Building the Mega IIe

(Based on a chip Apple never used for its intended purpose)

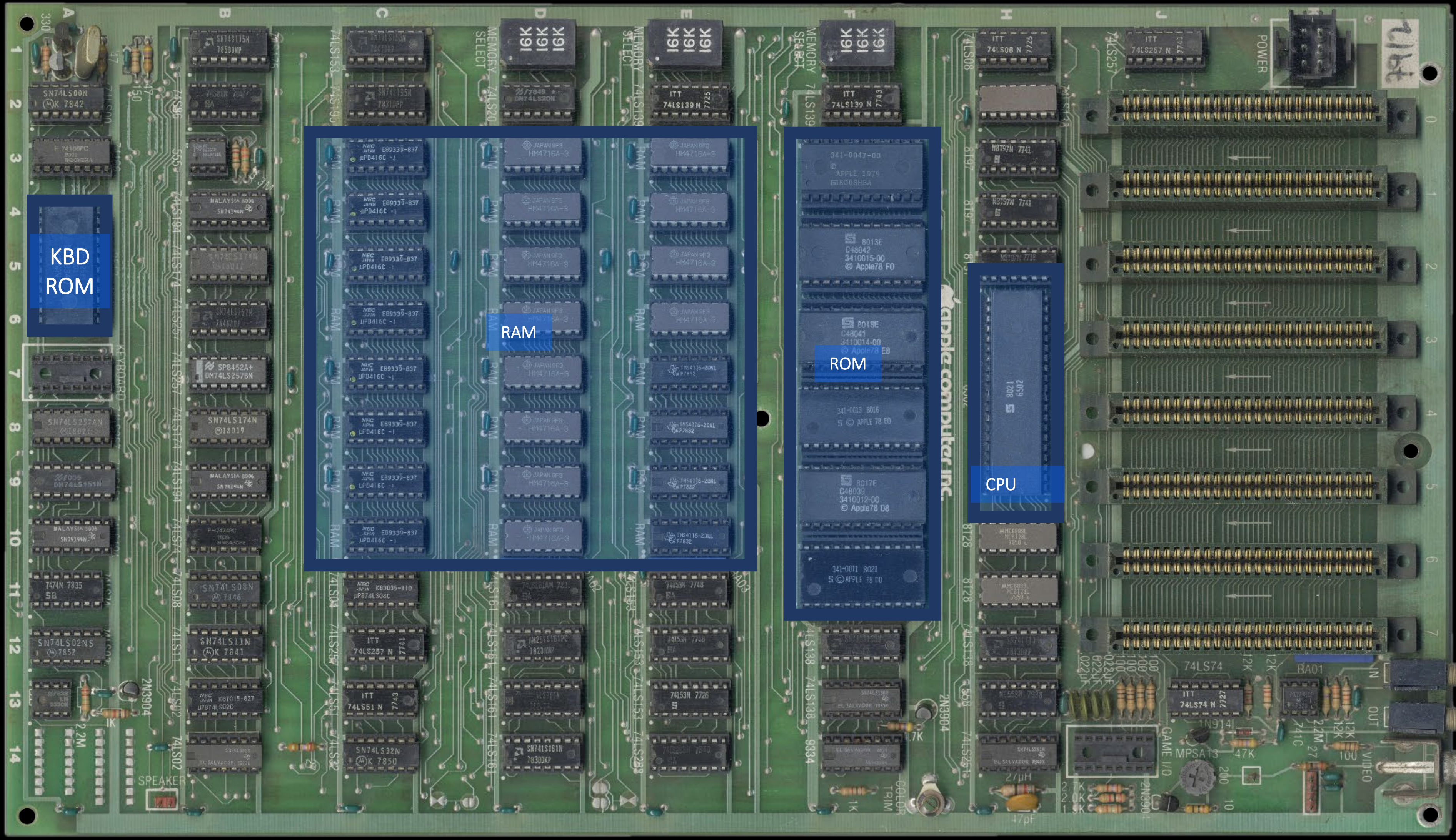
BALDENGINEER

Background

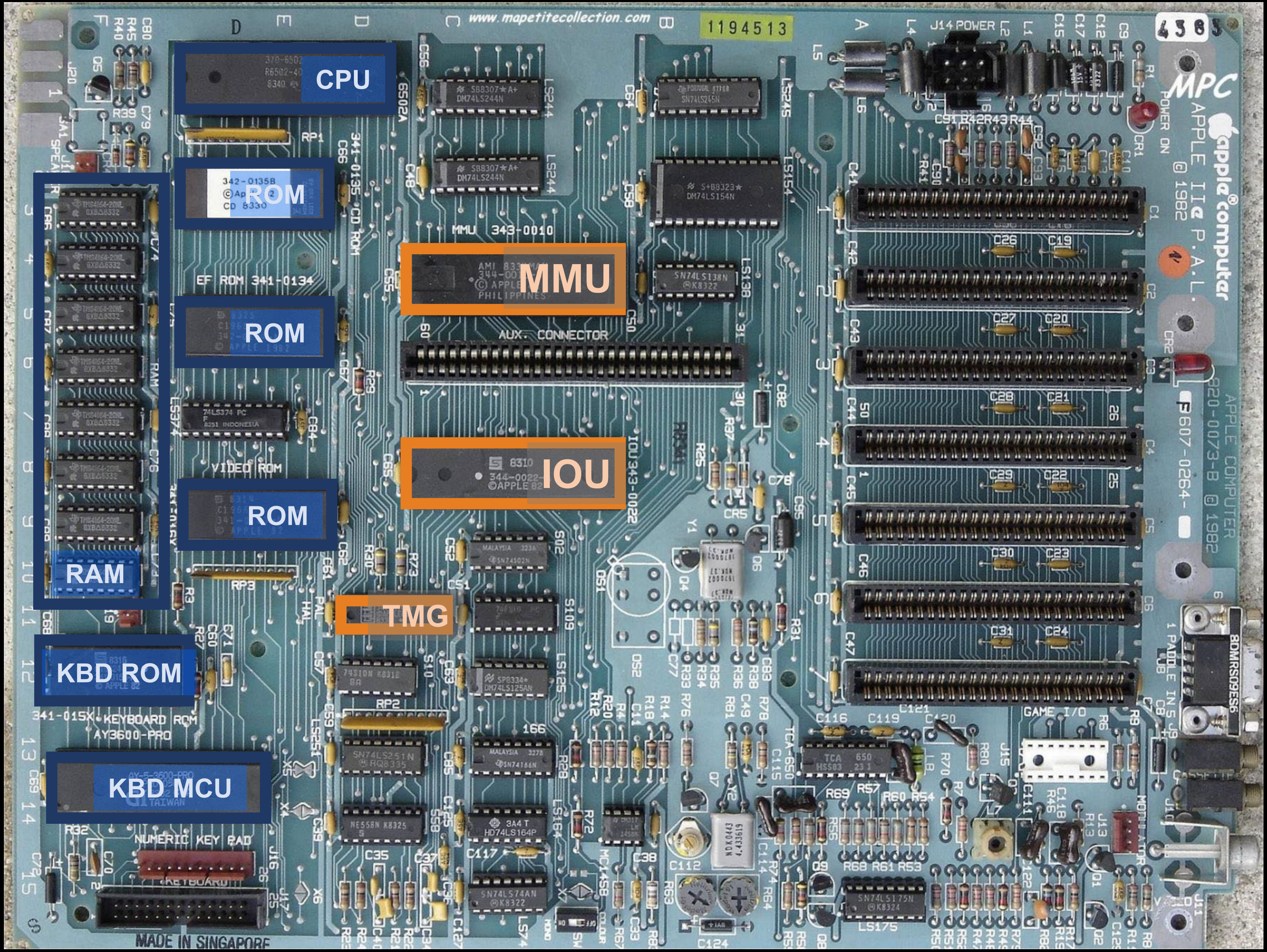
Mega IIe

BALDENGINEER

II/II+

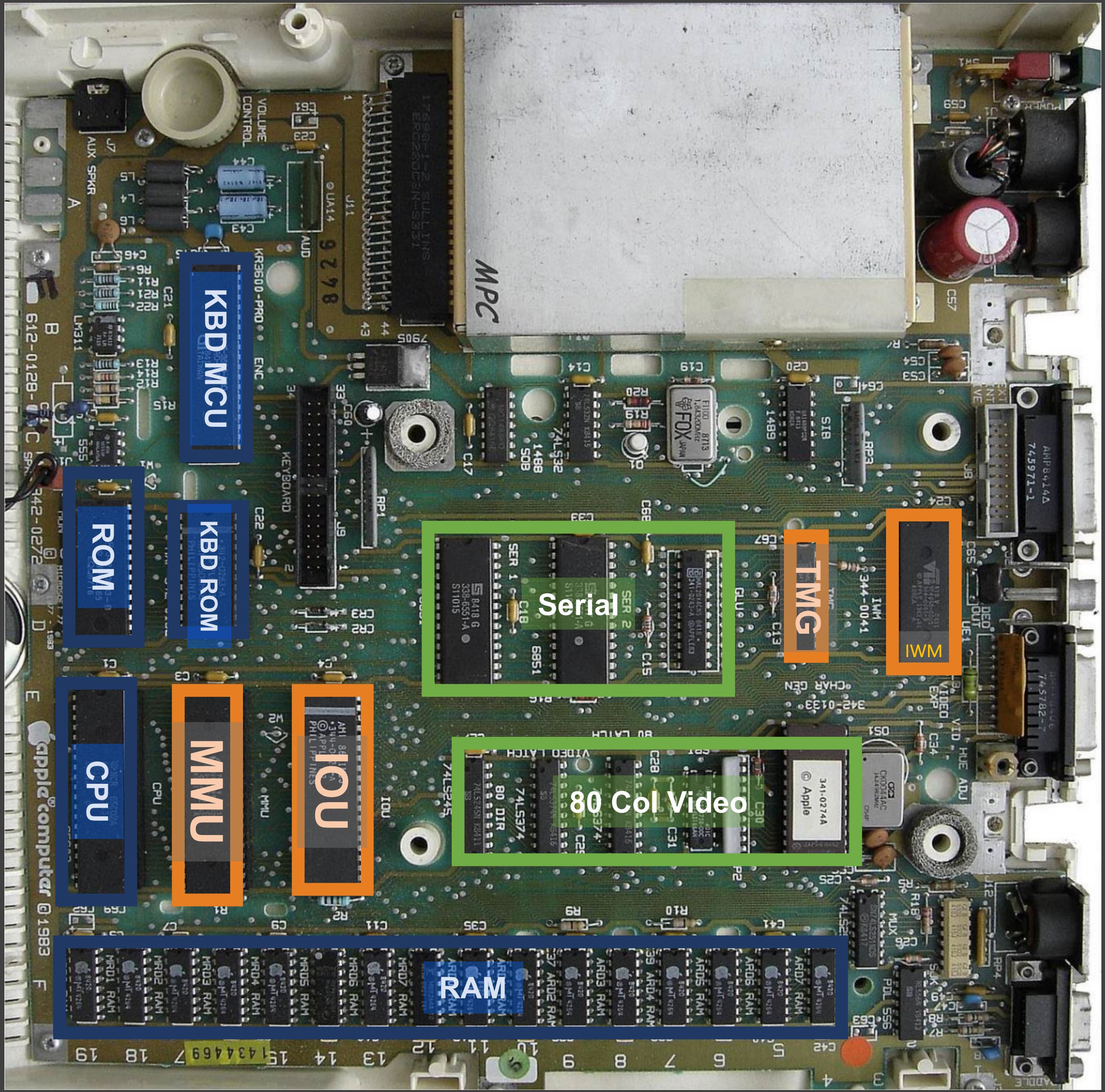


BALDENGINEER

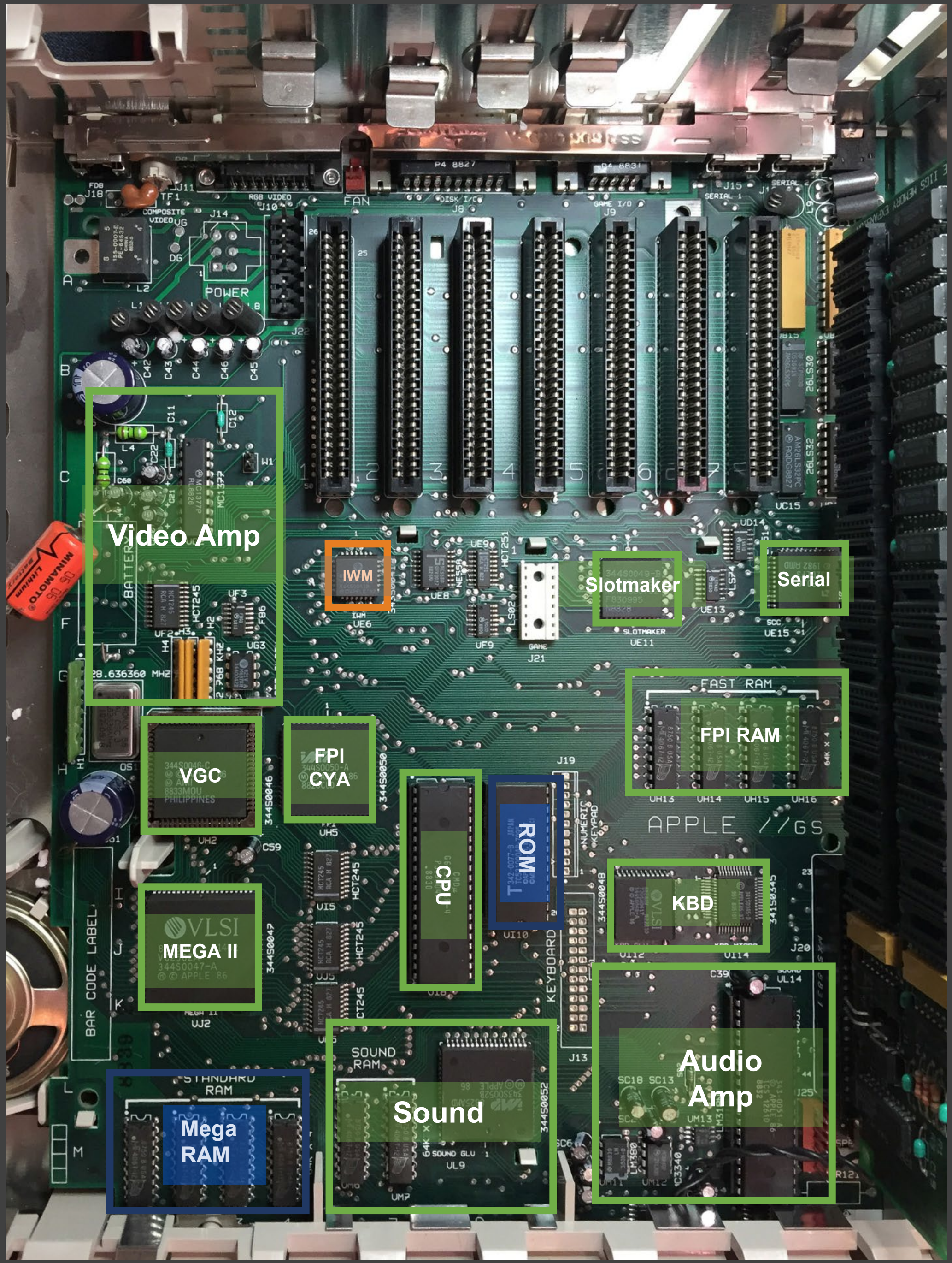


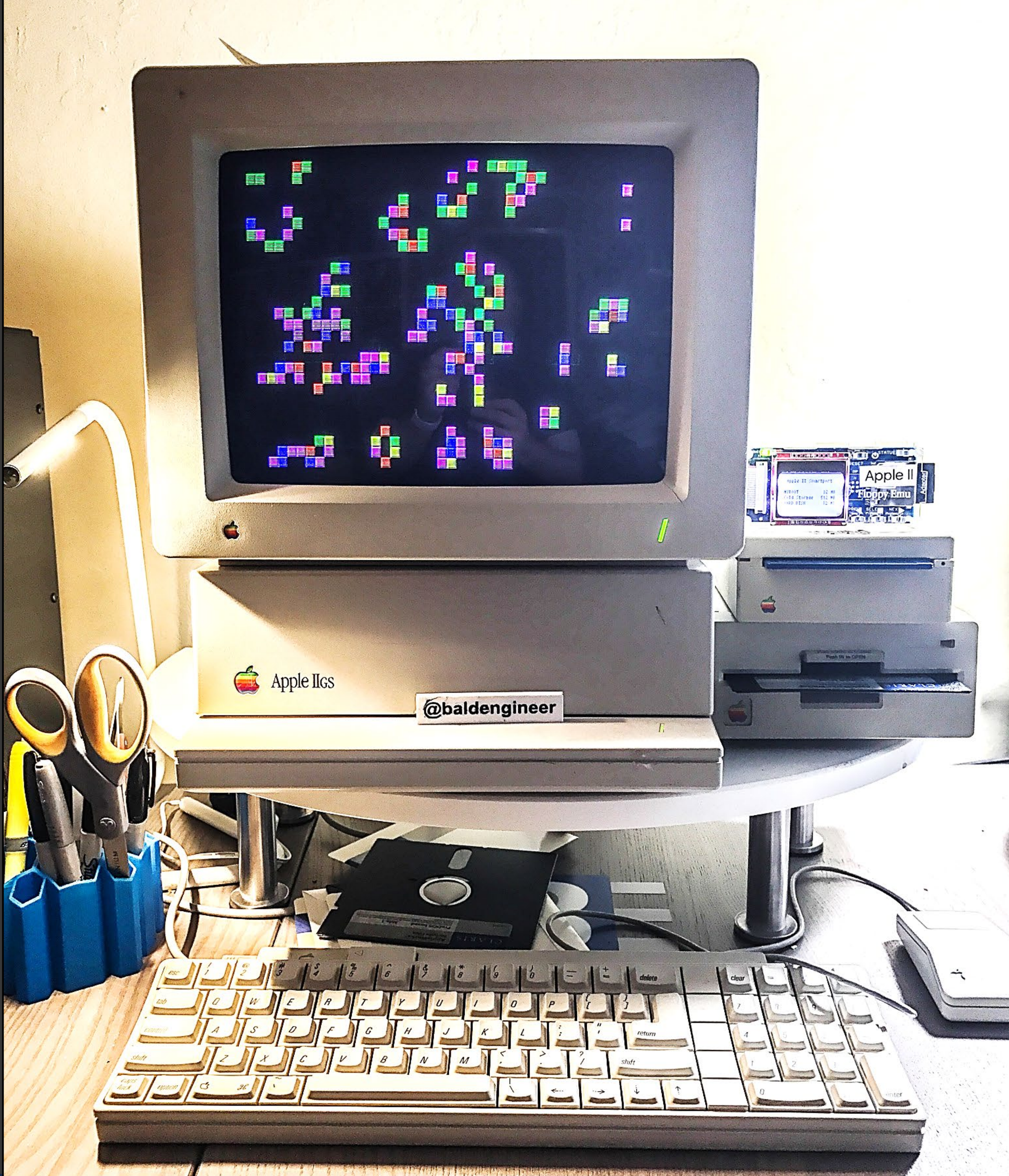
IIe

Apple IIc



BALDENGINEER


Video Amp
IWM
Slotmaker
Serial
FPI RAM
VGC
FPI
CYA
CPU
ROM
APPLE //GS
KBD
MEGA II
Mega
RAM
Sound
Audio
Amp


Apple IIGS
@baldengineer
Apple II
Floppy Emu

Apple IIGS Hardware Ref

by Apple Computer, Inc.

The Mega II custom IC

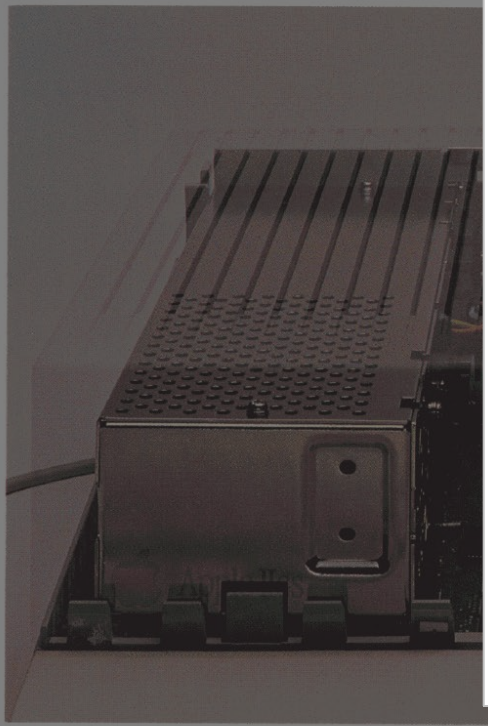
The Mega II custom IC combines the functions of several circuits found in the Apple IIe. Those circuits are

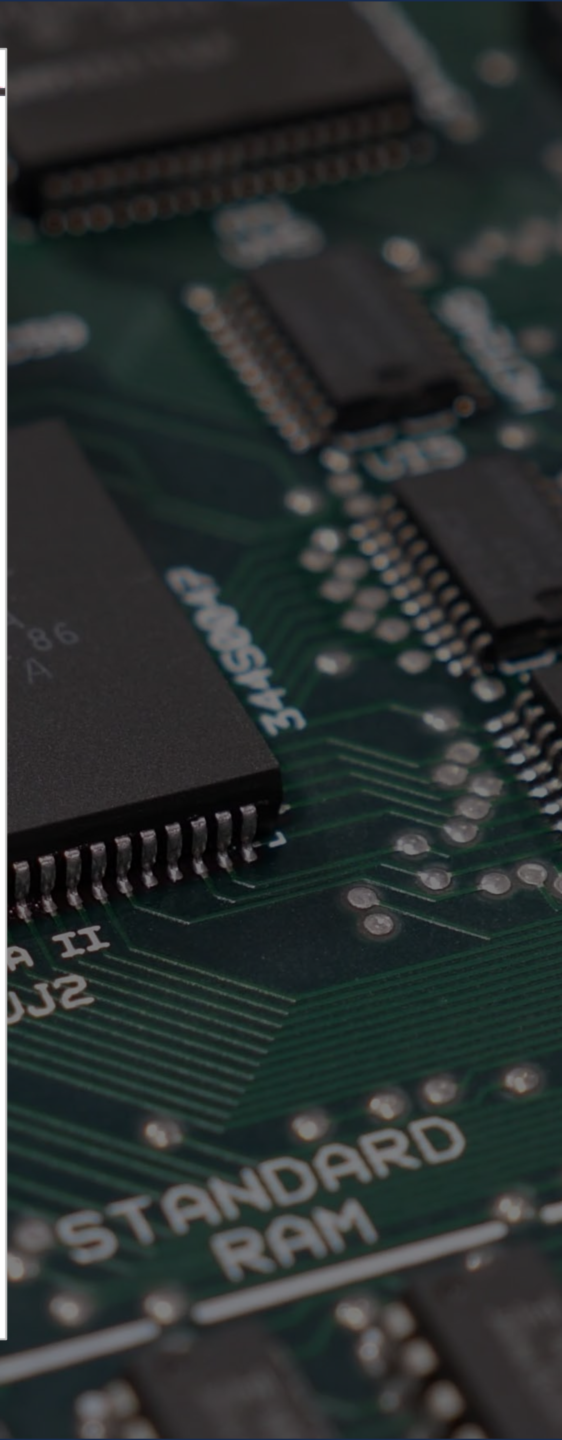
- the MMU (Memory Management Unit) custom IC
- the IOU (input/output unit) custom IC
- the **character generator** ROMs
- the video display circuitry

Except for central processor and memory, the Mega II incorporates the logic circuitry for all the major functions of an Apple IIe on a single chip. It works with the I/O expansion slots and the I/O ports built into the Apple IIGS and supports the part of memory that contains the video display **buffers.** The Mega II side of the machine consists of

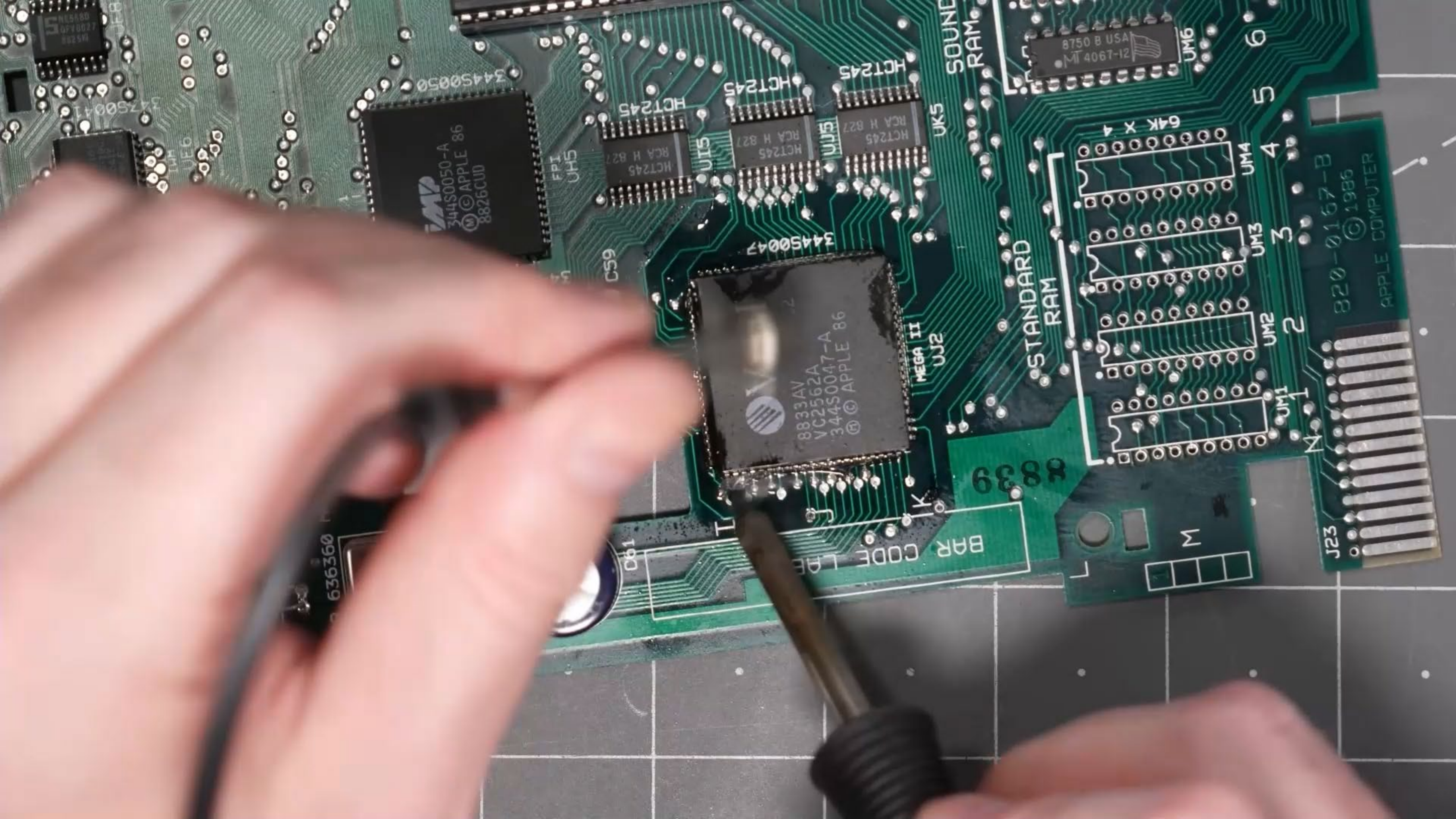
- the Mega II
- 128K of memory
- the I/O expansion slots
- the built-in I/O ports
- the video display circuitry

The Mega II contains the circuitry that generates video display signals from the data in the display buffers, along with the **soft switches** that select the different display modes.



