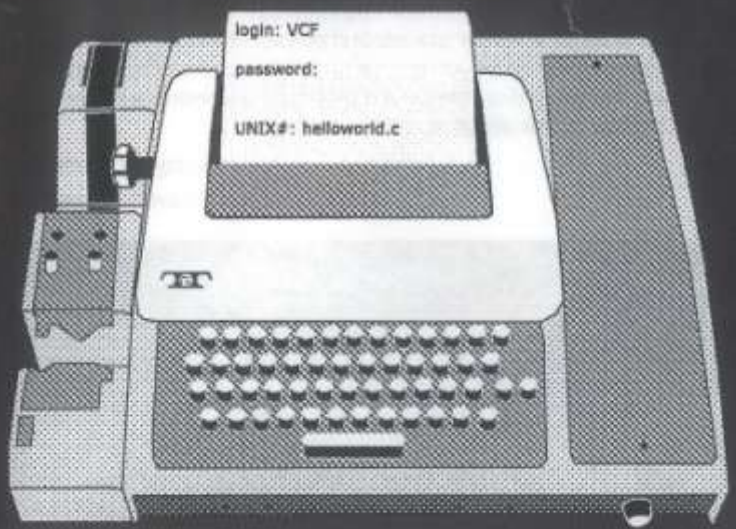
Vintage Computer Festival

Sunday, August 4, 2019

Photos by Dave Jaffe

2019 Vintage Computer Festival West



Program Guide

Hello, world!

Welcome to the Vintage Computer Festival West 2019. You're about to embark on a fantastic family-friendly adventure backward in time.

You will see and touch dozens of historic computers from many decades gone – everything from big iron to eight-bitters. You'll also experience some creative new replicas, modern enhancements, and new retrothemed systems. You will meet some historic people, learn their insider stories, and perhaps pick up our nerdily awesome t-shirt! While you're here, remember to tour the amazing museum all around us: they're a terrific host and worth a return trip. Be sure to talk about us online: #vcfwest

Happy computing,

- The Vintage Computer Federation

Vintage Computer Federation

Vintage Computer Federation Inc. (vcfed.org) is a 501(c)3 non-profit organization for and by computer history enthusiasts. We evolved in 2015 from the DNA of related groups.

In addition to Vintage Computer Festival West, we also own VCF East (New Jersey each spring) and VCF Pacific-Northwest, and we are working hard on creating more events.

We're big fans of online collaboration. We own Vintage Computer Forum, which is the hobby's largest discussion site. There are thousands of users worldwide to help you with whatever niche of vintage computing you prefer.

We also support in-person meetups through regional chapters. Our founding chapter in the U.S. Mid-Atlantic region has its own hands-on computer museum! We are actively incubating new chapters and partnering with existing local groups to join the Federation.

Saturday Schedule

9:00
Show opens

10:00 - 10:30
Welcome
CHM State of the State - *Dag Spicer*

11:00 - 12:00
IBM 1401 Demo at the CHM

1:00 - 2:30
ICs and Aging - *Bil Herd*
Bil Herd, designer and lead engineer of several models of Commodore computers from the mid 80's was in total disbelief that any units are still working 35 years later, but has figured out why there are still working units.
Join us as Bil asserts that all computers and all components will one day fail, and shares the mindset of designing for production from gaskets to IC's, and how to prolong the life of your vintage computer.
This is an ideal time to ask an engineer that was there what the heck were they thinking!
Topics: Heat and its effects and mitigation, Computer design, test, and production, to include the custom IC's, and the chemistry of everyday life.

2:30 - 3:30
PDP-1 Demo at the CHM

4:00 - 5:30
Apple 1 Owners Panel
Ten or more Apple 1 computers, including several up-and-running, will be displayed at VCF West.
Original and current owners will join early Apple employees in a panel to discuss the computers, why they were purchased, how they were used, and what the owners plan to do in the future.

6:00
Show closes

6:30
Dinner at Roberto's Cantina

Exhibitors

VCF exhibitors put amazing effort into displaying their favorite historic computing systems. Be sure to visit them all, ask questions, play, learn, Tweet, and take lots of pictures! Perhaps you'll be inspired to exhibit your own pride-and-joy at VCF West 2020 next year.

01 **Portable Storage Media**
Foone Turing, Milpitas, California, with Amber Turing, Ramona Sagan, and Rose Willard
Foone will show off floppy disks and optical discs, the main ways we used to portably store data for transfer between computers before flash storage and the cloud ruined all the fun.

02 **Sun Microsystems IPX Lunchbox Computer**
Simon Wynn, Redwood City, California
Simons says the Sun Microsystems IPX was an entry level Sparc-based UNIX workstation introduced in 1991, with an eye-popping $11,995 price tag. He'll display a restored and fully-loaded system, together with peripherals, the classic Type 4 keyboard, and an optical mouse. Software will include SunOS, Solaris, WABI Windows 3.0 emulation on Sparc, early Netscape web browsers, and the original 1.0 version of NCSA Mosaic.

03 **Re-creating Vintage Computers**
Chris Davis, Willmar, Minnesota
Chris enjoys building modern-powered vintage computers. It's an enjoyable way to learn and experience history, plus it's a great way to teach his kids! He will show vintage computer replicas such as an Altair 8800 using an Arduino Duo, ATMEL-powered Kenbak-1, and an Apple I replica.

04 **SF Acorn User Group / Bay Area Retrocomputing Club**
Phillip Pearson, Mountain View, California, with Chris Collins, Alex Perez, Luca Severini, and Anthony Curtis
The group will display a selection of British home computers, following on from their 2018 exhibit. The machines are an Acorn Atom, BBC Model B, BBC Master 128, Electron, and Archimedes. They'll also have modern add-ons.

05 **The Return of TACOBOT**
Steve Tonet, Sundance, Utah
Steve reminds you not to eat his exhibit. The award-winning TACOBOT video game, shown last year running on the homebrew STUPID computer, returns in arcade game form with a Motorola 6809 processor and using techniques

(Continued...)

Sunday Schedule

9:00
Show opens

10:00 - 11:00
Apple 1 Live Demo on the main stage

11:00 - 12:00
IBM 1401 Demo at the CHM

1:00 - 2:00
The Apollo Guidance Computer: Part 1
The Apollo Guidance Computer was entrusted with all guidance, navigation and control of the Apollo spacecraft for voyages to the Moon. Part 1 is a comprehensive introduction of the Apollo Guidance Computer's quirky architecture, the clever hardware, the quite unusual peripherals and the revolutionary system software. We will address how the designers overcame the limitations of the hardware and created a system that is sophisticated even by today's standards.

2:00 - 3:00
The Apollo Guidance Computer: Part 2
Building on Part 1 and moving into flight operations, we will describe the concepts needed to navigate a spacecraft from the Earth to the Moon, and how the computer accomplished this task. Finally, we will describe key phases of the mission and how the computer was used to accomplish them. Importantly, we will detail the procedures used to land on the moon, and the computer alarms that faced the crew of Apollo 11.

2:30 - 3:30
PDP-1 Demo at the CHM

3:30 - 5:00
Cadetwriter
Developed as a by-product of the IBM 1620 Jr. project, the Cadetwriter is a general-purpose ASCII teleprinter. It can be connected via RS-232 (TTL level) or USB to any mini, micro, mainframe, or replica computer as a terminal device. All of the plans, schematics, software, and documentation are being made freely available to the community so that anyone can build their own Cadetwriter for nominal cost and little effort. This talk will describe the unit, the challenges in designing it, how to build one, and how to configure & customize it.

5:00
Awards Presentation

5:30
Show closes

Exhibitors, continued...

from Don Lancaster's Cheap Video Cookbook for video output.

06 **The Apple Lisa Documentary**
David Greelish, Johns Creek, Georgia, with Tamara Greelish
David is exhibited about his Apple Lisa documentary which is in development and scheduled for release this fall.

07 **ATARI 400/800 Computers 40th Anniversary**
Kevin Lund, Livermore, California, with Bob Woolley, Robert Bridges, Garrett Holthaus, and Bill George
The SLCC (San Leandro Computer Club) proudly presents an exhibit of the original Atari 400 & 800 computers. They will have complete working systems with all the peripherals on display to see and use. Come play games like the first FPS game ever released: Star Raiders! They'll also have a kiosk used by Atari at C.E.S. booths running the 400/800 sales interactive program E.R.I.C. along with displays of all the original released Atari software.

08 **RetroShield for Arduino Mega**
Erturk Kocalar, Sunnyvale, California
Erturk designed several Arduino shields to connect 8-bit microprocessors to the Arduino Mega microcontroller system. Mega emulates ROM, RAM, and I/O devices so the real 8-bit microprocessor executes code. Examples include 6502, Z80, and 6809 boards running Apple-1, Simon6809, and Z80 Efex monitor code. More are under development.

09 **Apple 1 and Apollo Guidance Computer**
Jonathan Sieffken, Boston, Massachusetts, with Bobby Livington
These men work for RR Auctions. They'll preview upcoming auctions of super-rare artifacts.

10 **The Wonderful World of Quake**
Chris Satterfield, Fairfield, California, with Zachary Hardesty
Chris and Zachary remind you that Quake is a game we all know and love from the 1990s, but that it wasn't just for DOS and Windows! They will demonstrate a Quake multiplayer setup across the RS/6000 series, Sun Ultra, Daystar Genesis, and possible an SGI machine.

11 **Microprocessor/Controller Trainers: Past and Present**
Francis Bauer, Santa Rosa, California
Francis is a fan of single-board computers. They were common in the second half of the 1970s to teach people how to program and how to use microprocessors/microcontrollers for prototyping new designs. His exhibit will also include some relay-based trainers, so you can hear them run!

12 **Living Computers: Museum+Labs**
Josh Dersch, Seattle, Washington, with Casey Linden
LCM|'s latest exhibit is a Xerox 8010 Information System, better known as the Star workstation, alongside a microcode-level Star emulator developed which they named Darkstar. You can experience GUI history and early desktop metaphors with Viewpoint and Star OS, do some hacking in Mesa on XDE, or delve into AI on Interlisp-D.

13 **Early Handwriting: Apple Newton vs. Palm Treo**
Thomas Conrad, Morgan Hill, California
Thomas knows PDA-writing; do you? Newton and Treo were both landmark device series in the history of mobile computing. But how well do they recognize your handwriting? The answers may surprise you.

14 **Apple II Rev. 0 vs. Rev. 7 Replica**
Logan Greer, Fresno, California
Logan built a replica Apple II based on Mike Willegal's CAD files for the motherboards.

The new boards will become part of kits to be available for sale online.

15 **The Future of Retro Computing**
Jay Cotton, Livermore, California
Jay's exhibit will feature a Z-80 machine – the RC2014 – running CP/M and BASIC along with some games.

16 **Rare Computers From Japan**
Duncan Mac Dougall, Santa Clara, California, with Alex Cmaylo, Mitch Zollinger, and Thomas Daede
Duncan and company are fans of Japanese systems that never reached Western shores. These include an X68000, several PC-98 systems, an MSX2+, PC-88, and FM-TOWNS.

17 **RISCy Business**
Cameron Kaiser, Rialto, California
Cameron won't drive a Porsche into a lake, but he will show RISC-powered UNIX portables. Examples are the Sun Ultra-3 running Solaris (SPARC), Tadpole SPARCBook running Solaris (SPARC), RDI PrecisionBook running HP/UX (PA-RISC), SAIC Galaxy 1100 running NeXTSTEP (PA-RISC), and IBM ThinkPad 860 running AIX (PowerPC). A couple of surprise non-UN*X oddballs from the SH and m68k families will also make an appearance.

18 **BSD: Then and Now**
Madeline Autumn-Rose, Milpitas, California
Madeline digs BSD. She'll teach us about this unique operating system, from a a running instance of 4.3 BSD in simulation to modern NetBSD on a vintage VAX.

19 **6502-Based Microcomputers**
David Henderson, Tempe, Arizona
David knows 6502, so he will demonstrate the SYM-1 and KIM-1 single board computers, Ohio Scientific Challenger 1P, Commodore 128, Atari 130XL, BBC Master 128, and a 65816-based Apple IIGS Woz Edition.

20 **IBM 1620 Jr. / Recreating the Console Typewriter**
Dave Babcock, Mountain View, California, with Steve Casner and Joe Fredrick
A team representing Computer History Museum volunteers will show off their IBM 1620 Jr. project. The goal is to produce an operational version of the IBM 1620 Model 1 Level F computer that recreates, as much as possible, the experience – physically, visually, and viscerally – of operating a real one.

21 **Cadetwriter - a Wheelwriter-based Computer Terminal**
Dave Babcock, Mountain View, California, with Steve Casner and Joe Fredrick
Cadetwriter: A Wheelwriter-Based Computer Terminal — But wait, there's more! Beside their 1620 Jr. project itself, the CHM team will also demo Cadetwriter, which is a general-purpose ASCII terminal. It can be connected via RS-232 (TTL-level) or USB to any mini, micro, mainframe, or replica computer. It's a reliable, low-maintenance, low-cost substitute for Teletype, DECWriter, Diablo, Spinwriter, ImageWriter, and other teleprinters. Bring your favorite computer and try it out!

22 **Tandy/TRS-80 Color Computers**
Michael Furman, San Jose, California, with Tim Lindner, Rob Inman, and Mark D. Overholser
This crew teaches us about CoCo, the popular home computer introduced in 1980 and sold by Radio Shack until 1991. Over the past few years the community of people keeping the CoCo alive has been vibrant and growing. They demonstrate many of the ongoing projects and innovations in hardware upgrades, game/OS software, and PC/FPGA emulation.

23 **The Cactus: More 6502 Blinkenlights**
Alexander Pierson, Falls Church, Virginia
Alex and his Cactus are back to show

(Continued...)

Exhibitors, continued...

the latest updates to the awesome 6502 front-panel computer, which won a Best of VCF East show a few years ago. Explore the improved front panel logic, now with a perfected single-step mode and software controlled switches.

24 **MOnSter 6502**
Eric Schlaepfer, Sunnyvale, California
The MOnSter6502 team will show the latest version of their transistorized 6502. This year it runs inside a picture frame and displays visualizations including a clock mode.

25 **The History of Videogames**
The MADE, Oakland, California
Staff from the Museum of Art and Digital Entertainment will bring out their favorite historic videogames. Grab a controller and go with the flow!

26 **Building the First Computer**
Brian Parker, Redwood City, California
Brian through outside the box and went Babbage! He will show us the design and fabrication of Charles Babbage's Analytical Engine, 1833-1840. This half-scale model in aluminum and steel will eventually be the size of an executive desk and run code off punch cards.

27 **Solid-State Monopoly Game**
Stephen Casner, Sunnyvale, California
Stephen is again featuring his homebrewed solid-state Monopoly game, operated with what used to be handheld calculators. It's all written in assembly language and occupies less than 16KB of ROM and 8KB of RAM.

28 **The Modern Apple II**
Les Barrows, Mountain View, California, with Eiko Okura
Les modified his Apple II with all sorts of new peripherals. It has Ian Kim's A2Z80Plus board (Z80), Michael Packard's continuing Apple II game software, Thomas Cherryhome's alpha version of the IRATA.ONLINE PLATO client, and a MIST FPGA Apple IIe core.

