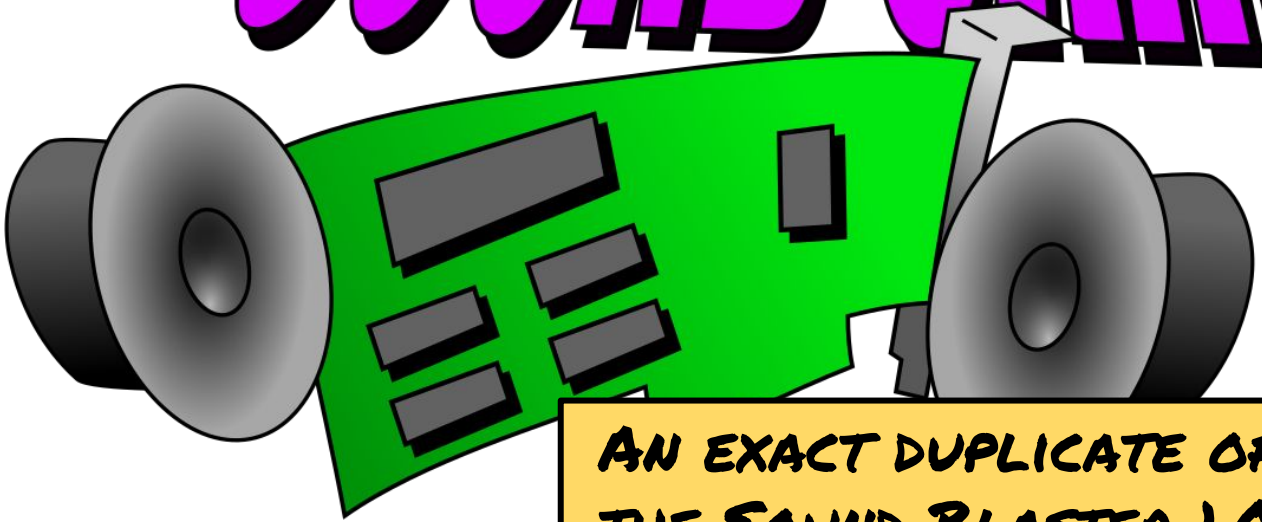
CLONING A SOUND CARD



TUBE TIME

An exact duplicate of the Sound Blaster 1.0!

Christmas, 1989...

That was almost **30 years ago!**

...A killer card appears!


SOUND BLASTER
© COPYRIGHT 1989
CREATIVE LABS, INC.
DSP — 1321
FM1312
© COPYRIGHT CREATIVE LABS, INC. 1990
CT-1320B
MADE IN SINGAPORE
IT'S GLORIOUS!
IF YOU LIKE SCRATCHY 8-BIT SOUND. GRMPH


CLONE A CRAPPY 90'S SOUND CARD?
BUT WHY?

ebay Shop by category Search for anything All C

Back to home page | Listed in category: Computers/Tablets & Networking > Vintage Computing > Other Vintage Computing

This listing has ended.

Creative Sound Blaster 1.5 Card CT-1320C FM1312 AdLib OPL2 PC ISA Synth Bundle

Condition: --

Ended: Aug 22, 2018, 8:55AM

Sold for: **US $199.99**

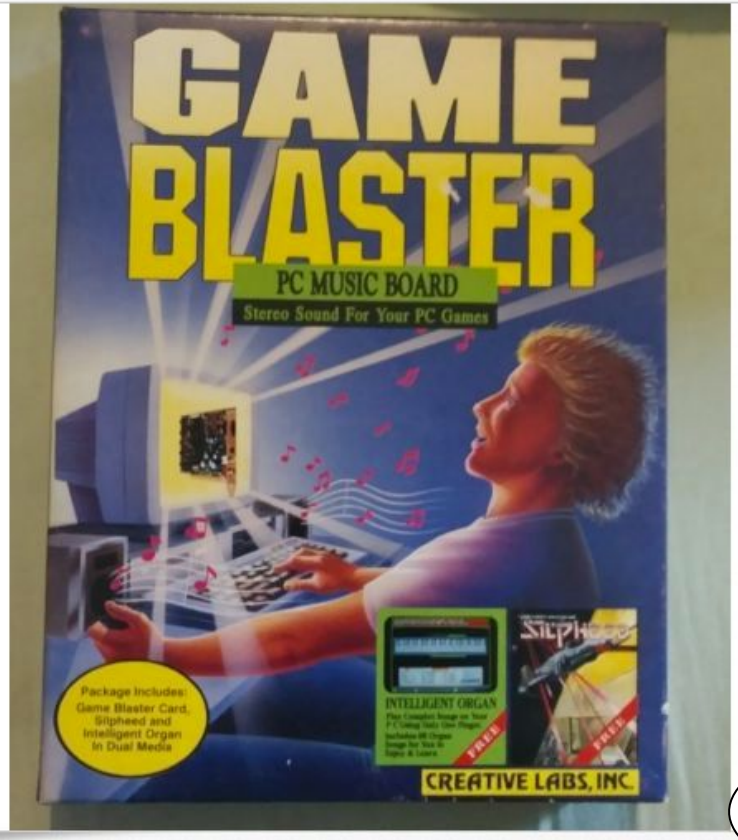
WAT.

tails

ed States

ct. 17 to

Payments: PayPal VISA MasterCard AMERICAN EXPRESS DISCOVER



Game Blaster PC Board ISA Sound Card Creative Music Lab Systems Vintage CT 1300B

Condition: --

Ended: Jul 26, 2018, 5:00PM

Winning bid: **US $400.00** [30 bids]

WAT

on: Dayton, Ohio

Delivery: Varies

Payments: PayPal VISA MasterCard

PayPal CREDIT

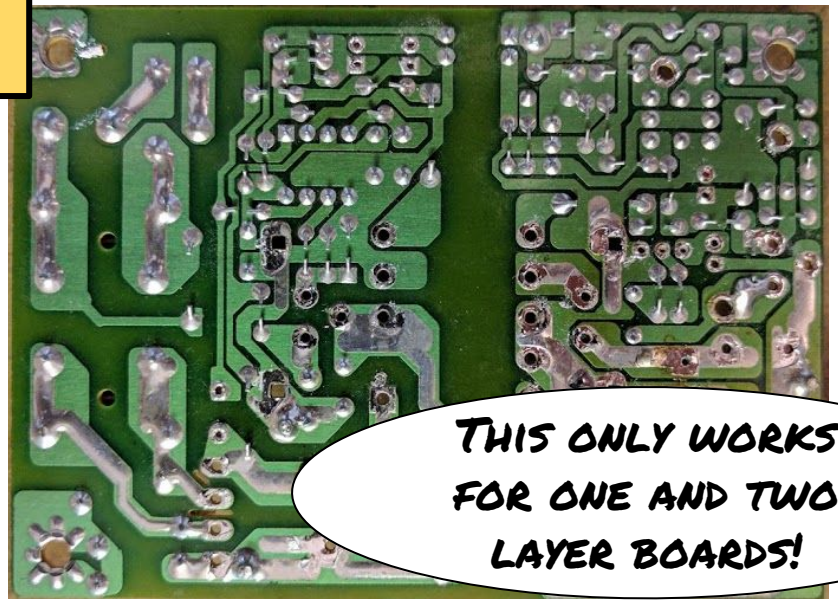
No Interest if paid in full in

Returns: Seller does not accep

HAHA THAT'S WHY HE DOESN'T OWN ONE!

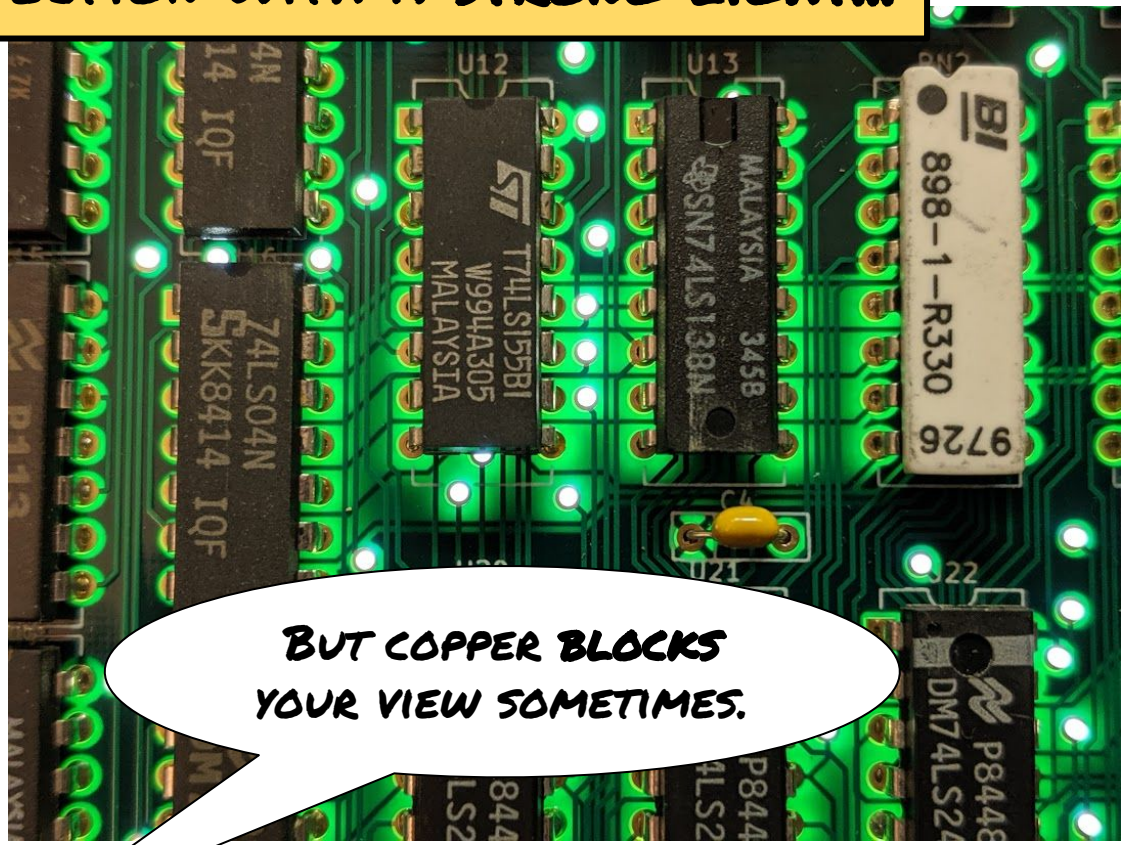
Usual methods for reverse engineering printed circuit boards:

Visual inspection...

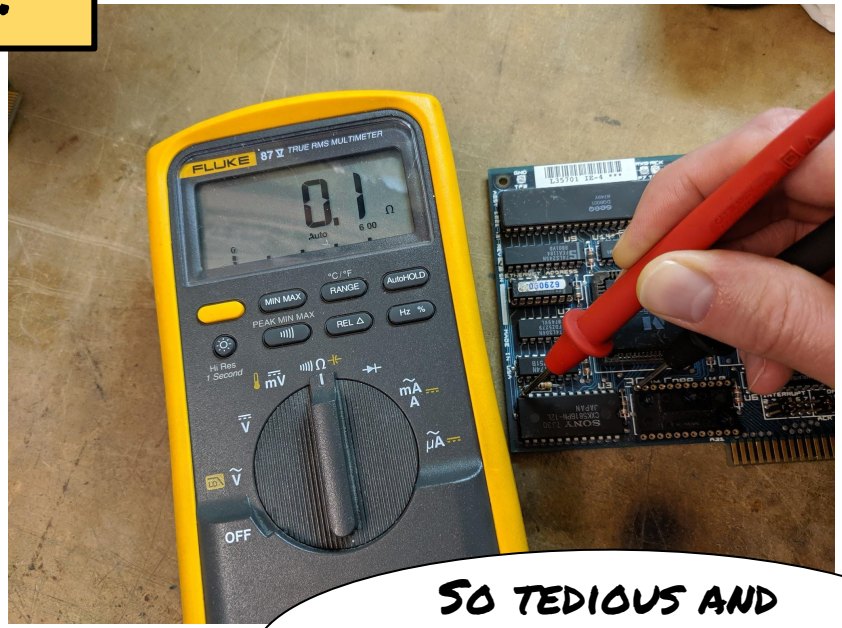


This only works for one and two layer boards!

Visual inspection with a strong light...