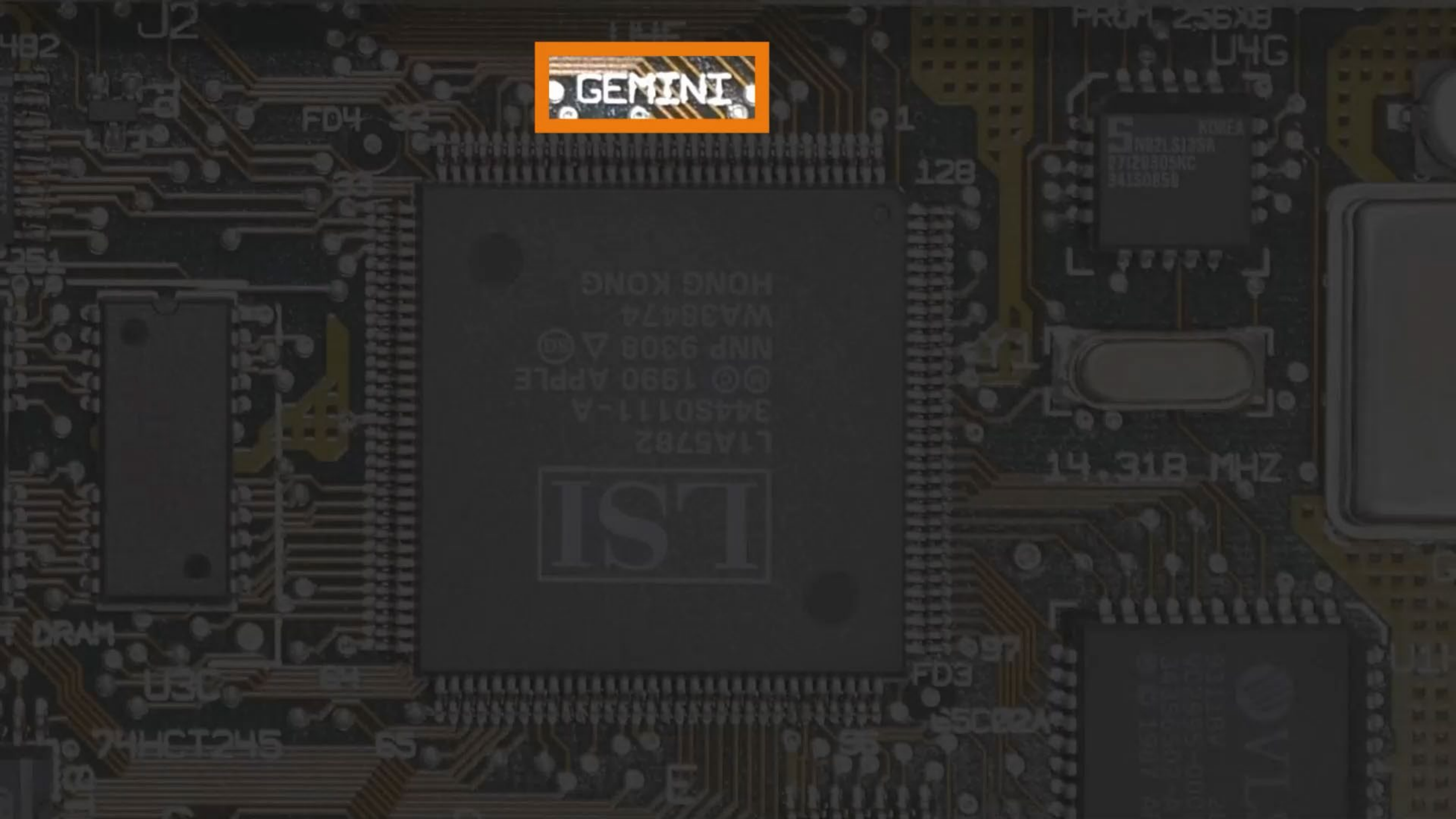


Second Edition



SOUND RAM
STANDARD RAM
64K X 4
UM1
UM2
UM3
UM4
UM6
J23
820-0167-B
© 1986
APPLE COMPUTER
8750 B USA
4067-12
HCT245
UI5
UJ5
UK5
UH5
MEGA II
UJ2
344S0047
8833AV
VC25562A
344S0047-A
© APPLE 86
344S0050
344S0050-A
© APPLE 86
8826CUD
C59
C61
8839

Pictures provided by David Schmidt


GEMINI
J2
FD4
128
PROM 256X8
U4G
14.318 MHZ
DRAM
U3C
74HCT245
FD3

Rev 1

Mega IIe

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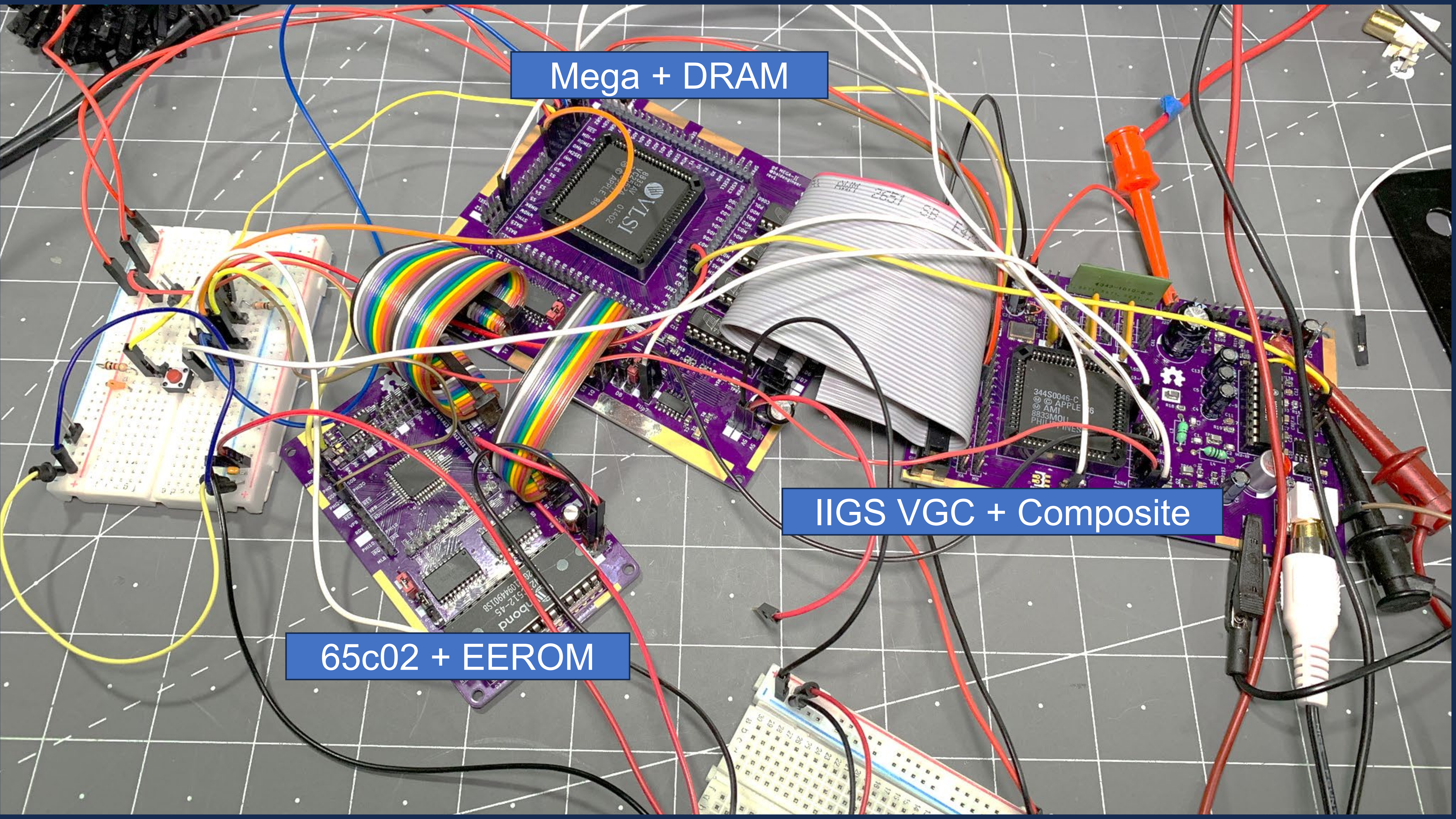
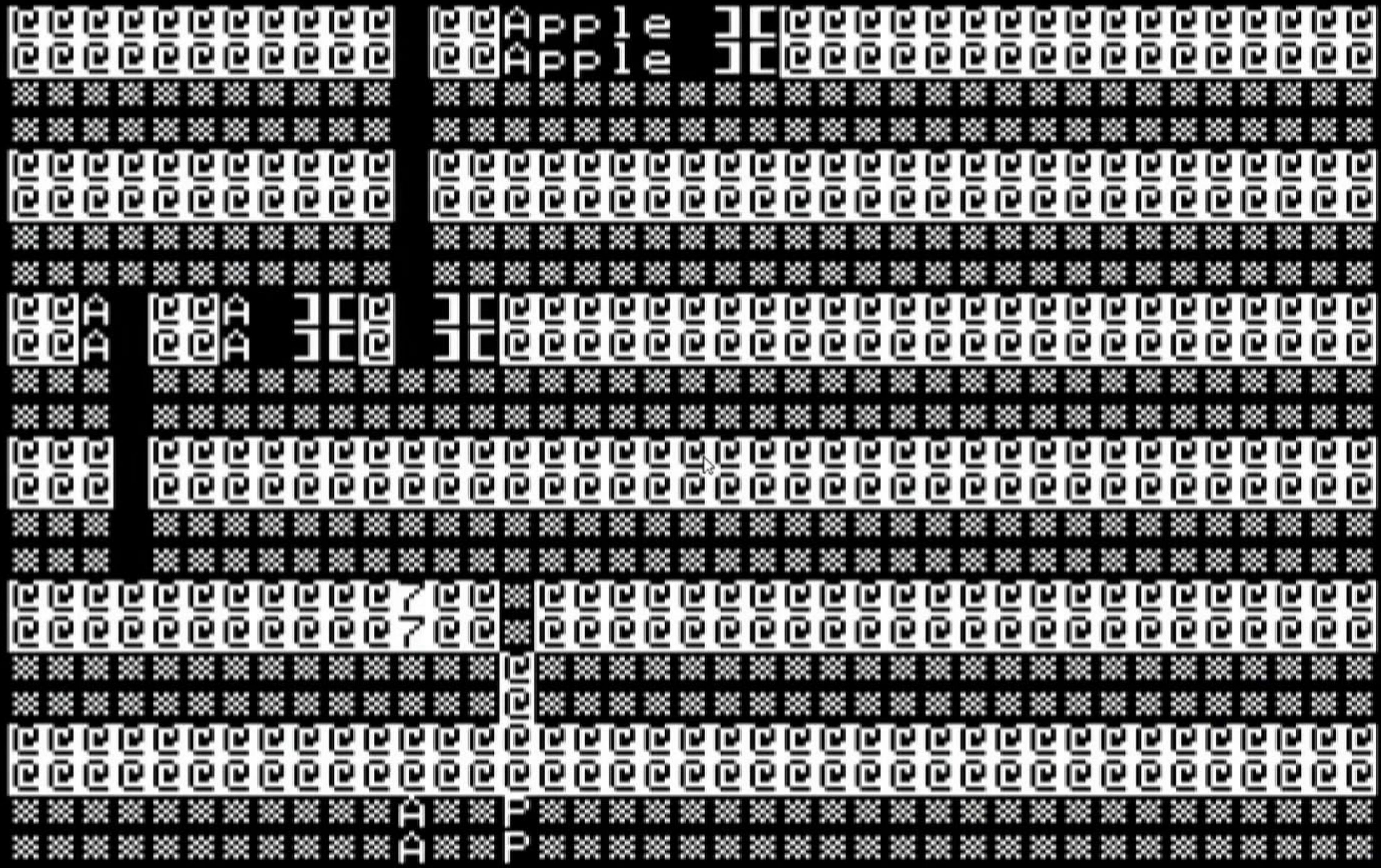
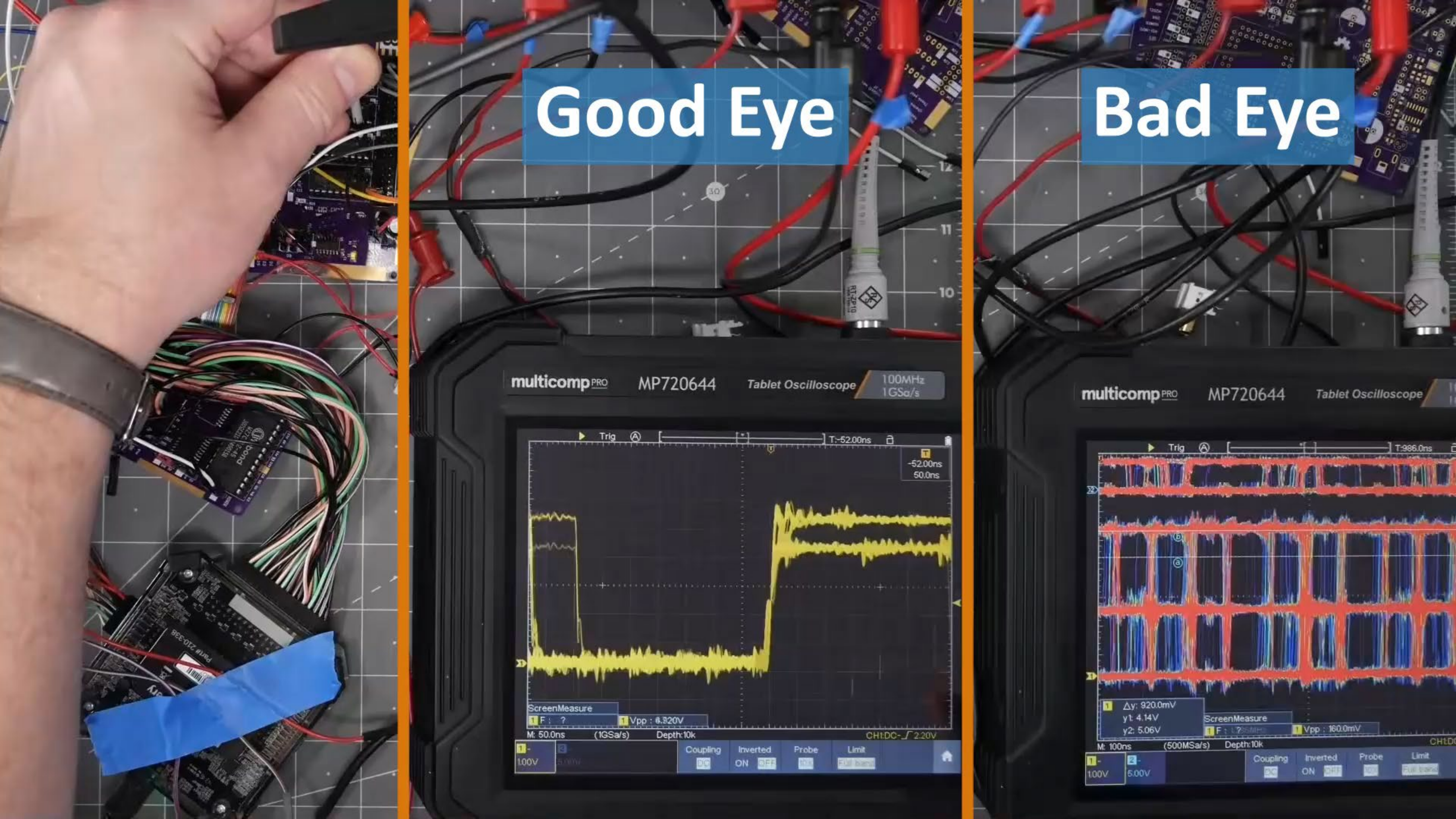
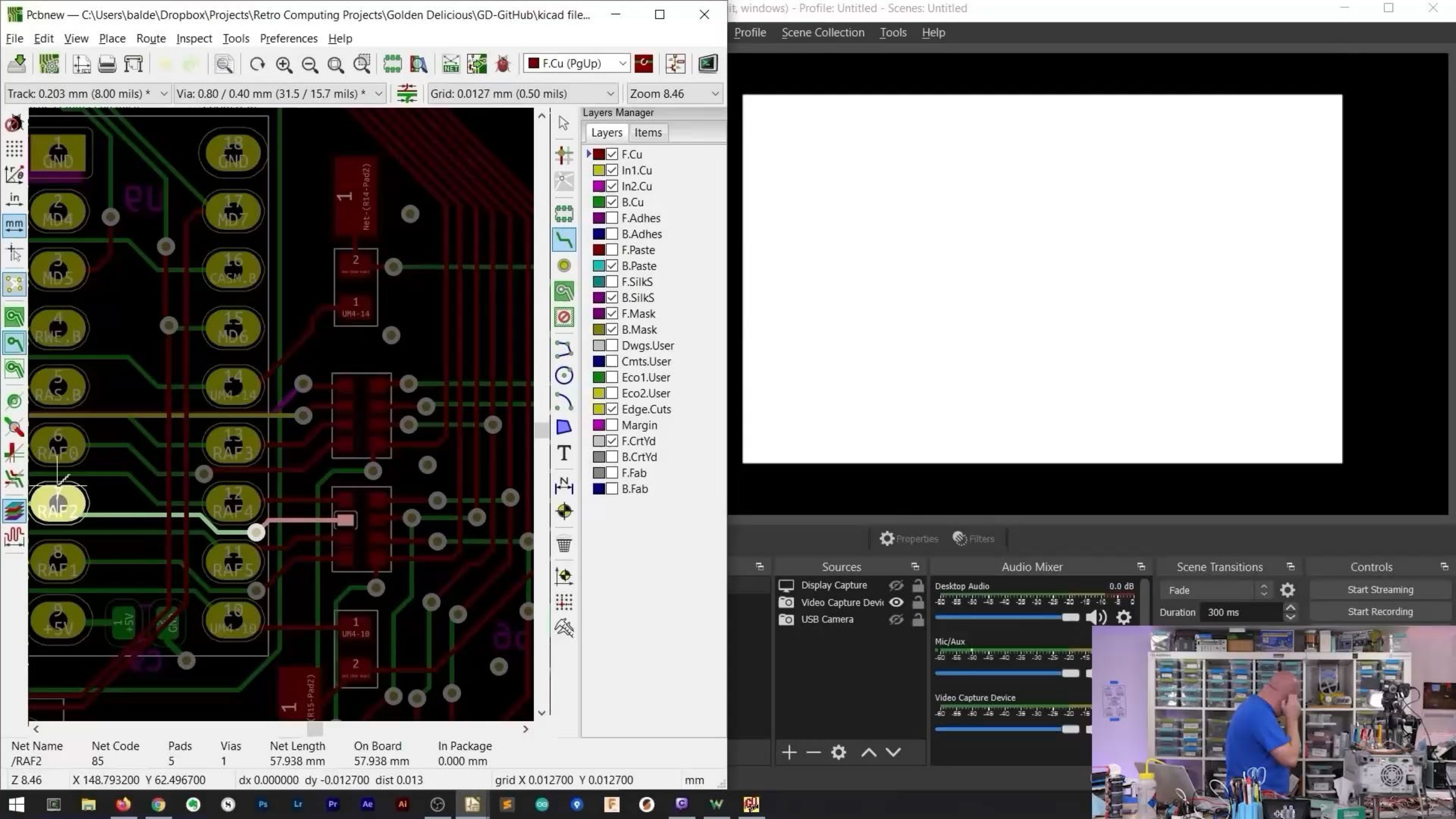
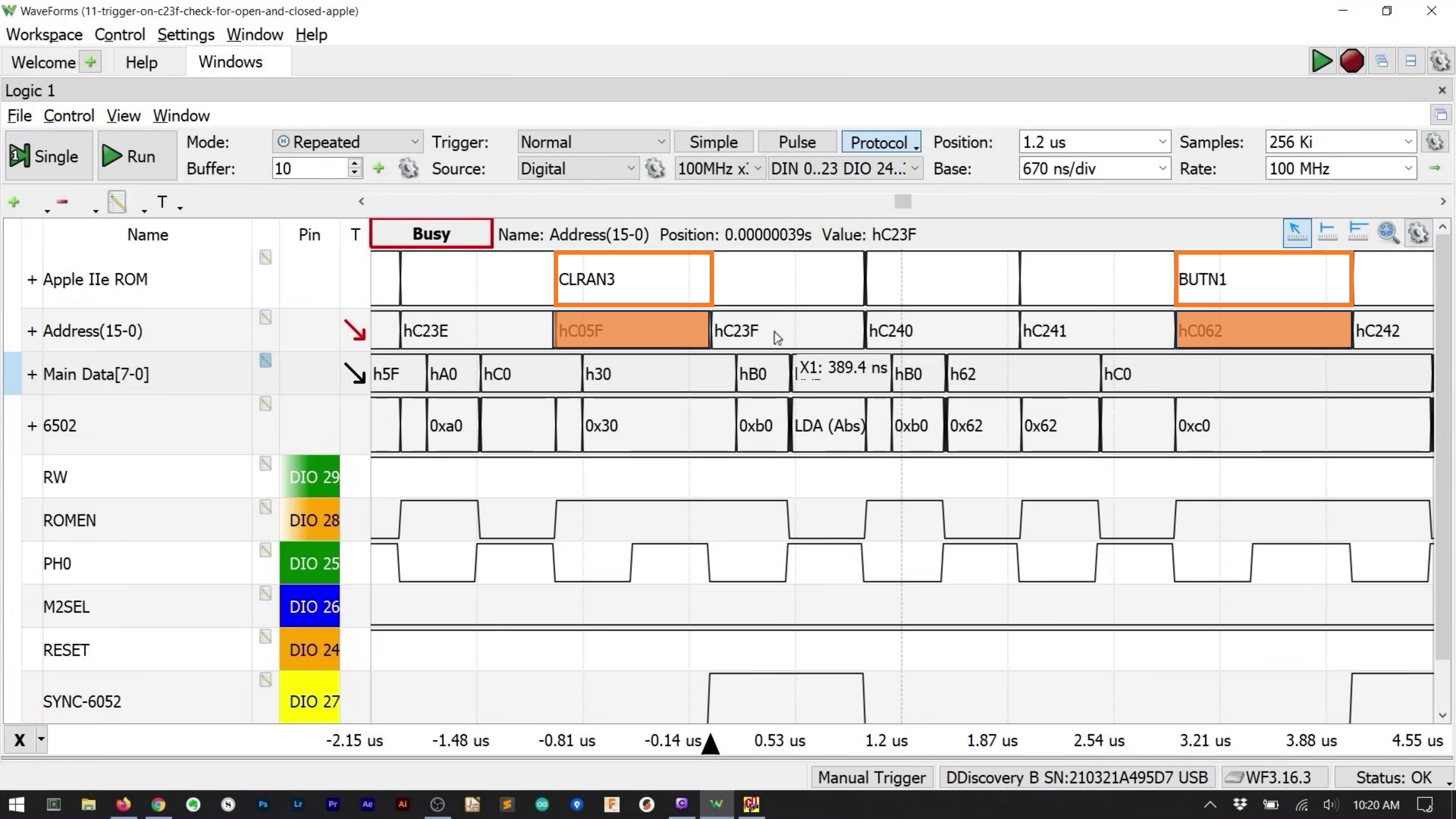
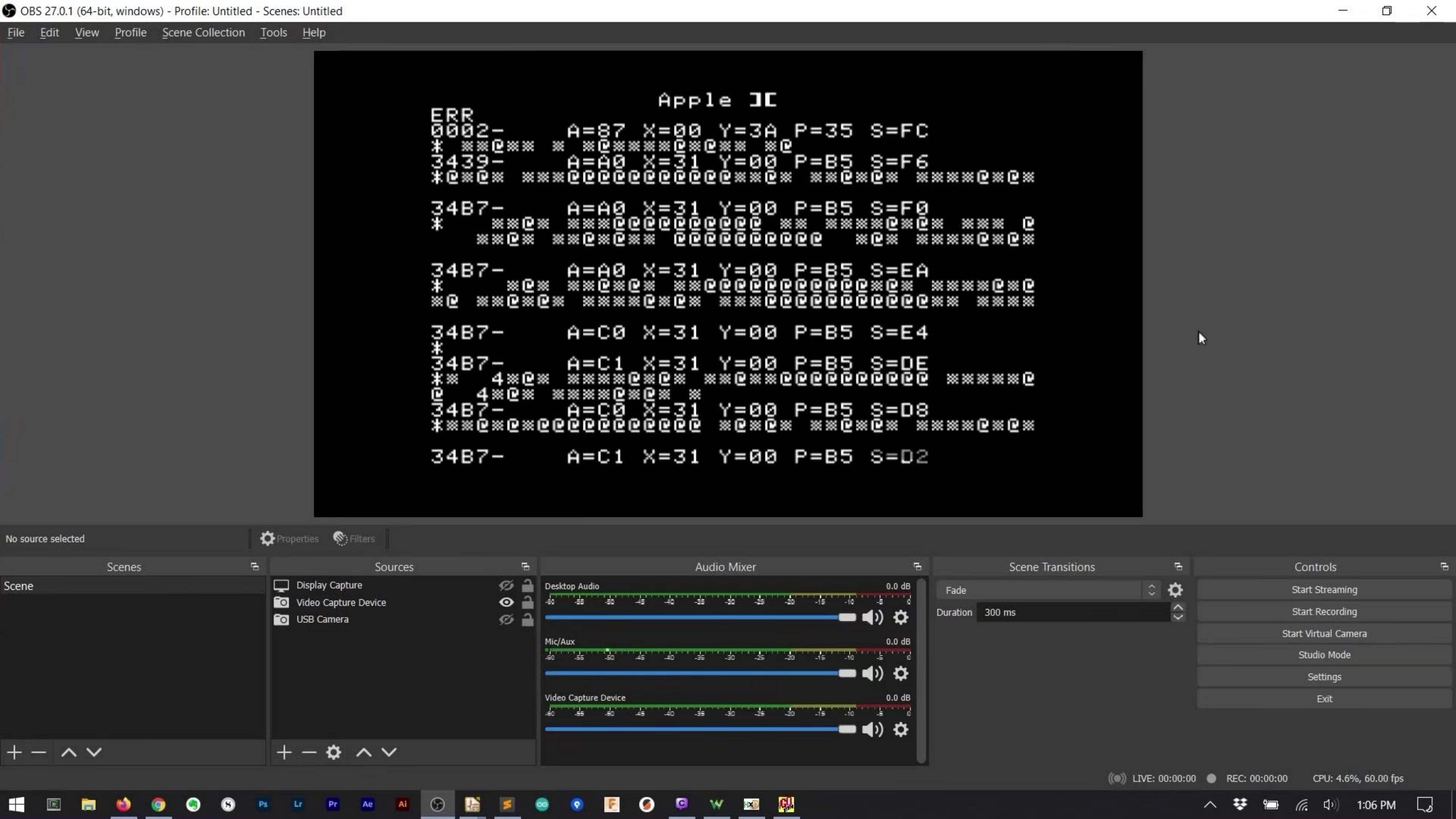

