ports with the release of the first iMac in 1998, hastening the acceptance of USB. [Plus ça change, plus c'est pareil.](#)*
- Here's a side-by-side comparison of a single-button [voice command peripheral](#) and a magic-based, gesture-capable, wireless input device.
- Okay, technically that boxy one is an Apple Mouse II, Model Number M0100. It utilizes a D-subminiature serial connector (DE-9 to be exact). The spacey egg is a [Magic Mouse](#).

## Step 4



- Now *that's* a model number: Macintosh Model M0001. (Apple built in just a *teensy* bit of headroom for future models.)
- These early labels are sad tidings— even in Apple's younger, wilder days they didn't want people to service their own gadgets.
  - (i)* This is it, the beginning of an exciting challenge—to fight for the [right to repair!](#)
- That FCC label means business: if you're going to tinker with your Mac, you run the risk of local radio interference. (We're guessing Pandora wasn't a viable alternative in 1984.)

## Step 5



- It makes no difference to our [Pro Tech Toolkit](#) when this Mac was manufactured—it's packed with all the tools you need for the repairs of yesterday, today, and [tomorrow](#).
- Our flex extension takes on the deeply recessed T15 screws in the case.
- True to form, Apple hid a screw; this time, it's under the clock battery door. No fuss for us, it's out and we're spudgering into history.

***(i) Cult of Mac adds:*** *Fortunately these early Macs were not glued together—and even had a user-replaceable battery.*

## Step 6



- We deliver and [open the vault](#); we're only slightly disappointed at the lack of a [cool pneumatic sound effects](#).
- The entire machine slides out of the back case, revealing the power supply, CRT display, 3.5-inch floppy drive, and hiding beneath it all, the logic board.
- Molded into the inside rear plastic casing are ~~runes of technology~~ past the autographs of [Steven Jobs](#), [Woz](#), Bill Atkinson, Andy Hertzfeld, Bruce Horn, Jef Raskin and the rest of the historic team.

***(i) Cult of Mac adds:*** *Real artists sign their work.*

## Step 7



- Now that we're in authorized-service-personnel-only land, we found a few calibration potentiometers for fine-tuning the display.

**⚠** Ye olde CRTs were a mixed bag for repair purposes—easier to access than today's tight-fitting flat panel displays, but boy were they dangerous if mishandled. Those high voltage warnings are no joke.

- All the lead (Pb) in the CRT glass is [slightly more joke-worthy](#), but it's still [not very funny](#).
- Present, meet your past, [face to face](#). And if you're both here in 30 years, maybe you'll meet [the future](#).

## Step 8



- Between the CRT and the capacitors, disconnecting this power supply sort of feels like disarming a bomb.
- Apple did their best to keep average users out of the Macintosh, using Torx screws on the exterior. But once you're inside, it's a fun mix of screw types, including Phillips and flathead. Time to pull out our favorite roll of fixed-handle drivers, the [Pro Tech Screwdriver Set](#).

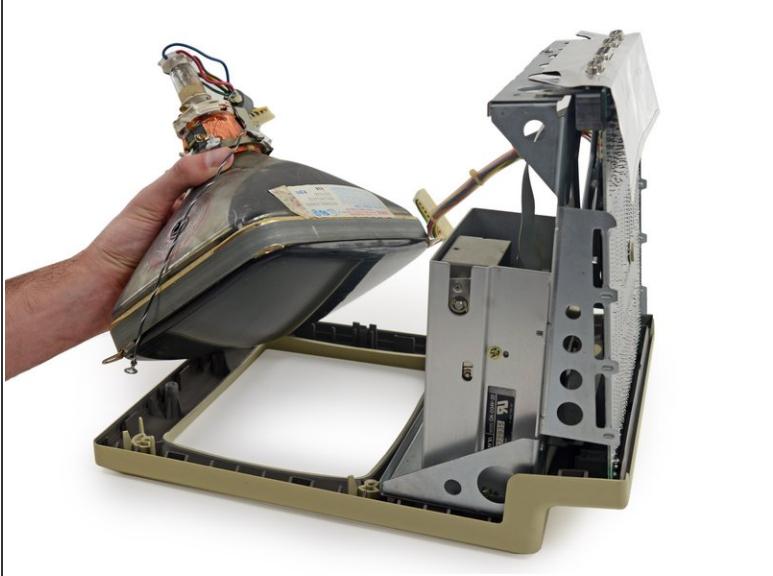
***(i) Cult of Mac adds: We'd still rather disassemble a 128K Mac than an [iMac](#) any day!***