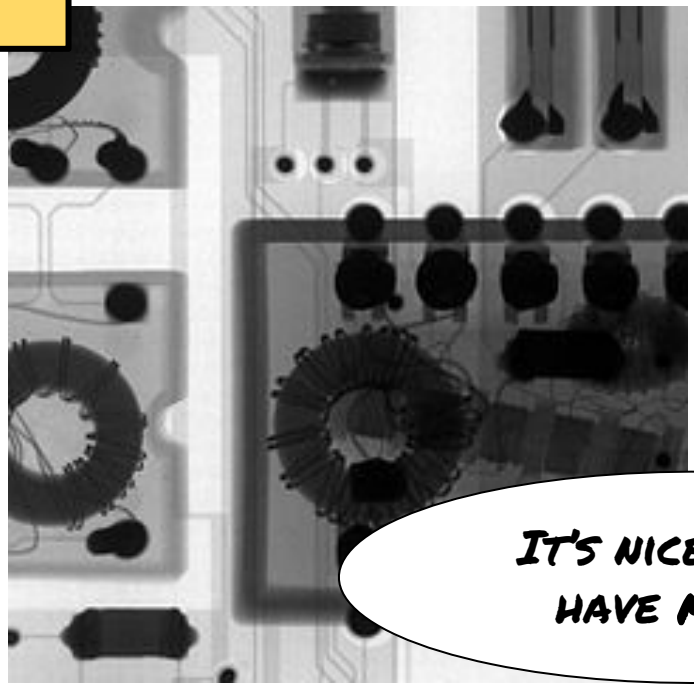


Ohming it out...



So tedious and sometimes impossible!

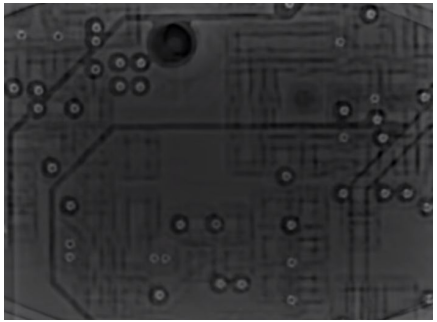
X-RAY...



IT'S NICE-IF YOU HAVE MONEY!

https://commons.wikimedia.org/wiki/File:X-Ray_Circuit_Board_Zoom_3.jpg

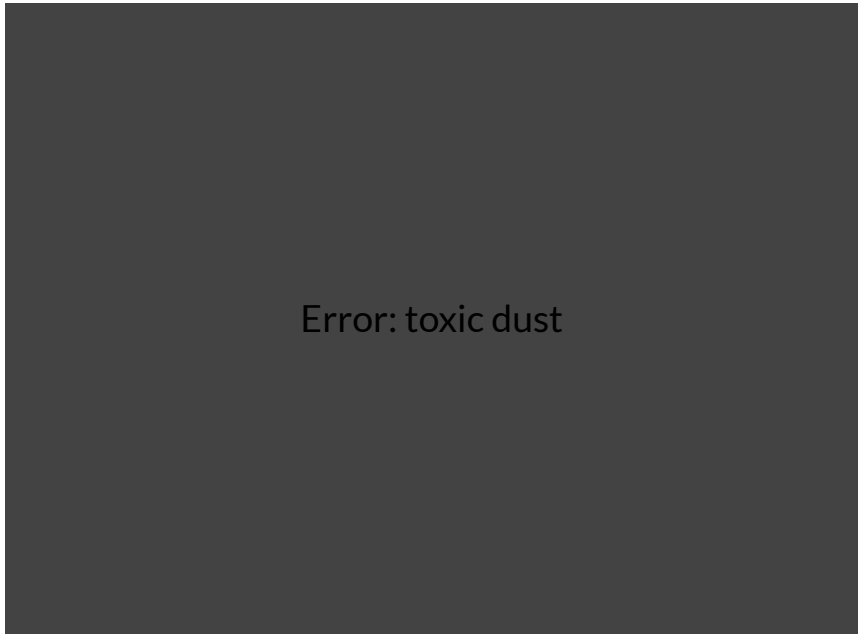
3D X-Ray CT...



https://www.youtube.com/watch?v=itTkItXiHsk

It's nice if you have a **LOT** of money!

Or sand it down!

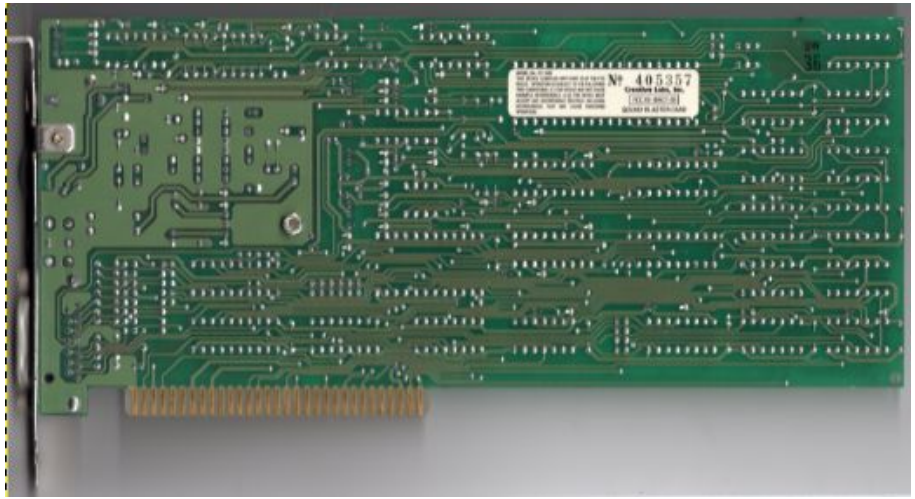


Joe Grand has some good info.

http://www.grandideastudio.com/pcbdt/

But I can't use any of these approaches since I don't have a card!

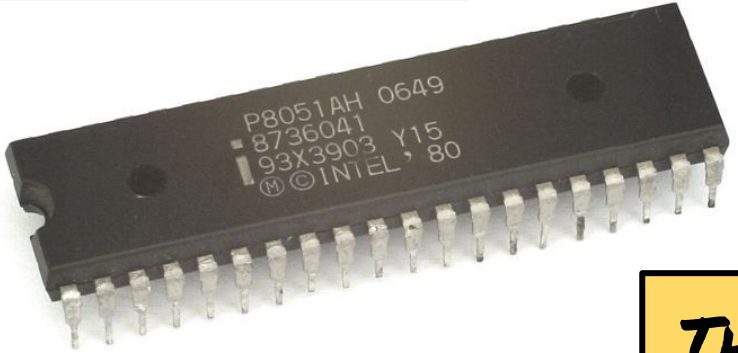
I just have a photo of the front and the back.



But it gets worse!

What about this chip?

Turns out it's an Intel 8051!



The pinouts match!

Random people on the Internet™ agree

So just dump it already!

Yeah!

What he said!

You heard him! He doesn't own one!

China to the rescue!?

utsource

search

Inquiry

Category

Fiber Optics | PCB Customization | Free PLUS | Video & Articles

Home > Elec-component > IC Chips > N80C51BHP(CT1351V202)

Back to search list

PLCC
Sample Image

Official

Third Party

Certificated

N80C51BHP(CT1351V202)

2 sellers list N80C51BHP(CT1351V202)

60 days quality guarantee for all products

UTSOURCE Official ★★★★★ - 44513

- PLCC
- Intel
- 92+

Details

1

Stock Status: 75663

≥		PLUS
≥1:	US $8.87	US $7.98
≥10:	US $7.39	US $6.65
≥100:	US $7.39	US $6.65

US $4.19 ? Wholesale

...And why would anyone else besides me buy this chip?!?

The chips arrive, and...

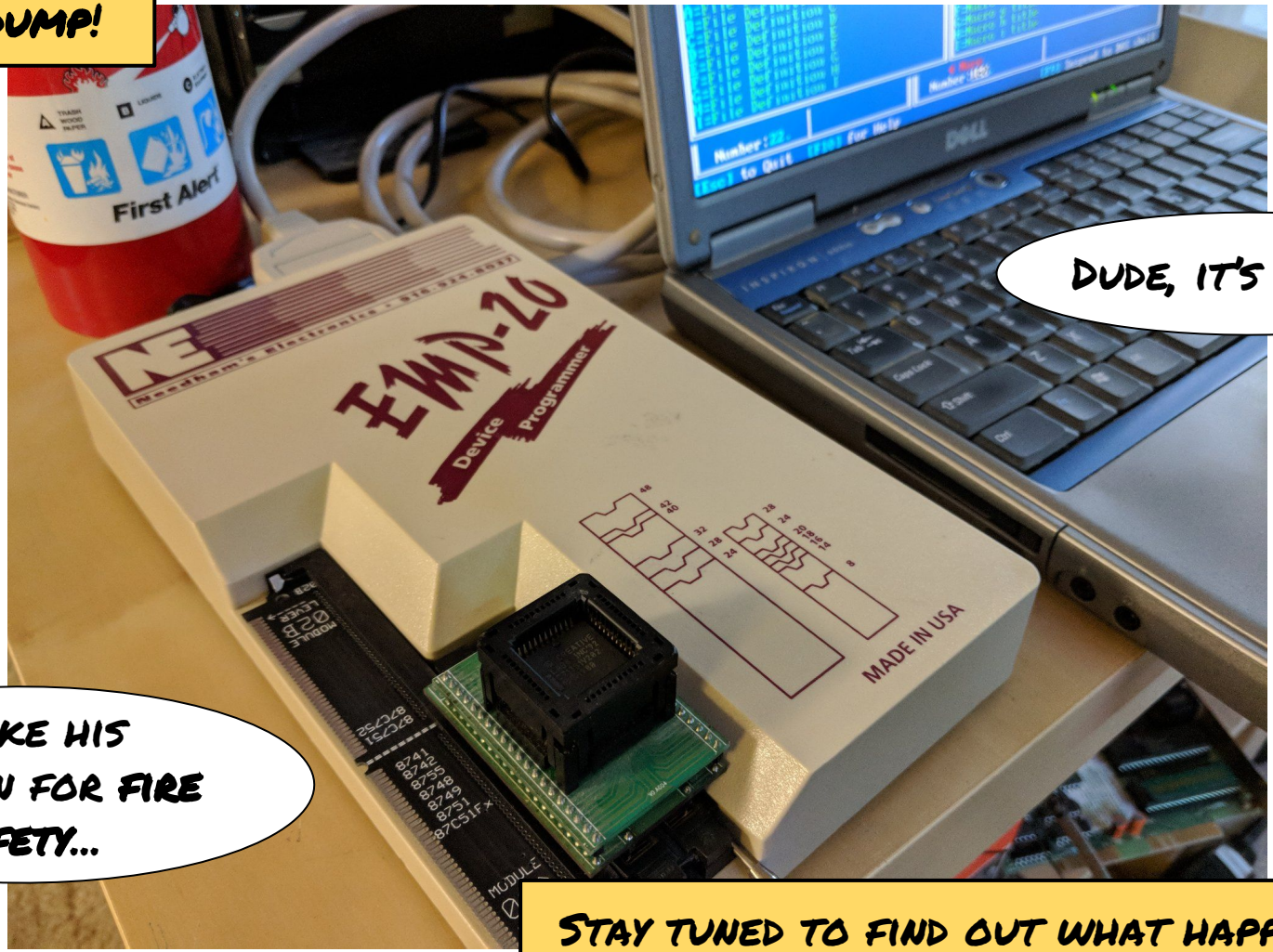
It looks Black-topped!

And recently laser-marked?