Mega + DRAM
IIGS VGC + Composite
65c02 + EEROM

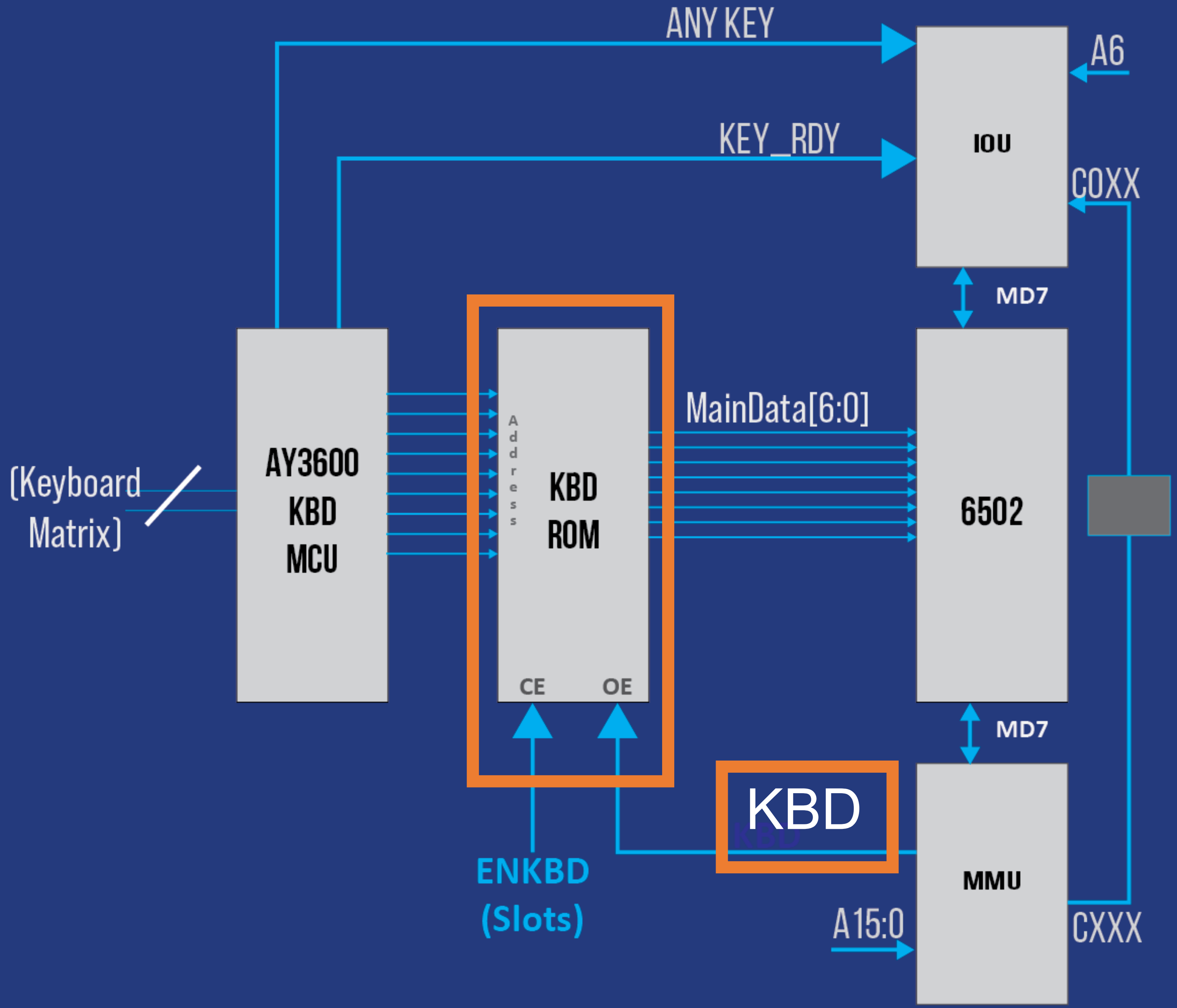

Apple][

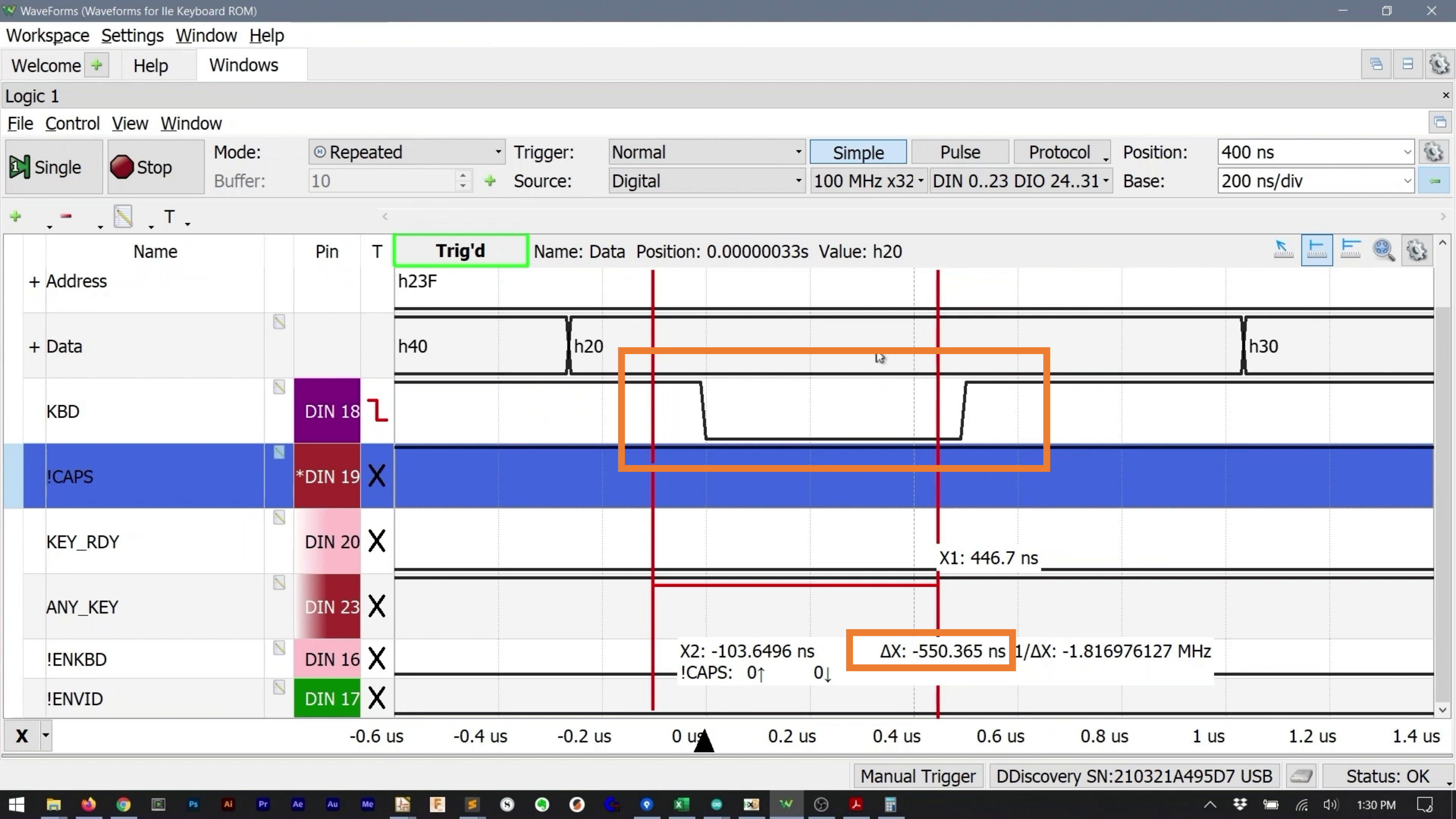

Good Eye
Bad Eye
multicomp PRO
MP720644
Tablet Oscilloscope
100MHz
1GSa/s
Trig
T:-52.00ns
-52.00ns
50.0ns
ScreenMeasure
Vpp : 6.320V
M: 50.0ns
(1GSa/s)
Depth:10k
CH1:DC- 2.20V
Coupling
Inverted
ON
OFF
Probe
Limit
Full band
1.00V
T:986.0ns
Δy: 920.0mV
y1: 4.14V
y2: 5.06V
Vpp : 160.0mV
M: 100ns
(500MSa/s)
Depth:10k
5.00V

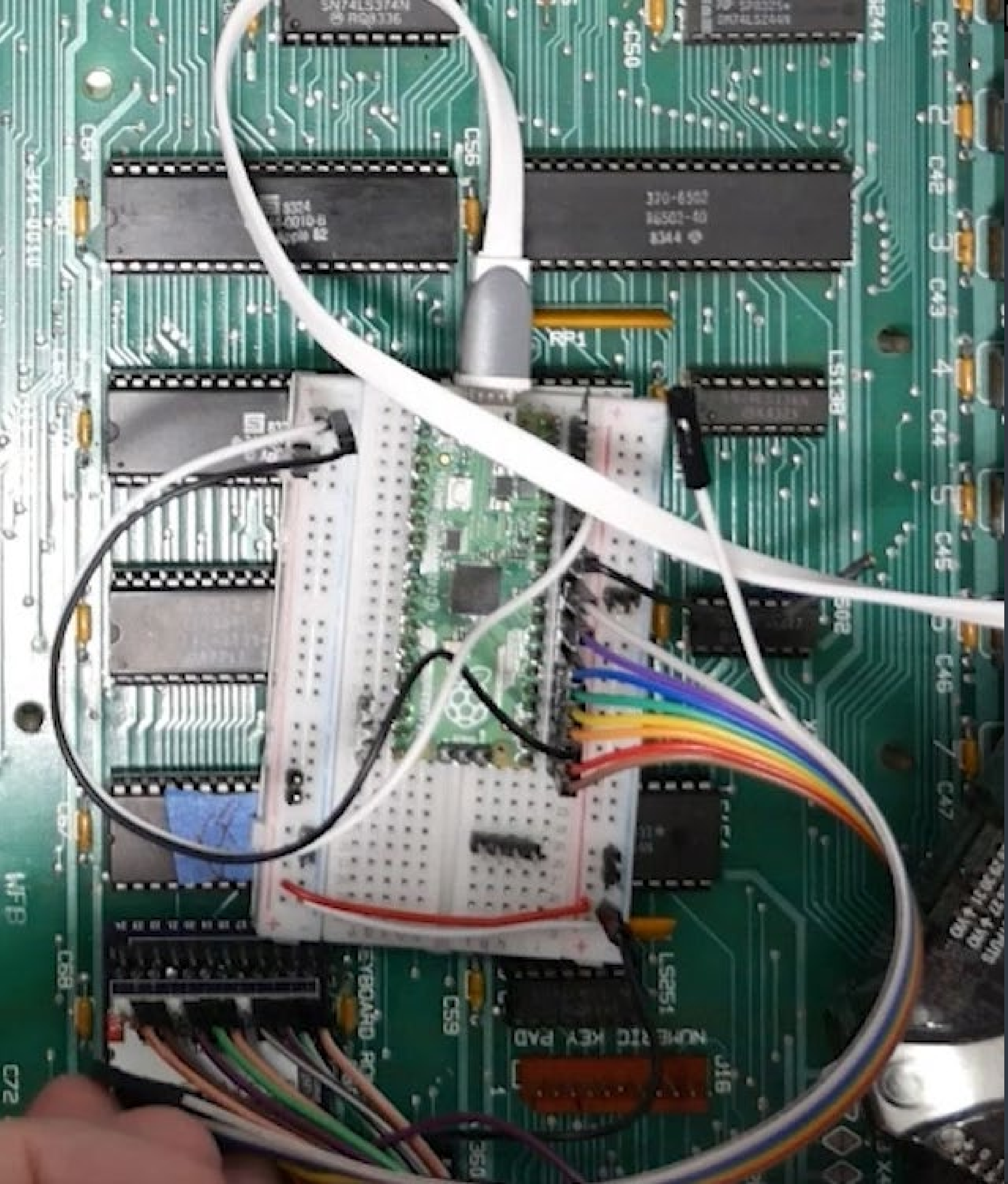

Pcbnew — C:\Users\balde\Dropbox\Projects\Retro Computing Projects\Golden Delicious\GD-GitHub\kicad file...
File Edit View Place Route Inspect Tools Preferences Help
F.Cu (PgUp)
Track: 0.203 mm (8.00 mils) *
Via: 0.80 / 0.40 mm (31.5 / 15.7 mils) *
Grid: 0.0127 mm (0.50 mils)
Zoom 8.46
Layers Manager
Layers Items
F.Cu
In1.Cu
In2.Cu
B.Cu
F.Adhes
B.Adhes
F.Paste
B.Paste
F.SilkS
B.SilkS
F.Mask
B.Mask
Dwgs.User
Cmts.User
Eco1.User
Eco2.User
Edge.Cuts
Margin
F.CrtYd
B.CrtYd
F.Fab
B.Fab
GND
MD4
MD5
RWE.B
RAS.B
RAF0
RAF2
RAF1
+5V
MD7
CASM.B
MD6
UM4-14
RAF3
RAF4
RAF5
UM4-10
Net-(R14-Pad2)
Net Name Net Code Pads Vias Net Length On Board In Package
/RAF2 85 5 1 57.938 mm 57.938 mm 0.000 mm
Z 8.46 X 148.793200 Y 62.496700 dx 0.000000 dy -0.012700 dist 0.013 grid X 0.012700 Y 0.012700 mm
it, windows) - Profile: Untitled - Scenes: Untitled
Profile Scene Collection Tools Help
Properties Filters
Sources
Display Capture
Video Capture Devic
USB Camera
Audio Mixer
Desktop Audio 0.0 dB
Mic/Aux
Video Capture Device
Scene Transitions
Fade
Duration 300 ms
Controls
Start Streaming
Start Recording


WaveForms (11-trigger-on-c23f-check-for-open-and-closed-apple)
Workspace Control Settings Window Help
Welcome
Help
Windows
Logic 1
File Control View Window
Single
Run
Mode: Repeated
Buffer: 10
Trigger: Normal
Source: Digital
Simple
Pulse
Protocol
100MHz x
DIN 0..23 DIO 24..
Position: 1.2 us
Base: 670 ns/div
Samples: 256 Ki
Rate: 100 MHz
Name
Pin
T
Busy
Name: Address(15-0) Position: 0.00000039s Value: hC23F
+ Apple IIe ROM
CLRAN3
BUTN1
+ Address(15-0)
hC23E
hC05F
hC23F
hC240
hC241
hC062
hC242
+ Main Data[7-0]
h5F
hA0
hC0
h30
hB0
X1: 389.4 ns
hB0
h62
hC0
+ 6502
0xa0
0x30
0xb0
LDA (Abs)
0xb0
0x62
0x62
0xc0
RW
DIO 29
ROMEN
DIO 28
PH0
DIO 25
M2SEL
DIO 26
RESET
DIO 24
SYNC-6052
DIO 27
X
-2.15 us
-1.48 us
-0.81 us
-0.14 us
0.53 us
1.2 us
1.87 us
2.54 us
3.21 us
3.88 us
4.55 us
Manual Trigger
DDiscovery B SN:210321A495D7 USB
WF3.16.3
Status: OK
10:20 AM


OBS 27.0.1 (64-bit, windows) - Profile: Untitled - Scenes: Untitled
File Edit View Profile Scene Collection Tools Help
Apple IIc
ERR
0002- A=87 X=00 Y=3A P=35 S=FC
3439- A=A0 X=31 Y=00 P=B5 S=F6
34B7- A=A0 X=31 Y=00 P=B5 S=F0
34B7- A=A0 X=31 Y=00 P=B5 S=EA
34B7- A=C0 X=31 Y=00 P=B5 S=E4
34B7- A=C1 X=31 Y=00 P=B5 S=DE
34B7- A=C0 X=31 Y=00 P=B5 S=D8
34B7- A=C1 X=31 Y=00 P=B5 S=D2
No source selected
Properties
Filters
Scenes
Scene
Sources
Display Capture
Video Capture Device
USB Camera
Audio Mixer
Desktop Audio 0.0 dB
Mic/Aux 0.0 dB
Video Capture Device 0.0 dB
Scene Transitions
Fade
Duration 300 ms
Controls
Start Streaming
Start Recording
Start Virtual Camera
Studio Mode
Settings
Exit
LIVE: 00:00:00
REC: 00:00:00
CPU: 4.6%, 60.00 fps
1:06 PM


ANY KEY
A6
KEY_RDY
IOU
COXX
MD7
AY3600
KBD
MCU
(Keyboard
Matrix)
Address
KBD
ROM
CE
OE
MainData[6:0]
6502
MD7
KBD
MMU
ENKBD
(Slots)
A15:0
CXXX


WaveForms (Waveforms for IIe Keyboard ROM)
Workspace Settings Window Help
Welcome
Help
Windows
Logic 1
File Control View Window
Single
Stop
Mode:
Repeated
Buffer:
10
Trigger:
Normal
Source:
Digital
Simple
Pulse
Protocol
100 MHz x32
DIN 0..23 DIO 24..31
Position:
400 ns
Base:
200 ns/div
Name
Pin
T
Trig'd
Name: Data Position: 0.00000033s Value: h20
+ Address
h23F
+ Data
h40
h20
h30
KBD
DIN 18
!CAPS
*DIN 19
KEY_RDY
DIN 20
ANY_KEY
DIN 23
!ENKBD
DIN 16
!ENVID
DIN 17
X1: 446.7 ns
X2: -103.6496 ns
!CAPS: 0↑ 0↓
ΔX: -550.365 ns
1/ΔX: -1.816976127 MHz
-0.6 us
-0.4 us
-0.2 us
0 us
0.2 us
0.4 us
0.6 us
0.8 us
1 us
1.2 us
1.4 us
Manual Trigger
DDiscovery SN:210321A495D7 USB
Status: OK
1:30 PM



C:\Users\balde\Dropbox\Projects\Retro Computing Projects\Golden Delicious\GD-GitHub\firmware\lle-keyboard_emulator\src\KBD.pio - Sublime T

File Edit Selection Find View Goto Tools Project Preferences Help

FFFC FFFD | KBD.pio

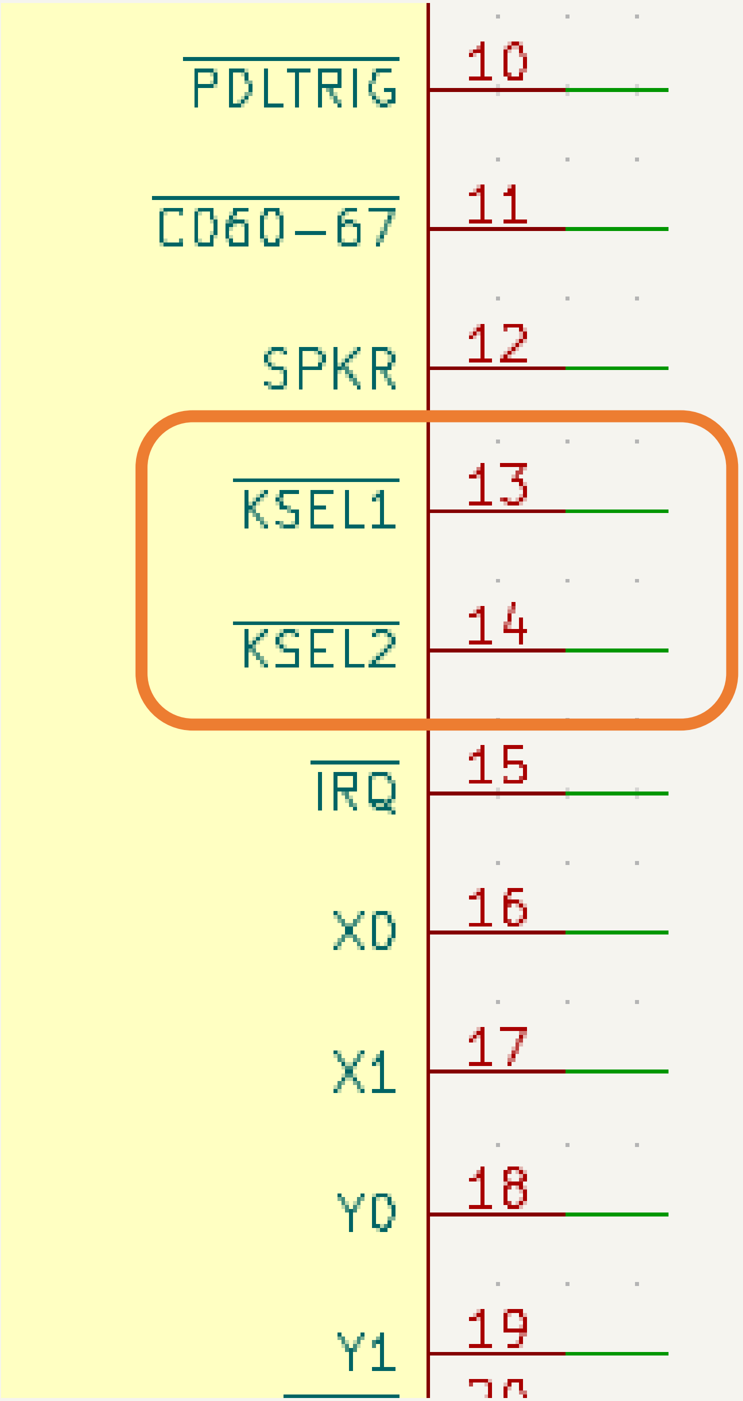
```
.wrap_target
start:
    wait 1 gpio PH0      ; wait for Data Cycle
    wait 0 gpio KSEL2 side 1 [7]  ; [6] KSEL2 and de-assert 245
    wait 0 gpio KSEL1 side 1  [7] ; [6] KSEL1 both seem to do t
C0XX:
    pull noblock          [7] ; [6] Get Values 0xYX Y = anykey X =

    mov isr,null         ; Clear ISR
    in PINS, 1           ; get KSEL0 from the input pins (bottom
    mov Y, ISR           ; move to y for comparison
    jmp !Y, C000         ; KSEL0 0 C000
C010:
    ; Clear bit 0         ; Clear Keystrobe

    irq 1                ; below here bit 0 is supposed to be Ke
    out null,1           ; Delete KeyRDY 0xxx xxxx xxxx xxxx xxx
    mov isr,::osr
    in null,1
    mov osr,::isr        ; xxxx xxxx xxxx xxxx xxxx xxxx xxxx xx
    mov x,osr ;Backup osr
    out null,1
    out pins,1
    jmp wait_phase
C000:
    mov x,osr ;Backup osr
    out pins,1           ;output keystrobe Gets reset when C sid

wait_phase:
    irq clear 0
```