## Step 9



- To the tune of [Mission Impossible](#), we quickly and safely remove the power supply. No electrocuted technical writers... today.
- This 60-watt power supply is Apple Part number 630-0102.
  - [\*i\*](#) We think 60 watts peak is pretty dang impressive for an entire computer and CRT display.
- Our comparison iMac features a [186 watt power supply](#), that fits onto a considerably smaller circuit board than the 128K's.

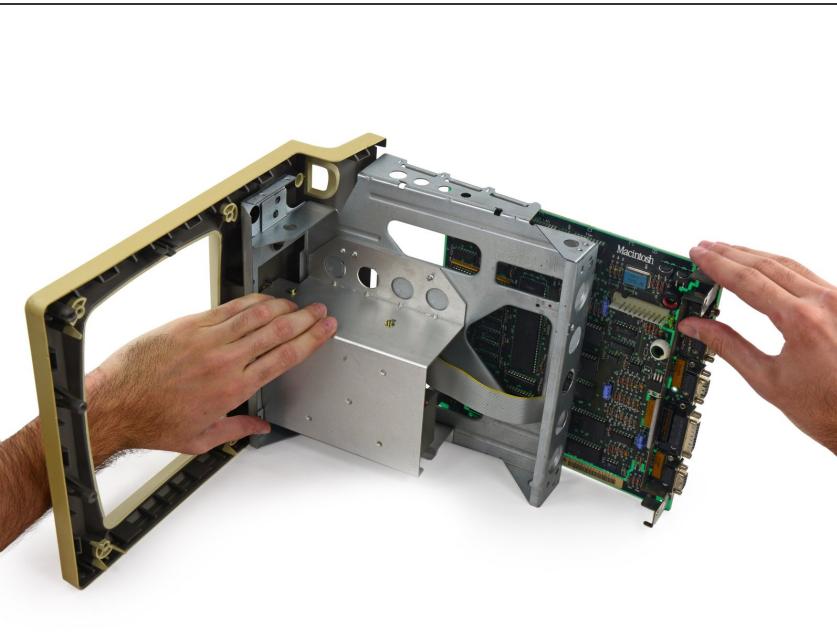
## Step 10



- And the award for most noticeable technological advancement goes to: Mac displays. This enormous old CRT is a far cry from the graphics offered by today's ultra-thin Retina displays.
- Bulky, heavy, and full of lead, these old-school electron guns in vacuum tubes and their deflection coils were all the rage in the '80s. Totally tubular!

**(i) Cult of Mac adds:** *The original Macintosh display was only 1-bit black & white, yet ushered in the revolutionary era of [WYSIWYG \(What You See Is What You Get\)](#) graphics and desktop publishing.*