TOTALLY LEGIT

Please allow 2-4 weeks for LASER MARKING hahaha

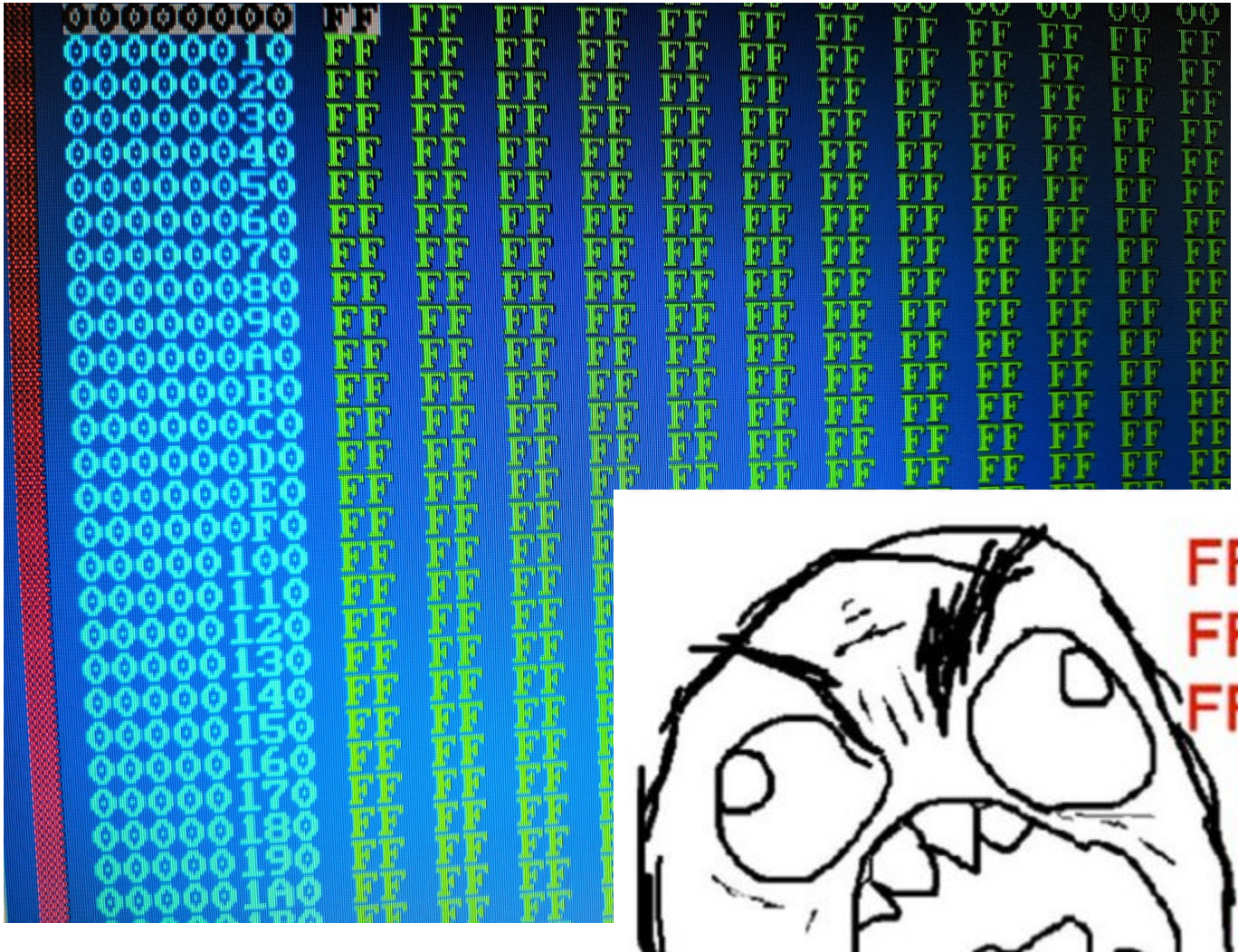
Time to dump!

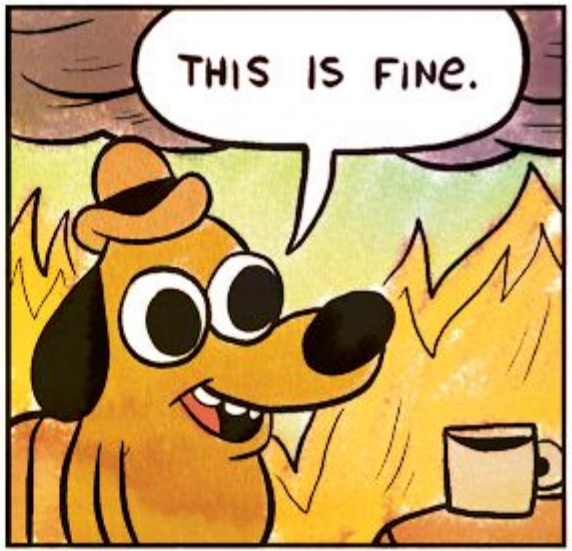


Dude, it's a Dell.

I like his concern for fire safety...

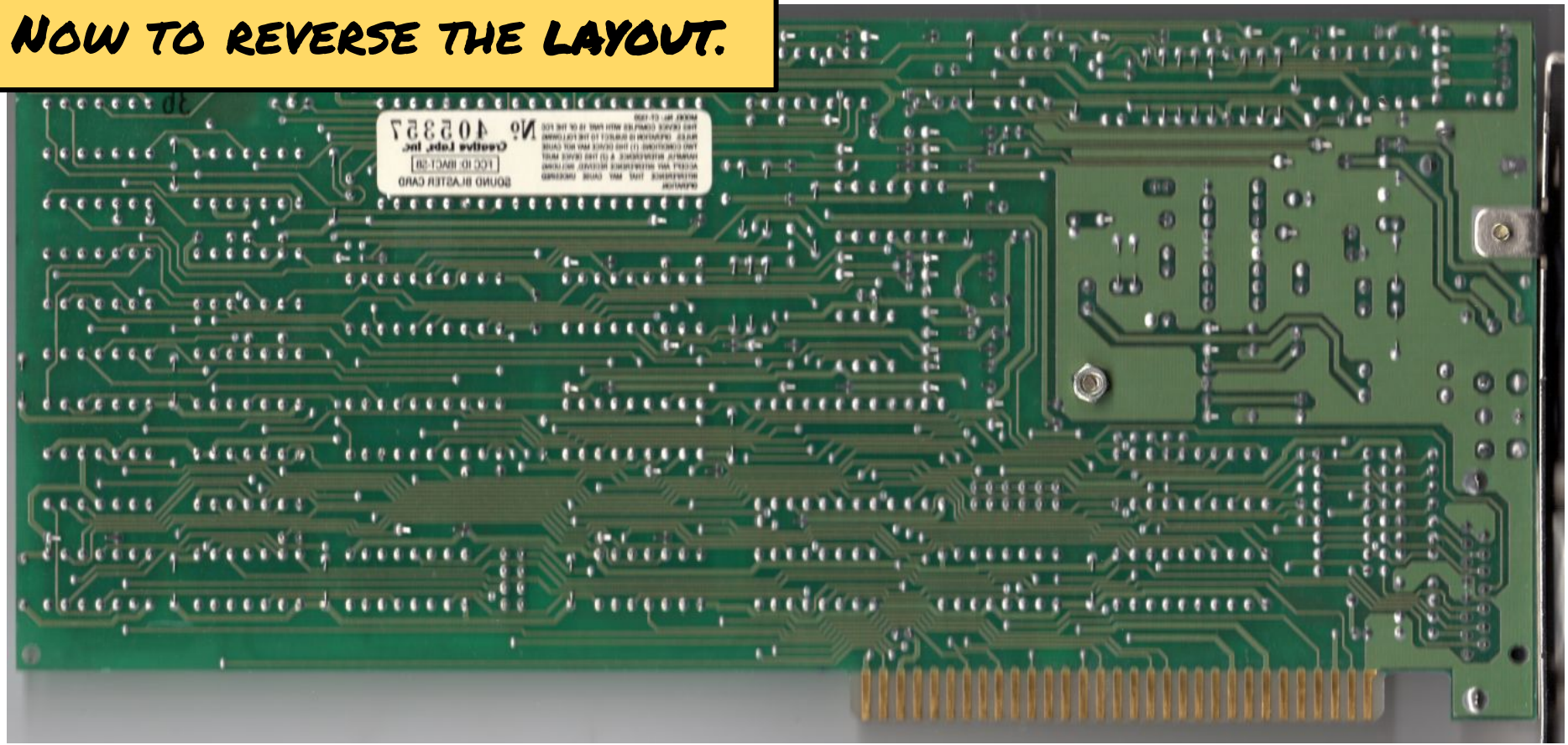
Stay tuned to find out what happens next...


FFFFFFF
FFFFFFF
FFFFFFF
FFFFF
FFFFF
FFFFF

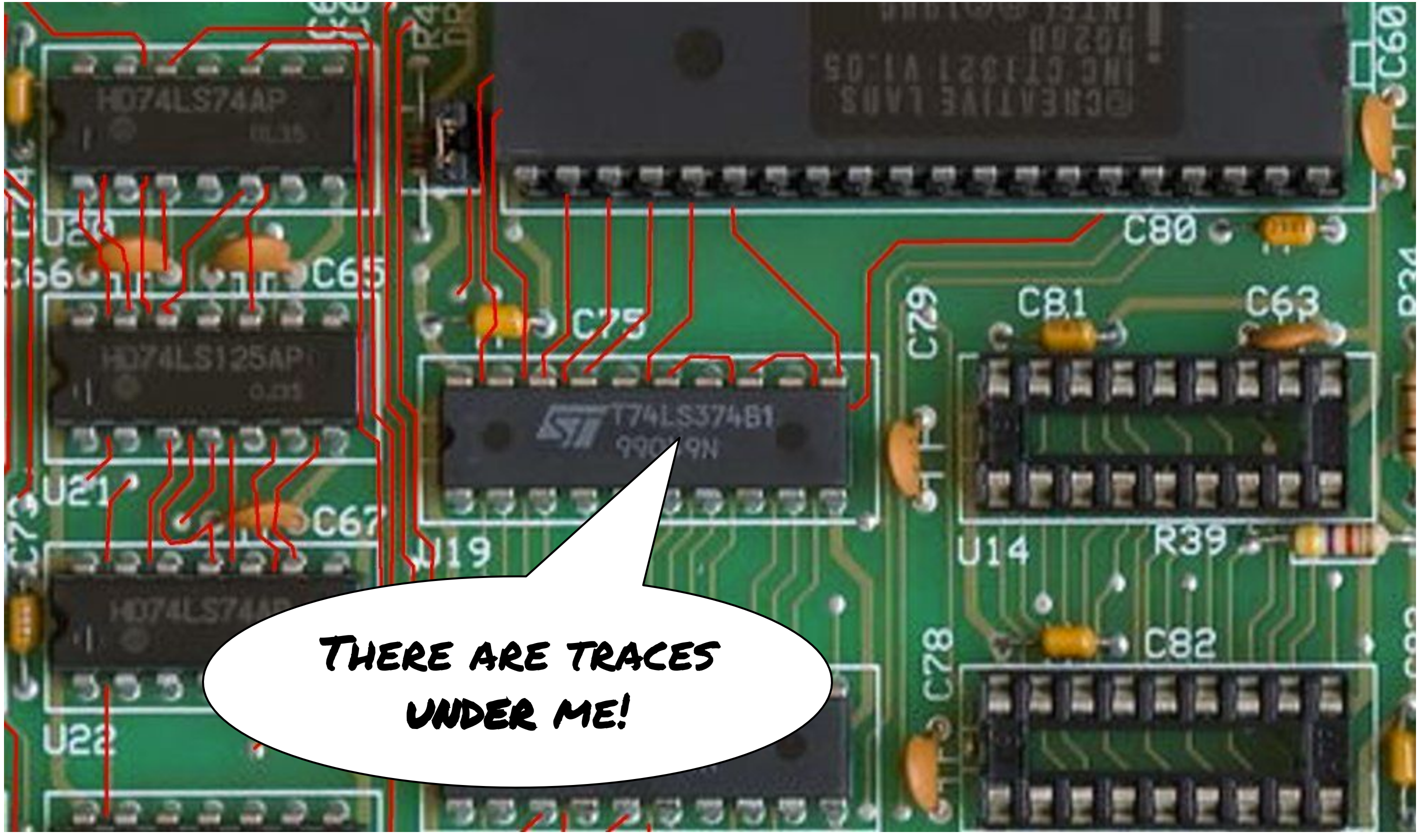

THIS IS FINE.

IT'LL PROBABLY BE OK

Now to reverse the layout.



SW
36
SOUND BLASTER CARD
Creative Labs, Inc.


There are traces under me!

Fortunately Twitter came to the rescue!