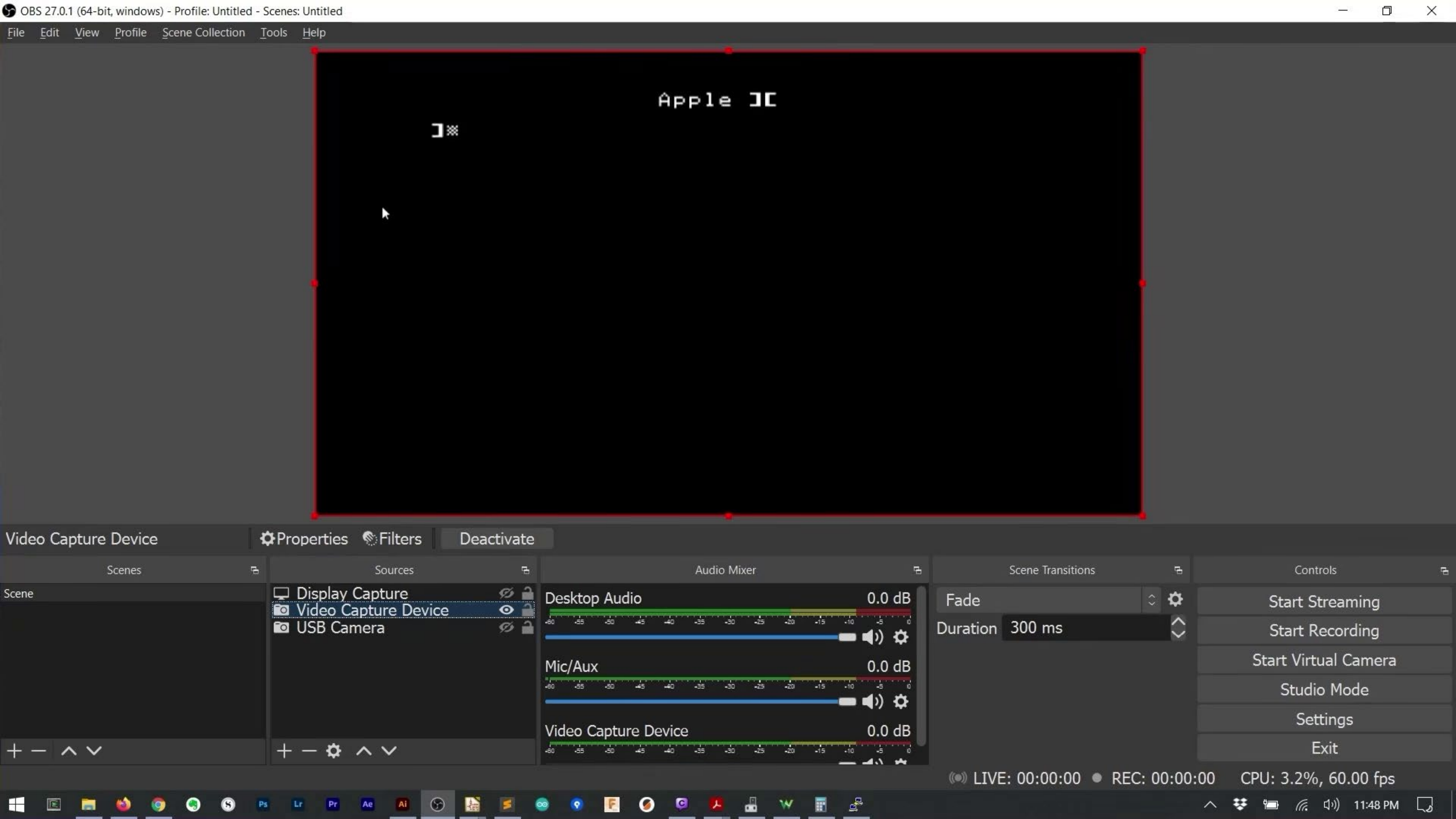
Line 1, Column 1

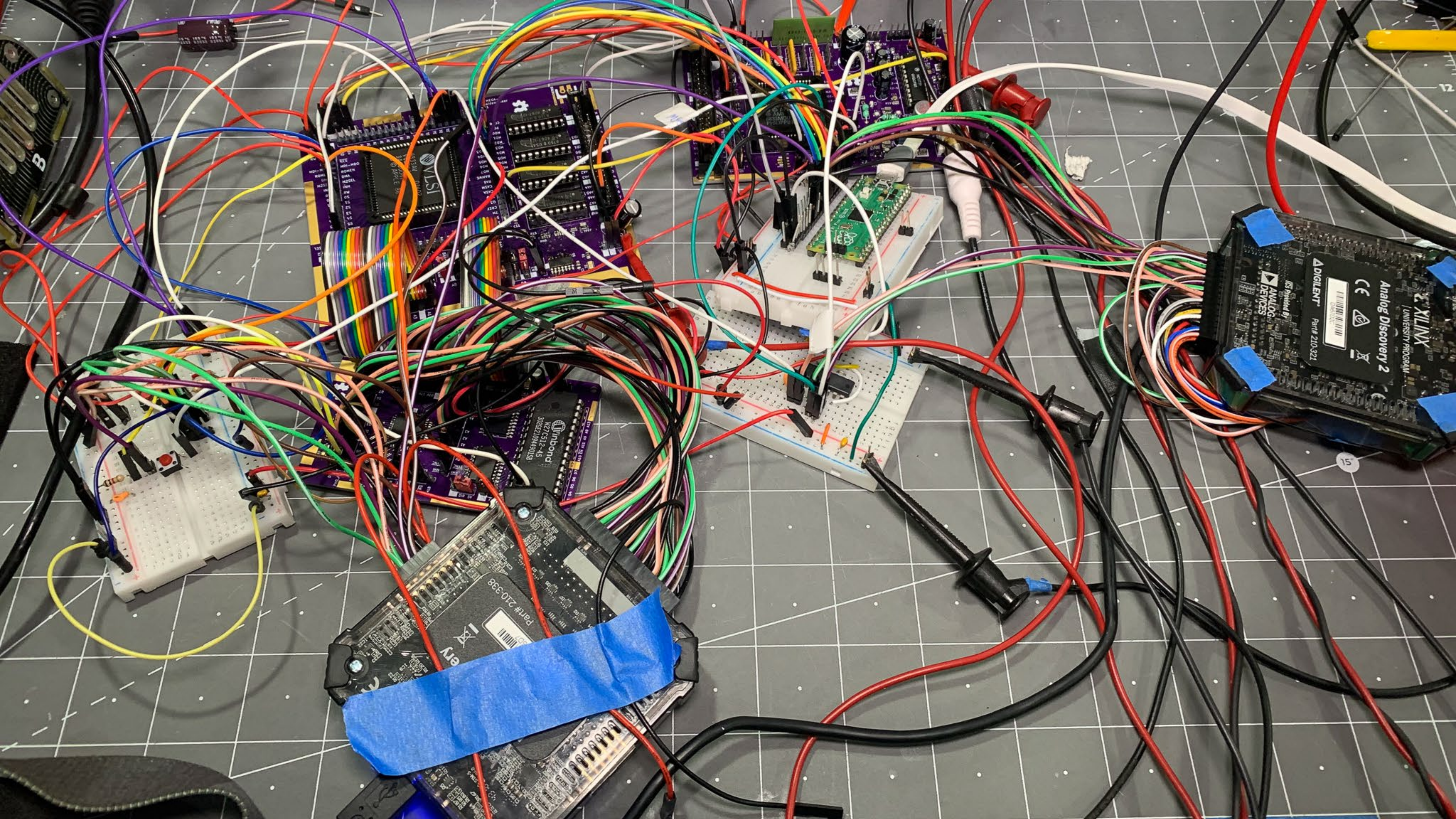


MEGA-II

"I bet these are:
KBD and **KEY_RDY**!"

(Narrator: They are not.)


OBS 27.0.1 (64-bit, windows) - Profile: Untitled - Scenes: Untitled
File
Edit
View
Profile
Scene Collection
Tools
Help
Apple][
]
Video Capture Device
Properties
Filters
Deactivate
Scenes
Sources
Audio Mixer
Scene Transitions
Controls
Scene
Display Capture
Video Capture Device
USB Camera
Desktop Audio
0.0 dB
Mic/Aux
0.0 dB
Video Capture Device
0.0 dB
Fade
Duration
300 ms
Start Streaming
Start Recording
Start Virtual Camera
Studio Mode
Settings
Exit
LIVE: 00:00:00
REC: 00:00:00
CPU: 3.2%, 60.00 fps
11:48 PM


Analog Discovery 2
XILINX
UNIVERSITY PROGRAM
DIGILENT
ANALOG DEVICES
Part# 210-321
Part# 210-338
Winbond
VLSI

Rev 2

Mega IIe

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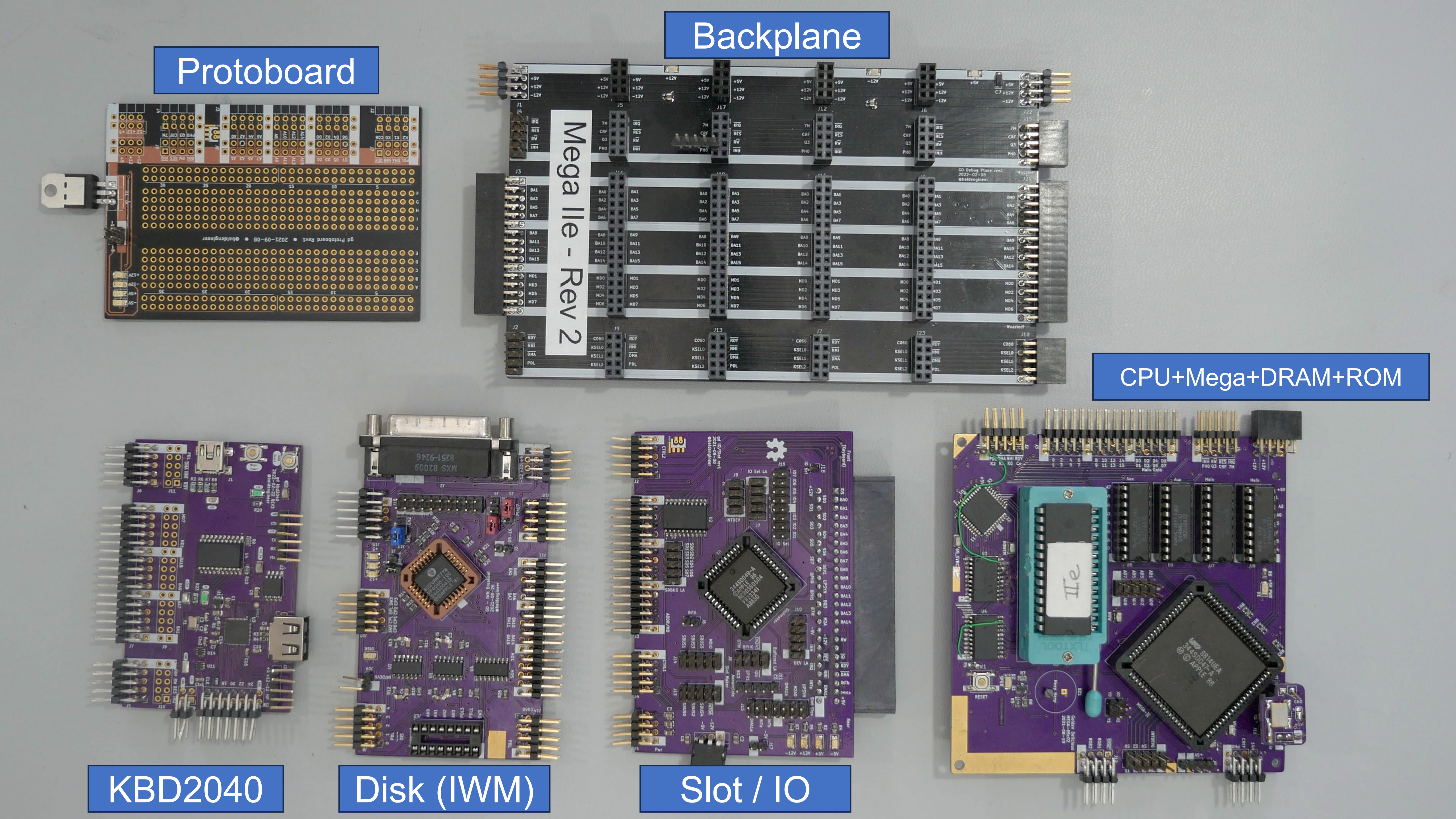
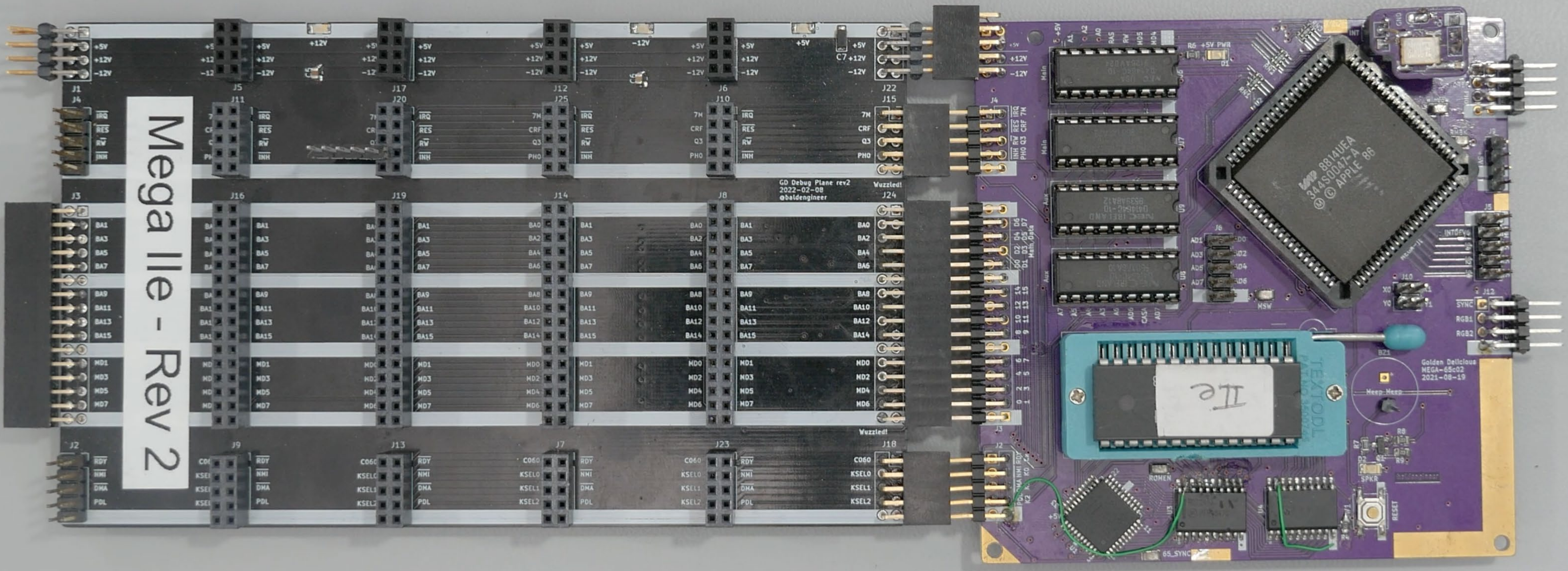
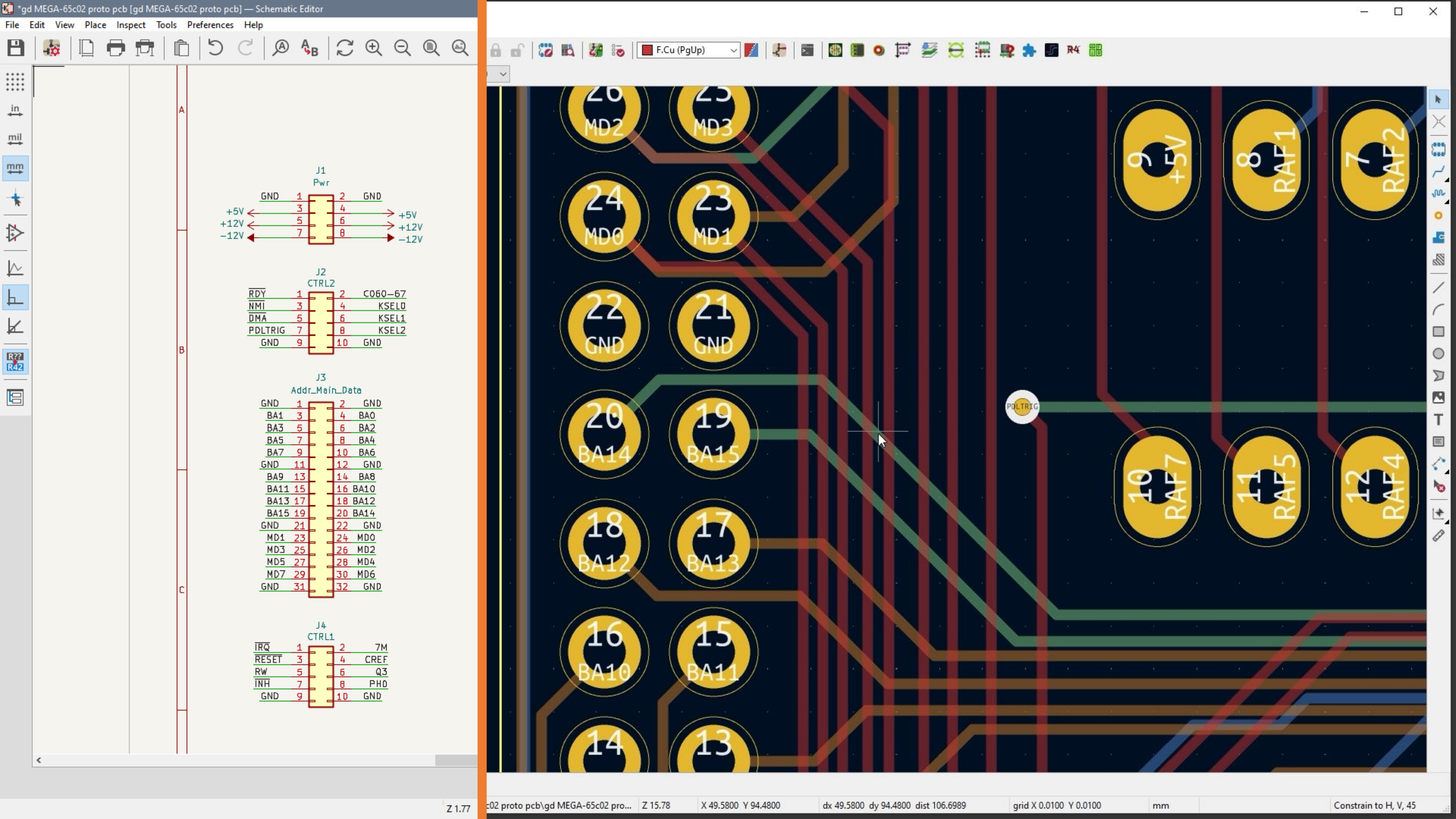
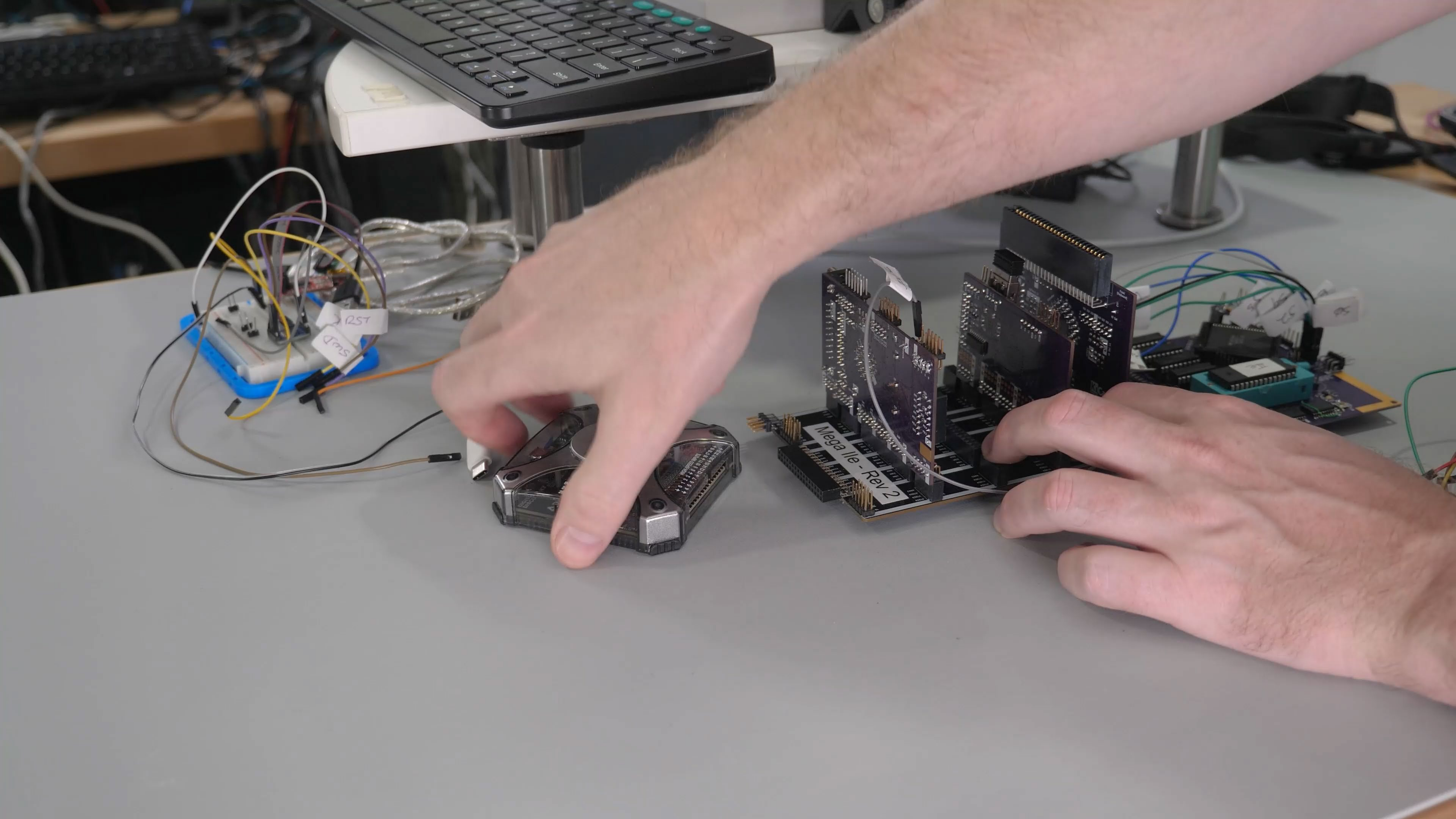
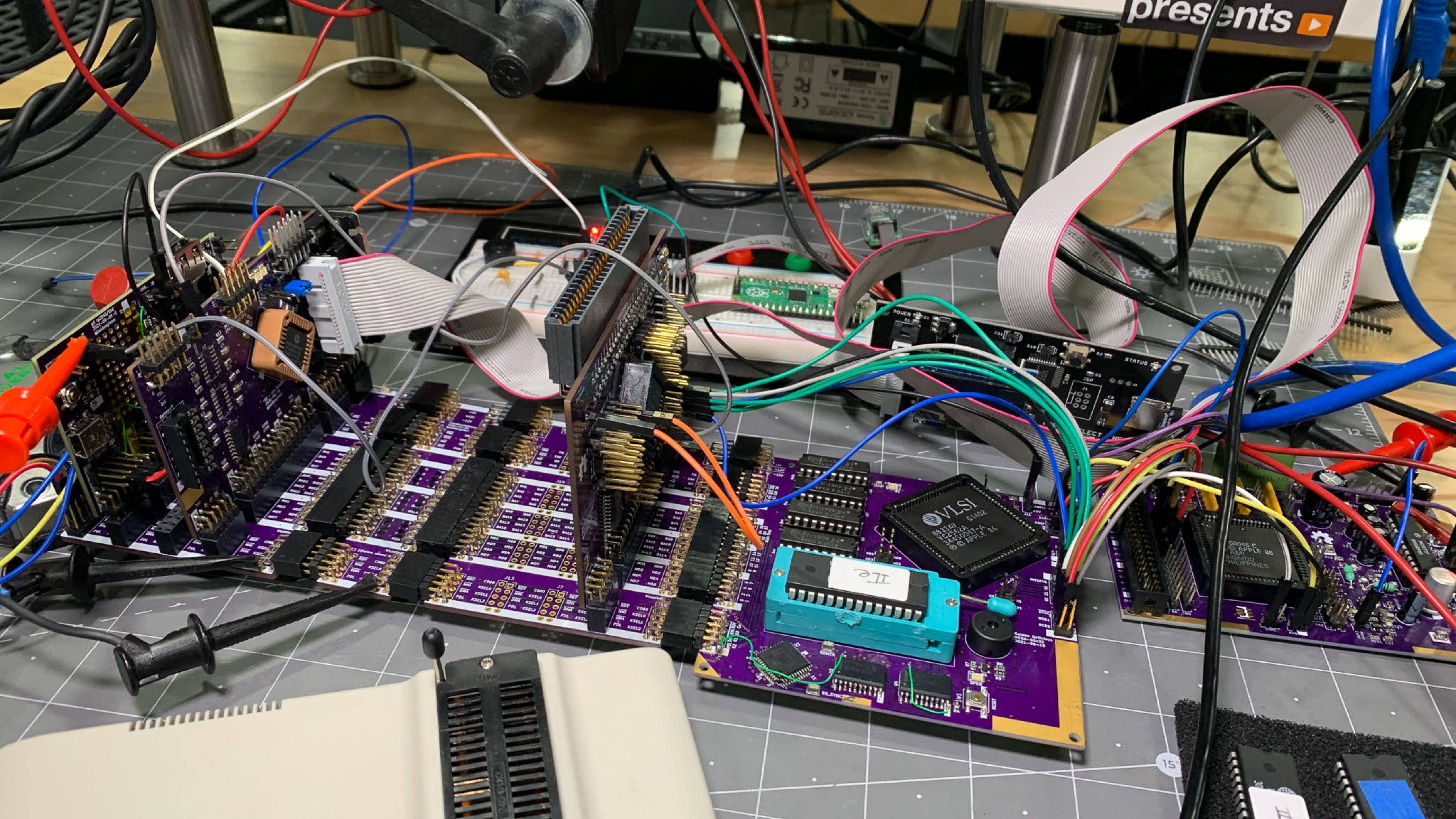