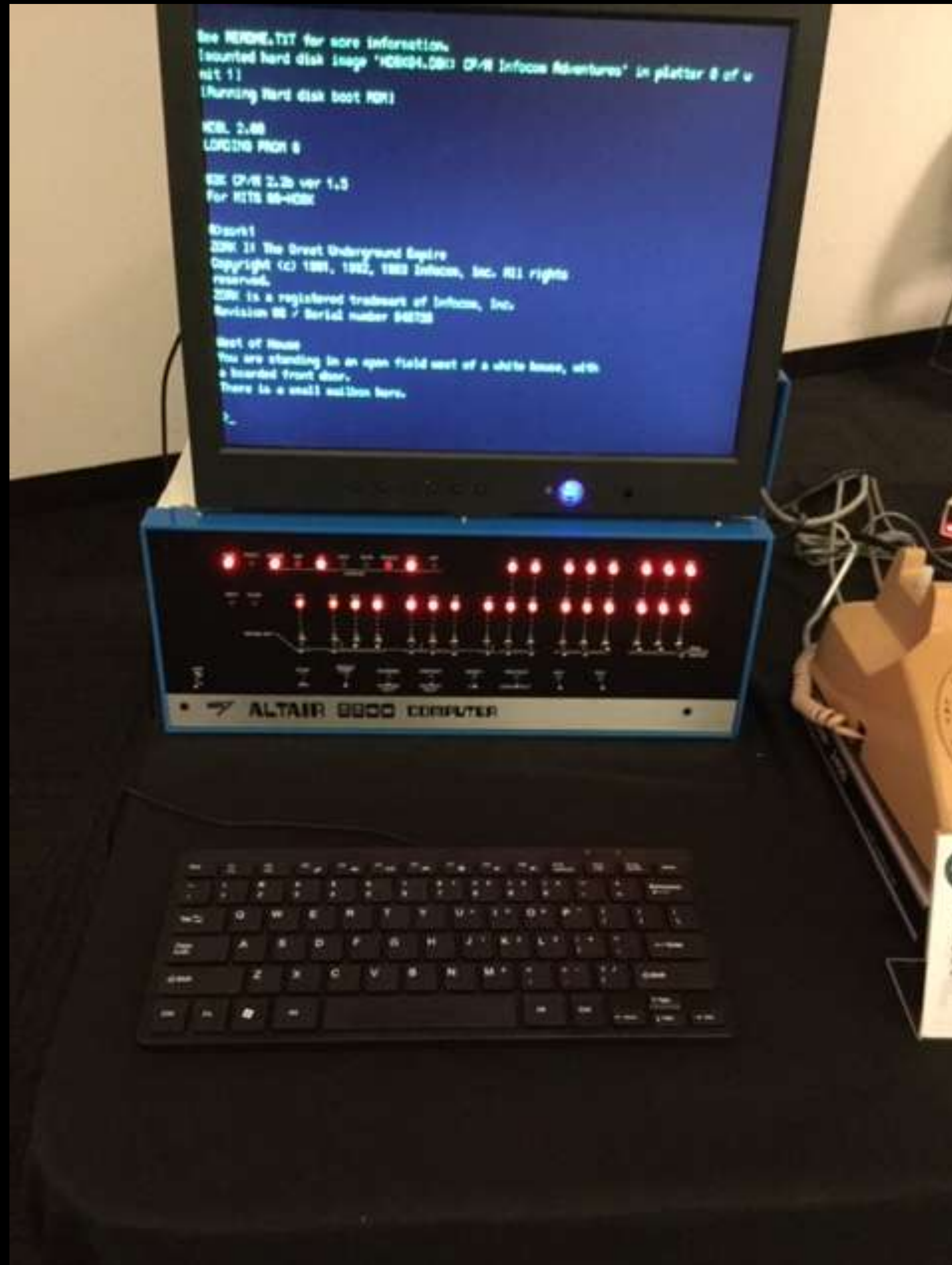
29 **The IBM PC Family**
Jarrod Coombes, Dublin, California, with Anthony Hoppe
Jarrod is bringing a thorough exhibit of the IBM personal computer family. His collection of 51xx-series machines includes the original PC, XT, XT/286, and AT. He will also have the PC's cousins on display, including the Portable, Convertible, and PCjr.

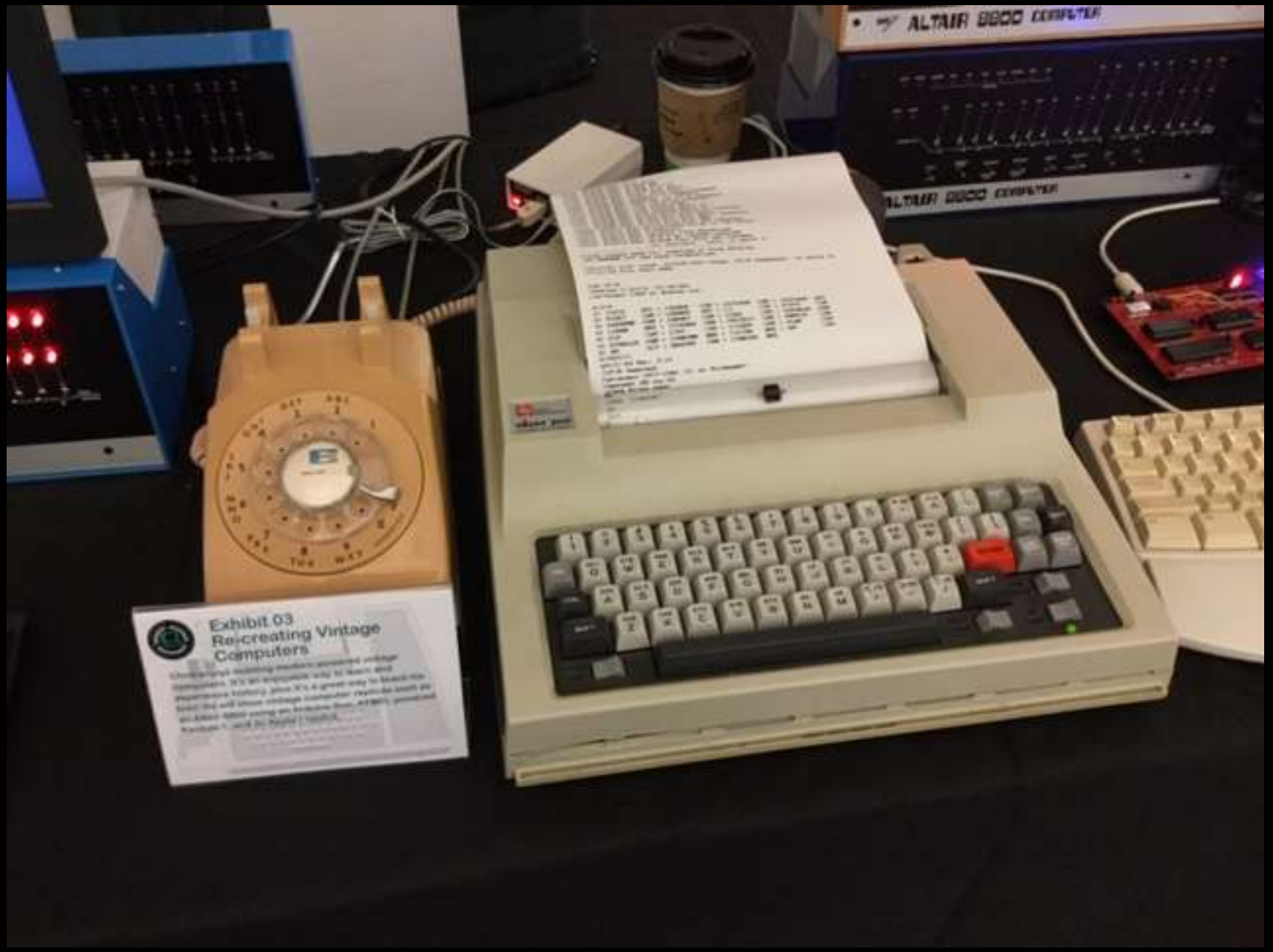
30 **MakerLisp Machine**
Luther Johnson, Chandler, Arizona
Luther's built a homemade Lisp computer out of modern components. It is very small but very powerful! It's also got a laser-cut wood enclosure for a keyboard, LCD monitor, and a prototyping area with a breadboard.

31 **Vintage Video**
Michael Hill, Daly City, California
Michael will present an exploration of modern media playback on vintage computer hardware such as Commodore 64, Commodore PET, and Apple II.

32 **Zilog Inside**
Alex Nascimento, Mountain View, California
Alex will present an exhibit of some of the most successful 'Zilog inside' machines in Japan and Europe. He will also be exhibiting some rare machines and some recent machine re-launches.

33 **SDF Public Access UNIX System presents: UNIX @ 50**
Stephen M. Jones, Seattle, Washington and Peter Hall
Stephen and Peter feature simulations of Hysterical UNIXes from 1969 - 1992 presented on an AT&T 605 Travelling UNIX Terminal. Visitors are encouraged to best Karl Koscher's winning B code by writing their own 'clever' B program.


ZORK II: The Great Underground Empire
ALTAIR 8800 COMPUTER


ALTAIR 8800 COMPUTER
ALTAIR 8800 COMPUTER
Exhibit 03
Re-creating Vintage
Computers


ALTAIR 8800 COMPUTER
ALTAIR 8800 COMPUTER


Panasonic
A1
Z80 8-Bit
ESC
TAB
CTRL
SHIFT
SPACE
SHIFT


PHILIPS
VG-8020
F1-6
F2-7
F3-8
F4-9
F5-10
SELECT
STOP
ESC
TAB
CTRL
RETURN
GRPH
CODE


Zilog
inside
Z80 © 8-Bit


significantly changed from its UK ancestor. Arguably one of the first Sinclair
clones to significantly improve on the original design, it added several new
features. However, they made the machine incompatible with most of all
commercial titles. To remedy this, users built a cartridge with a Spectrum ROM
for emulation. It was able to run most software produced for the Spectrum.
Type
Home computer
Sinclair QL
BLACK


Amstrad CPC (1984)
AMSTRAD
CPC 464


sinclair
128K
ZX Spectrum +2


ZX Spectrum +3 (1987)
The ZX Spectrum +3 looked like the +2 but featured a built in 3 inch floppy disk drive instead of the tape drive and was in a black case. It was launched in 1987, initially retailed for £249 and then later £199 and was the only Spectrum capable of running the CP/M operating system without additional hardware.
The +3 saw the addition of two more 16 KB ROMs, now physically implemented as two 32 KB chips. One was home to the second part of the reorganised 128 ROM and the other hosted the +3's disk operating system. This was a modified version of Amstrad's AMDOS, called +3DOS. To facilitate the new ROMs and CP/M, the bank switching was further improved, allowing the ROM to be paged out for another 16 KB of RAM. Almost all +3 machines have a sound fault, due to a component being left off the board, which means the sound is distorted and clips.
128K
ZX Spectrum+3
128K

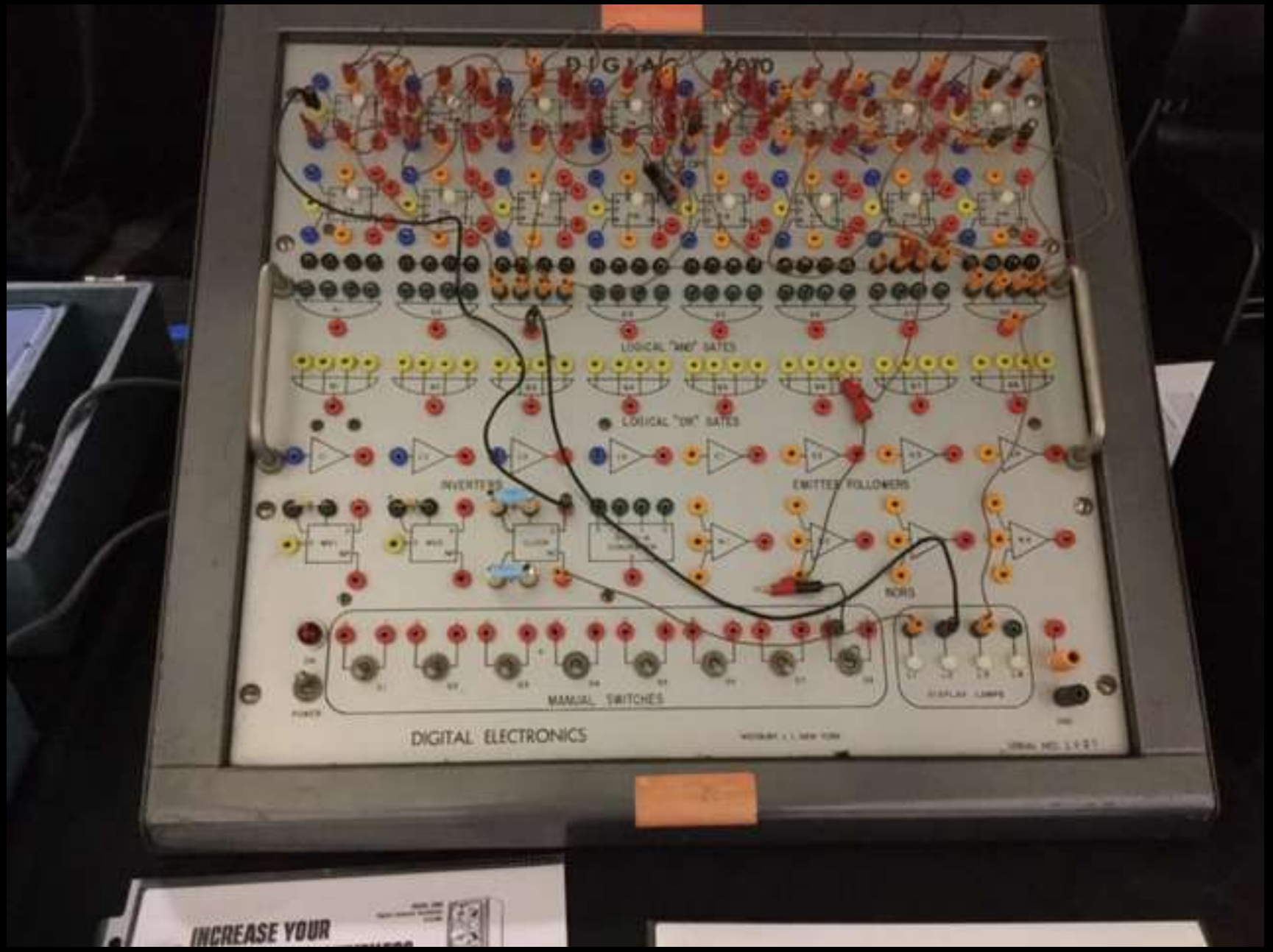

R K
WRITE DATA
PORTB
PORTA
A ADDRESS
B ADDRESS
99.00.02.00
00
Francis Bauer
A1 B1 A2 B2
C1 C2
DPDT
Relay
Single
Board
Computer