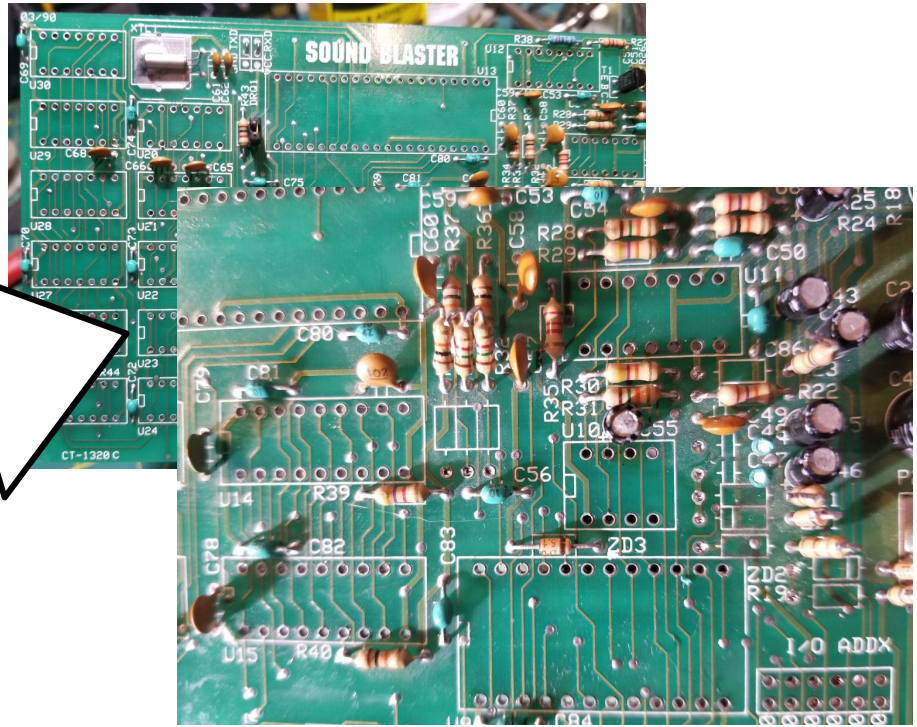
Tube Time
@TubeTimeUS

wanted: your *broken* old Sound Blaster 1.0, 1.5, or 2.0 cards. that DSP needs to get dumped. (pic from Wikipedia)

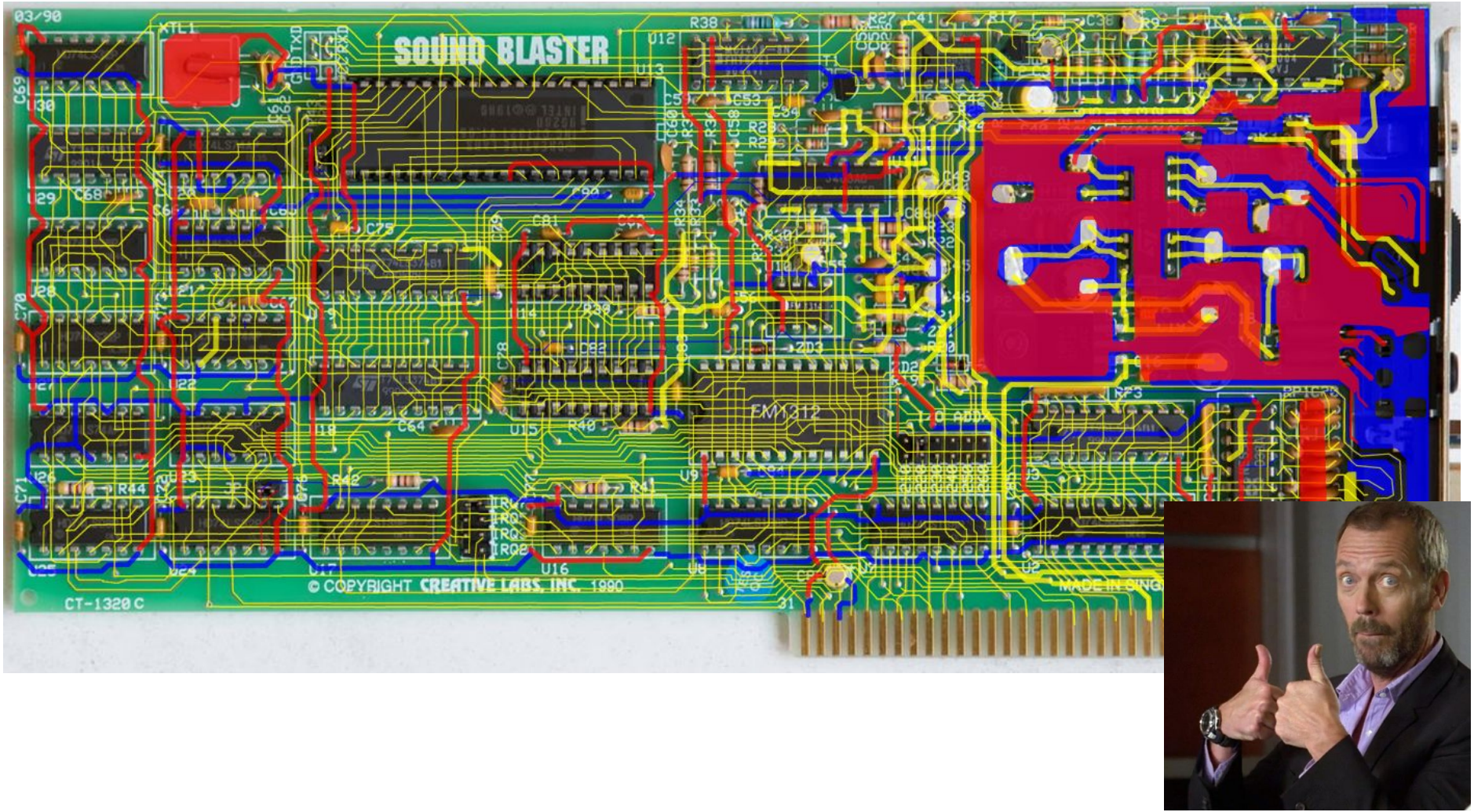
12:59 PM - 17 Jul 2018

77 Retweets 169 Likes

14 77 169



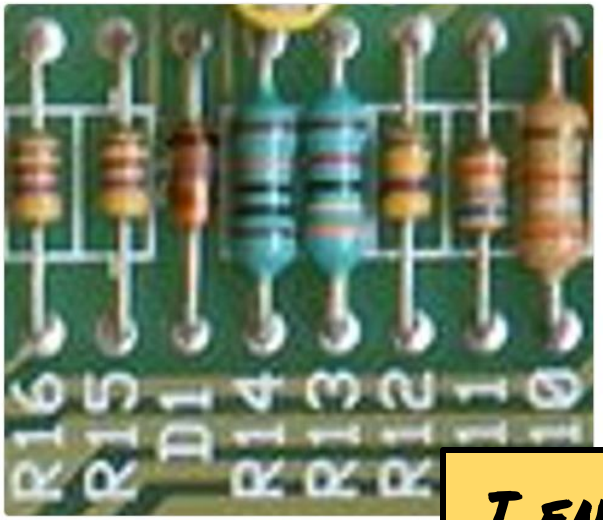

ENTERTAINMENT SYSTEM
FM1312


SOUND BLASTER
© COPYRIGHT CREATIVE LABS INC. 1990
CT-1320 C

JPEG ARTIFACTS STRIKE BACK!

Tube Time
@TubeTimeUS

what are the values of these resistors?



6:45 PM - 21 Jul 2018

8 Likes

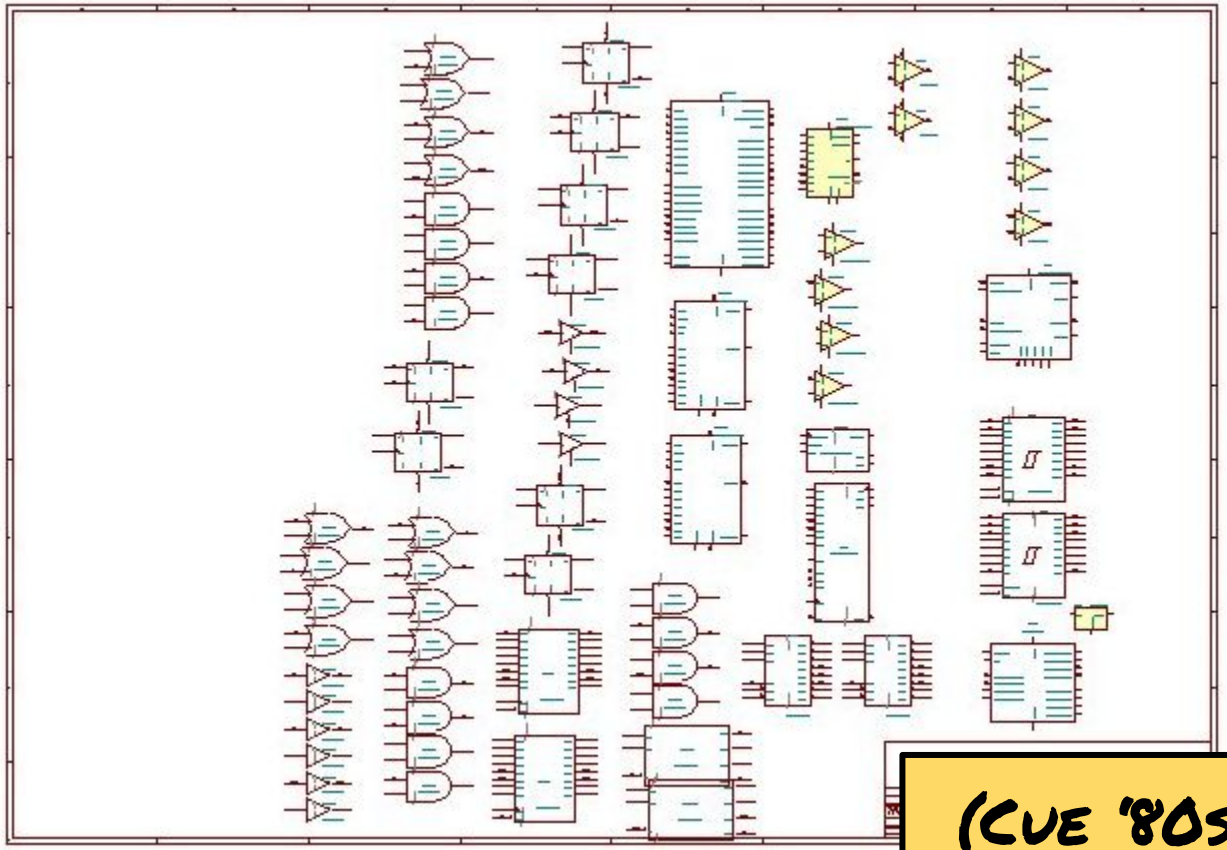
11 8

WHY DOESN'T HE JUST GET BETTER PICTURES?