Protoboard
Backplane
Mega IIe - Rev 2
CPU+Mega+DRAM+ROM
KBD2040
Disk (IWM)
Slot / IO

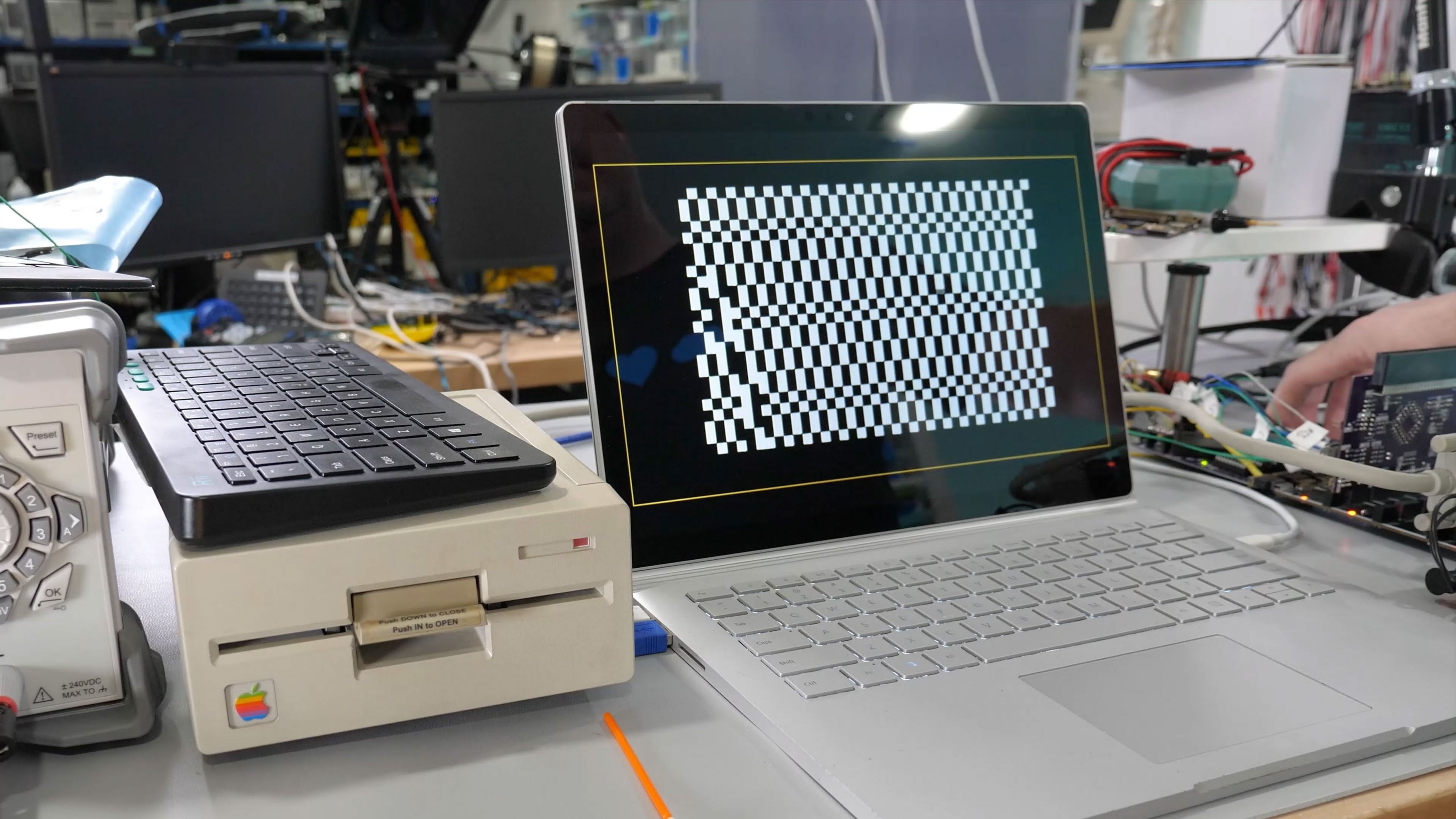

Mega IIe - Rev 2
GD Debug Plane rev2
2022-02-08
@baldengineer
Wuzzled!
Golden Delicious
MEGA-65c02
2021-08-19
Meep Meep
APPLE 86
RESET


IIe


*gd MEGA-65c02 proto pcb [gd MEGA-65c02 proto pcb] — Schematic Editor
File Edit View Place Inspect Tools Preferences Help
J1
Pwr
GND 1 2 GND
+5V 3 4 +5V
+12V 5 6 +12V
−12V 7 8 −12V
J2
CTRL2
RDY 1 2 C060−67
NMI 3 4 KSEL0
DMA 5 6 KSEL1
PDLTRIG 7 8 KSEL2
GND 9 10 GND
J3
Addr_Main_Data
GND 1 2 GND
BA1 3 4 BA0
BA3 5 6 BA2
BA5 7 8 BA4
BA7 9 10 BA6
GND 11 12 GND
BA9 13 14 BA8
BA11 15 16 BA10
BA13 17 18 BA12
BA15 19 20 BA14
GND 21 22 GND
MD1 23 24 MD0
MD3 25 26 MD2
MD5 27 28 MD4
MD7 29 30 MD6
GND 31 32 GND
J4
CTRL1
IRQ 1 2 7M
RESET 3 4 CREF
RW 5 6 Q3
INH 7 8 PH0
GND 9 10 GND
Z 1.77
F.Cu (PgUp)
26 MD2
25 MD3
24 MD0
23 MD1
22 GND
21 GND
20 BA14
19 BA15
18 BA12
17 BA13
16 BA10
15 BA11
14
13
9 +5V
8 RAF1
7 RAF2
10 RAF7
11 RAF5
12 RAF4
PDLTRIG
c02 proto pcb\gd MEGA-65c02 pro... Z 15.78 X 49.5800 Y 94.4800 dx 49.5800 dy 94.4800 dist 106.6989 grid X 0.0100 Y 0.0100 mm Constrain to H, V, 45


RST
Mega IIe - Rev 2


presents
VLSI
APPLE 86
IIe
POWER
STATUS


Preset
OK
± 240VDC
MAX TO
Push DOWN to CLOSE
Push IN to OPEN

Keyboard

Mega IIe

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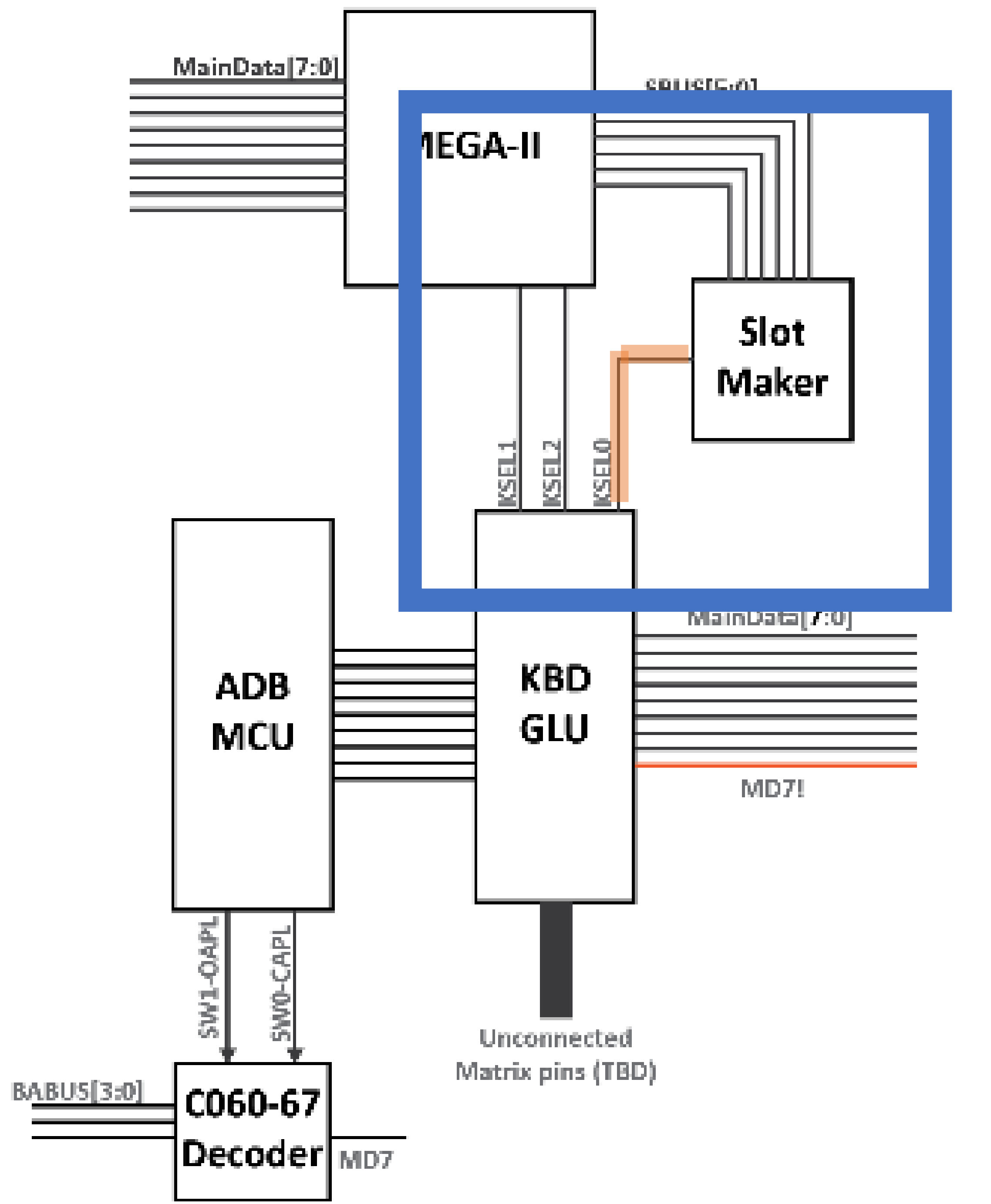


$C000
KSEL[2:0] = 0x0

$C010
KSEL[2:0] = 0x1

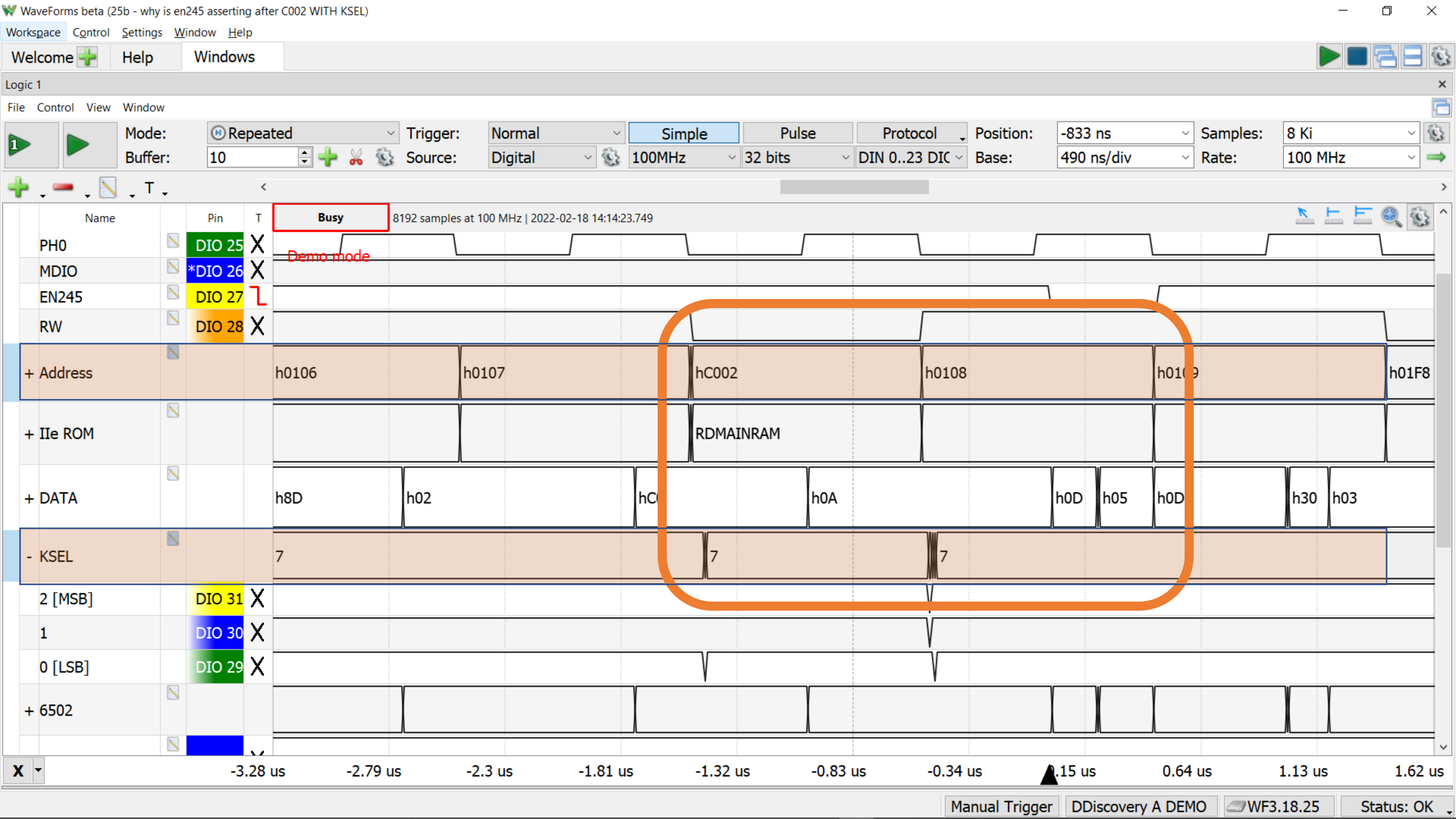
IDLE
KSEL[2:0] = 0x7

KBD GLU may contain something like the IIe's KBD ROM.
The MEGA-II has the Character ROM...


HID device address = 1, instance = 0
HID device address = 1, instance = 1
HID device address = 1, instance = 0
HID Interface Protocol = Keyboard
Error: cannot request to receive rep
HID device address = 1, instance = 1
HID Interface Protocol = None
HID has 3 reports
Error: cannot request to receive rep
Forcing Caps Lock to High
HELLO
BREAK IN 10
]NEW
?SYNTAX ERROR
]NEW
]10 PRINT "USB HELLO"
]


APPLE
VERSION
by
OLAF
FROGG
Space to Play, D efine Keys


]
4088- A=9E X=9C Y=25 P=F5 S=EA


WaveForms beta (25b - why is en245 asserting after C002 WITH KSEL)
Workspace Control Settings Window Help
Welcome Help Windows
Logic 1
File Control View Window
Mode: Repeated
Buffer: 10
Trigger: Normal
Source: Digital
Simple Pulse Protocol
100MHz 32 bits DIN 0..23 DIC
Position: -833 ns
Base: 490 ns/div
Samples: 8 Ki
Rate: 100 MHz
Name Pin T
Busy
8192 samples at 100 MHz | 2022-02-18 14:14:23.749
Demo mode
PH0 DIO 25
MDIO *DIO 26
EN245 DIO 27
RW DIO 28
+ Address h0106 h0107 hC002 h0108 h0109 h01F8
+ IIe ROM RDMAINRAM
+ DATA h8D h02 hC0 h0A h0D h05 h0D h30 h03
- KSEL 7 7 7
2 [MSB] DIO 31
1 DIO 30
0 [LSB] DIO 29
+ 6502
-3.28 us -2.79 us -2.3 us -1.81 us -1.32 us -0.83 us -0.34 us 0.15 us 0.64 us 1.13 us 1.62 us
Manual Trigger DDiscovery A DEMO WF3.18.25 Status: OK

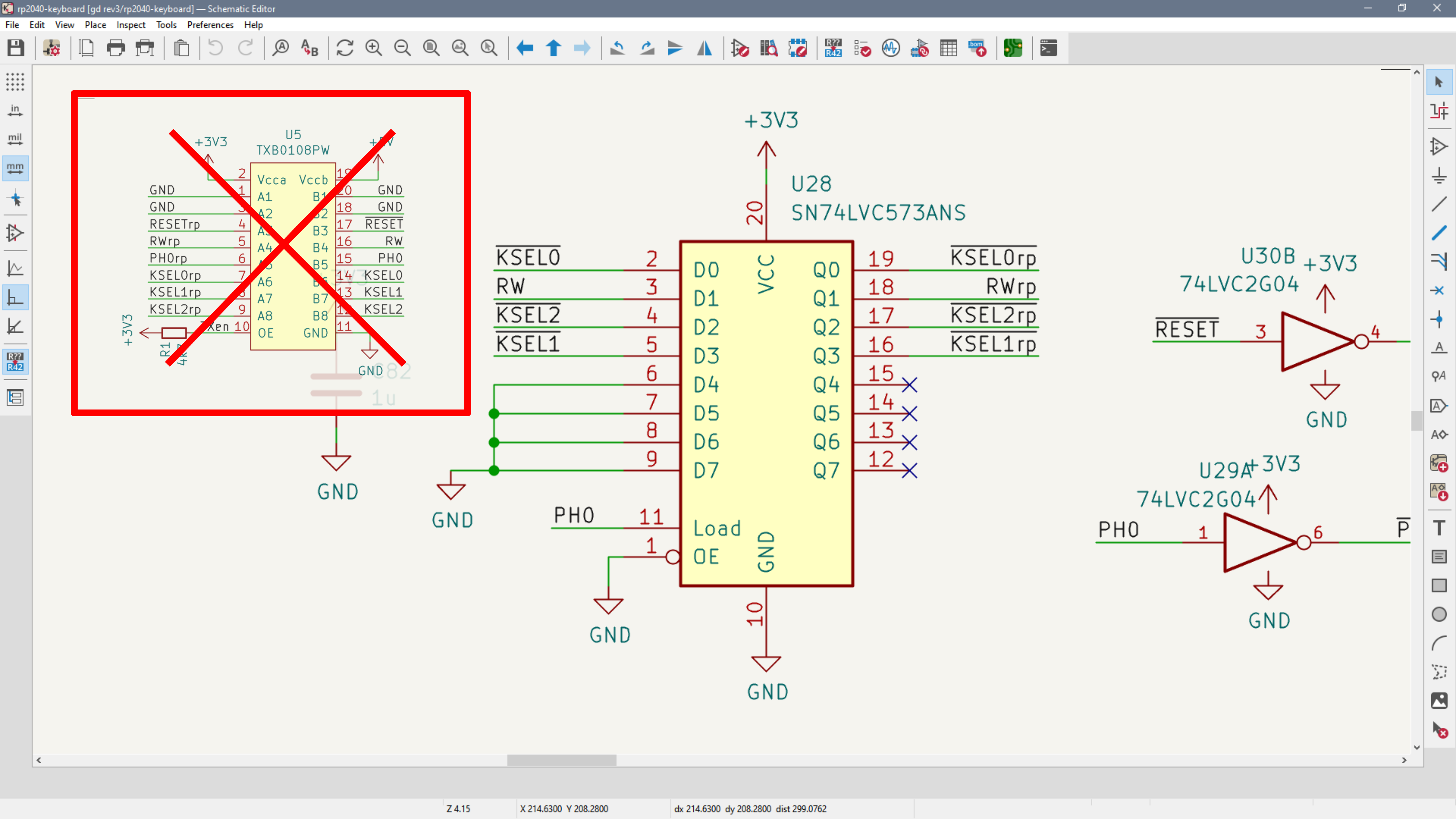
C:\Users\balde\Dropbox\Projects\Retro Computing Projects\Golden Delicious\GD-GitHub\firmware\IIe-keyboard_emulator\src\KBD.pio - Sublime Text

File Edit Selection Find View Goto Tools Project Preferences Help

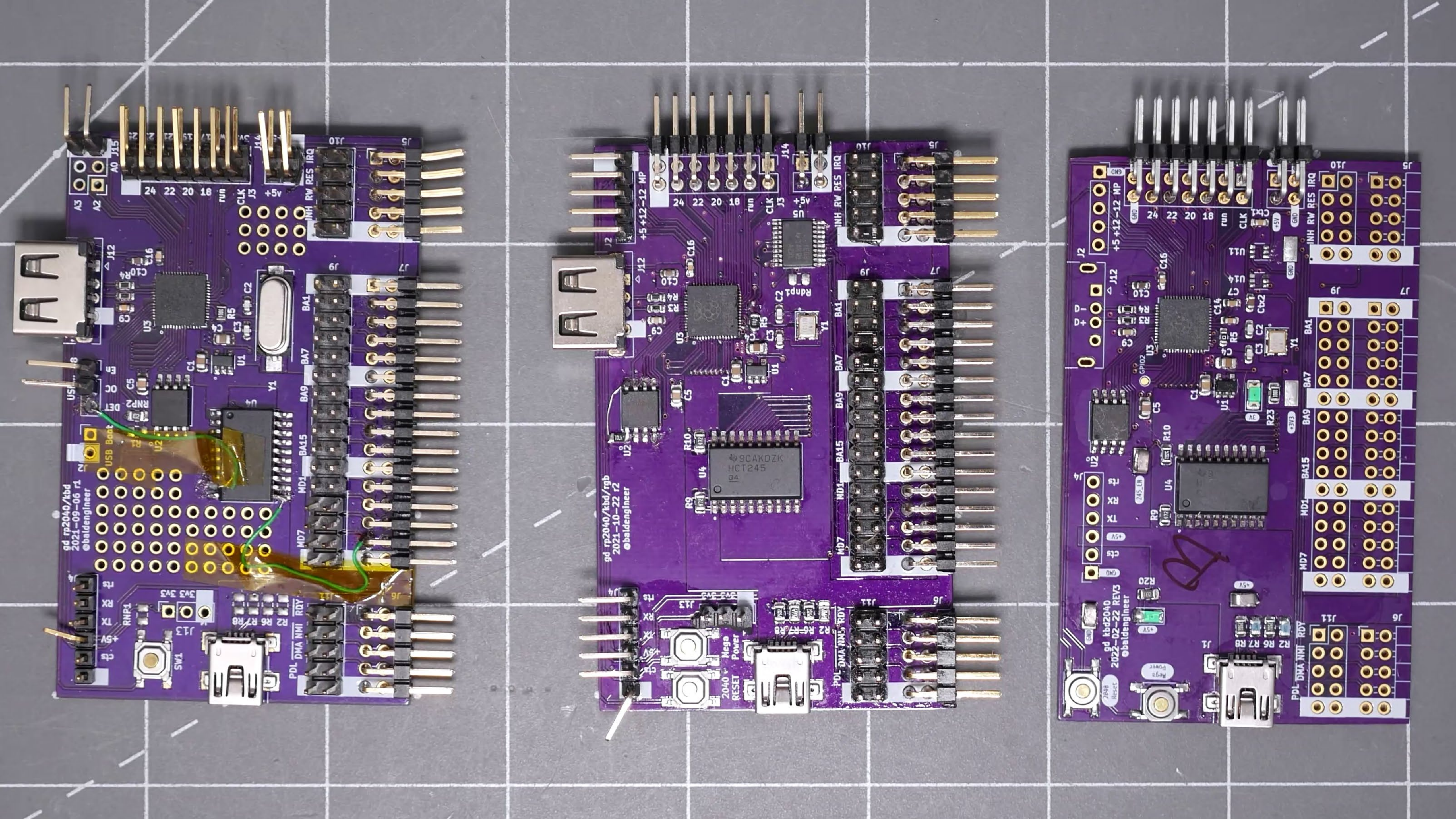
FFFC FFFD | KBD.pio

```
.wrap_target
start:
    wait 1 gpio PH0      ; wait for Data Cycle
    wait 0 gpio KSEL2 side 1 [7]  ; [6] KSEL2 and de-assert 245
    wait 0 gpio KSEL1 side 1  [7] ; [6] KSEL1 both seem to do the same thing
C0XX:
    pull noblock       [7] ; [6] Get values 0xYX Y = anykey X = key

    mov isr,null        ; Clear ISR
    in PINS, 1          ; get KSEL0 from the input pins (bottom bit)
    mov Y, ISR          ; move to y for comparison
    jmp !Y, C000        ; KSEL0 0 C000
C010:
    ; Clear bit 0        ; Clear Keystrobe

    irq 1               ; below here bit 0 is supposed to be KeyRDY/MD7
    out null,1          ; Delete KeyRDY 0xxx xxxx xxxx xxxx xxxx xxxx xxxx xxxY | X
    mov isr,::osr
    in null,1
    mov osr,::isr       ; xxxx xxxx xxxx xxxx xxxx xxxx xxxx xxy0
    mov x,osr ;Backup osr
    out null,1
    out pins,1
    jmp wait_phase
C000:
    mov x,osr ;Backup osr
    out pins,1          ;output keystrobe Gets reset when C side sends new values

wait_phase:
    irq clear 0
```