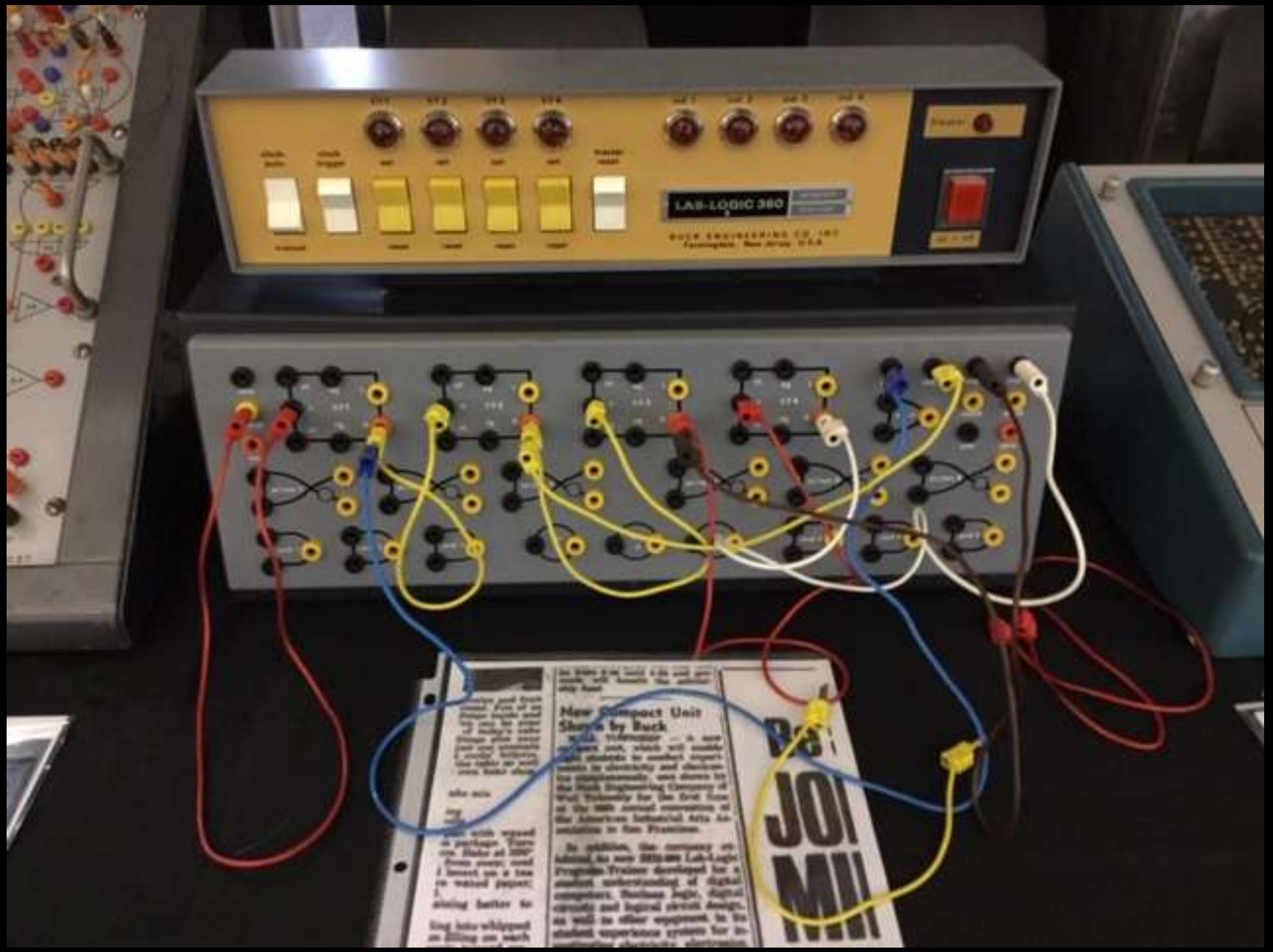

R K
99000800
00
7 8 9 A
4 5 6 B
1 2 3 C
0 F E D
Francis Bauer
A1 B1 A2 B2
C1 C2
DPDT
Relay
Single
Board
Computer

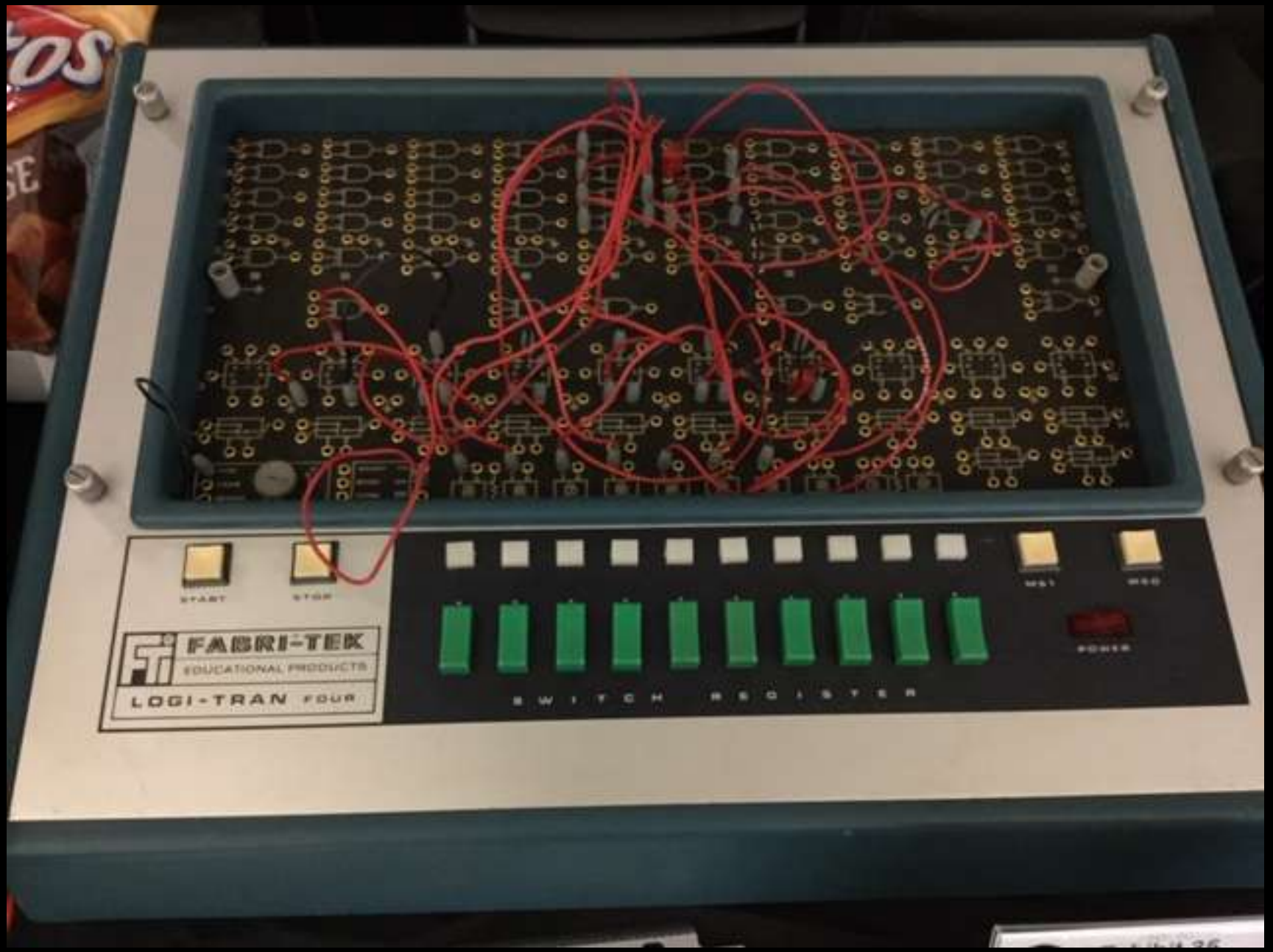

NORTH
SOUTH
WEST
EAST
1
2
3
4
TRAFFIC SIGNAL DEMO BOARD

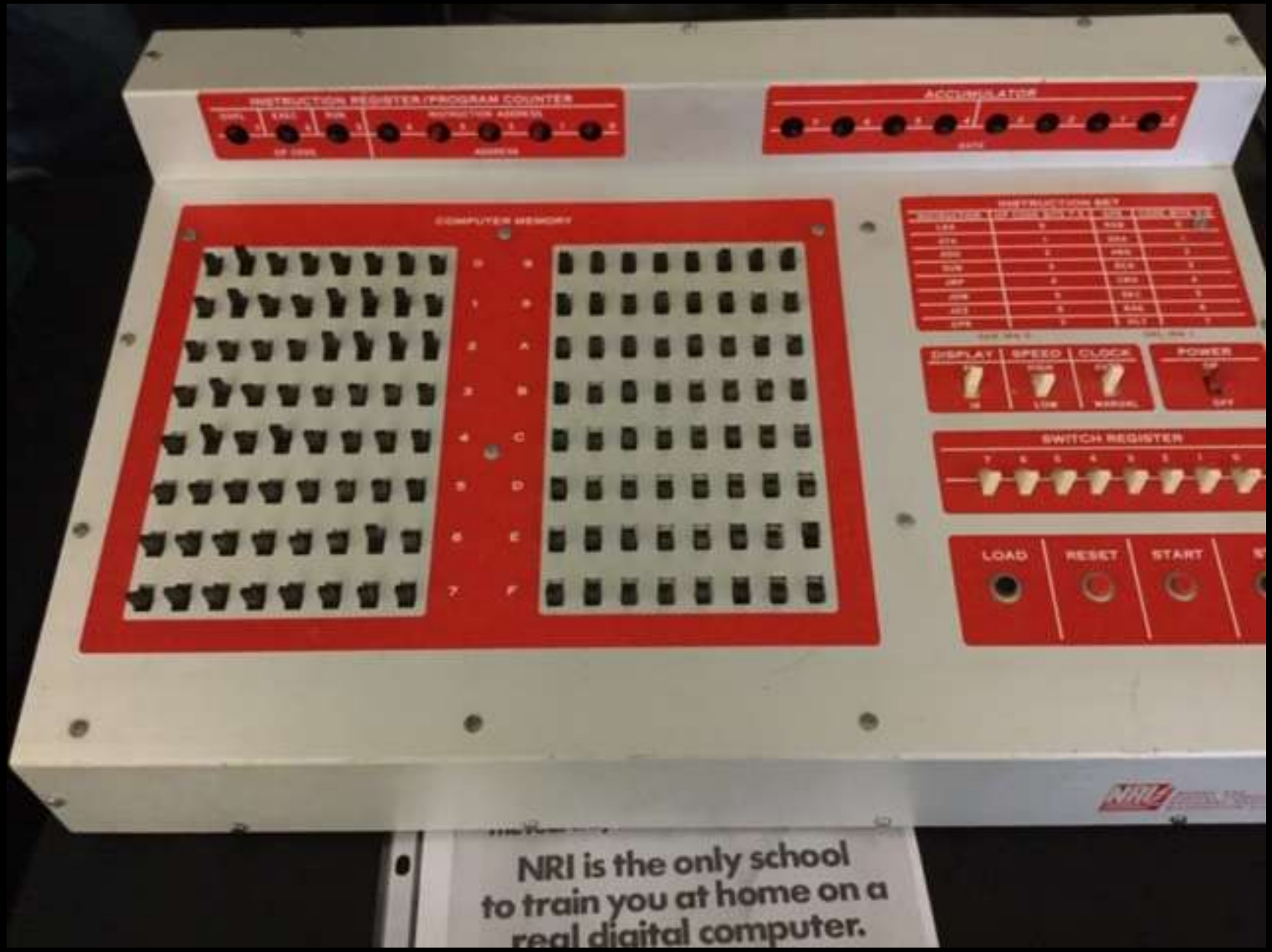

LOGIC CIRCUIT BOARD
AMF
L1
L2
L3
L4
A
B
C
D
ON
OFF


LOGIC
AMF
P
Q
R
L1
L2
L3
L4
A
B
C
D
ON
OFF


DIGIAC 2070
LOGICAL "AND" GATES
LOGICAL "OR" GATES
INVERTERS
EMITTER FOLLOWERS
NORS
MANUAL SWITCHES
DIGITAL ELECTRONICS
INCREASE YOUR