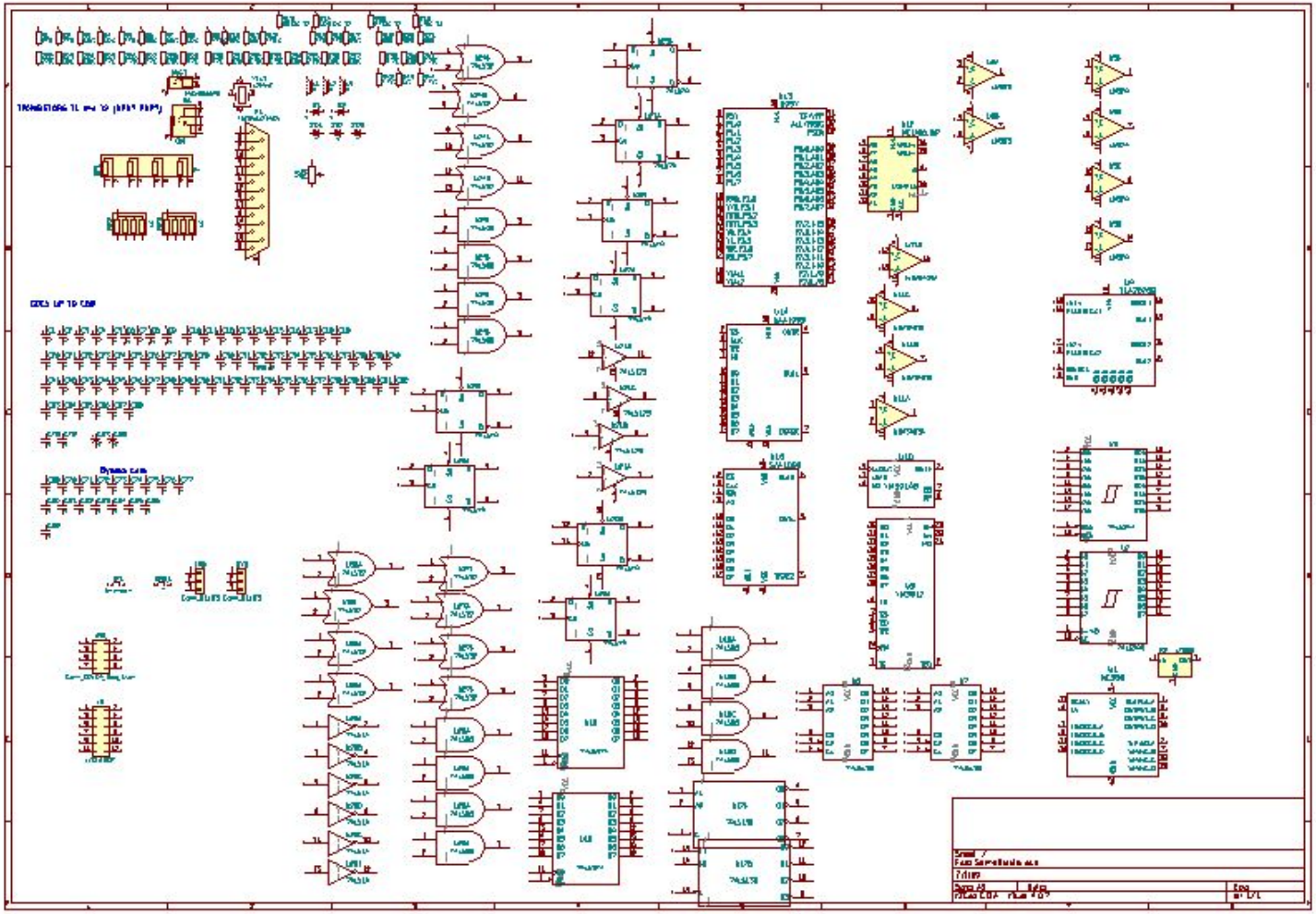
BECAUSE SOCIAL MEDIA ENGAGEMENT.

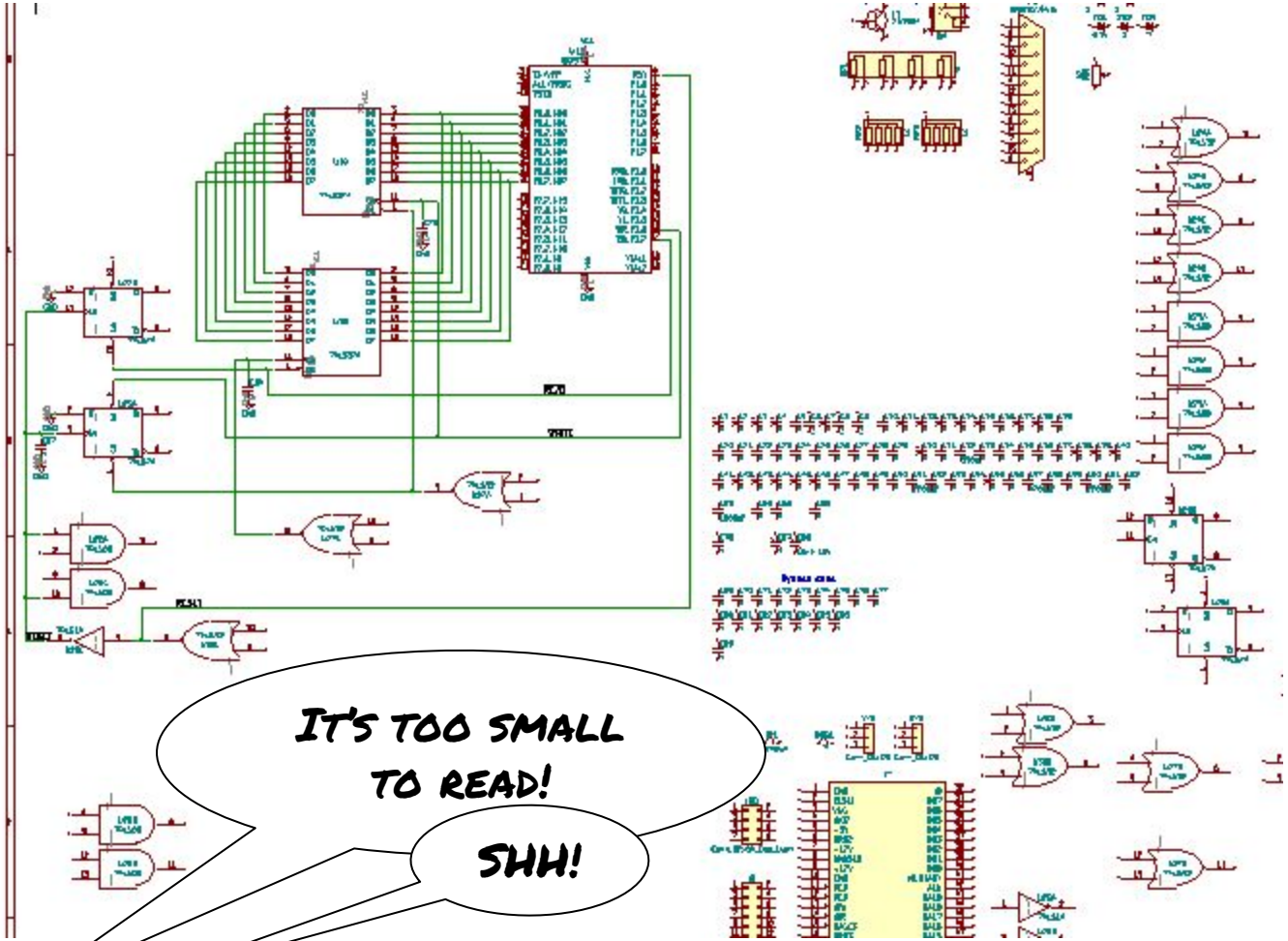
I ENDED UP JUST GETTING BETTER PICTURES.

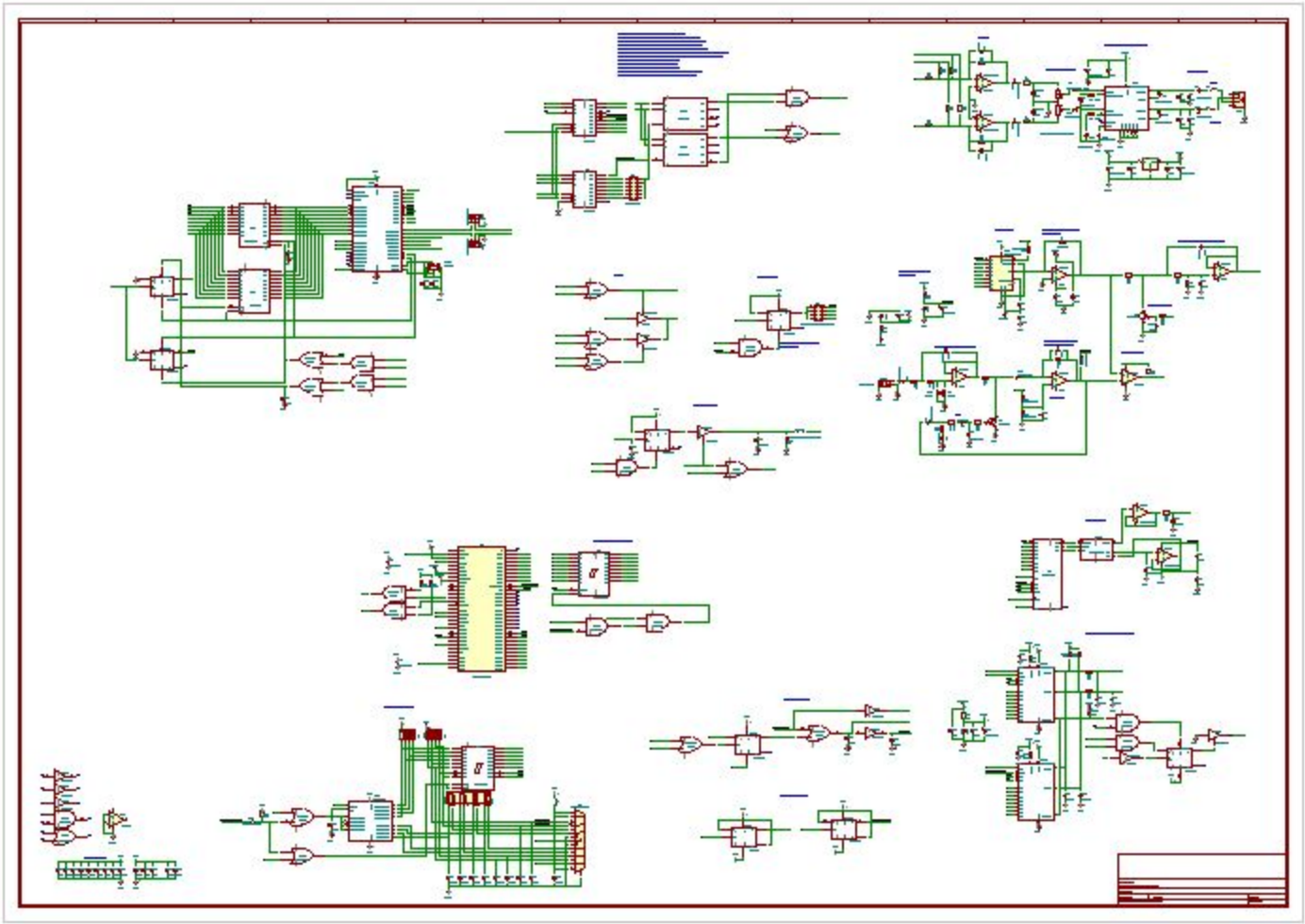
Schematic capture begins.