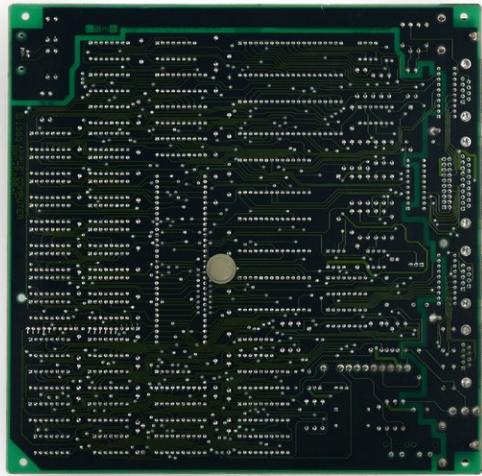
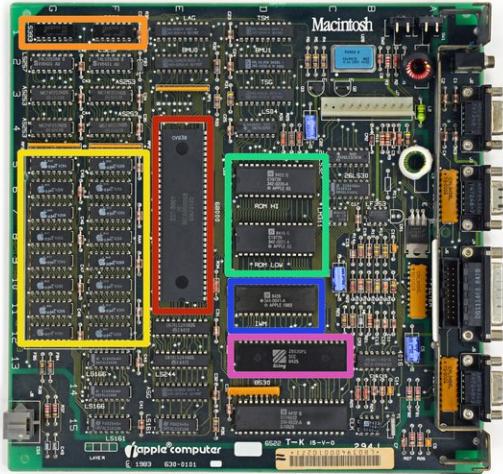
## Step 11



- Even 30 years ago, Apple had a thing for tidy packaging. With just a little coaxing, the logic board slides neatly out of its tray.
- There's no active cooling on this daddy Mac. The Motorola 68000 has a little breathing room, but nothing more.
- This processor, commonly called the 68k, is a surprisingly popular chip. Aside from the Macintosh, it can also be found in the [Sega Genesis](#), [Commodore Amiga](#), [Atari ST](#), and even the [TI-89 graphing calculator](#).

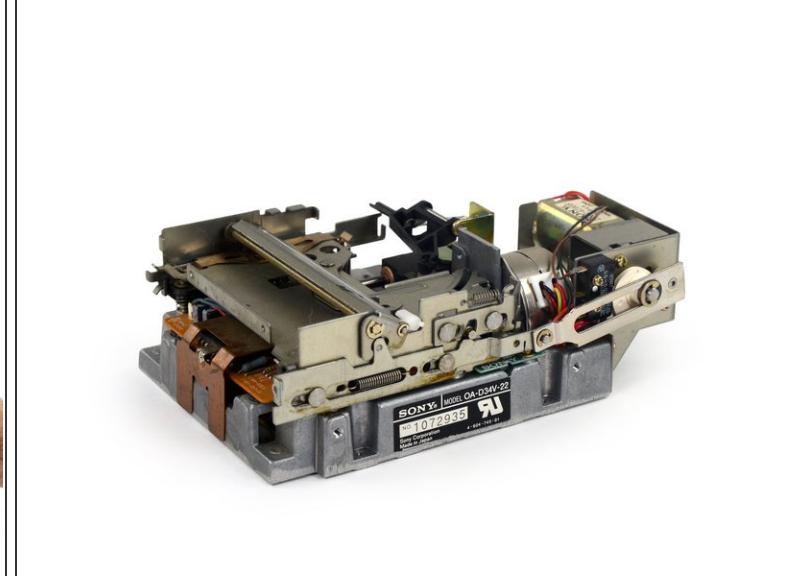
***(i) Cult of Mac adds:*** *The 68k also powered the [Lisa](#), Apple's predecessor to the Macintosh.*

## Step 12



- Notable ICs on the Mac 128K logic board:
  - Motorola [MC68000G8](#) Microprocessor
  - Fairchild Semiconductor 74LS393 Video Counter
  - Micron 4264 64 kb RAM (64 kb x 16 chips = 1024 kb, or 128 KB)
    - *i* The namesake for the 128K was this non-upgradable array of RAM. Anticipating that customers would want more power, Apple engineers [secretly designed](#) the logic board to facilitate manufacturing a 512 KB version, which was released only nine months later.
  - Simtek C19728 and C19729 32 KB ROM (32 KB x 2 ICs = 64 KB)
  - Simtek 344-0041-A "[Integrated Woz Machine](#)" Disk Controller
  - Zilog Z8530PS [Serial Communications Controller](#)

## Step 13



- What do we have here? A Sony...printing press? Planer? [Turbo Encabulator](#)?
- We know you guessed right; it's a 3.5-inch floppy disk again leading the charge to new technology, leaving the old [5.25-inch drives](#) in the past.

