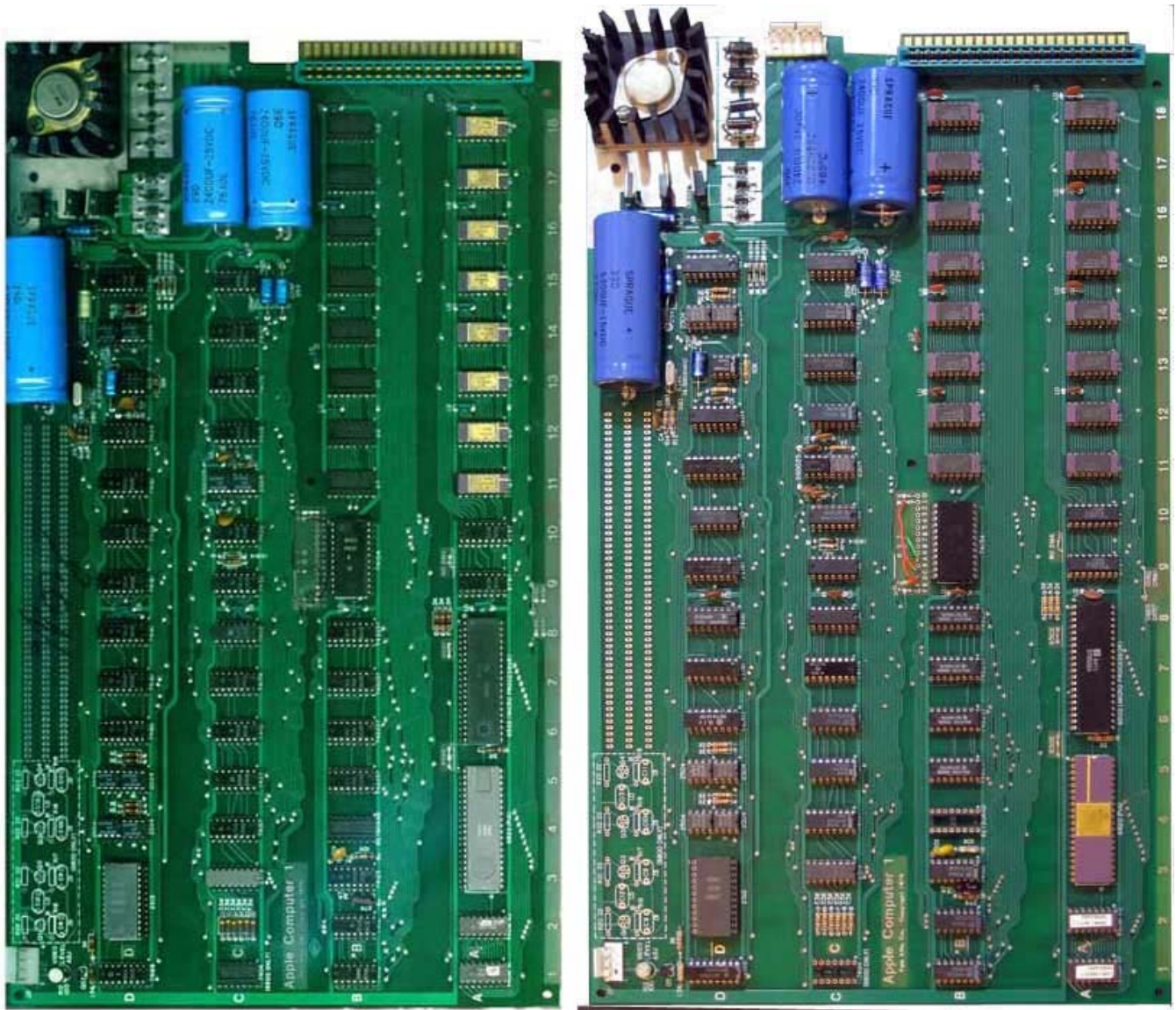# Apple 1 Mimeo Project

An Original Apple 1 Motherboard (left)   A Mimeo 1 Motherboard (right)

The Apple 1 Registry - information about original Apple 1 computers

Build your own Apple 1 clone

Information about my replication process

Little known details about Apple 1 hardware

The Apple 1 Cassette Interface (ACI)

Find sources for Apple 1 software

What I did for an Enclosure

Reproduction Datanetics Rev B Keyboard

Vist my blog for updates on my latest work on the Apple 1 and other projects

My Apple 1 Keyboard Solution

Finding ASCII keyboards for your Apple 1 project can be difficult. This adapter lets you connect readily available PS/2 keyboards, to your vintage computer that expects a parallel ASCII type keyboard. The included serial interface also allows you to download software quite easily into your Apple 1.