Line 1, Column 1 | rev3b-code-integration 5 | Spaces: 4 | Plain Text



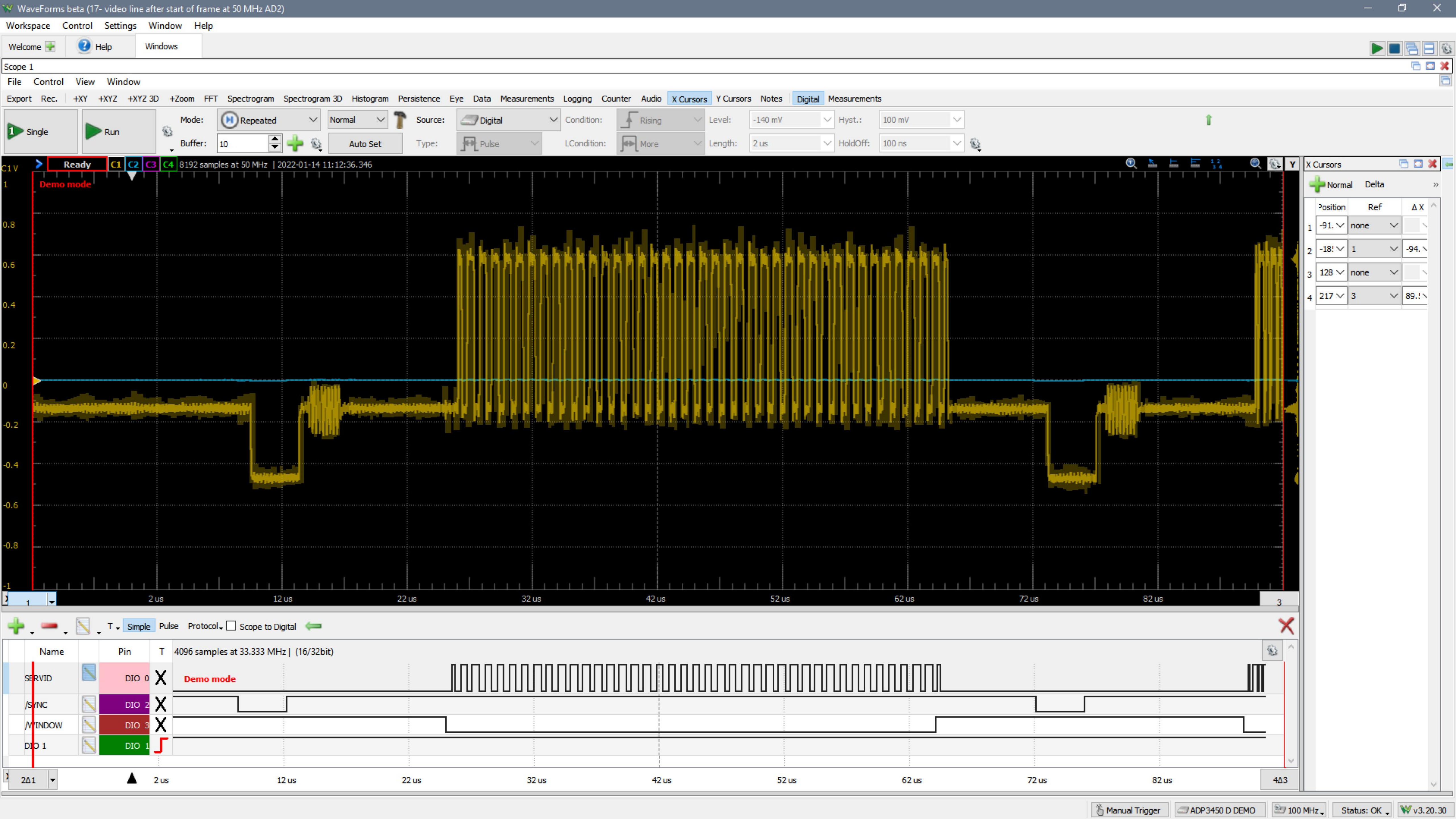
rp2040-keyboard [gd rev3/rp2040-keyboard] — Schematic Editor
File Edit View Place Inspect Tools Preferences Help
U5
TXB0108PW
+3V3
Vcca Vccb
A1 A2 A3 A4 A5 A6 A7 A8 OE
B1 B2 B3 B4 B5 B6 B7 B8 GND
GND
GND
RESETrp
RWrp
PH0rp
KSEL0rp
KSEL1rp
KSEL2rp
RESET
RW
PH0
KSEL0
KSEL1
KSEL2
R1
GND
+3V3
U28
SN74LVC573ANS
VCC
D0 D1 D2 D3 D4 D5 D6 D7
Q0 Q1 Q2 Q3 Q4 Q5 Q6 Q7
Load
OE
GND
KSEL0
RW
KSEL2
KSEL1
PH0
KSEL0rp
RWrp
KSEL2rp
KSEL1rp
U30B
74LVC2G04
+3V3
RESET
GND
U29A
74LVC2G04
+3V3
PH0
GND
Z 4.15
X 214.6300 Y 208.2800
dx 214.6300 dy 208.2800 dist 299.0762

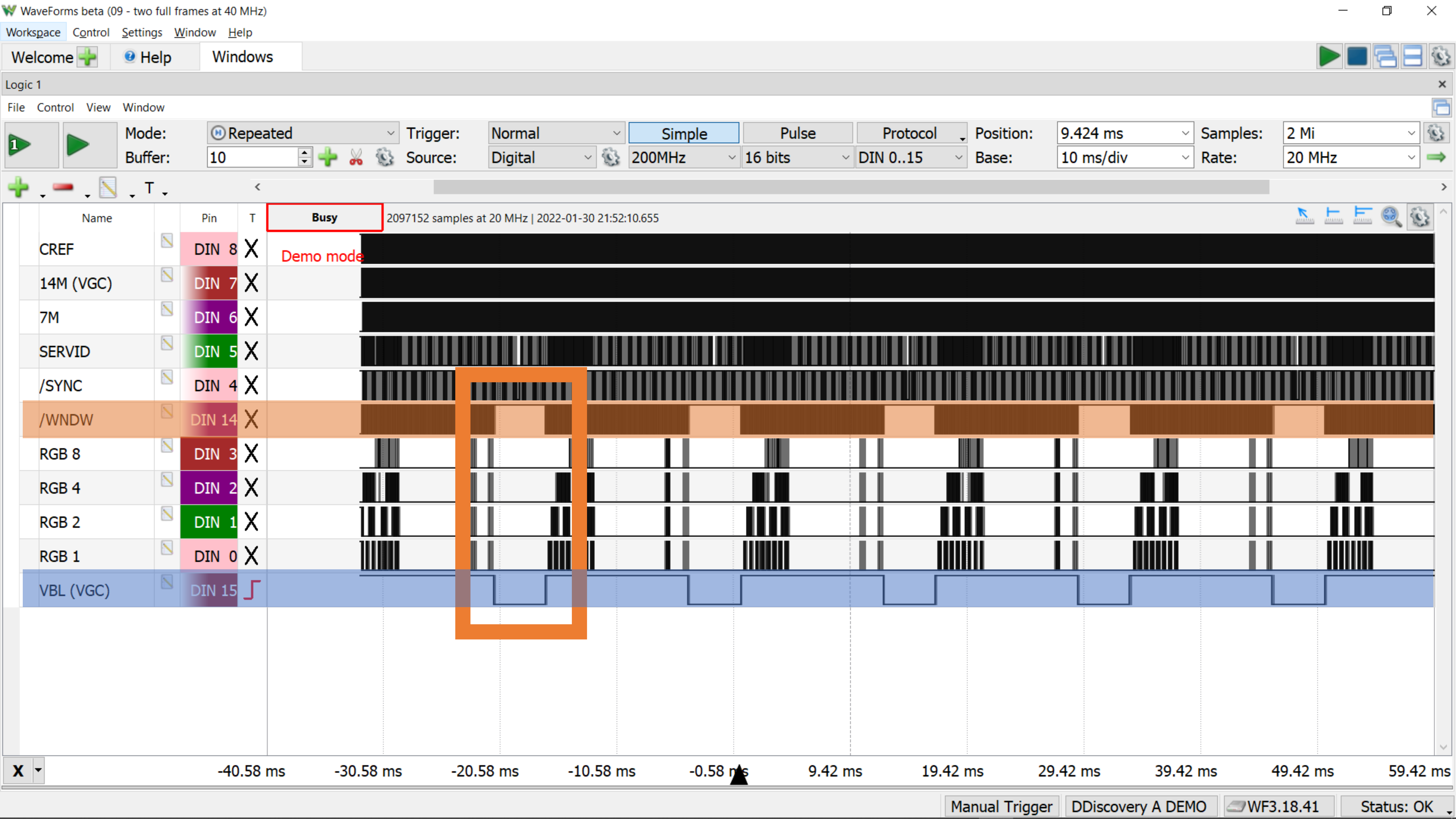

gd rp2040/kbd
2021-09-06 r1
@baldengineer
gd rp2040/kbd/rgb
2021-10-22 r2
@baldengineer
HCT245
gd kbd2040
2022-02-22 REV3
@baldengineer


Hi Score 000000
Your Score 000000
Floppy Emu

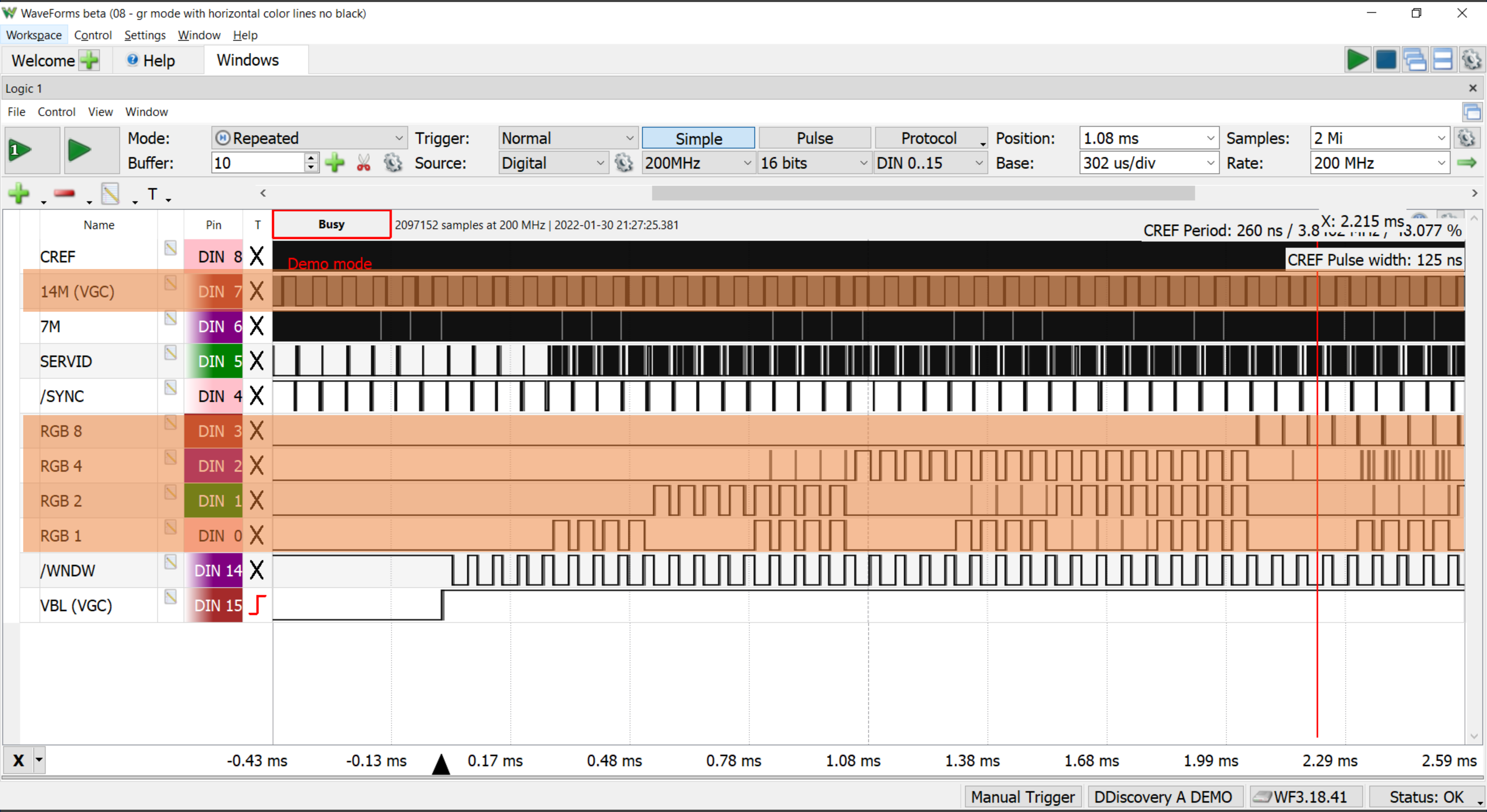
VGA

Mega IIe


WaveForms beta (17- video line after start of frame at 50 MHz AD2)
Workspace Control Settings Window Help
Welcome Help Windows
Scope 1
File Control View Window
Export Rec. +XY +XYZ +XYZ 3D +Zoom FFT Spectrogram Spectrogram 3D Histogram Persistence Eye Data Measurements Logging Counter Audio X Cursors Y Cursors Notes Digital Measurements
Single Run
Mode: Repeated Normal
Buffer: 10
Auto Set
Source: Digital
Type: Pulse
Condition: Rising
LCondition: More
Level: -140 mV
Length: 2 us
Hyst.: 100 mV
HoldOff: 100 ns
Ready C1 C2 C3 C4 8192 samples at 50 MHz | 2022-01-14 11:12:36.346
Demo mode
2 us 12 us 22 us 32 us 42 us 52 us 62 us 72 us 82 us
X Cursors
Normal Delta
Position Ref ΔX
none
1
none
3
Simple Pulse Protocol Scope to Digital
Name Pin T
4096 samples at 33.333 MHz | (16/32bit)
SERVID DIO 0
/SYNC DIO 2
/WINDOW DIO 3
DIO 1 DIO 1
Demo mode
Manual Trigger
ADP3450 D DEMO
100 MHz
Status: OK
v3.20.30

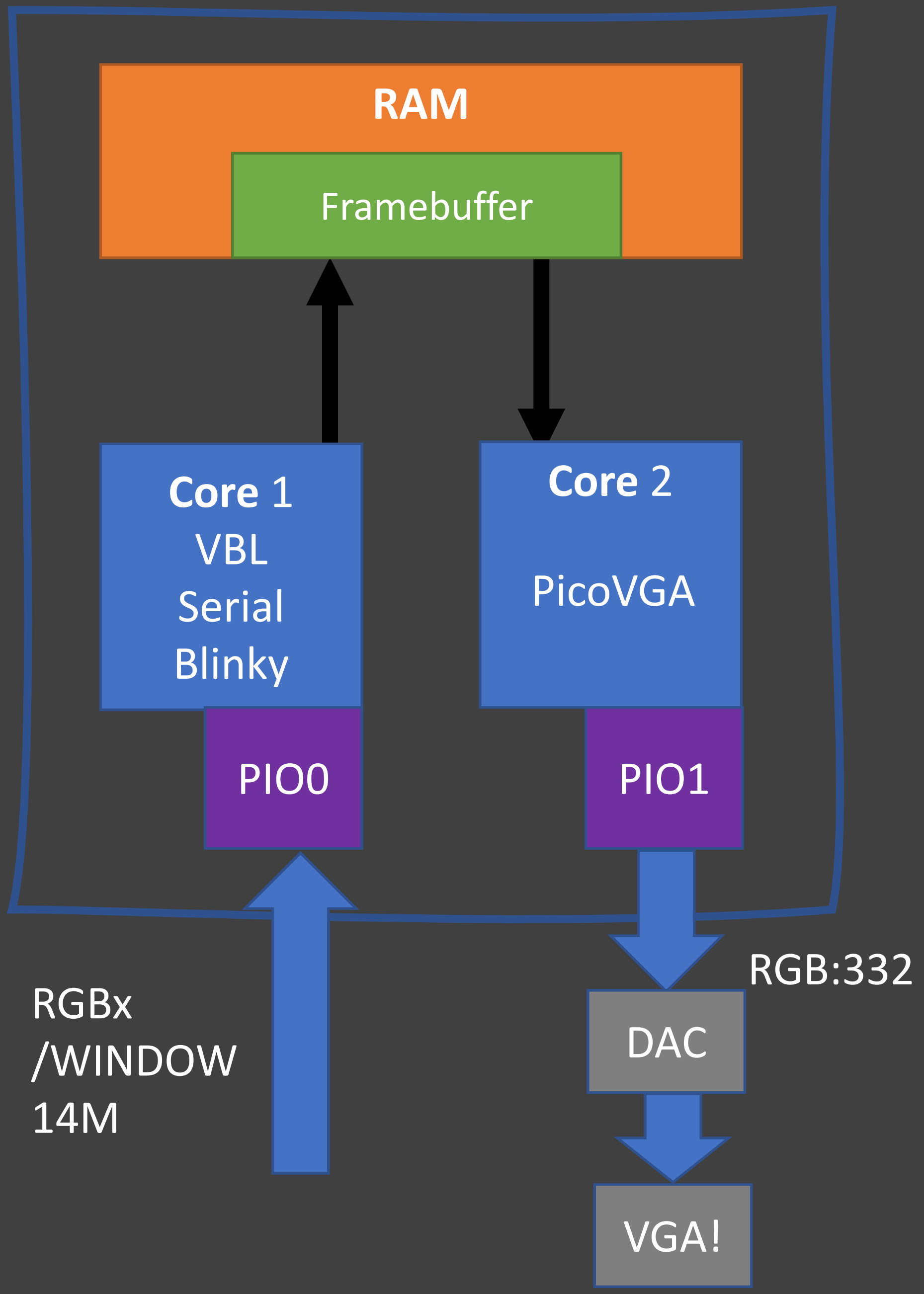


WaveForms beta (09 - two full frames at 40 MHz)
Workspace
Control
Settings
Window
Help
Welcome
Help
Windows
Logic 1
File
Control
View
Window
Mode:
Repeated
Buffer:
10
Trigger:
Normal
Source:
Digital
Simple
Pulse
Protocol
200MHz
16 bits
DIN 0..15
Position:
9.424 ms
Base:
10 ms/div
Samples:
2 Mi
Rate:
20 MHz
Name
Pin
T
Busy
2097152 samples at 20 MHz | 2022-01-30 21:52:10.655
Demo mode
CREF
DIN 8
14M (VGC)
DIN 7
7M
DIN 6
SERVID
DIN 5
/SYNC
DIN 4
/WNDW
DIN 14
RGB 8
DIN 3
RGB 4
DIN 2
RGB 2
DIN 1
RGB 1
DIN 0
VBL (VGC)
DIN 15
-40.58 ms
-30.58 ms
-20.58 ms
-10.58 ms
-0.58 ms
9.42 ms
19.42 ms
29.42 ms
39.42 ms
49.42 ms
59.42 ms
Manual Trigger
DDiscovery A DEMO
WF3.18.41
Status: OK


WaveForms beta (08 - gr mode with horizontal color lines no black)
Workspace Control Settings Window Help
Welcome Help Windows
Logic 1
File Control View Window
Mode: Repeated
Buffer: 10
Trigger: Normal
Source: Digital
Simple Pulse Protocol
200MHz 16 bits DIN 0..15
Position: 1.08 ms
Base: 302 us/div
Samples: 2 Mi
Rate: 200 MHz
Name Pin T
Busy
2097152 samples at 200 MHz | 2022-01-30 21:27:25.381
X: 2.215 ms
CREF Period: 260 ns
CREF Pulse width: 125 ns
Demo mode
CREF DIN 8
14M (VGC) DIN 7
7M DIN 6
SERVID DIN 5
/SYNC DIN 4
RGB 8 DIN 3
RGB 4 DIN 2
RGB 2 DIN 1
RGB 1 DIN 0
/WNDW DIN 14
VBL (VGC) DIN 15
-0.43 ms -0.13 ms 0.17 ms 0.48 ms 0.78 ms 1.08 ms 1.38 ms 1.68 ms 1.99 ms 2.29 ms 2.59 ms
Manual Trigger DDiscovery A DEMO WF3.18.41 Status: OK


WaveForms beta (02 - 16K at 20M Apple IIe)
Workspace
Control
Settings
Window
Help
Welcome
Help
Windows
Logic 1
File
Control
View
Window
Mode:
Repeated
Trigger:
Normal
Simple
Pulse
Protocol
Position:
233.6528 us
Samples:
16 Ki
Buffer:
10
Source:
Digital
100MHz
16 bits
DIN 0..15
Base:
950 ns/div
Rate:
100 MHz
Name
Pin
T
Busy
16384 samples at 20 MHz | 2022-01-30 19:38:07.837
Demo mode
CREF
DIN 8
14M
DIN 7
7M
DIN 6
SERVID
DIN 5
/SYNC
DIN 4
RGB 8
DIN 3
RGB 4
DIN 2
RGB 2
DIN 1
RGB 1
DIN 0
VBL
DIN 15
X
228.9 us
229.85 us
230.8 us
231.75 us
232.7 us
233.65 us
234.6 us
235.55 us
236.5 us
237.45 us
238.4 us
Manual Trigger
DDiscovery A DEMO
WF3.18.41
Status: OK