**i** **Cult of Mac adds:** *The Macintosh almost shipped with the same 5.25-inch "Twuggy" floppy disk drive the early Lisa used, but the Sony 3.5-inch drive earned its job in a rather [entertaining fashion](#).*

## Step 14



- CLICK CLACK CLICKITY CLACKITY
- *(i)* Some say there's [nothing more soothing](#) than the clicking and clacking of a mechanical keyboard.
- Others say [LISTEN TO MY LOUD KEYBOARD!](#)
- Regardless, the first person who guesses what we're typing in the video will win a prize: [a handy pocket-sized battery removal tool](#).

*(i)* *We've got a winner! User [vw lou89](#) cracked the code and will be getting a prize in the post posthaste.*

## Step 15



- Removing a few screws allows us to take a peek inside the keyboard.
- *i* But we don't get much farther than that. Each mechanical button is soldered to the board. So unless you want [12 steps of us busting off the plastic keys...](#)
- *i* **Cult of Mac adds:** *The keyboard cable used a standard RJ9 [telephone handset connector](#), but the pin wiring was different. This means existing phone cords wouldn't work as a substitute.*
- The unholy union of [phone and computer](#) was [never seen again](#).

## Step 16

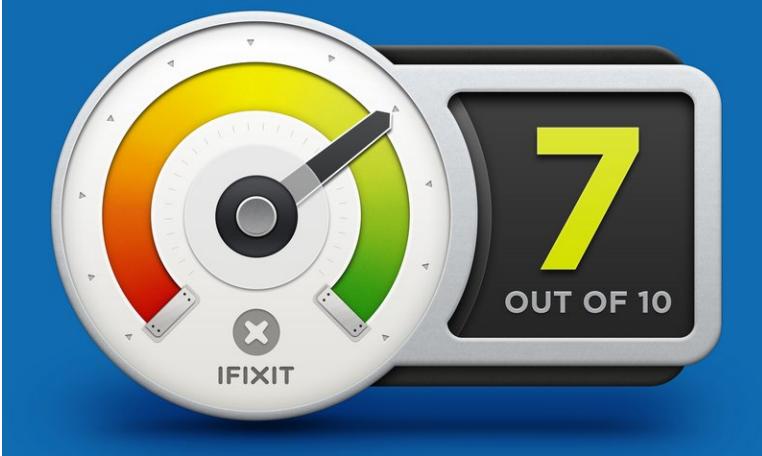


- Now for some [mouse dissection](#)! Don't worry—this will be much more humane than what went down in [high school biology class](#).
- We pop out the eye ball with a quick twist.
- ***(i) Cult of Mac adds:*** *Ah, we remember the lost art of [cleaning mechanical mice...](#)*
- Opened up, we find plenty of plastic viscera, two quadrature encoders and a few resistors. Surprisingly, that's about all we find.
- ***(i)*** This simplified design decreased costs and improved reliability by moving the complex circuitry out of the mouse and into the desktop, paving the way for cheap [desktop mice](#) for years to come.

## Step 17



### REPAIRABILITY SCORE:



- Macintosh 128K Repairability Score **7 out of 10** (10 is easiest to repair).
- Once you're inside, it's simple and straightforward to replace any of the main components: floppy drive, power supply, logic board, or CRT display.
- No adhesive anywhere.
- User-replaceable clock battery.
- Limited upgradability: The RAM is soldered to the logic board and can't be replaced, and there's no slot/port to add an internal drive. However, you can expand storage via an optional external floppy drive.
- The case is fairly difficult to open, with deeply recessed screws and a tight panel fit.
- There are some dangerous high voltages on both the power supply and the CRT that make repair potentially hazardous.

To reassemble your device, follow these instructions in reverse order.