LAB-LOGIC 380
New Compact Unit
Shown by Buck
JO!
MII

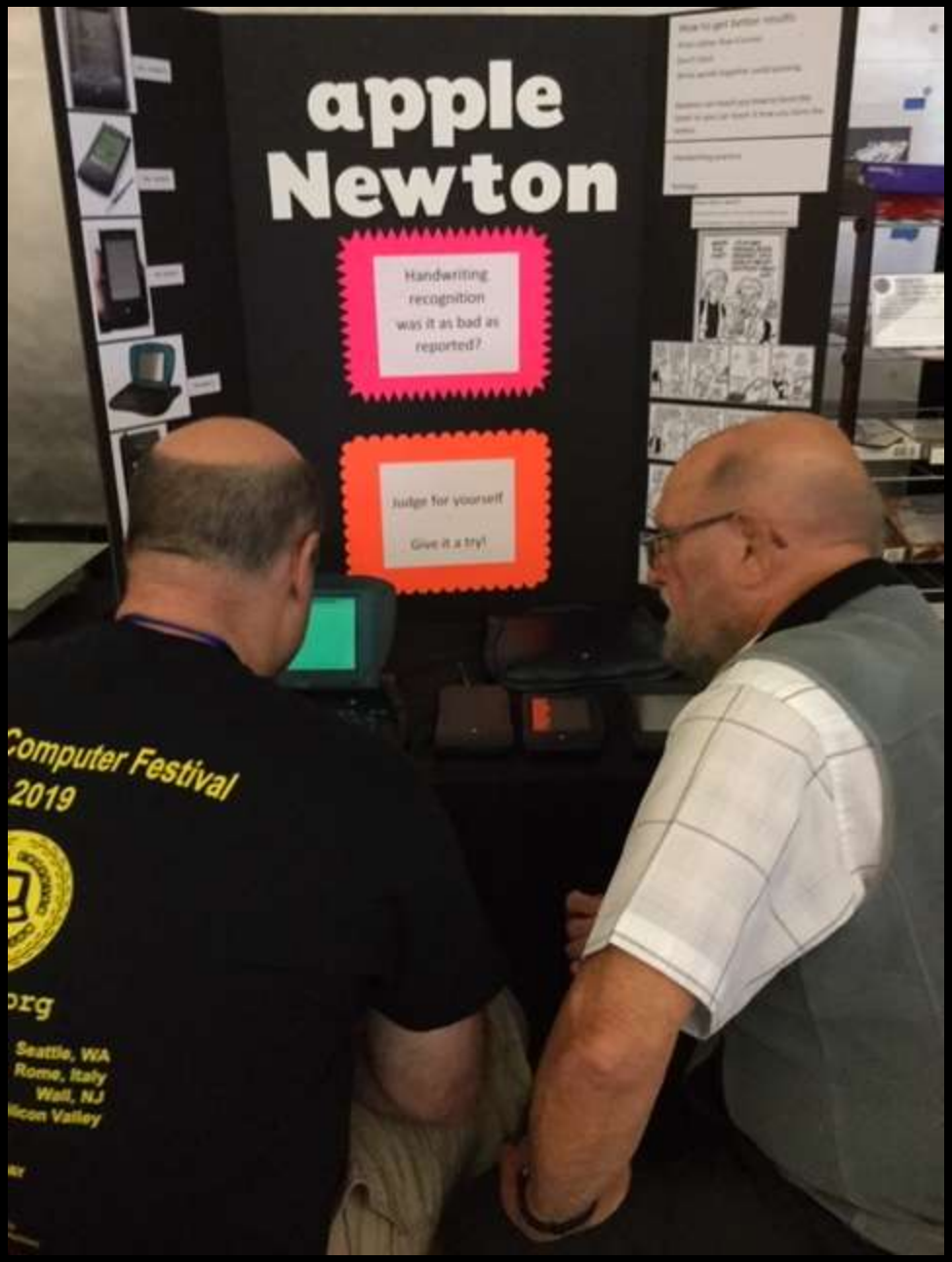

START
STOP
FABRI-TEK
EDUCATIONAL PRODUCTS
LOGI-TRAN FOUR
MS1
MS0
POWER
SWITCH REGISTER

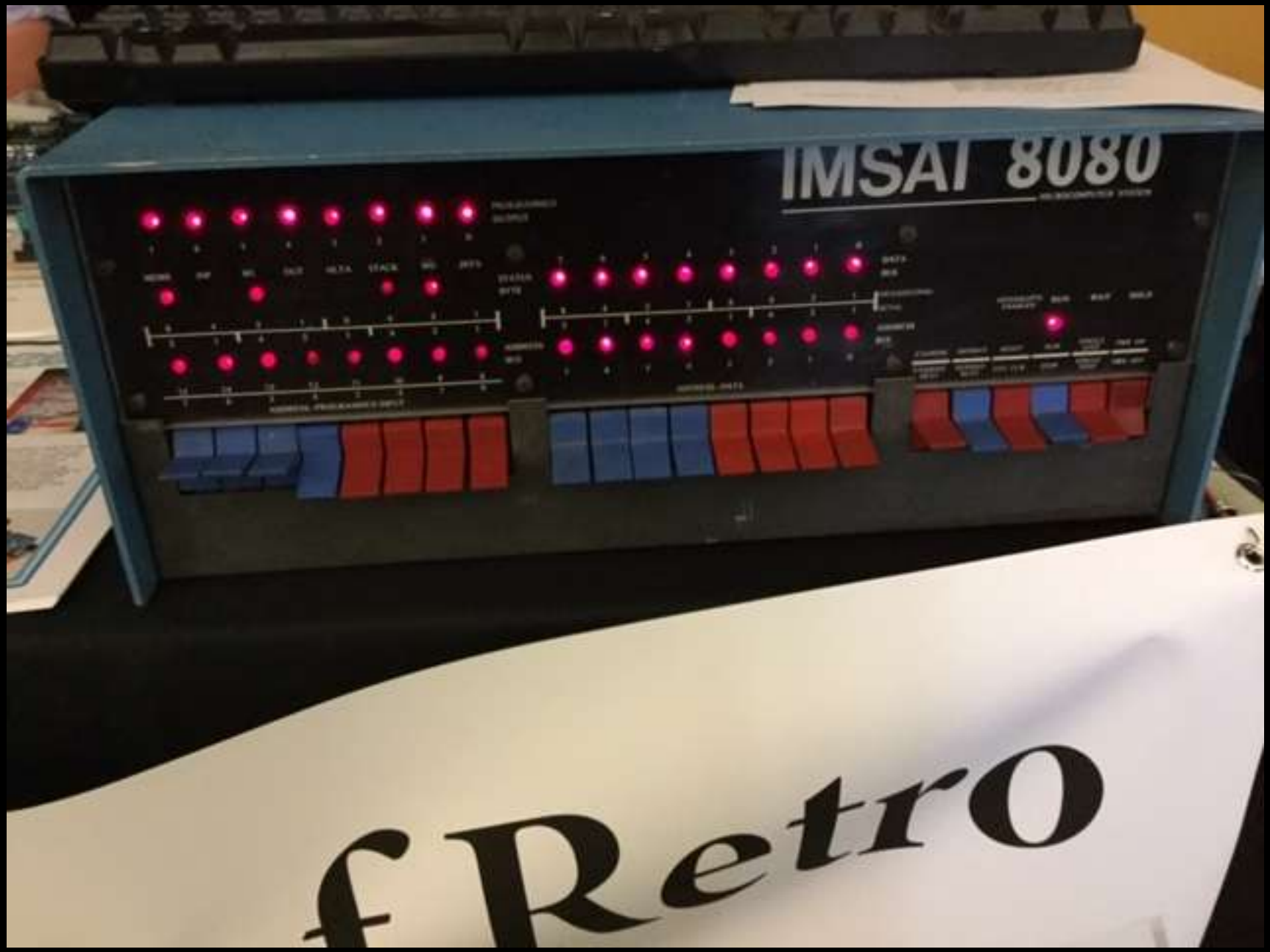

INSTRUCTION REGISTER/PROGRAM COUNTER
ACCUMULATOR
COMPUTER MEMORY
INSTRUCTION SET
DISPLAY
SPEED
CLOCK
POWER
SWITCH REGISTER
LOAD
RESET
START
NRI is the only school
to train you at home on a
real digital computer.


ADDRESS BUS
ADDRESS BUS BUFFERS
ADDRESS
CPU
ROM
RAM
BUS SWITCH
DATA BUS
DECODE/CONTROL
BUS BUFFER
DATA
STATUS
I/O PORTS
SPEAKER
DISPLAY OUTPUT
KEY INPUT
ADDRESS/REGISTER
DATA
OUTPUT LEDS
INPUT SWITCHES
5036A MICROPROCESSOR LAB
HEWLETT-PACKARD


C D E F
8 9 A B
4 5 6 7
0 1 2 3


CPU 2020
MEMORY
1024 x 8 BIT
MXP
STATUS PORT
INTERRUPT INSTRUCTION PORT


apple
Newton
Handwriting recognition was it as bad as reported?
Judge for yourself
Give it a try!
Computer Festival
2019
.org
Seattle, WA
Rome, Italy
Wall, NJ
Silicon Valley

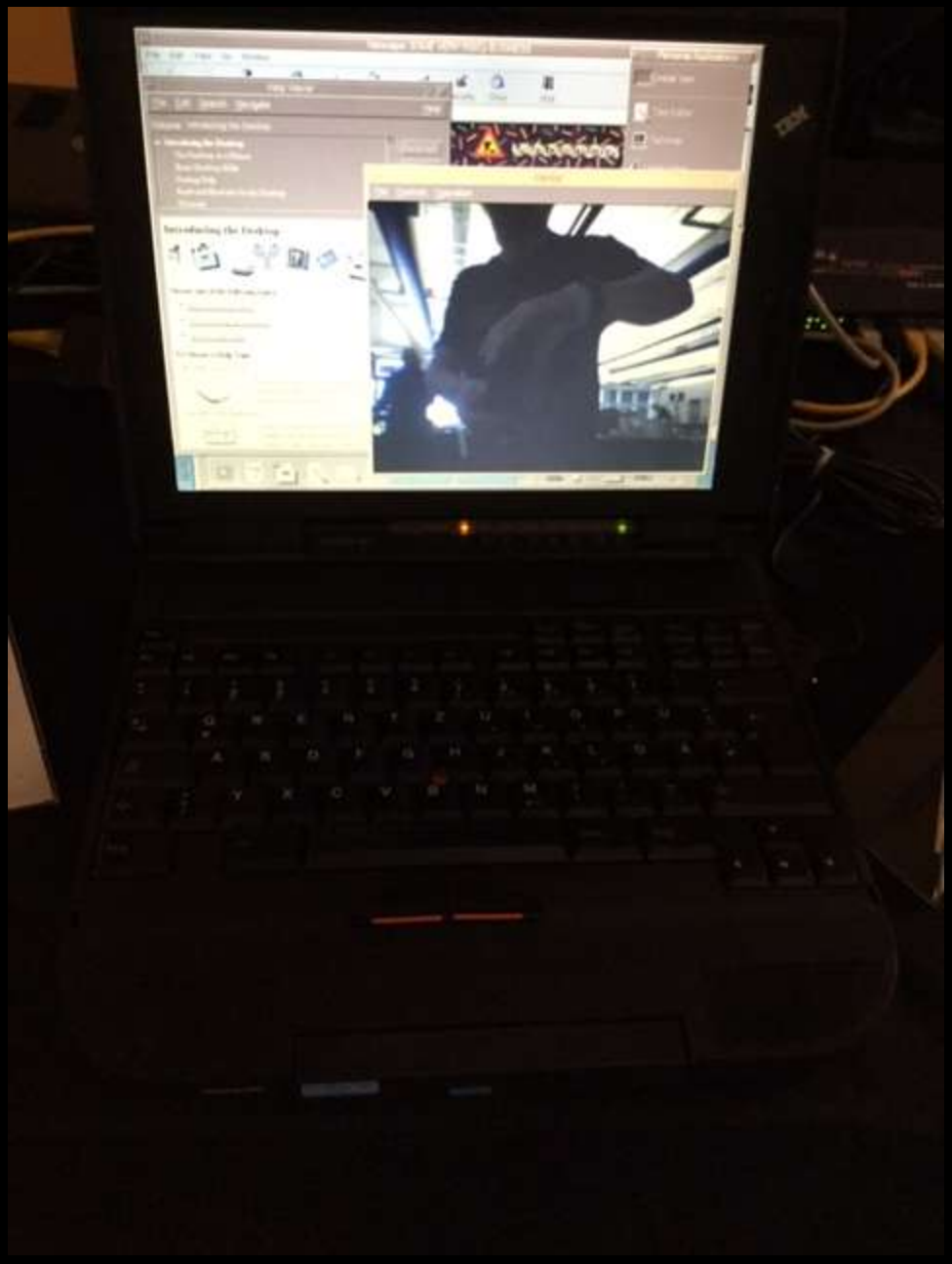

IMSAI 8080
fRetro

Original RC2014 Z80 System

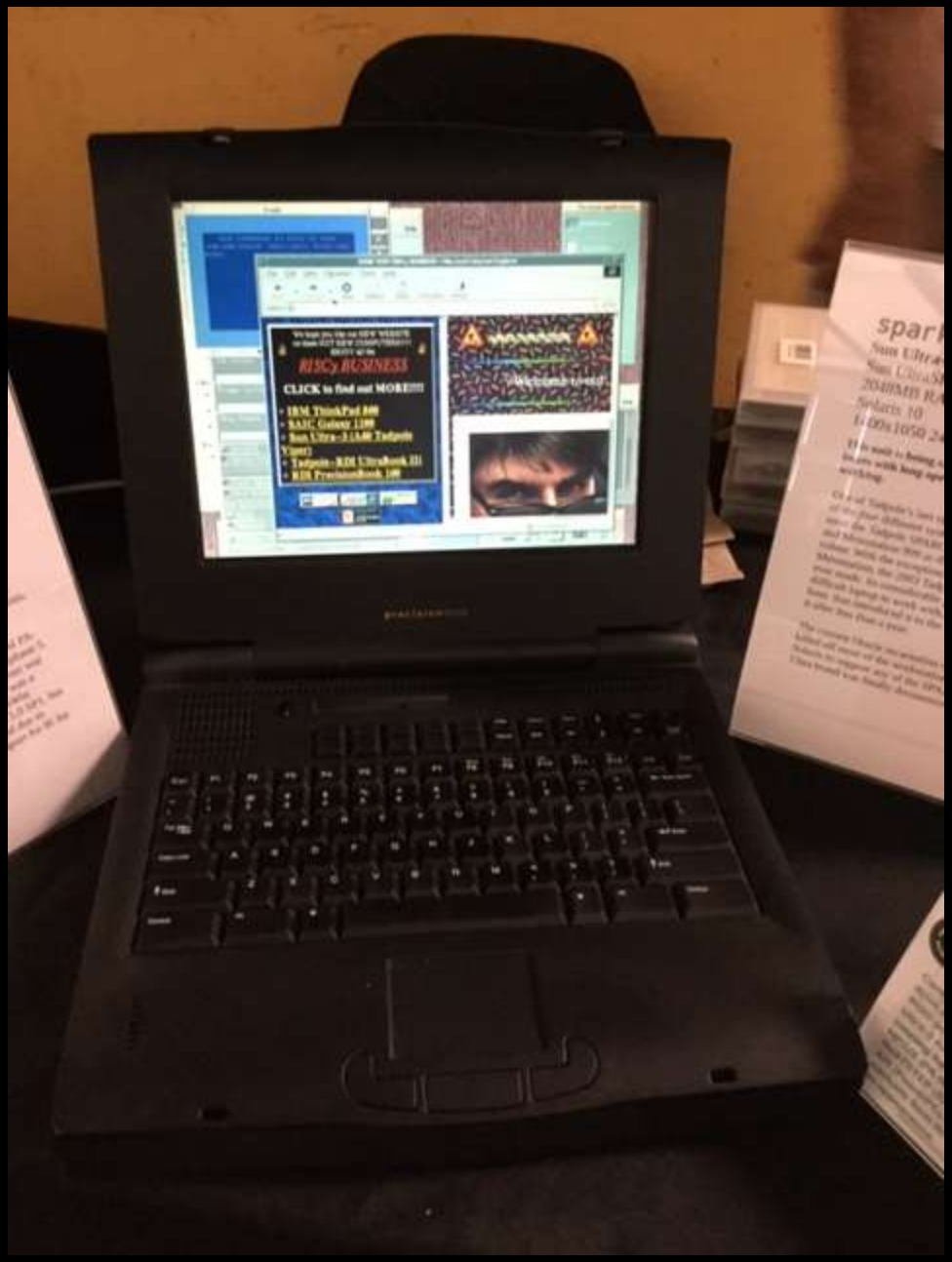
- Backplane
  - Vector board with socket strip
- Boards
  - Clock and Reset Board
  - ROM Memory Board
  - RAM Memory Board
  - Z80 Processor Board
  - 6850 Serial Board
- Software
  - 8K Basic in ROM
- PC used for keyboard/display
  - USB to TTL (FTDI) connection