VGA2040
Block Diagram



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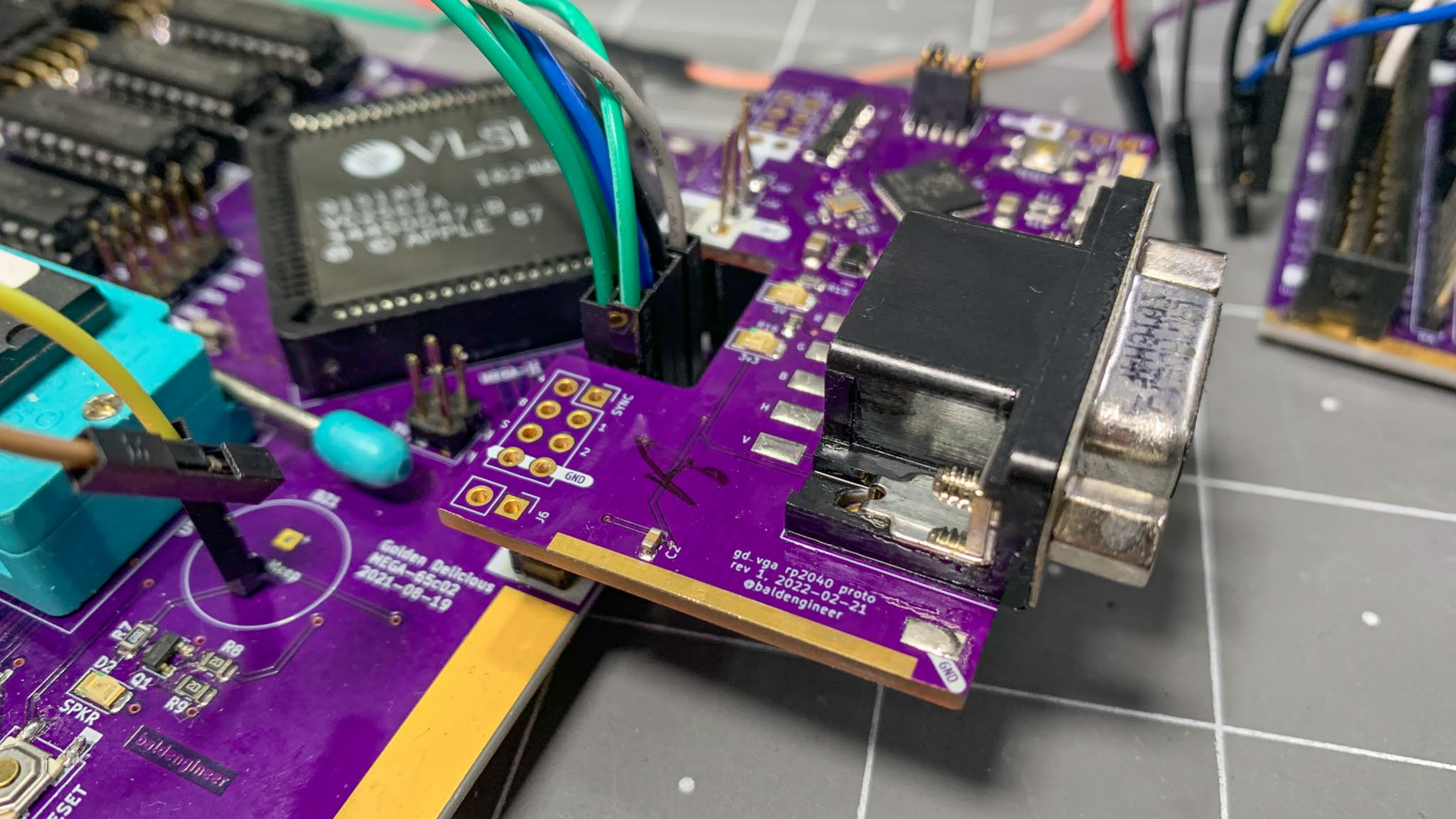
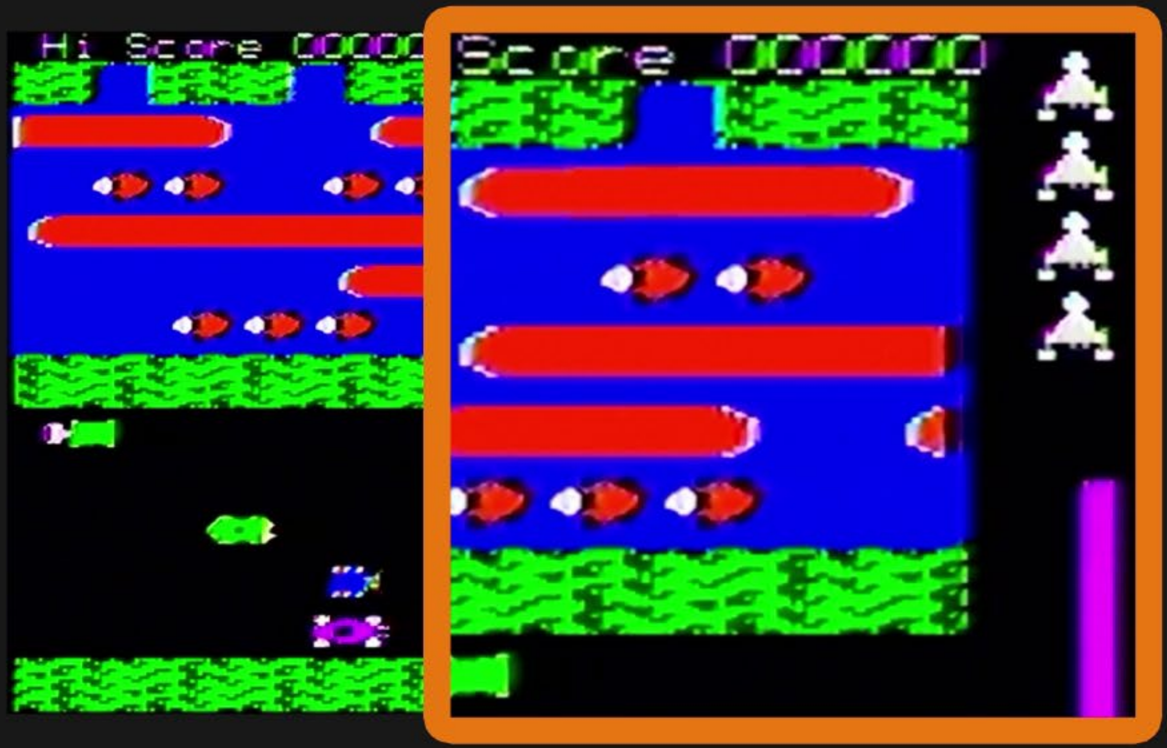
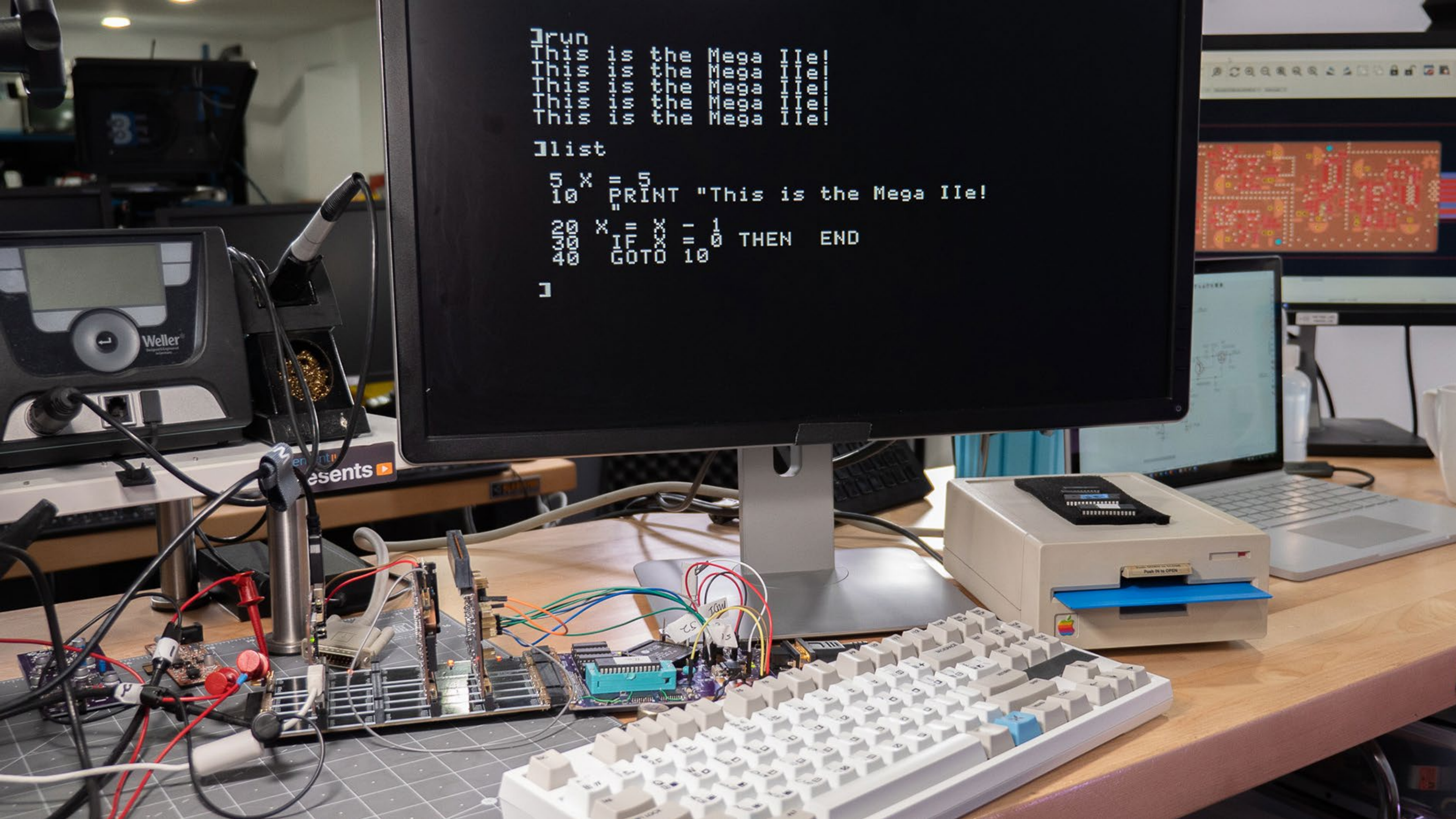
github.com/Panda381/PicoVGA


VLSI
© APPLE 87
SYNC
GND
J6
5V
R
G
B
H
V
C2
gd_vga rp2040 proto
rev 1, 2022-02-21
@baldengineer
GND
Golden Delicious
MEGA-65c02
2021-08-19
R7
R8
R9
D2
Q1
SPKR
baldengineer



Composite

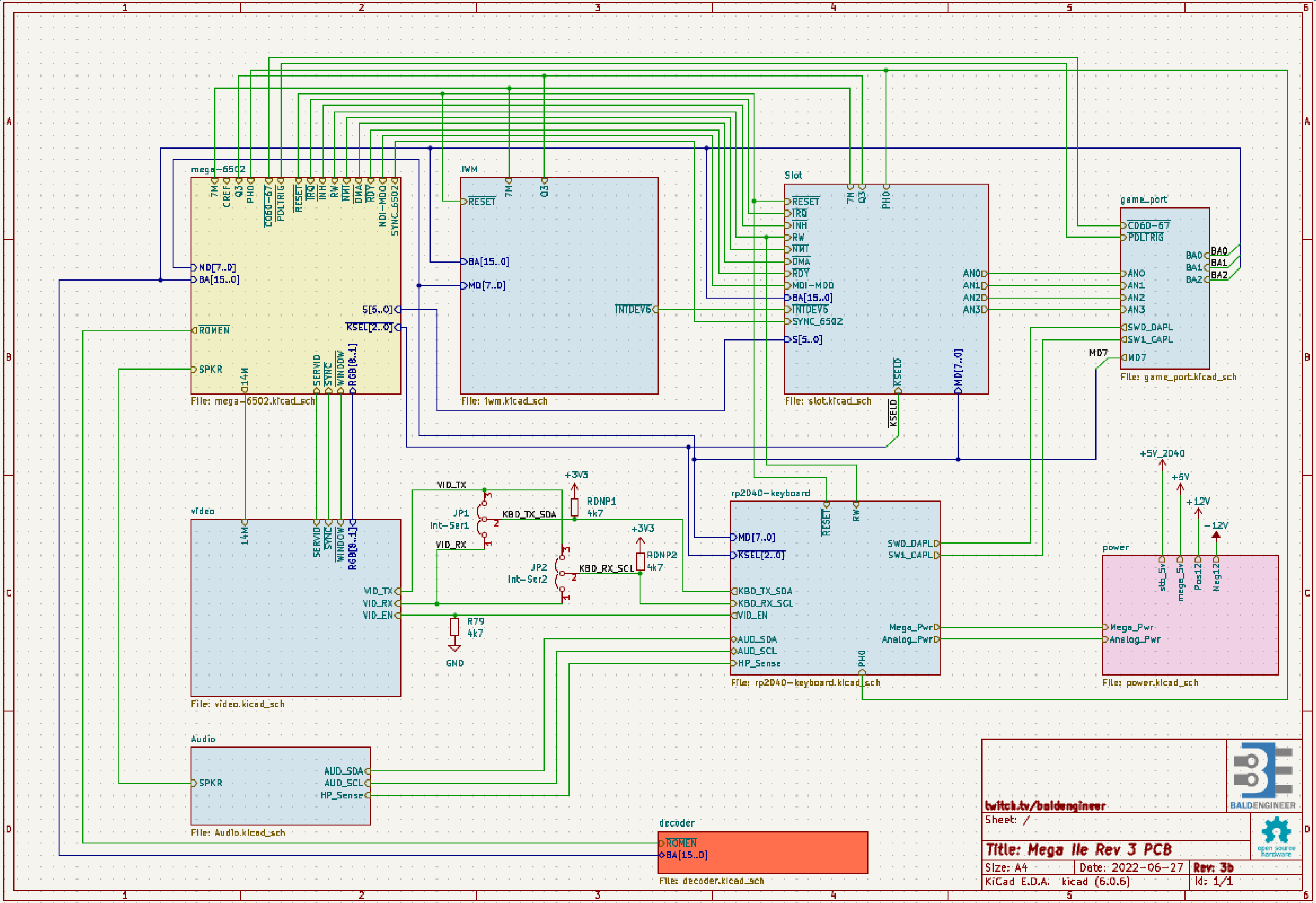
VGA


]run
This is the Mega IIe!
This is the Mega IIe!
This is the Mega IIe!
This is the Mega IIe!
This is the Mega IIe!
]list
5 X = 5
10 PRINT "This is the Mega IIe!
"
20 X = X - 1
30 IF X = 0 THEN END
40 GOTO 10
]
Weller