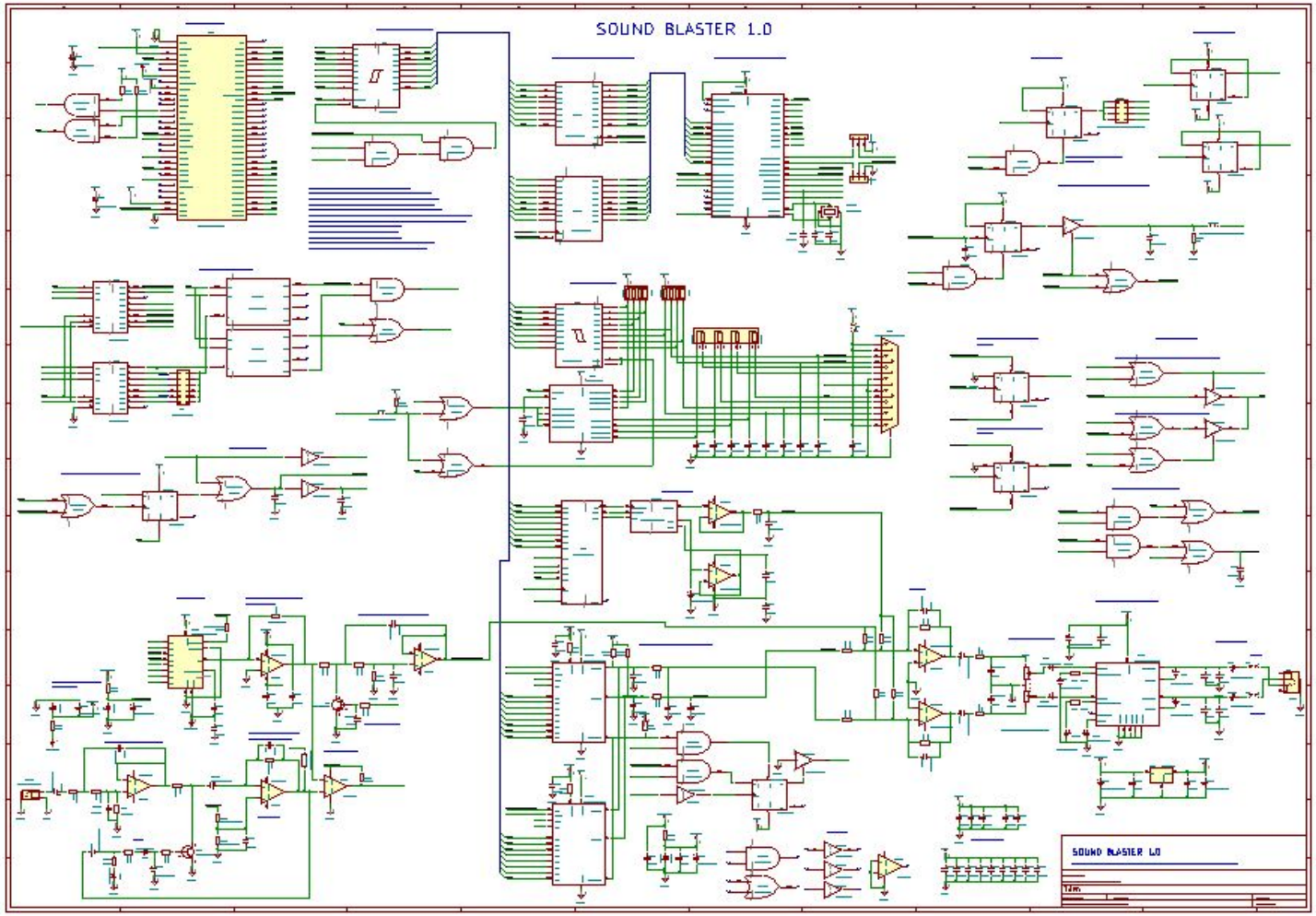


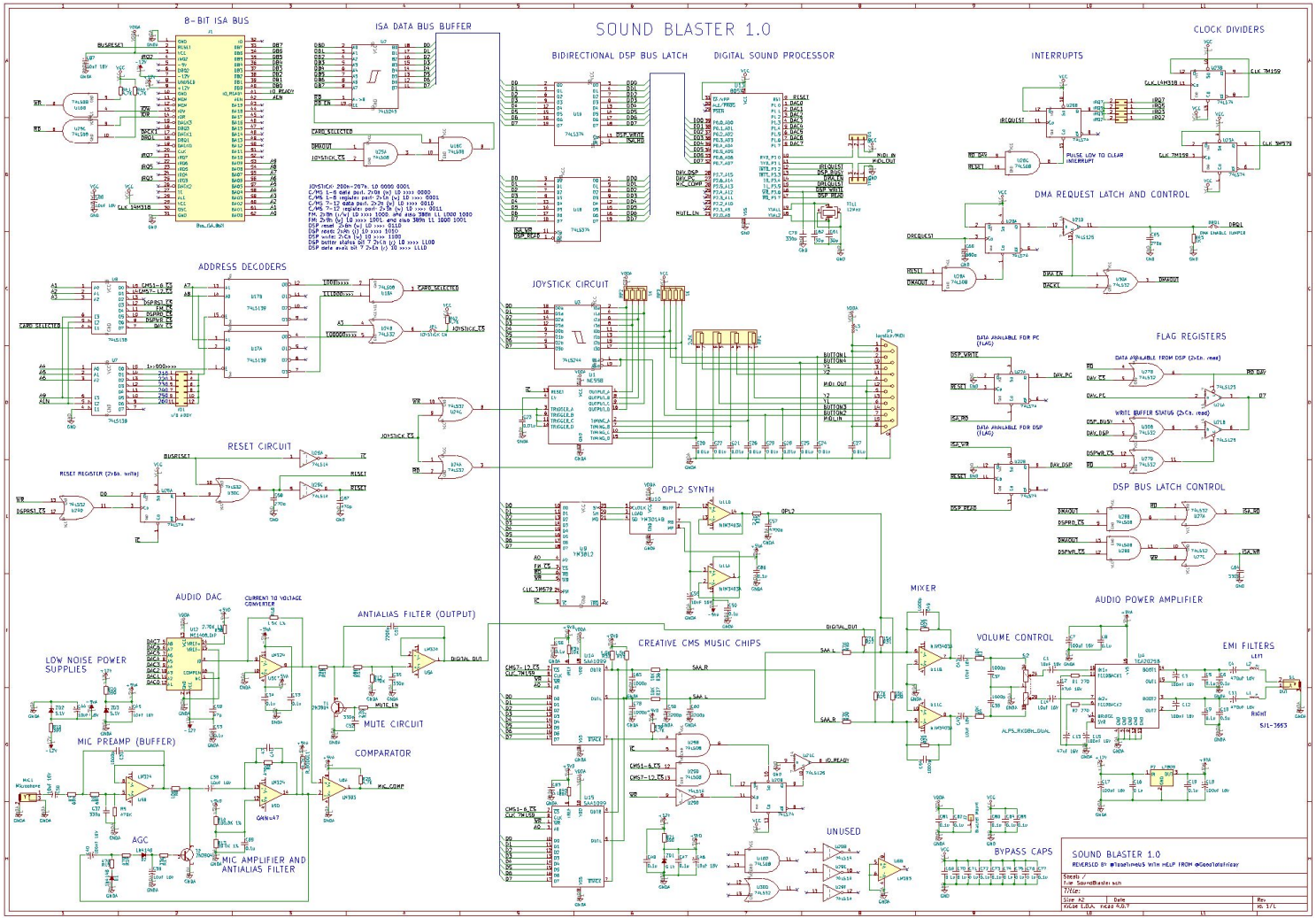
(Cue '80s montage)



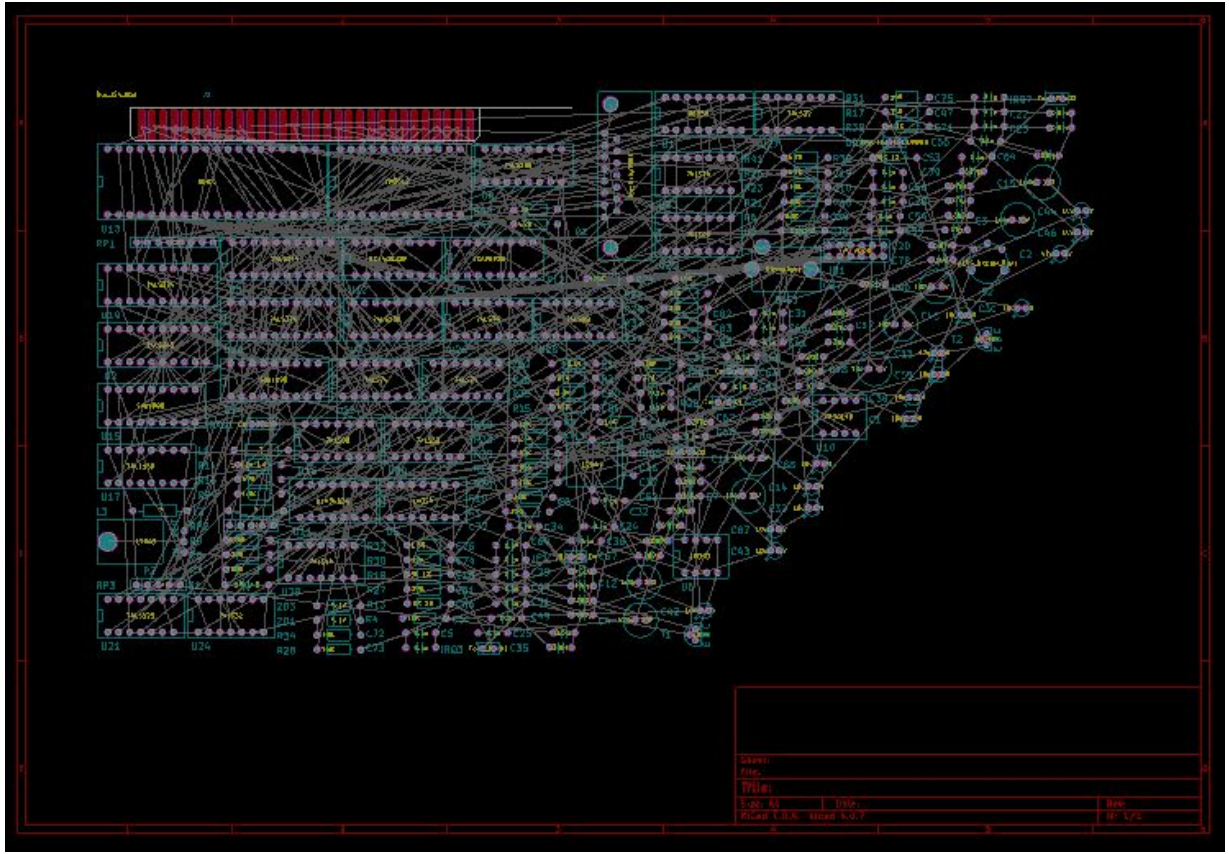

IT'S TOO SMALL TO READ!
SHH!