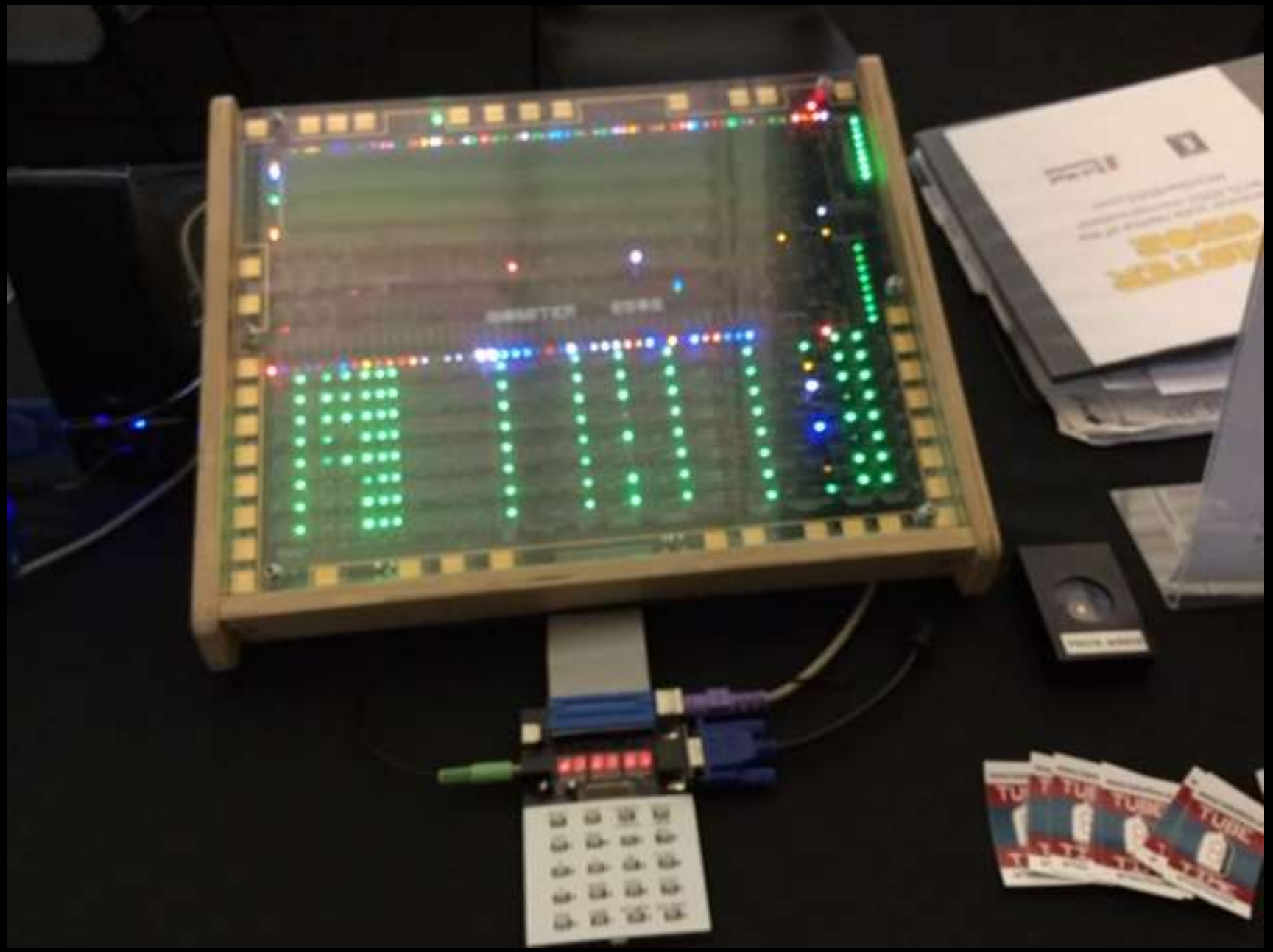
Z180 Single Board Computer (SBC) System

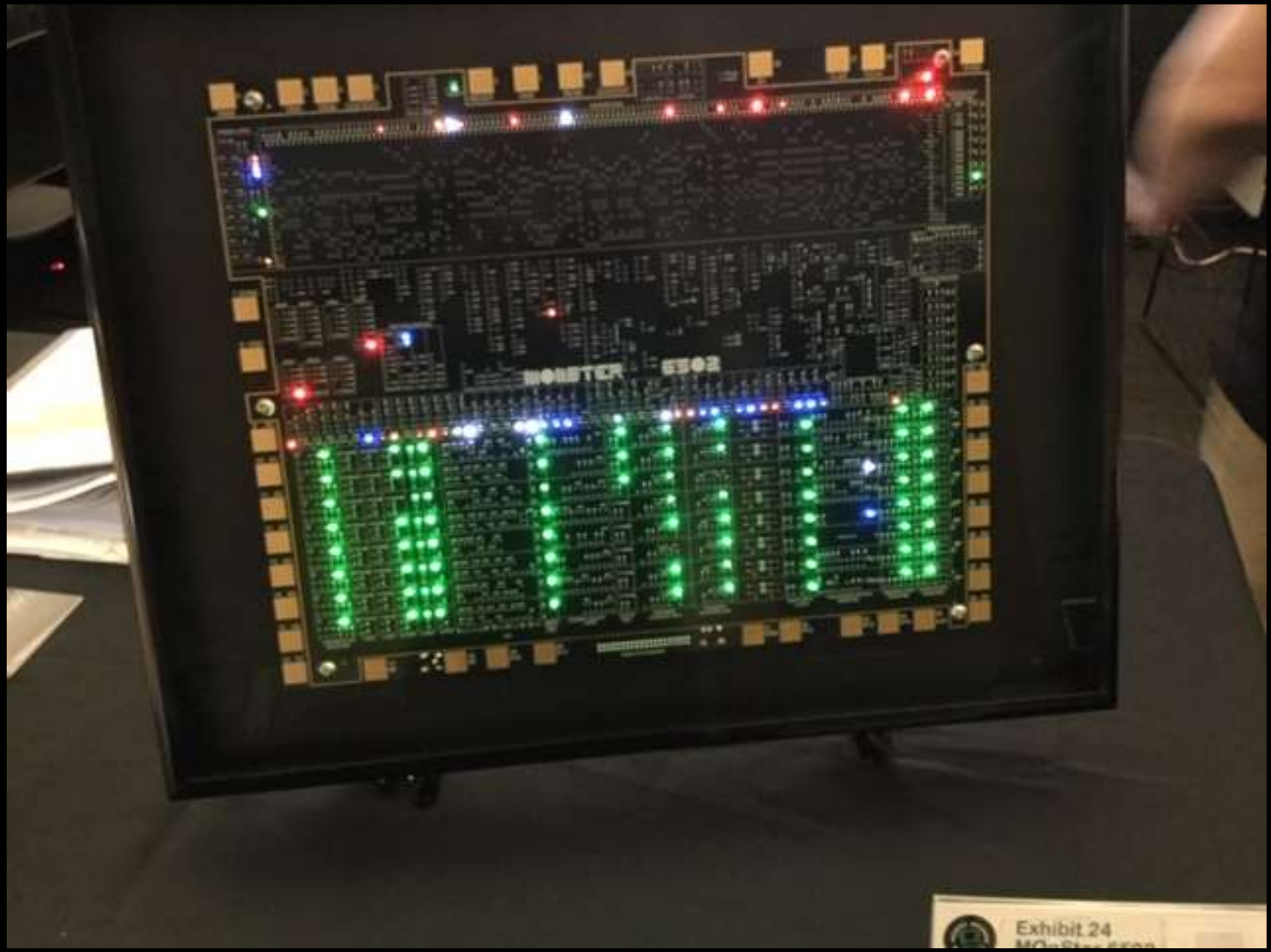
- Z180 Processor @ 18MHz
  - 1MB Linear Address Space
- Functions
  - 512K FLASH ROM
  - 512K RAM
  - Dual Serial Interfaces
  - IDE Interface
- +5V Input, Reset & On/Off Switch
- IDE to Compact Flash Adapter
- Software
  - 8K Basic in ROM
  - CP/M
- RC2014 Compatible Sockets
  - Additional I/O Cards

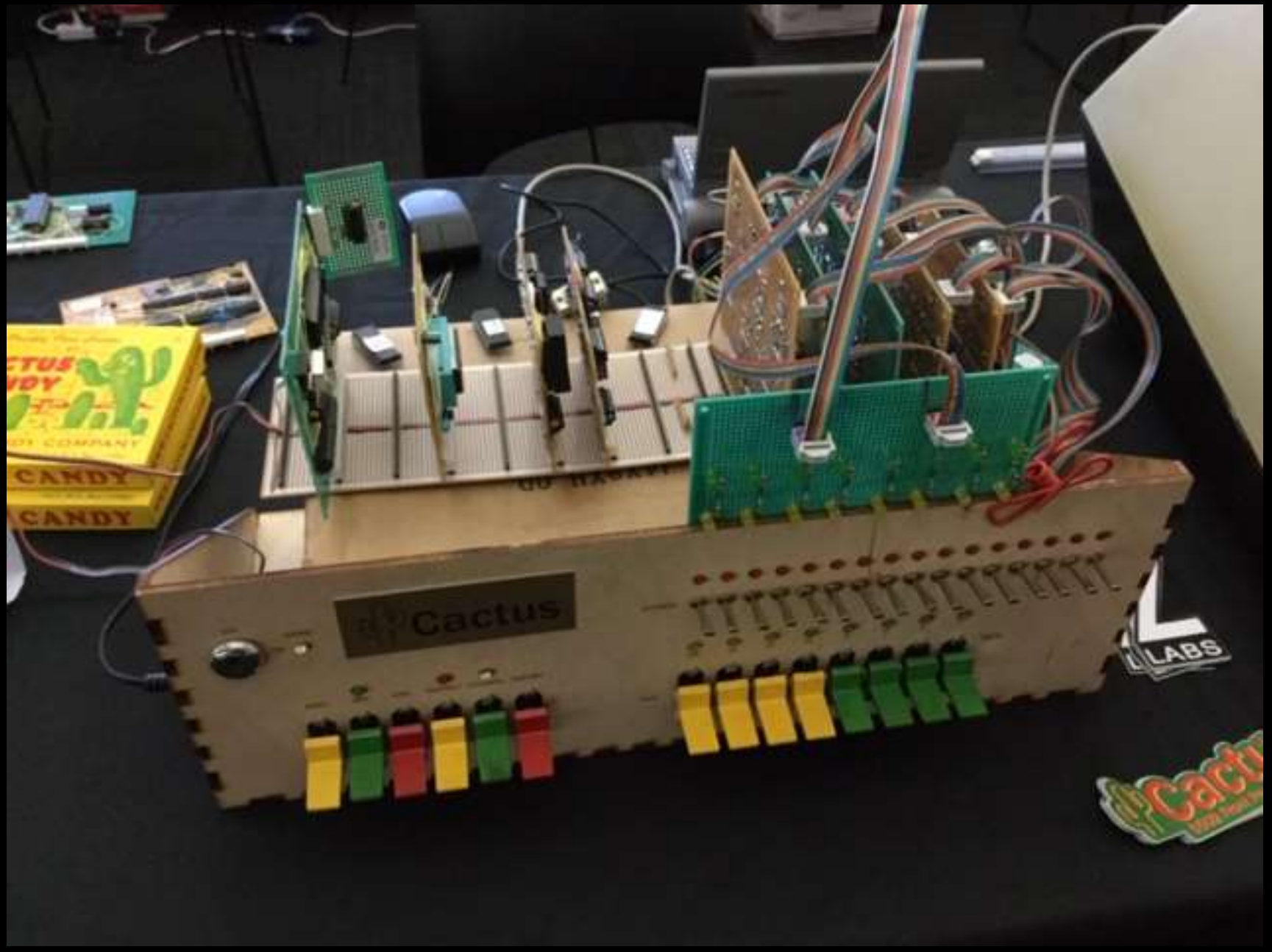


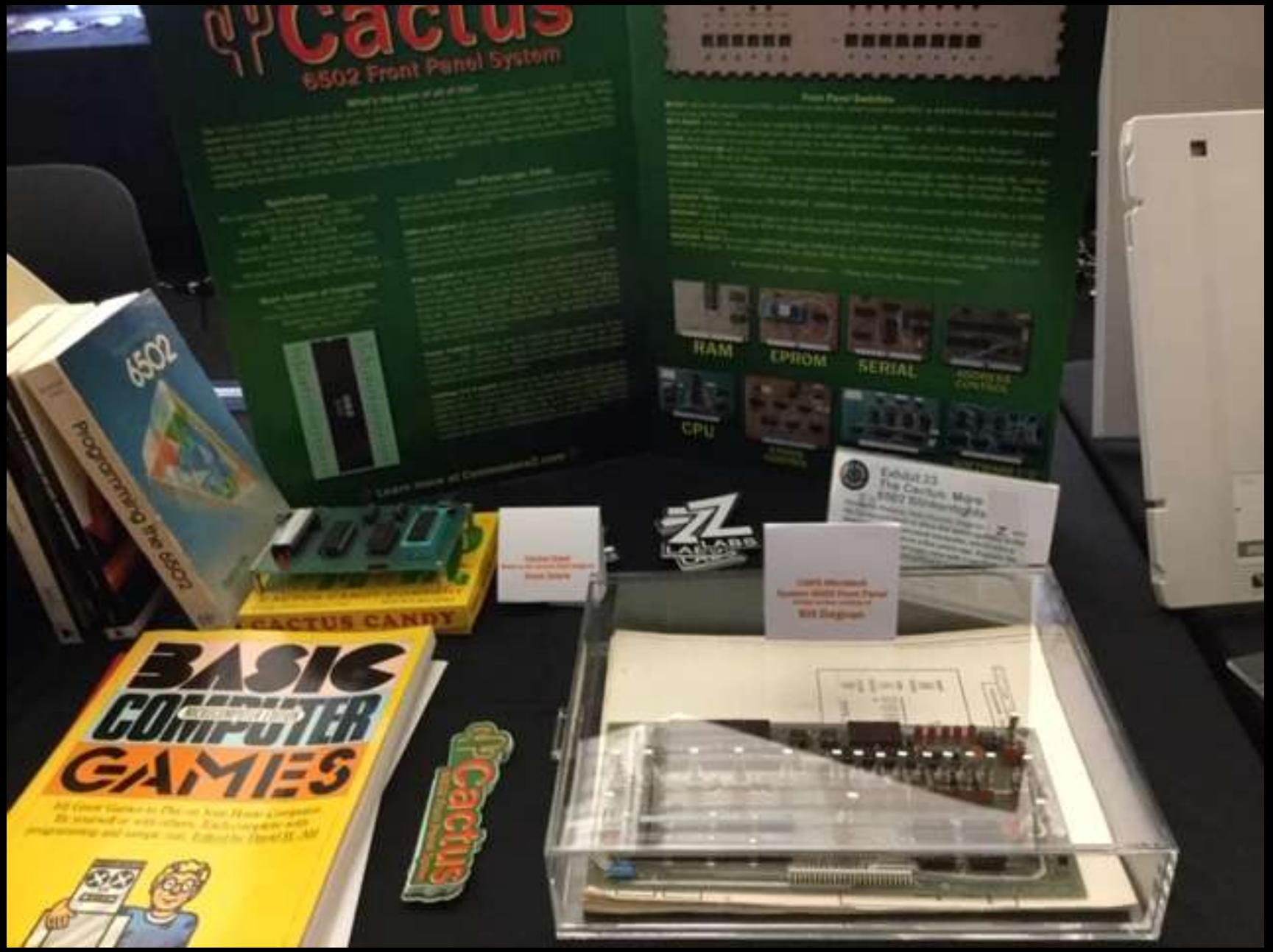

SAIC Galaxy 1100


RISCy BUSINESS
CLICK to find out MORE!!!!