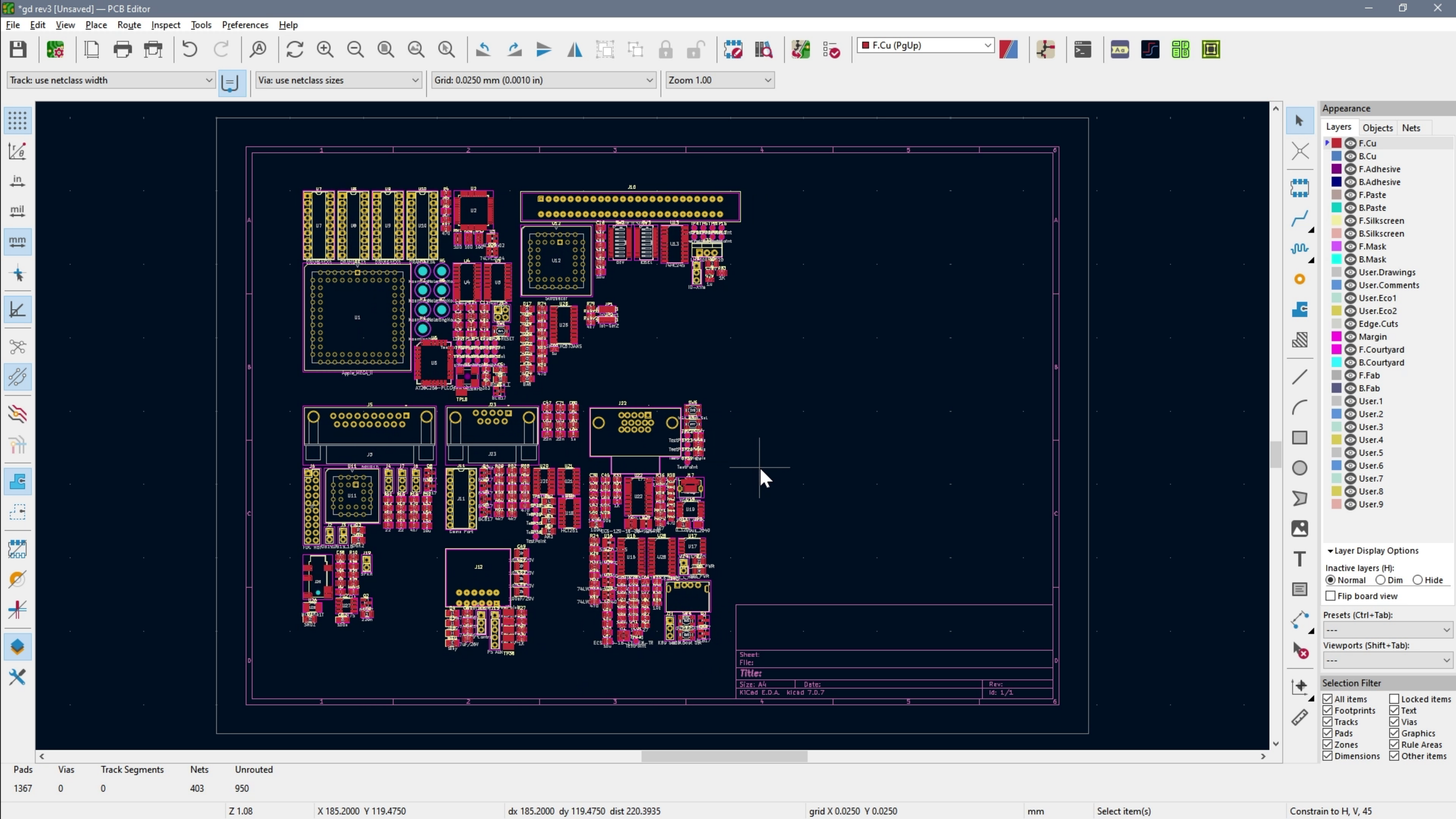
Rev 3

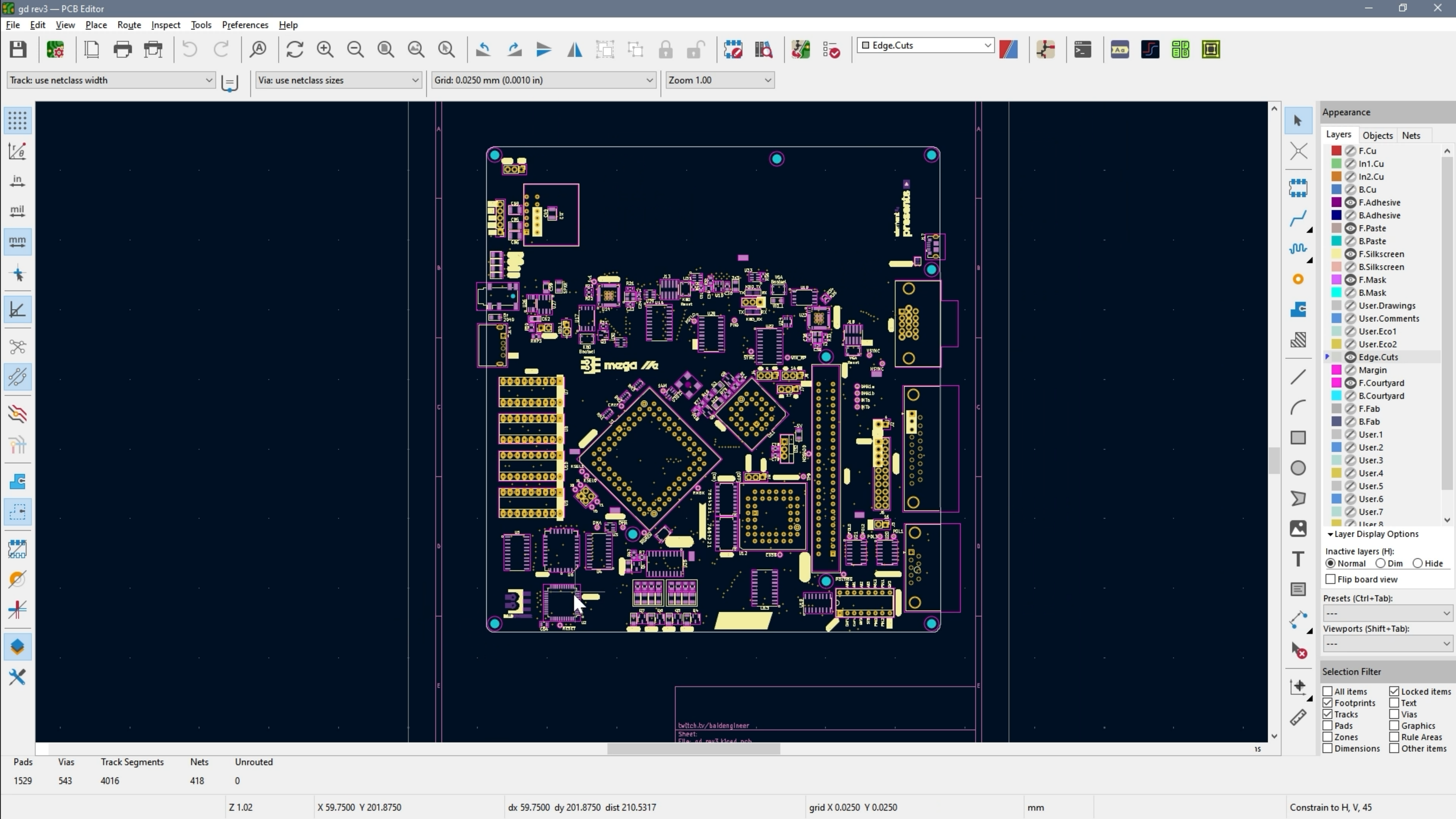
Mega IIe

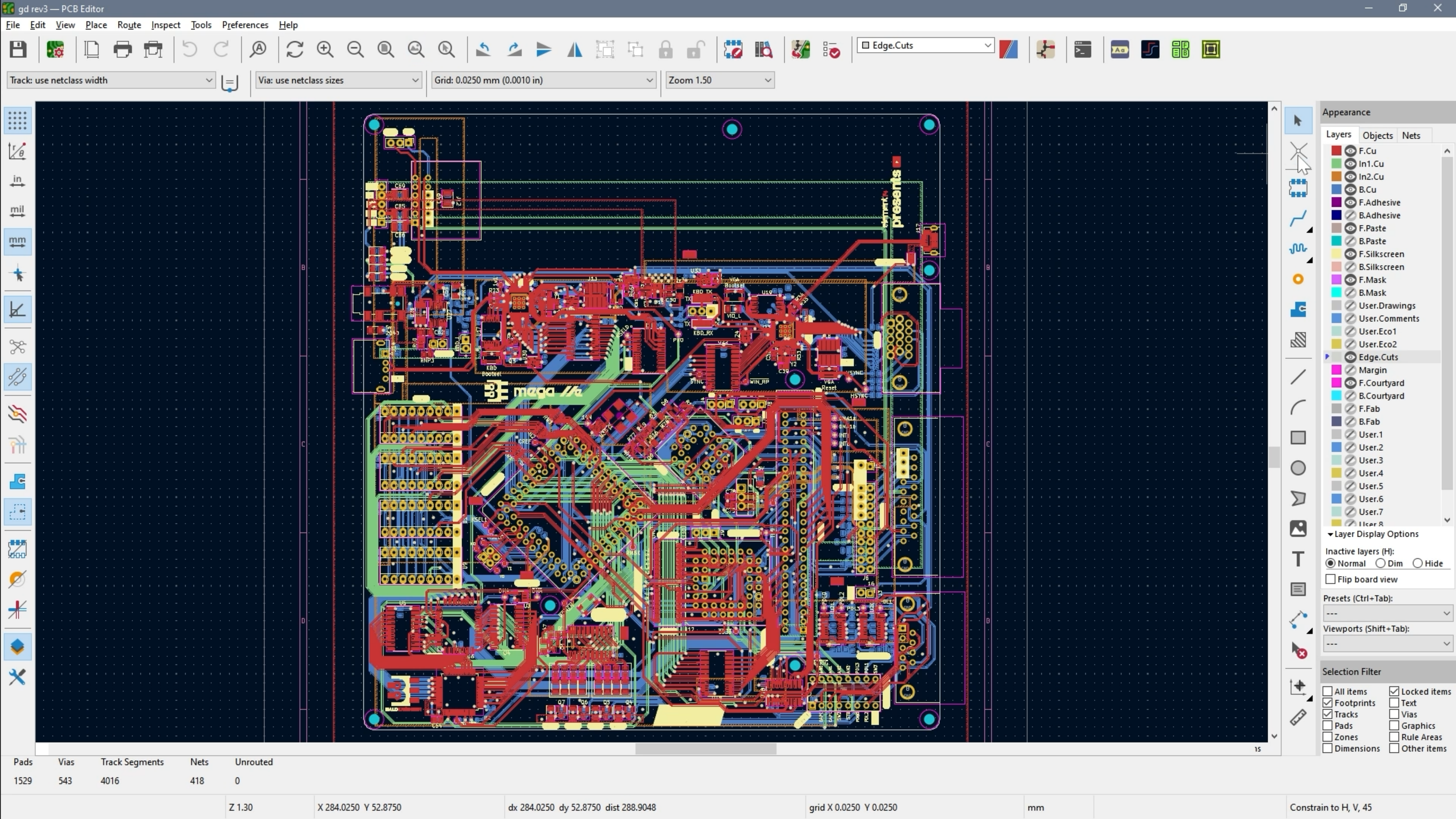
BALDENGINEER

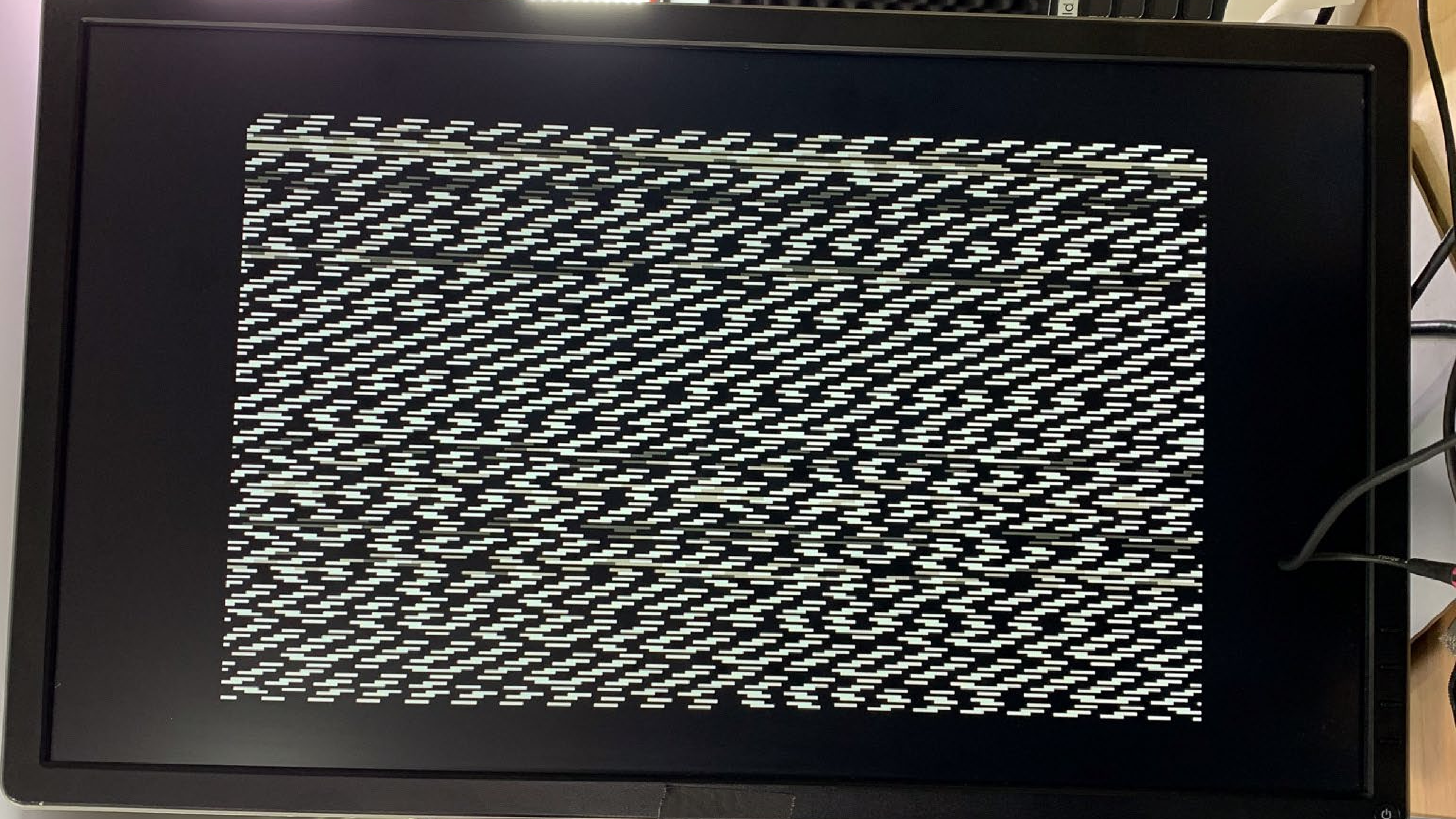


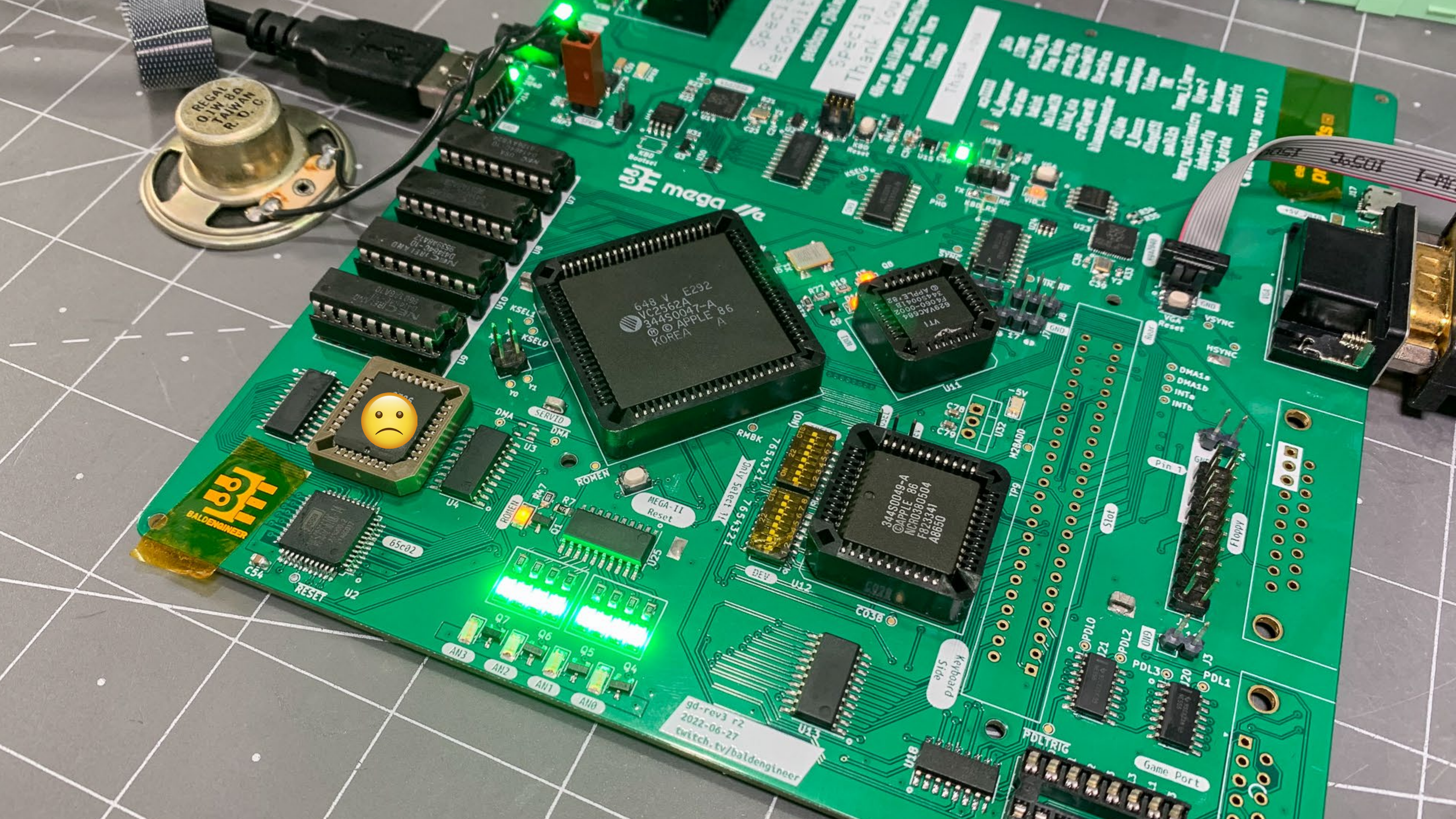
mega-6502
7M
CREF
Q3
PH0
C060-67
PDLTRIG
RESET
IRQ
INH
RW
NMI
DMA
RDY
NDI-MD0
SYNC_6502
MD[7..0]
BA[15..0]
S[5..0]
KSEL[2..0]
ROMEN
SPKR
14M
SERVID
SYNC
WINDOW
RGB[8..1]
File: mega-6502.kicad_sch
IWM
BA[15..0]
MD[7..0]
INTDEV6
File: iwm.kicad_sch
Slot
MDI-MD0
SYNC_6502
AN0
AN1
AN2
AN3
KSEL0
MD[7..0]
File: slot.kicad_sch
game_port
BA0
BA1
BA2
SW0_CAPL
SW1_CAPL
MD7
File: game_port.kicad_sch
video
VID_TX
VID_RX
VID_EN
File: video.kicad_sch
JP1
Int-Ser1
JP2
Int-Ser2
KBD_TX_SDA
KBD_RX_SCL
+3V3
RDNP1
4k7
RDNP2
4k7
R79
4k7
GND
rp2040-keyboard
Mega_Pwr
Analog_Pwr
AUD_SDA
AUD_SCL
HP_Sense
File: rp2040-keyboard.kicad_sch
+5V_2040
+5V
+12V
-12V
power
stb_5v
mega_5v
Pos12
Neg12
File: power.kicad_sch
Audio
File: Audio.kicad_sch
decoder
File: decoder.kicad_sch
twitch.tv/baldengineer
BALDENGINEER
open source hardware
Sheet: /
Title: Mega IIe Rev 3 PCB
Size: A4
Date: 2022-06-27
Rev: 3b
KiCad E.D.A. kicad (6.0.6)
Id: 1/1

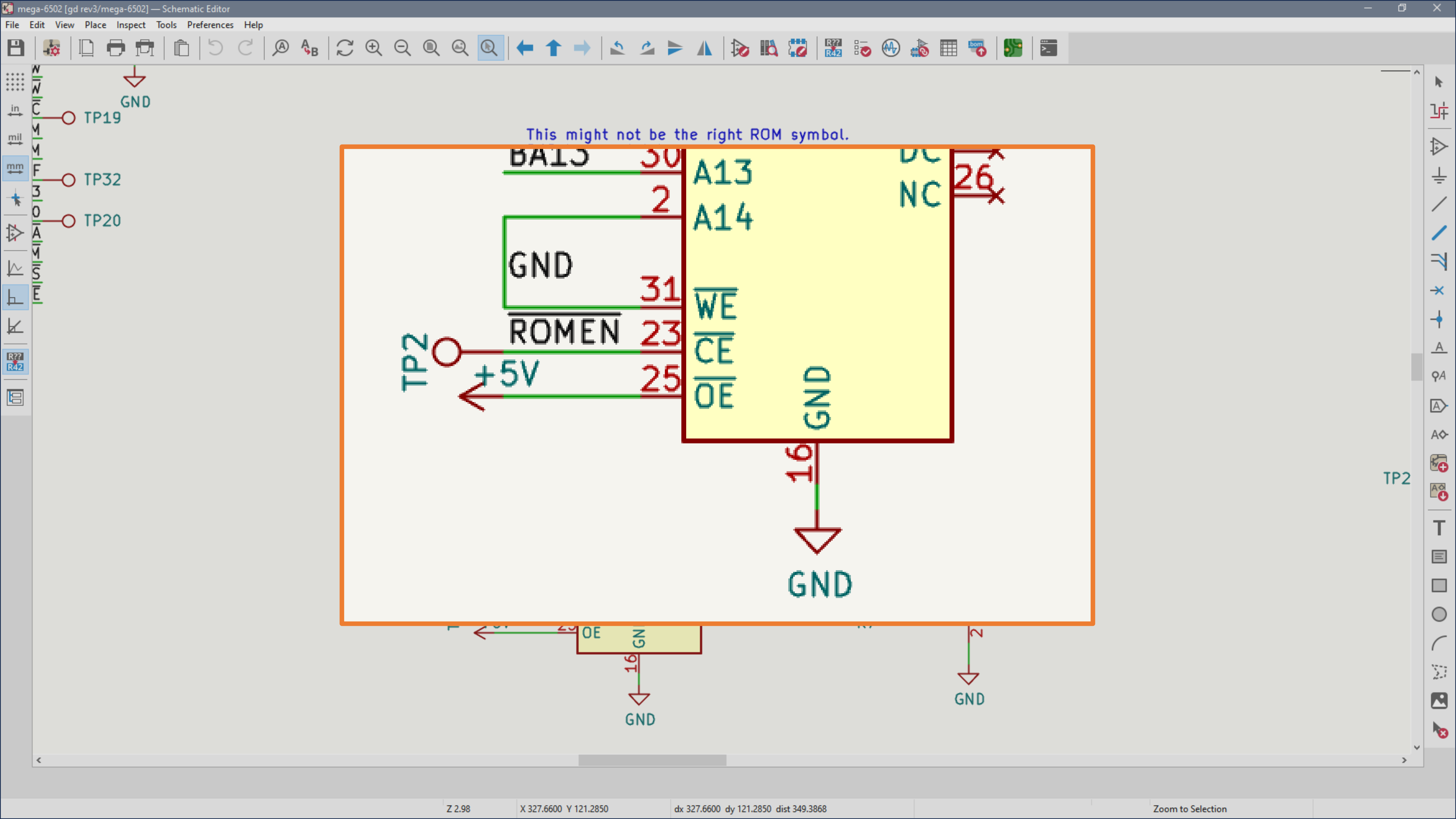

*gd rev3 [Unsaved] — PCB Editor
File Edit View Place Route Inspect Tools Preferences Help
F.Cu (PgUp)
Track: use netclass width
Via: use netclass sizes
Grid: 0.0250 mm (0.0010 in)
Zoom 1.00
Appearance
Layers Objects Nets
F.Cu
B.Cu
F.Adhesive
B.Adhesive
F.Paste
B.Paste
F.Silkscreen
B.Silkscreen
F.Mask
B.Mask
User.Drawings
User.Comments
User.Eco1
User.Eco2
Edge.Cuts
Margin
F.Courtyard
B.Courtyard
F.Fab
B.Fab
User.1
User.2
User.3
User.4
User.5
User.6
User.7
User.8
User.9
Layer Display Options
Inactive layers (H):
Normal Dim Hide
Flip board view
Presets (Ctrl+Tab):
Viewports (Shift+Tab):
Selection Filter
All items Locked items
Footprints Text
Tracks Vias
Pads Graphics
Zones Rule Areas
Dimensions Other items
Sheet:
File:
Title:
Size: A4 Date: Rev:
KiCad E.D.A. kicad 7.0.7 Id: 1/1
Pads Vias Track Segments Nets Unrouted
1367 0 0 403 950
Z 1.08
X 185.2000 Y 119.4750
dx 185.2000 dy 119.4750 dist 220.3935
grid X 0.0250 Y 0.0250
mm
Select item(s)
Constrain to H, V, 45


gd rev3 — PCB Editor
File Edit View Place Route Inspect Tools Preferences Help
Edge.Cuts
Track: use netclass width
Via: use netclass sizes
Grid: 0.0250 mm (0.0010 in)
Zoom 1.00
Appearance
Layers Objects Nets
F.Cu
In1.Cu
In2.Cu
B.Cu
F.Adhesive
B.Adhesive
F.Paste
B.Paste
F.Silkscreen
B.Silkscreen
F.Mask
B.Mask
User.Drawings
User.Comments
User.Eco1
User.Eco2
Edge.Cuts
Margin
F.Courtyard
B.Courtyard
F.Fab
B.Fab
User.1
User.2
User.3
User.4
User.5
User.6
User.7
Layer Display Options
Inactive layers (H):
Normal Dim Hide
Flip board view
Presets (Ctrl+Tab):
Viewports (Shift+Tab):
Selection Filter
All items
Locked items
Footprints
Text
Tracks
Vias
Pads
Graphics
Zones
Rule Areas
Dimensions
Other items
twitch.tv/baldengineer
Pads 1529
Vias 543
Track Segments 4016
Nets 418
Unrouted 0
Z 1.02
X 59.7500 Y 201.8750
dx 59.7500 dy 201.8750 dist 210.5317
grid X 0.0250 Y 0.0250
mm
Constrain to H, V, 45


gd rev3 — PCB Editor
File Edit View Place Route Inspect Tools Preferences Help
Edge.Cuts
Track: use netclass width
Via: use netclass sizes
Grid: 0.0250 mm (0.0010 in)
Zoom 1.50
Appearance
Layers Objects Nets
F.Cu
In1.Cu
In2.Cu
B.Cu
F.Adhesive
B.Adhesive
F.Paste
B.Paste
F.Silkscreen
B.Silkscreen
F.Mask
B.Mask
User.Drawings
User.Comments
User.Eco1
User.Eco2
Edge.Cuts
Margin
F.Courtyard
B.Courtyard
F.Fab
B.Fab
User.1
User.2
User.3
User.4
User.5
User.6
User.7
Layer Display Options
Inactive layers (H):
Normal Dim Hide
Flip board view
Presets (Ctrl+Tab):
Viewports (Shift+Tab):
Selection Filter
All items
Locked items
Footprints
Text
Tracks
Vias
Pads
Graphics
Zones
Rule Areas
Dimensions
Other items
Pads 1529
Vias 543
Track Segments 4016
Nets 418
Unrouted 0
Z 1.30
X 284.0250 Y 52.8750
dx 284.0250 dy 52.8750 dist 288.9048
grid X 0.0250 Y 0.0250
mm
Constrain to H, V, 45




REGAL
0.1W 8Ω
TAIWAN
R.O.C.
648 V E292
VC2562A
344S0047-A
© APPLE 86
KOREA A
344S0049-A
©APPLE 86
NCR0380504
F823341
A8650
BALDENGINEER
65c02
RESET
ROMEN
MEGA-II
Reset
SERVID
DMA
Only Select 1!
DEV
AN3
AN2
AN1
AN0
gd-rev3 r2
2022-06-27
twitch.tv/baldengineer
Keyboard
Side
Slot
Floppy
Pin 1
PDLTRIG
Game Port
VGA
Reset
VSYNC
HSYNC
DMA1a
DMA1b
INTa
INTb
PDL0
PDL1
PDL2
PDL3
Special
Thank You


mega-6502 [gd rev3/mega-6502] — Schematic Editor
File
Edit
View
Place
Inspect
Tools
Preferences
Help
GND
TP19
TP32
TP20
This might not be the right ROM symbol.
BA13
30
A13
NC
26
2
A14
GND
31
WE
ROMEN
23
CE
TP2
+5V
25
OE
GND
16
GND
TP2
OE
16
GND
GND
Z 2.98
X 327.6600 Y 121.2850
dx 327.6600 dy 121.2850 dist 349.3868
Zoom to Selection


AT28C256
65c02
U2


5 WT = 100
10 A0 = 49240: REM AN0 OFF
20 A1 = 49241: REM AN0 ON
50 GOSUB 1000
100 FOR X = 0 TO 15
105 IT = X
110 PRINT IT
115 IF (IT > = 8) THEN POKE A
1 + 6,0:IT = IT - 8
120 IF (IT > = 4) THEN POKE A
1 + 4,0:IT = IT - 4
130 IF (IT > = 2) THEN POKE A
1 + 2,0:IT = IT - 2
140 IF (IT > = 1) THEN POKE A
1 + 0,1
150 FOR Y = 0 TO WT
200 NEXT Y
210 GOSUB 1000
220 NEXT X
250 GOTO 5
]

One more thing

Mega IIe


Mega IIe
THE APPLE II CIRCUIT DESCRIPTION
THE APPLE II CIRCUIT DESCRIPTION
Roger Wagner
Assembly Lines: The Complete Book
Apple IIc Technical Reference
2nd Edition

Resources

Mega IIe

Conclusion…

- MEGA-II is a fully functional Apple IIe
- Impossible projects are possible with enough time (and help)
- Ask for help--Someone knows the answer!

Special Recognition

geekbozu rjhelms

Special Thank You

48kram balika011 chicofelipe
edorfaus gbowne1 Therm
Tisboyo

Thank You

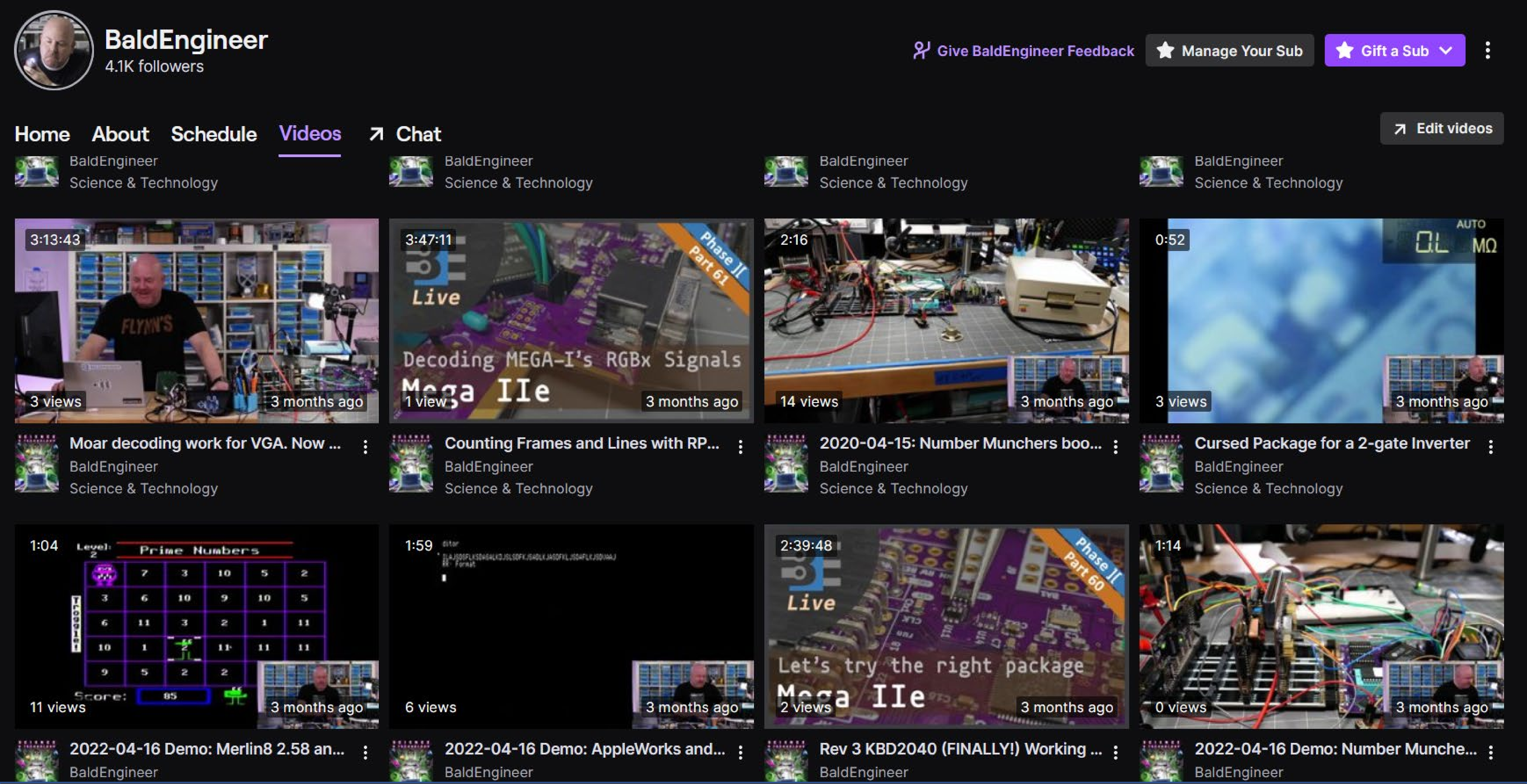
acp33333	jkiv
al_degenaar	LT3005
ataradov	michael_701
babint	Ping Winko
bellum128	proton_fig
blind_via	Squire0412
craftynerd81	Starchface
bluesmokemonster	sydheresy
d3jake	sudomaymays
D_Roxxxx	Tisboyo
dlboyd151	TMK
gam3t3ch	Tommy_T_Turner
Henry_reactivemicro	Viper-7
inbutterfly	Warphammer
int_pirate	xotmatrix

(and many more!)

Coming Soon

element14
presents

bald.ee/e14p

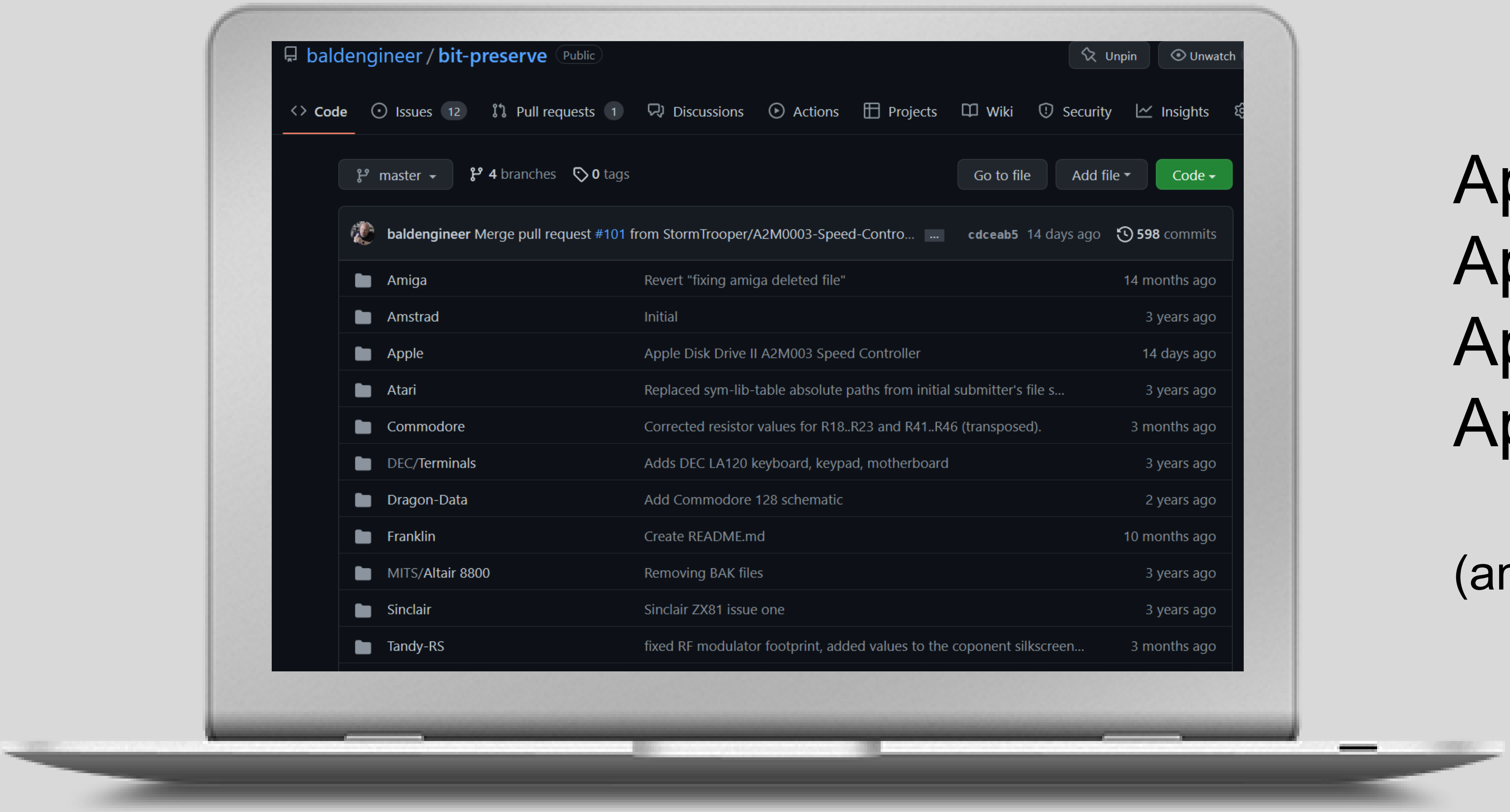


BALDENGINEER

twitch.tv/baldengineer/videos

Bit Preserve

Vintage Computer Schematics in KiCad



Apple II
Apple II+
Apple IIe
Apple IIGS

(and other 8-bits!)

bald.ee/**bit**preserve

BALDENGINEER

Thank You

BALDENGINEER

+ AddOhms

Links…

mastodon://

baldengineer**@qoto.org**