The best websites with Apple 1 or related info:

http://www.applefritter.com/main: Documents and a user forum (maybe the only Apple 1 specific forum in existance)
http://www.cpmuseum.com/Exhibit.aspx?address=7604: Images, documents and a recently wirewrapped Apple 1 prototype
http://www.sbprojects.com/projects/apple1/index.htm: A lot of good stuff including some theory of operation
http://apple1computer.blogspot.com/: John C.'s Apple 1 blog - his Apple 1 clone projects (including a Mimeo) and much more info on the original Apple 1
http://cameronscloset.com/ Cameron Coopers Apple 1 site. See his Mimeo PCB based replica using vintage chips scrounged from around the world
http://www.apple1notes.com/Home/Hello.html: W Sander's beautify repackaged original (includes some programs for download to cassette interface from an iPod)

Reproductions Using Later Generation Technology:

http://www.brielcomputers.com/wordpress/ Vince Briel's original
http://www.achatz.nl/catalog/index.php?cPath=3 Another version made in Europe

Mass Storage and expansion:

http://dreher.net/?s=projects/CFforApple1&c=projects/CFforApple1/main.php Solves your mass storage issues without dealing with a tricky cassette interface

Don Lancaster's TV Typewriter

http://www.swtpc.com/mholley/RadioElectronics/TV_Typewriter.htm: The video section has similarities to the Apple 1, and several people have speculated that Steve W. leveraged the TVT design in putting together the video section of the Apple 1. Here is Steve's reply to my inquiry to him about this.

Hi Steve,

There are a several people, including myself that has speculated that you leveraged and enhanced Don Lancaster's TV Typewriter video system when developing the Apple 1. I know you were also involved in video games to some extent, at the time. Can you comment on any existing designs that might have helped inspire the rather clever video system on the Apple 1?

Thanks and regards,
Mike Willegal

"nope

I was totally unaware of Don Lancaster's TV Typewriter when I designed my TV Terminal to access the Arpanet. I only found out about Don's device in subsequent years. Our designs had to be very different. I'm sure that both schematics are online so anyone could see this. I added a microprocessor and RAM to this terminal to create what became the Apple I.

Don did a lot of great and important stuff back then. But I wasn't in the discussion loop or Popular Electronics loop so I would not have even known his name.

The Apple I video system was designed with synchronous counters for NTSC television horizontal and vertical signals. They

The Apple I video system was designed with synchronous counters for NTSC television horizontal and vertical signals. They were probably identical to the ones I'd designed in to my Pong and Breakout designs.

In an early phase in my life I tried to minimize chip count. But by this time I tried to minimize chip area, with smaller chips winning out, even when there were more of them, in many cases.

I also looked for the absolute cheapest parts.

The major cost component of my TV Terminal was the video RAM. I chose 40 columns of text per line on the screen to match NTSC bandwidths. More characters would have meant that the dots forming them might not show on NTSC TV's. I chose 24 lines of text, giving 960 characters. I forget why I didn't use 25 lines but maybe it took an extra chip of address decoding. It still would have fit into the 1024-bit dynamic shift registers I chose for the screen memory. These 1024-bit dynamic shift registers were the most cost-effective solution I could find for the screen memory and they were tiny 8-pin chips. These RAM's had to shift once for each character on the screen. Since the screen was drawn every 60th of a second, it meant that any character only appeared 60 times a second. This also led to only being able to add one character every 60th of a second, which is much lower than microprocessor speeds. But this terminal would ONLY connect over a modem and high-speed modems then were 300 baud, or about 30 characters per second. That's how tightly optimized this design was.

When I turned it into the Apple I by adding my own local processor and RAM, the low character refresh rate was a real slow-down. But I was only modifying a terminal to get something built quickly.

The Apple][only took about 3 months to design and it was a computer from the ground up, so it wasn't held back by having been a modification of a TV terminal designed for low cost with modem connection. Oddly, the Apple][wound up with about half the parts doing 10 times as much, but that was due to other things that really couldn't have been applied easily when I designed my TV Terminal.

I hope this doesn't confuse you.

best,

Woz"