MONSTER 6502
Exhibit 24


CANDY
CANDY
Cactus
LABS


Cactus
6502 Front Panel System
RAM
EPROM
SERIAL
CPU
6502
Programming the 6502
CACTUS CANDY
BASIC
COMPUTER
GAMES
Cactus


SONY
SONY
A
Tranlog
A


Magneto-Optical
SHANIA TWAIN
Kodak


Kodak
NOEL


NOEL
KID


30GB
Universal Media Disc
Verbatim
Verbatim


HAVE YOU SEEN
THIS DISK?
"SWAN 130"
I only have the
case, no disk!
No info online.
130
20
3M
zip
PC100
Zip Disk
1994
Iomega
The most popular of the
'superfloppy' formats. A 'click of
death' affected the drives in the
late 90s, leading to drives
destroying themselves
clik! / PocketZip
Iomega
1999
Designed for laptops, cameras,
and mp3 players

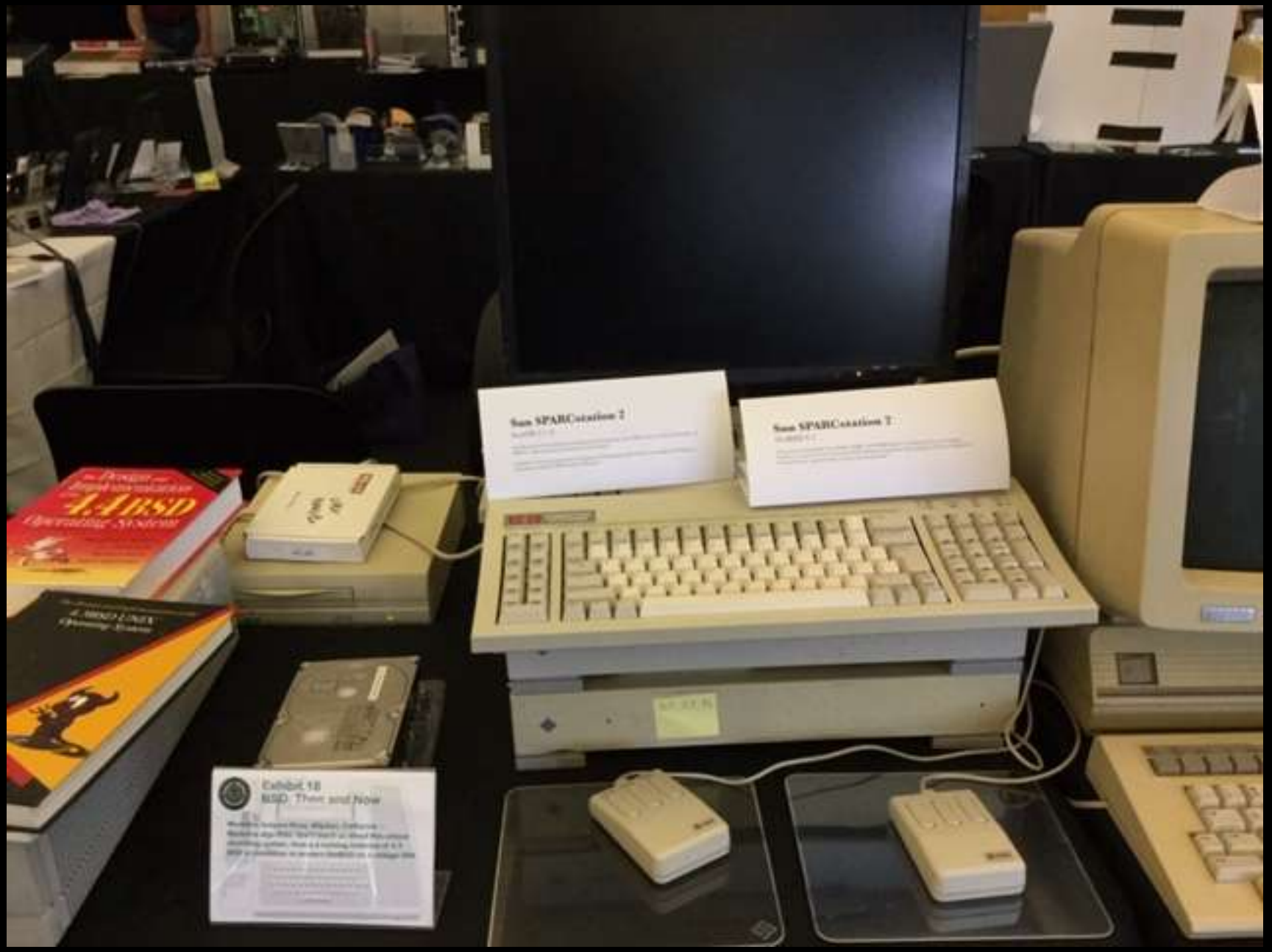

3M
20
HiFD
200MB
3M
21 MB
HiFD
1998
Sony
Fujifilm produced these disks.
Originally launched in 1998 at
SuperDisk
1997
Imation
A floptical format, with disks
produced by Matsushita. Drives
are backwards compatible with
Floptical
1991
Imation
Floptical drives use a standard
magnetic read/write head but use
optical positioning with an


Verbatim
1S


Data is stored in a single spiral rather than tracks/sectors like other floppies. Used in the PB040 minicomputer.
A continuous tape system designed as an inexpensive replacement for floppy disks. Not actually a floppy disk!


don't copy
that floppy!