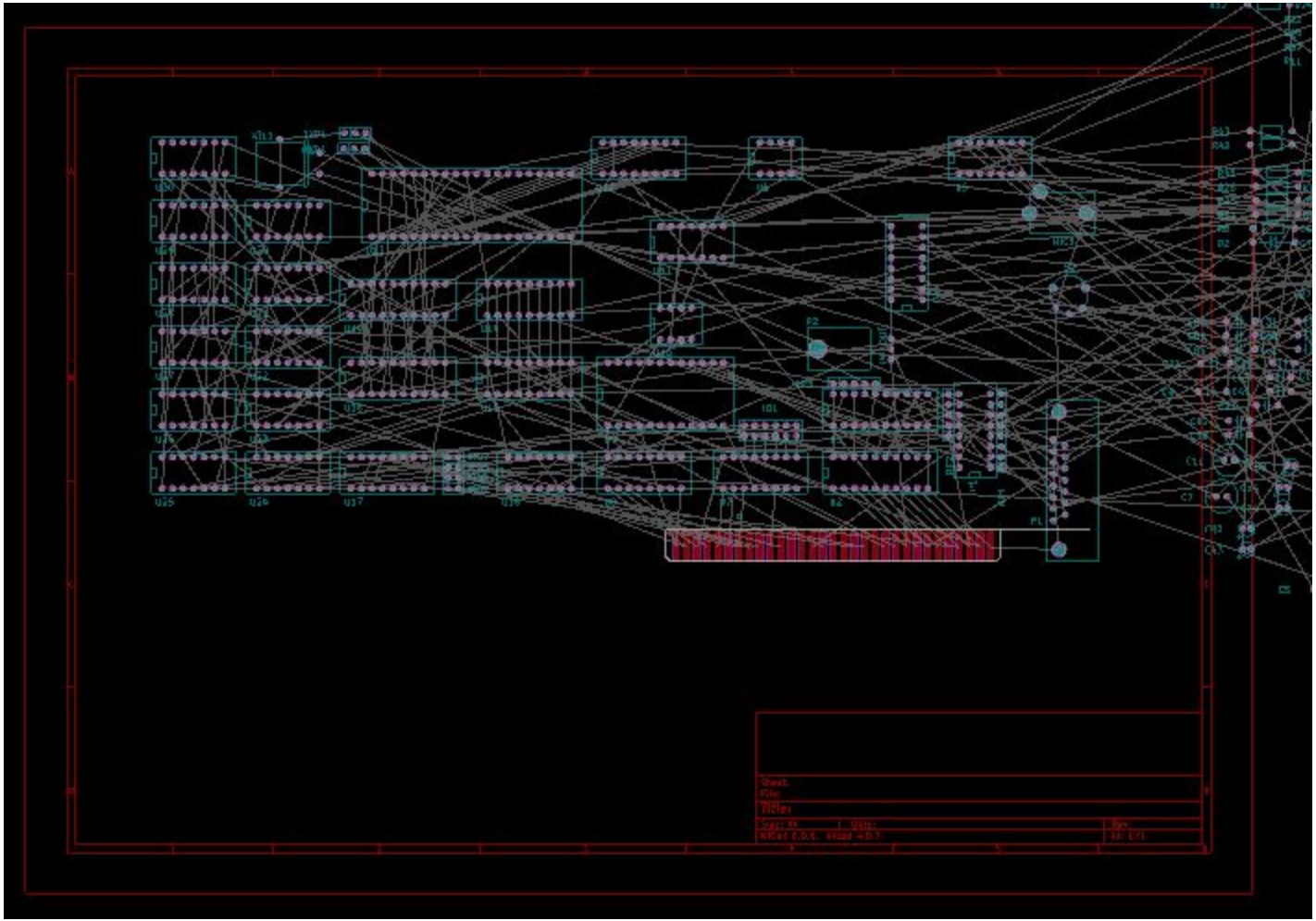


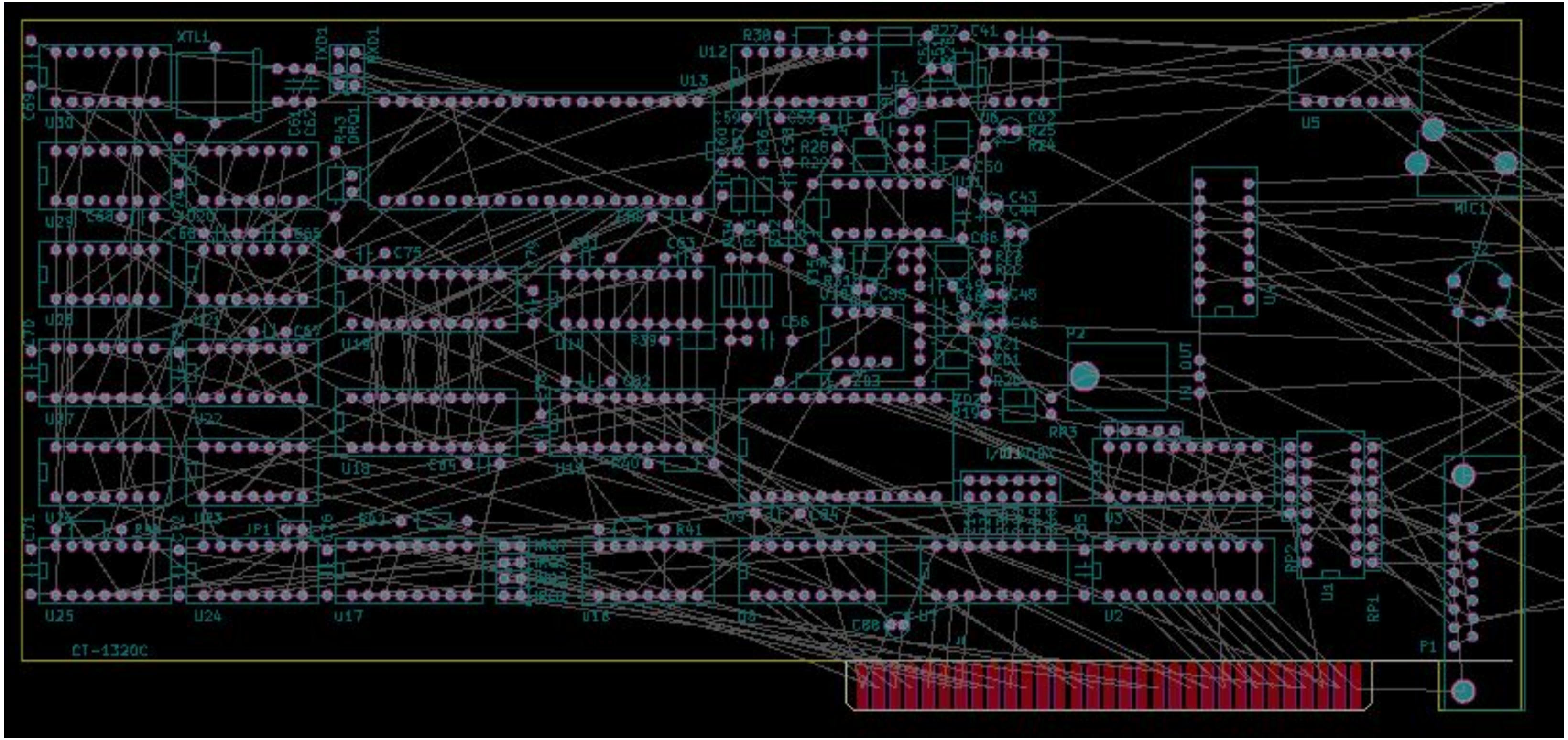

SOUND BLASTER 1.0
SOUND BLASTER 1.0

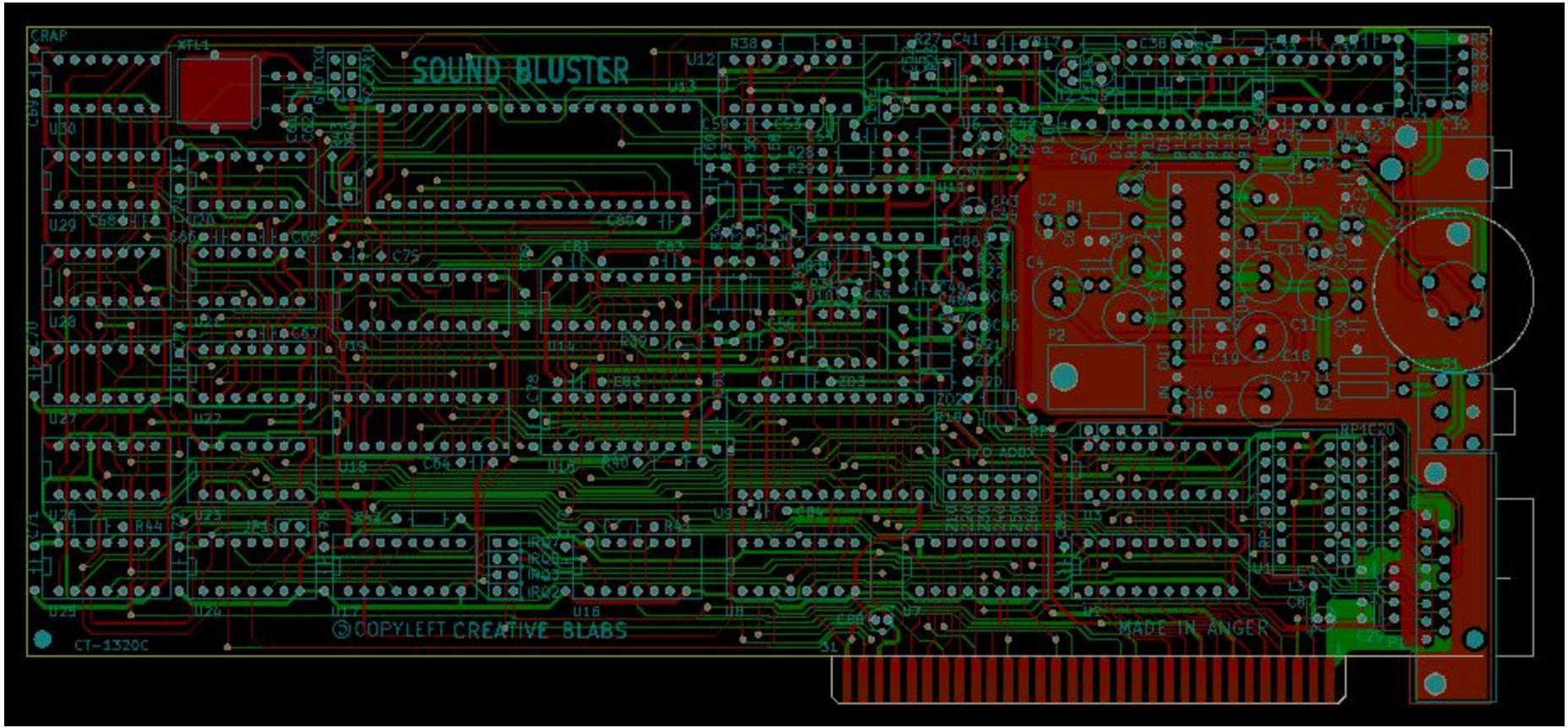

SOUND BLASTER 1.0
8-BIT ISA BUS
ISA DATA BUS BUFFER
BIDIRECTIONAL DSP BUS LATCH
DIGITAL SOUND PROCESSOR
CLOCK DIVIDERS
INTERRUPTS
DMA REQUEST LATCH AND CONTROL
ADDRESS DECODERS
JOYSTICK CIRCUIT
FLAG REGISTERS
RESET CIRCUIT
DSP BUS LATCH CONTROL
OPL2 SYNTH
AUDIO DAC
CURRENT TO VOLTAGE CONVERTER
ANTIALIAS FILTER (OUTPUT)
MIXER
AUDIO POWER AMPLIFIER
LOW NOISE POWER SUPPLIES
CREATIVE CMS MUSIC CHIPS
VOLUME CONTROL
EMI FILTERS
MUTE CIRCUIT
MIC PREAMP (BUFFER)
COMPARATOR
AGC
MIC AMPLIFIER AND ANTIALIAS FILTER
UNUSED
BYPASS CAPS
SOUND BLASTER 1.0
REVERSED BY @flashlineus WITH HELP FROM @GeodeIntrinsic

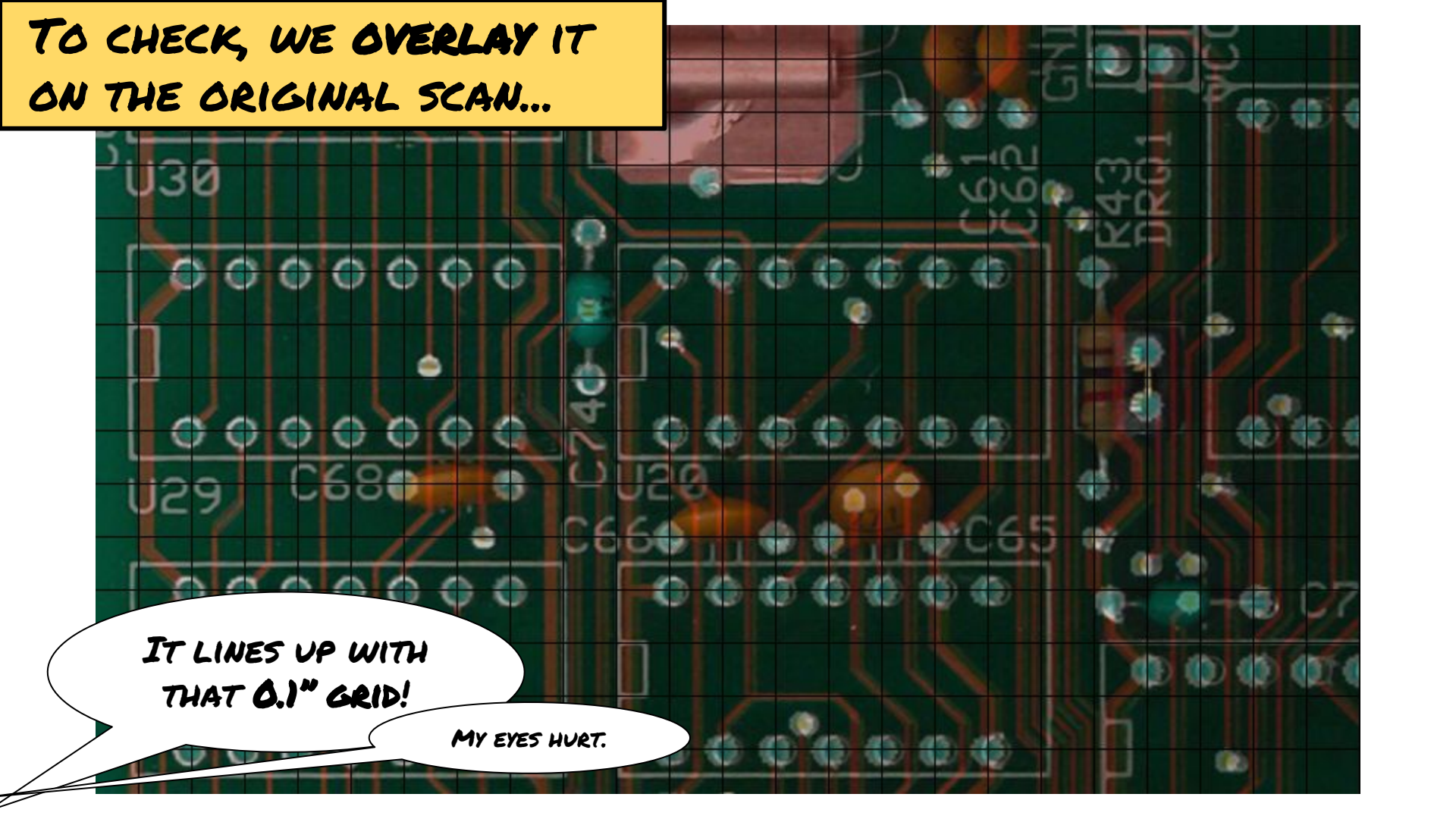
It's layout time!