DEC VAX 11/780

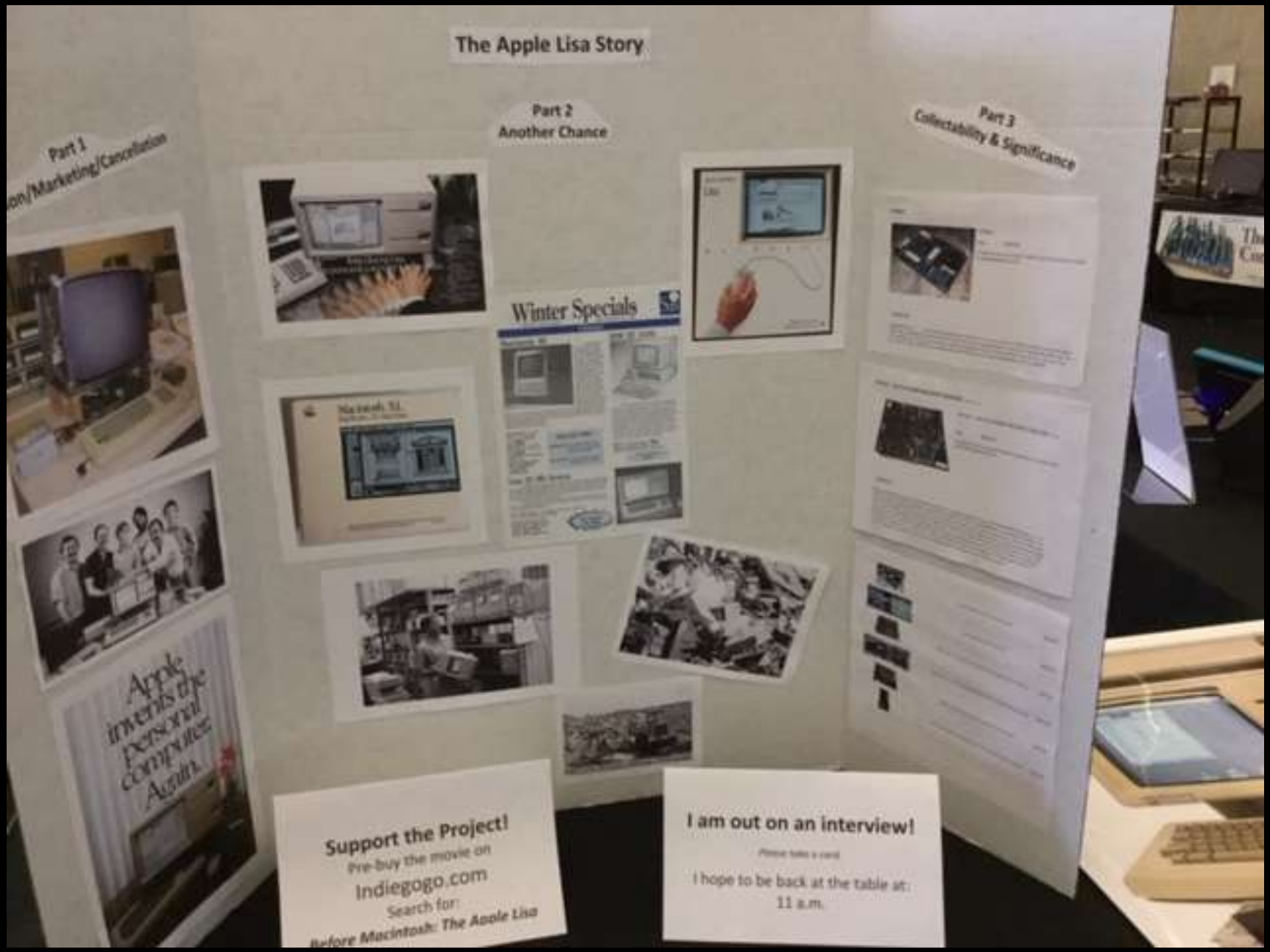

Sun SPARCstation 2
Sun SPARCstation 2
4.4BSD
Exhibit 18
BSD: Then and Now


VT 240
DEC InfoServer 150VXT


DECserver 90M
DEC AlphaServer 300 4/233
DEC InfoServer 150VXT

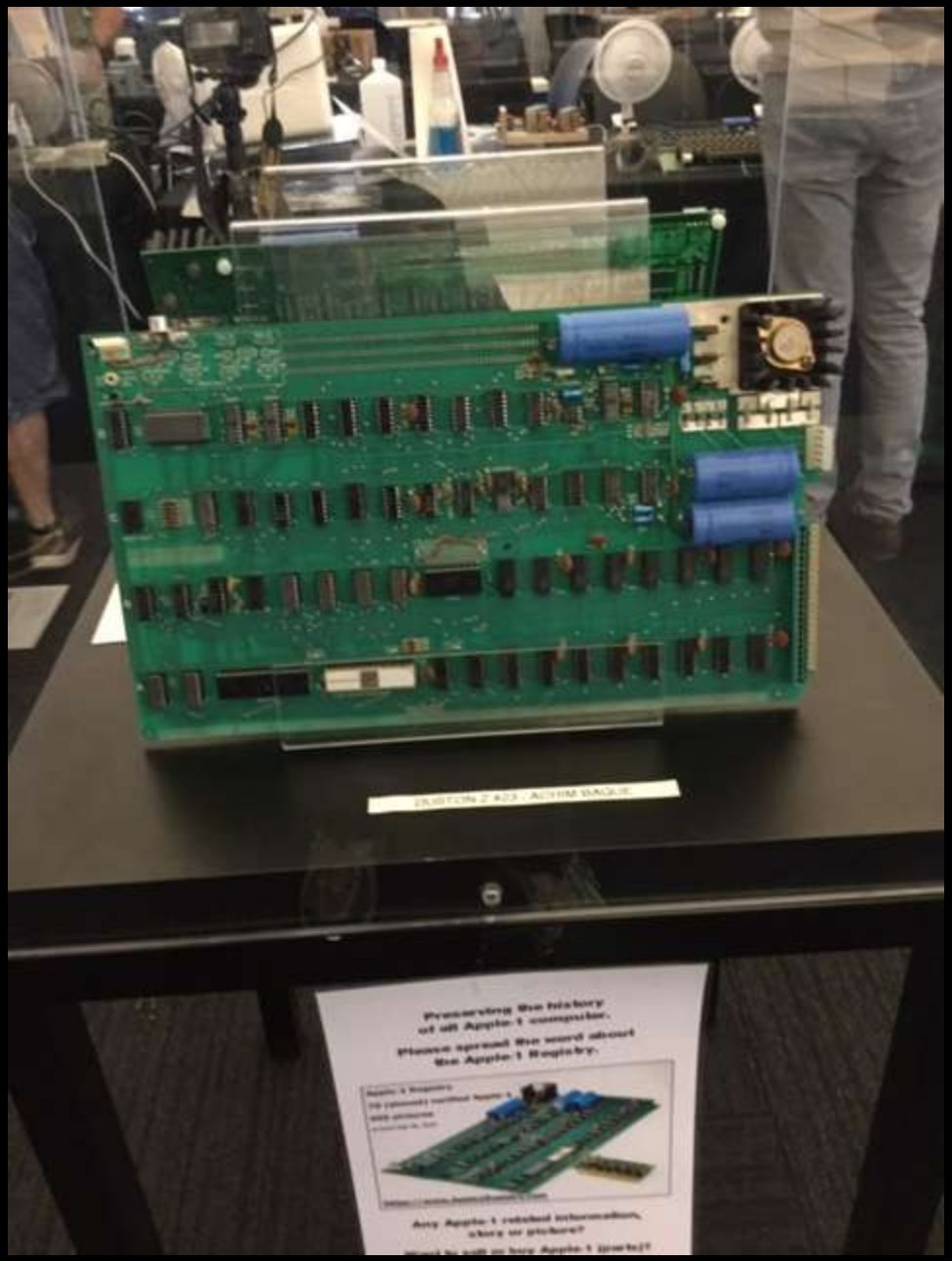

commodore
CBM
Model 8032
computer

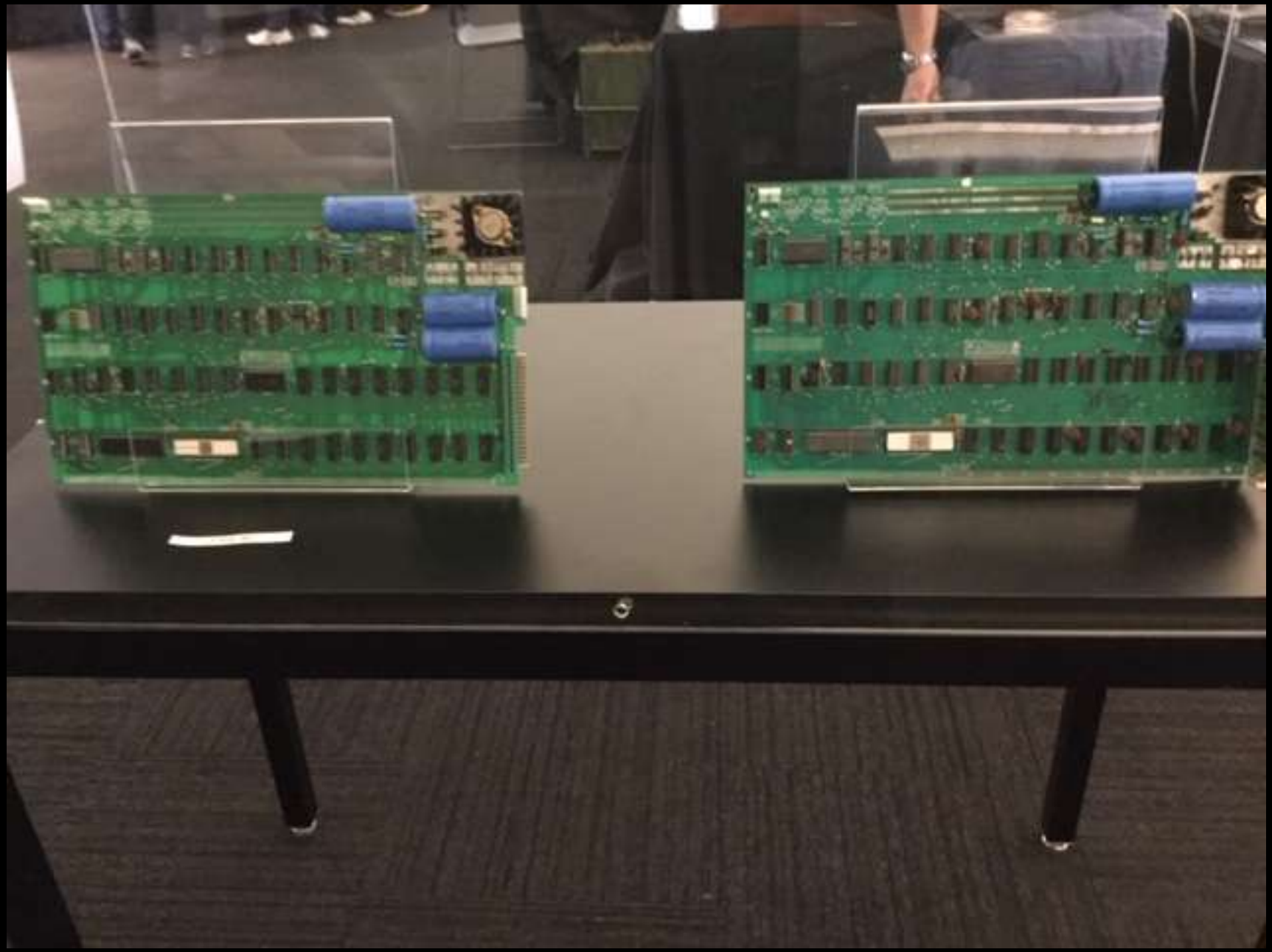

SHARP
RCA

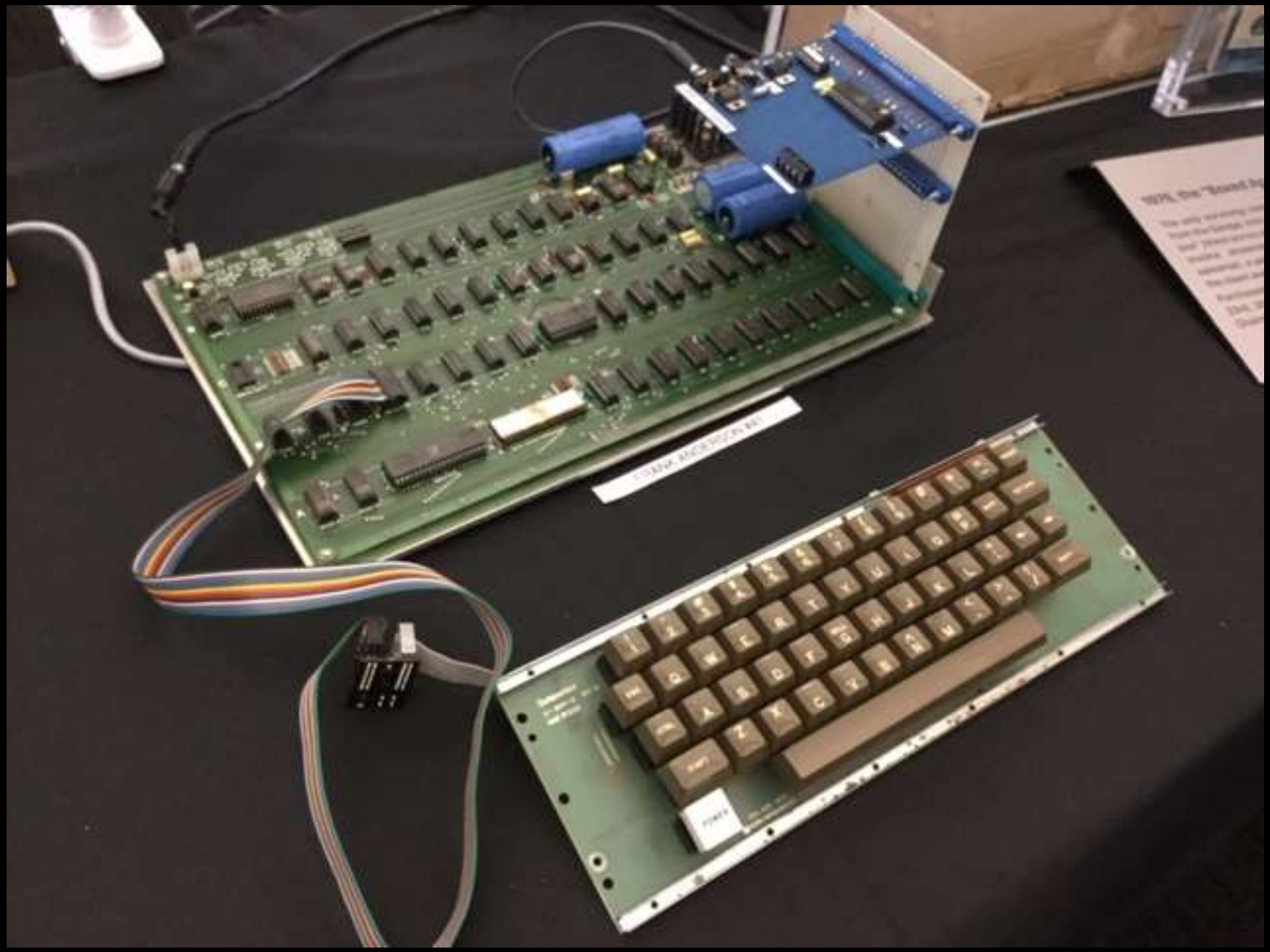

The Apple Lisa Story
Part 1
Part 2
Another Chance
Part 3
Collectability & Significance
Winter Specials
Apple invents the personal computer. Again.
Support the Project!
Pre-buy the movie on
Indiegogo.com
Search for:
Before Macintosh: The Apple Lisa
I am out on an interview!
I hope to be back at the table at:
11 a.m.


PLEASE
TOUCH


Preserving the history of all
Apple-1 computer.


Preserving the history
of all Apple-1 computer.
Please spread the word about
the Apple-1 Registry.
Any Apple-1 related information,
story or picture?






INSTRUCTION
TENGEN


SLCC
San Leandro Computer Club Since 1983
ATARI ATARI ATARI ATARI ATARI ATARI ATARI


Record Keeping
ATARI


SAN LEANDRO
COMPUTER CLUB
FOR ATARI MICROCOMPUTERS
Membership $20
Public Domain Disks $5
EMERGEN
EXIT
ONLY
ATARI 800

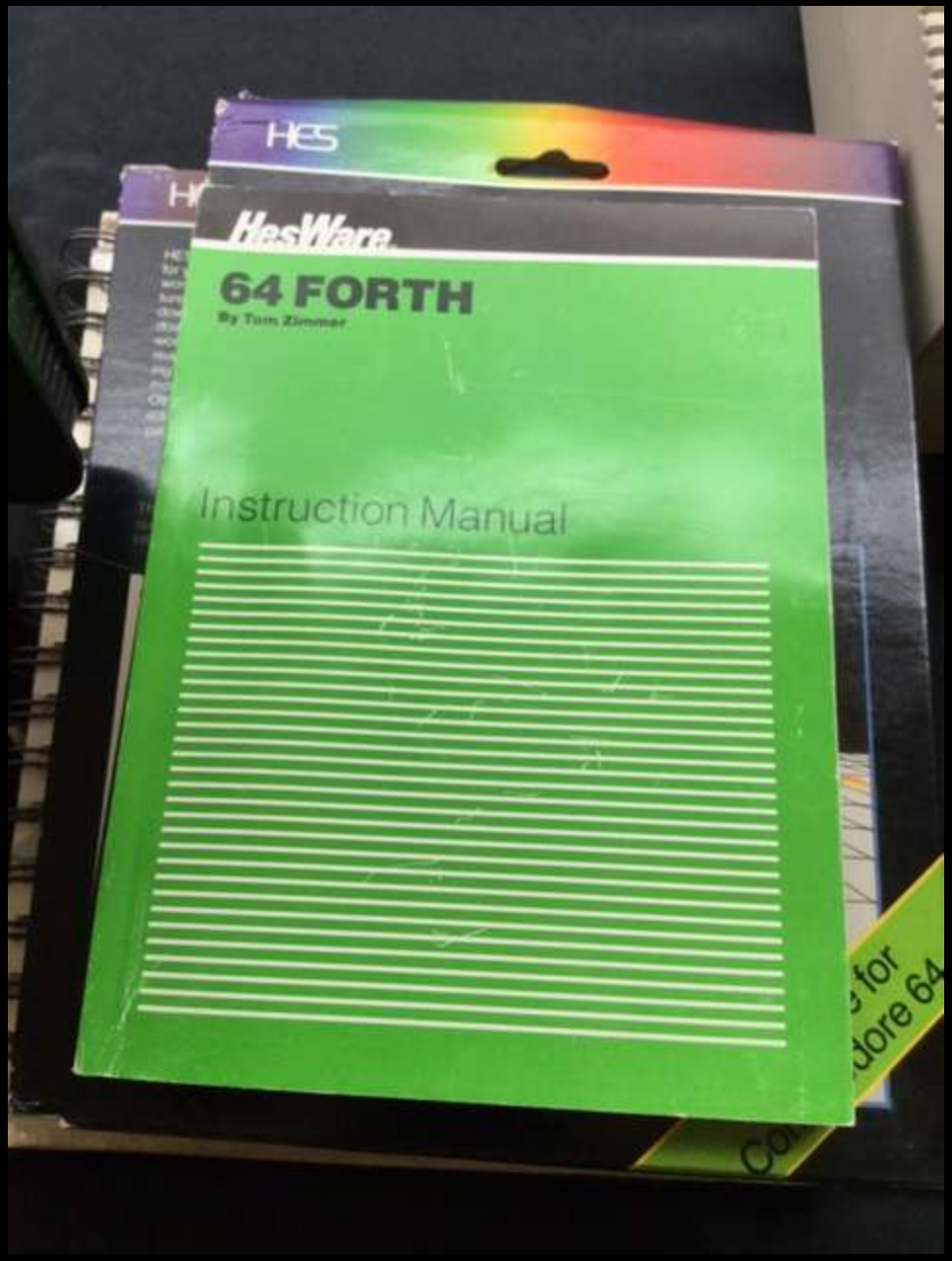

KIM-1
SY VIM


SONY
CHALLENGER IP


Commodore 64
Rockwell
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M


64 FORTH


HES
64 FORTH
By Tom Zimmer
C501
©1983 Human Engineered Software


HES
HesWare
64 FORTH
By Tom Zimmer
Instruction Manual


People buy
Apple II computers
for a number
of reasons.


Under Here: Power Supply

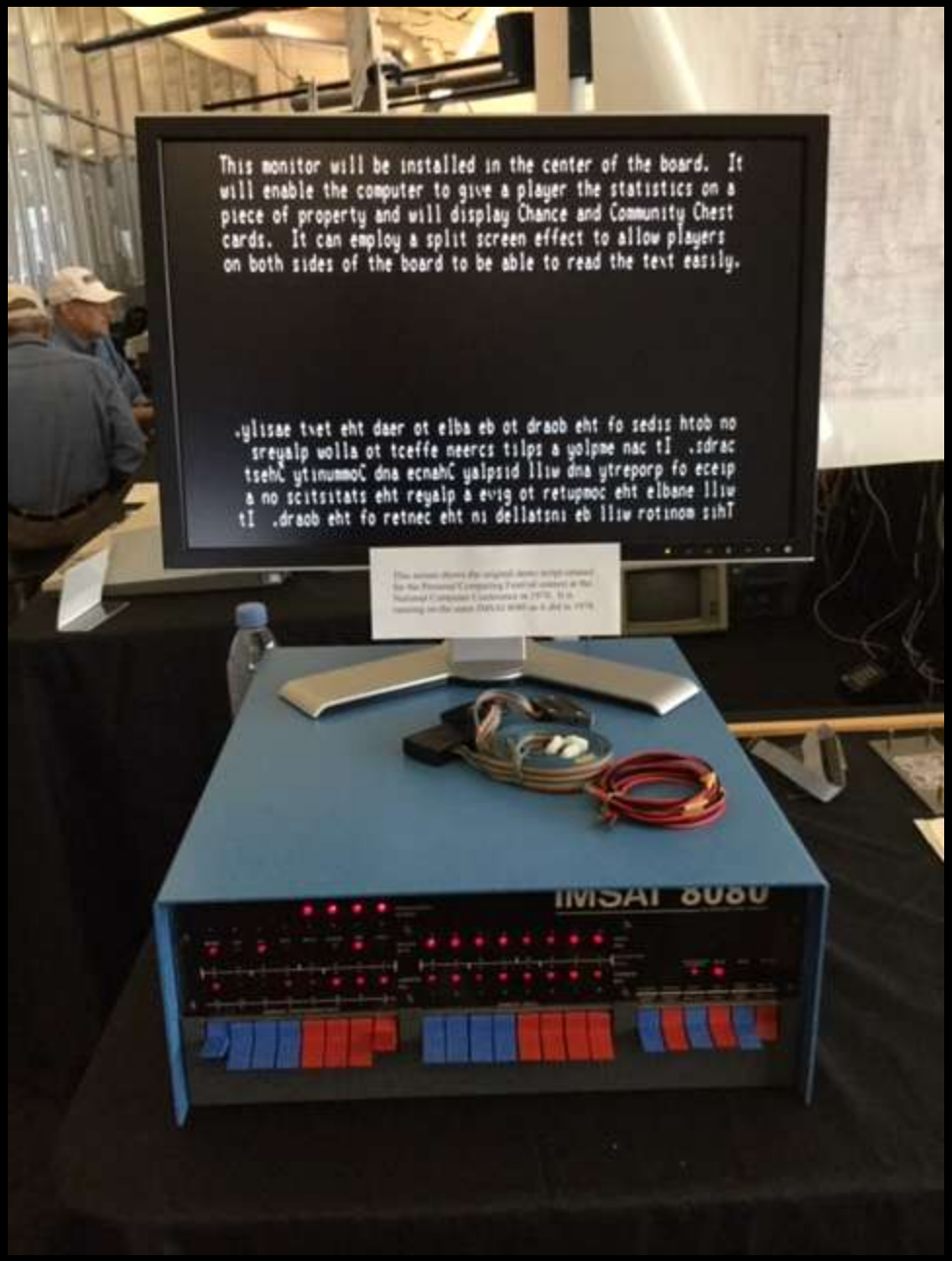

This monitor will be installed in the center of the board. It will enable the computer to give a player the statistics on a piece of property and will display Chance and Community Chest cards. It can employ a split screen effect to allow players on both sides of the board to be able to read the text easily.
.ylisae tset eht daer ot elba eb ot draob eht fo sedis htob no sreyalp walla ot tceffe neercs tilps a yolpme nac tI .sdrac tsehC ytinummoC dna ecnahC yalpsid lliw dna ytreporp fo eceip a no scitsitats eht reyalp a evig ot retupmoc eht elbane lliw tI .draob eht fo retnec eht ni dellatsni eb lliw rotinom sihT
IMSAI 8080


Exhibit 21
Cadetwriter: A
Based Comput


ALTAIR 8800 COMPUTER
02184
Name
Email Address
Comments / Suggestions
(Please print legibly)


PDP-8/I
User's Guide


IBM 1620
DATA PROCESSING SYSTEM
PROGRAMMING THE IBM 1620

Computer History Museum

IBM 1620 Jr.

Phase II: Recreating the Console Typewriter

IBM 1620 Jr. Project

Goals: To recreate the experience (visual, auditory, tactile, visceral) of running historic software on a 1960s-era computer.

IBM 1620 Console Typewriter Evolution

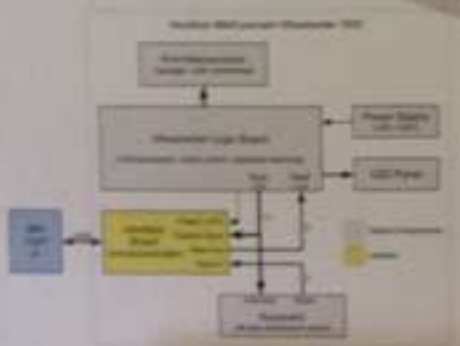
IBM 1620 Model I, 1960
IBM Executive Model 8 Typewriter
(unavailable now)

IBM 1620 Model II, 1963
IBM Selectric Typewriter
(hard to adapt)

IBM 1620 Jr., 2018
IBM/Lexmark Wheelwriter 1000
(widely available, adaptable)

Idea: Interface Wheelwriter to IBM 1620 Jr.

- Interpose circuit between keyboard and logic board
- Slaved to logic board's keyboard scan
- Senses key presses to divert to IBM 1620 Jr.
- Prints characters from IBM 1620 Jr. by sending virtual key presses to Wheelwriter logic board
- Based on Teensy 3.5 microcontroller (includes USB serial port for communication with IBM 1620 Jr.)
- Minimal modifications to Wheelwriter

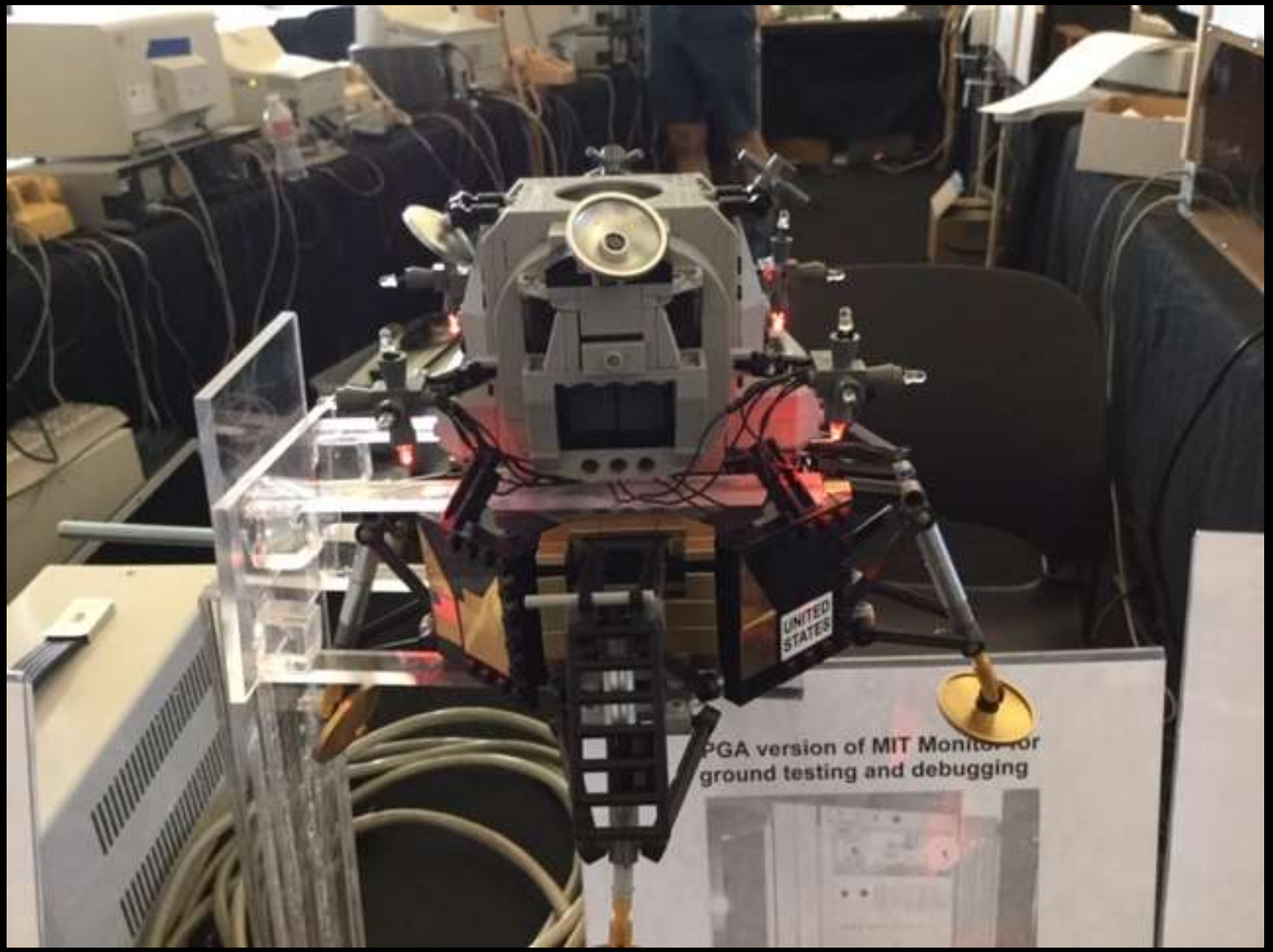


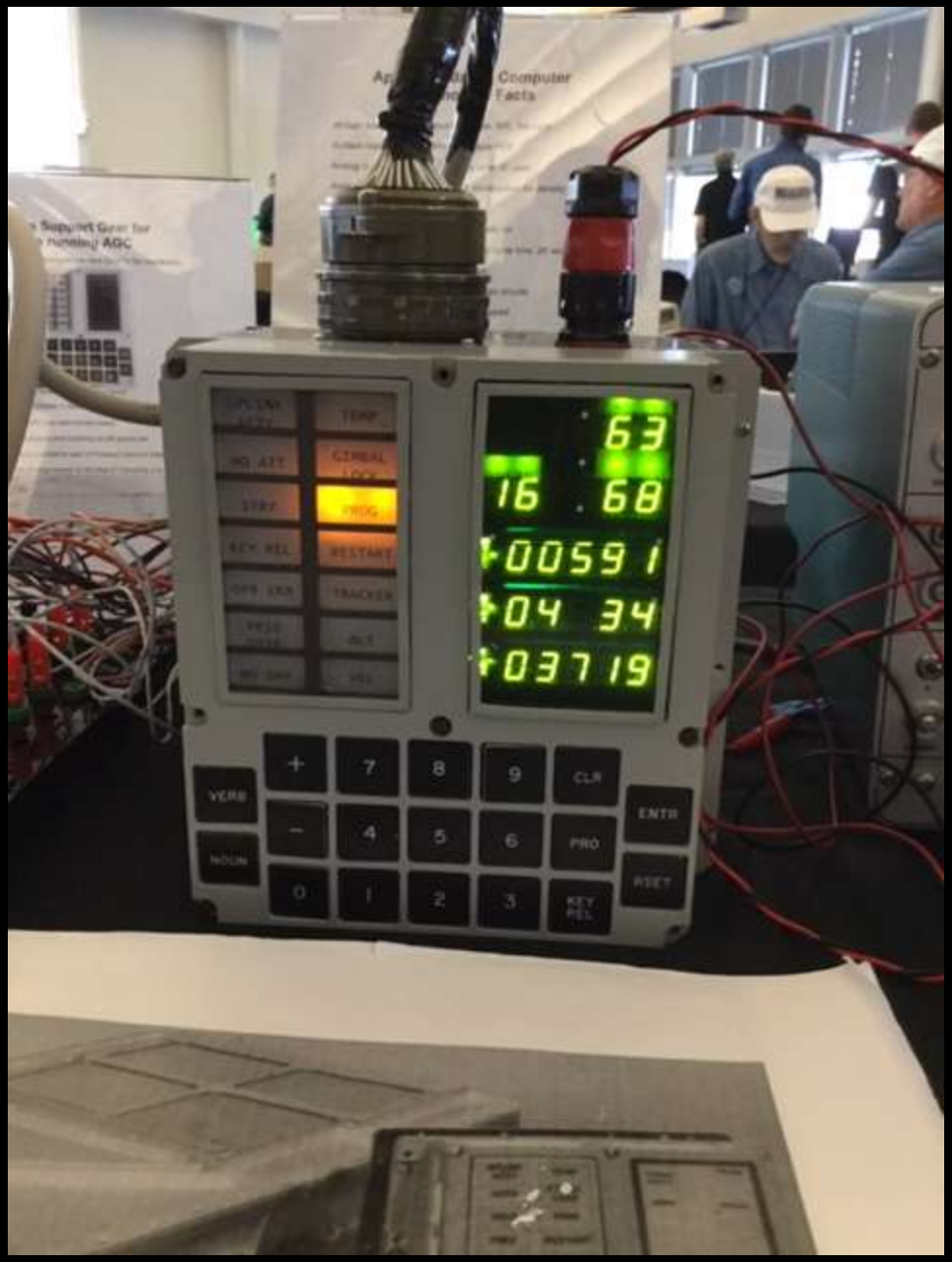
Reverse Engineering Wheelwriter Timing

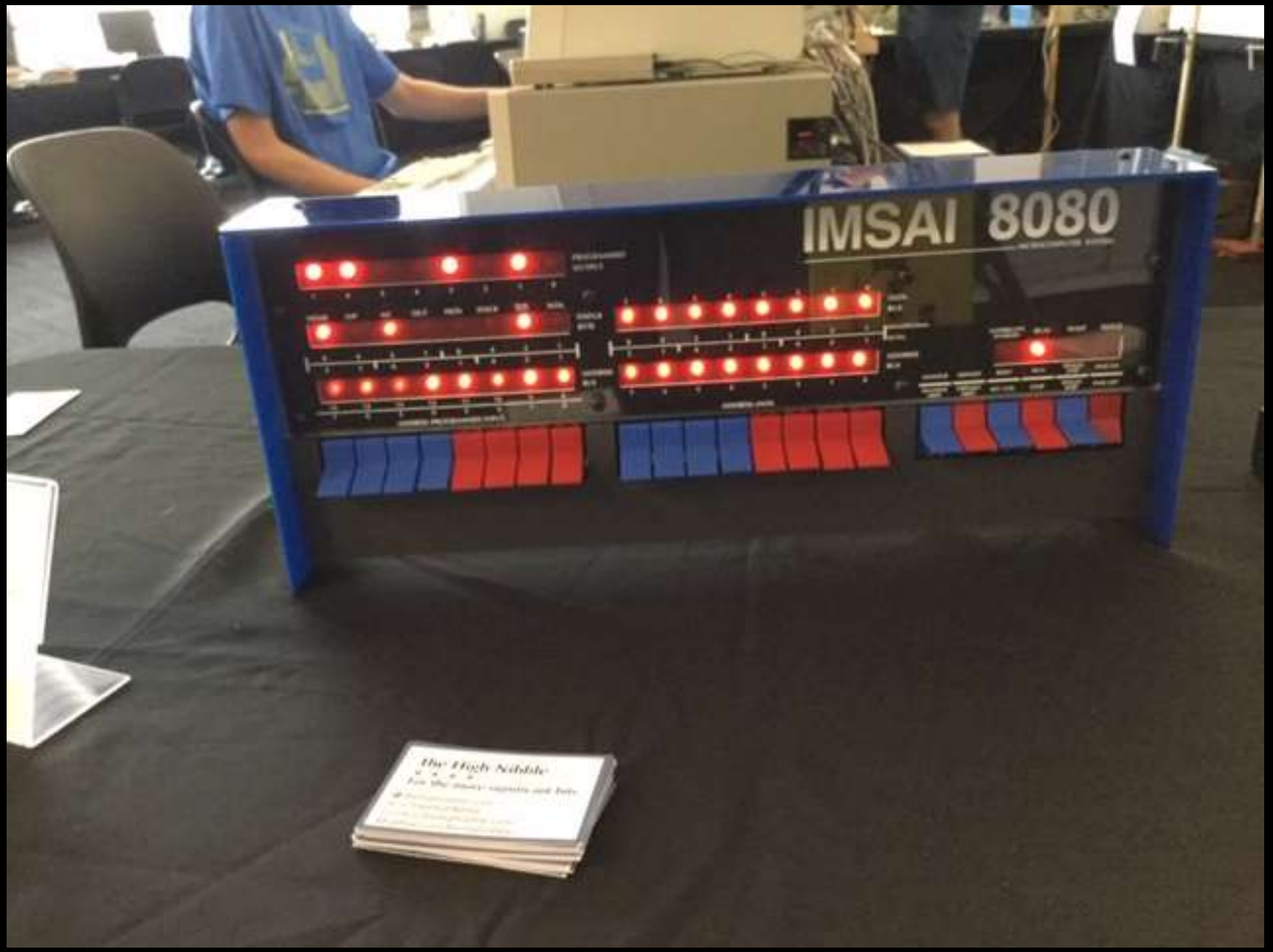
- No internal documents available
- Months of testing with breadboarded circuits, oscilloscope and logic analyzer
- Result is simple electrically but timing is complex

USB Interface Firmware

- Arduino "sketch" (C code)
- Interrupts for each column scan
- Scan keyboard rows, debounce key presses
- Drive keyboard row lines to inject virtual key presses
- Local echo of keyboard input
- Bidirectional communication with IBM 1620 Jr. using a custom character-based protocol
- Table translates from 1620 codes to key sequences
- Synthesize special 1620 characters by overprinting
- Easily adaptable to other teleprinter applications


UNITED
STATES
PGA version of MIT Monito for
ground testing and debugging


63
16 68
+00591
+04 34
+03719
VERB
NOUN
+
7
8
9
CLR
ENTR
4
5
6
PRO
RSET
0
1
2
3
KEY REL


IMSAI 8080

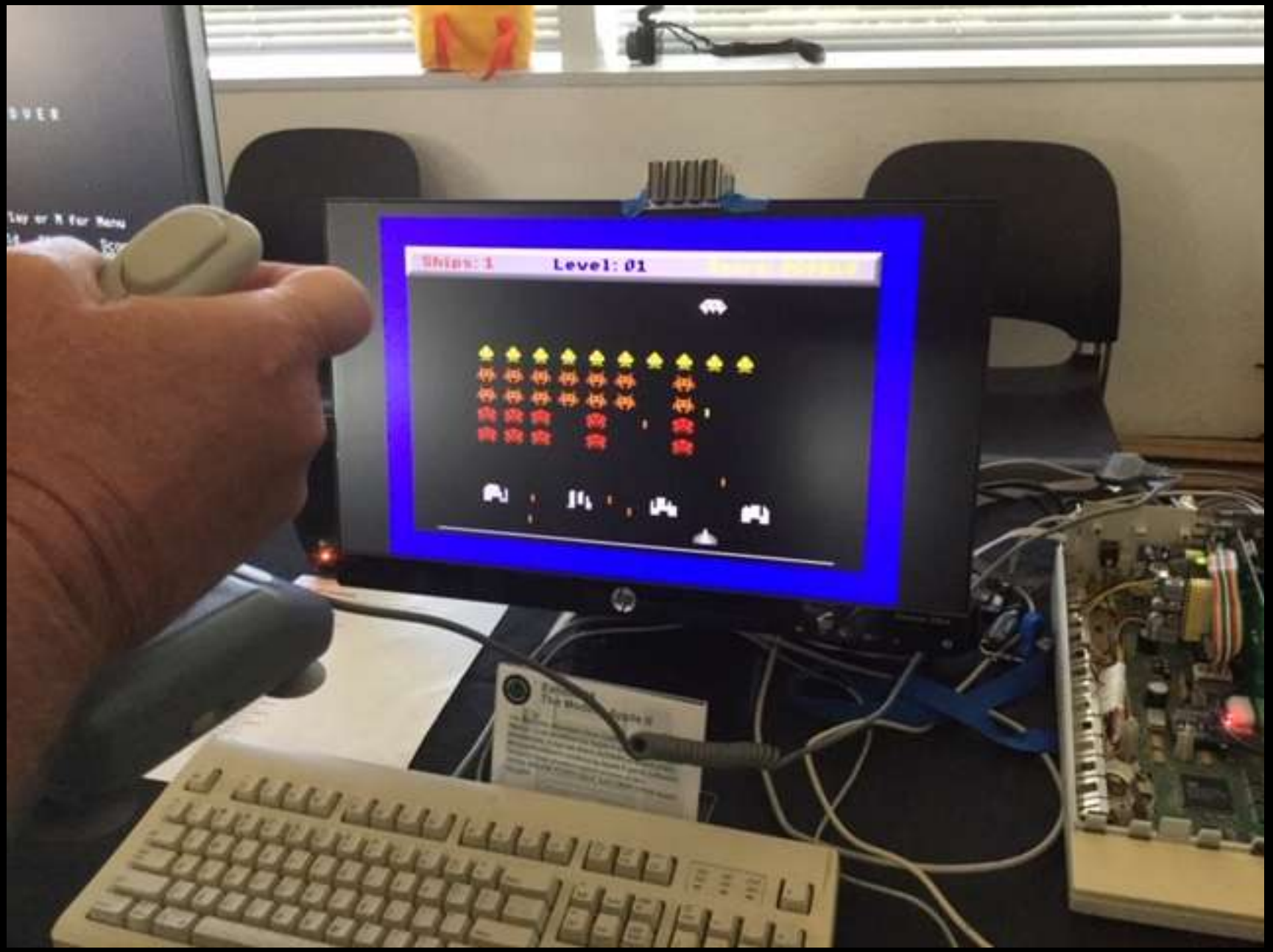

IBM


IBM


IBM
IBM


ATARI 1200XL


Zilog inside
Z80
Exhibit 32
Zilog Inside
ZX Spectrum (1982)
Sinclair ZX81 (1981)


Ships: 1
Level: 01