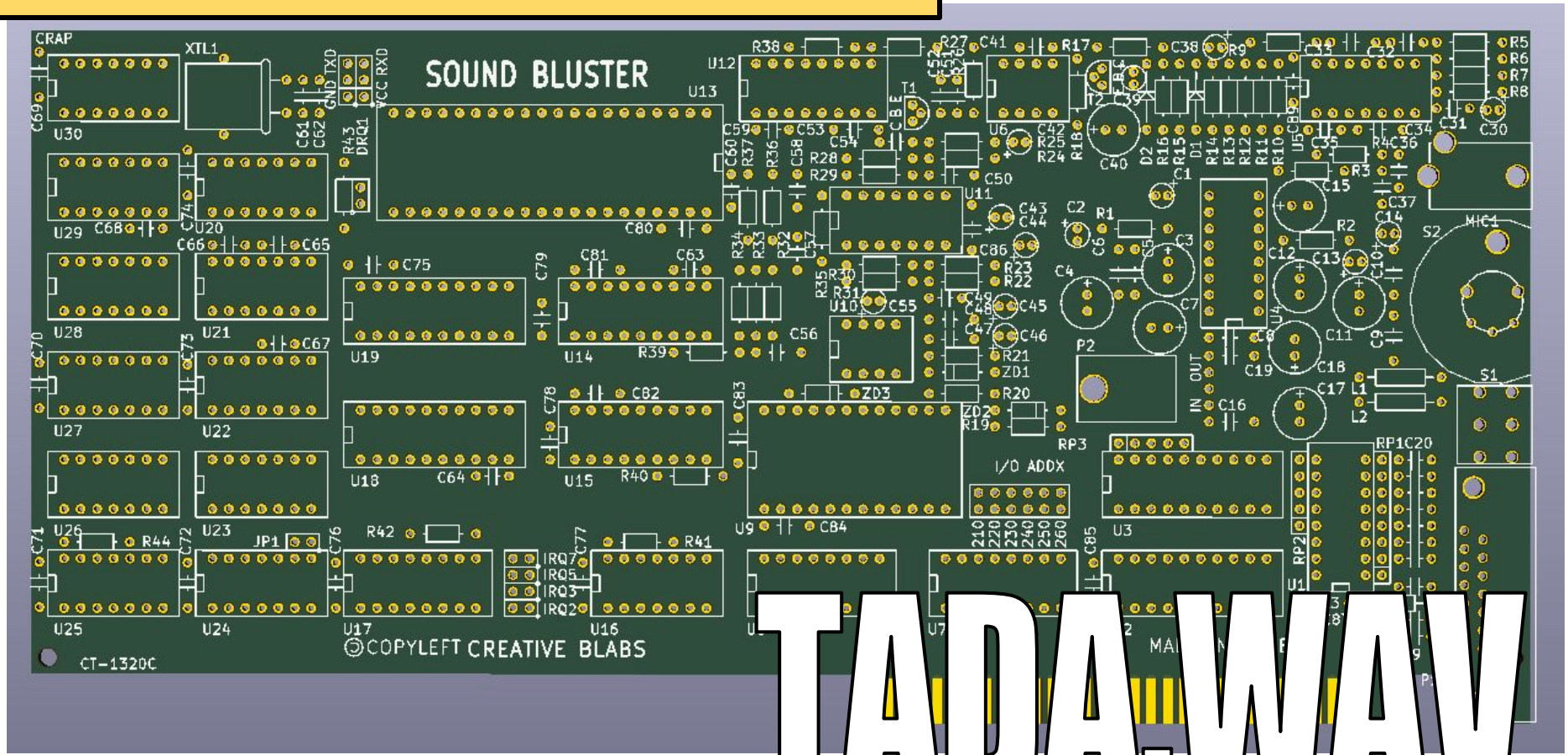



XTL1
TXD1
RXD1
U30
C69
R43
DRQ1
U13
U12
R30
R27
C41
T1
U6
C42
R25
R24
U5
MIC1
U29
U28
U27
U22
U26
U23
U25
U24
U17
U16
U8
U7
U2
U3
U1
RP1
RP2
RR3
P1
P2
IN
OUT
C75
C67
U19
U18
U14
U15
U9
C63
C56
C50
C43
C44
C66
C45
C46
R21
R39
R40
R41
R28
C59
C53
C80
C85
JP1
J1
C70
C71
CT-1320C


CRAP
SOUND BLUSTER
©COPYLEFT CREATIVE LABS
MADE IN ANGER
CT-1320C


TO CHECK, WE OVERLAY IT ON THE ORIGINAL SCAN...
U30
C61
C62
R43
C74
U29
C68
U28
C66
C65
IT LINES UP WITH THAT 0.1" GRID!
MY EYES HURT.

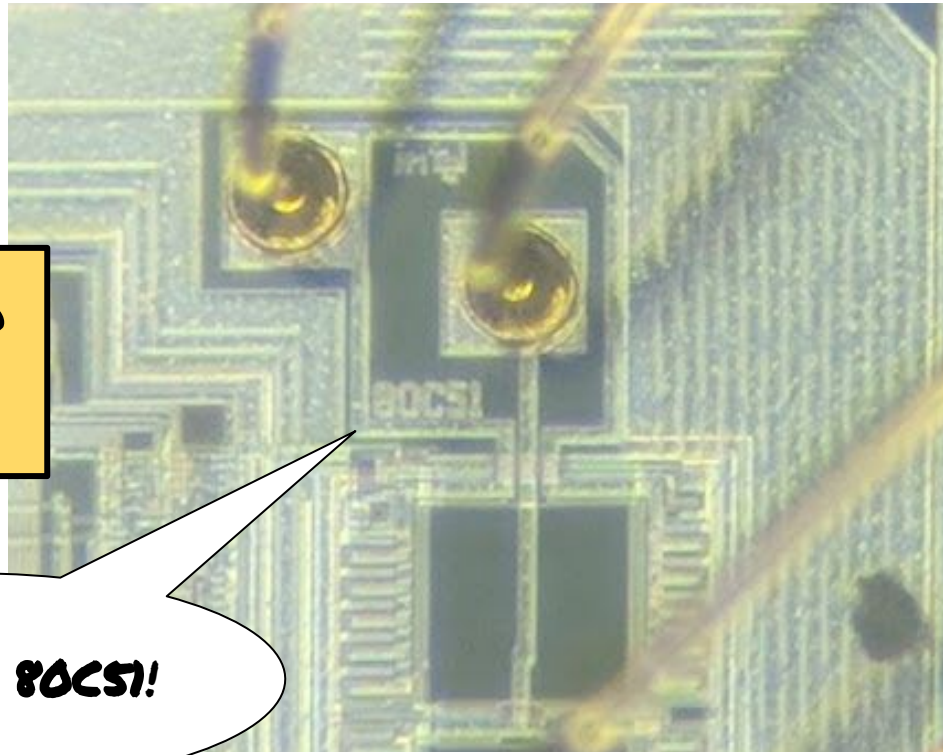
May I present...the Snud Bluffer!



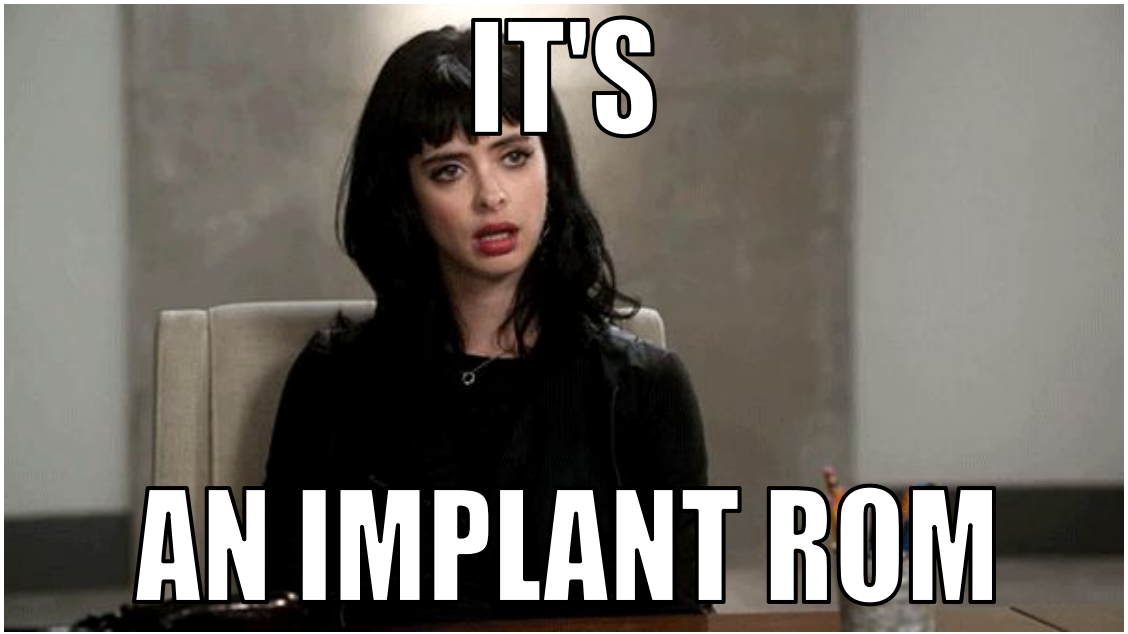
TADA.WAV

Meanwhile, in a secret laboratory...

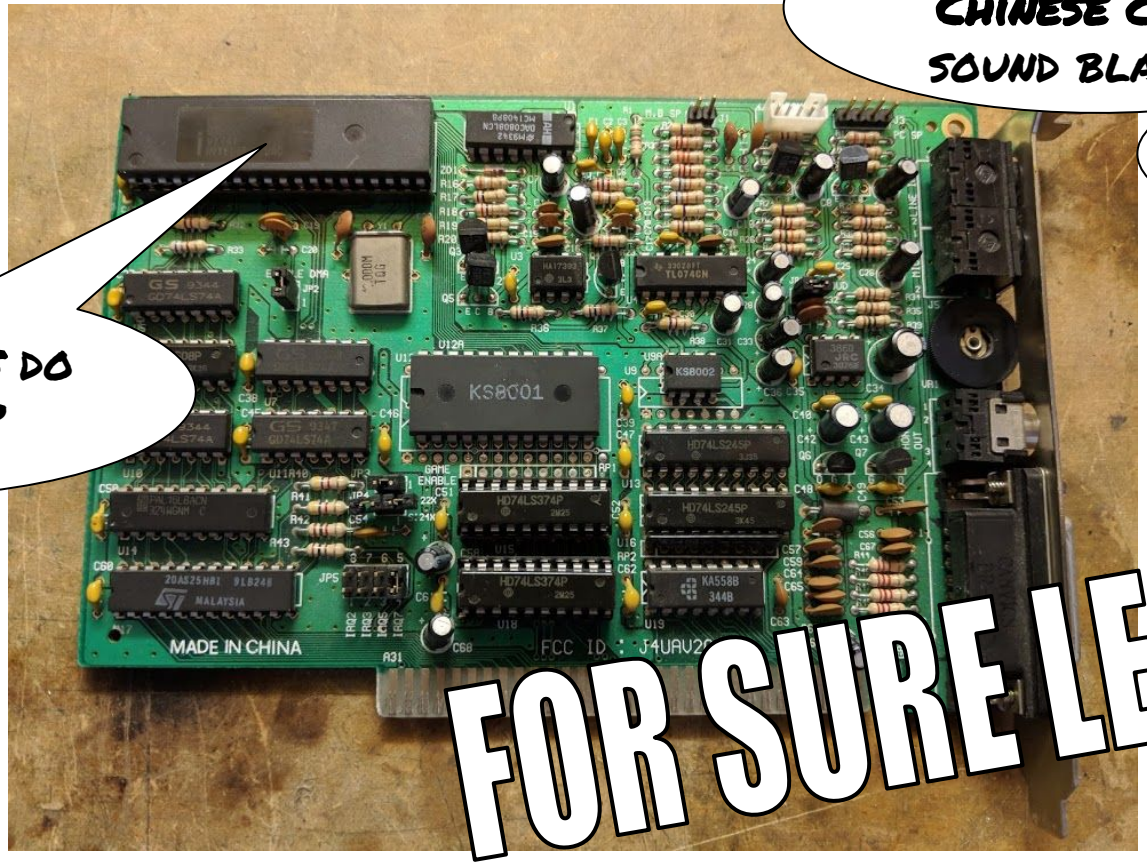
We use acid to decap the chips from China



Unfortunately for our hero...



My friend Al comes to the rescue and gives me this:

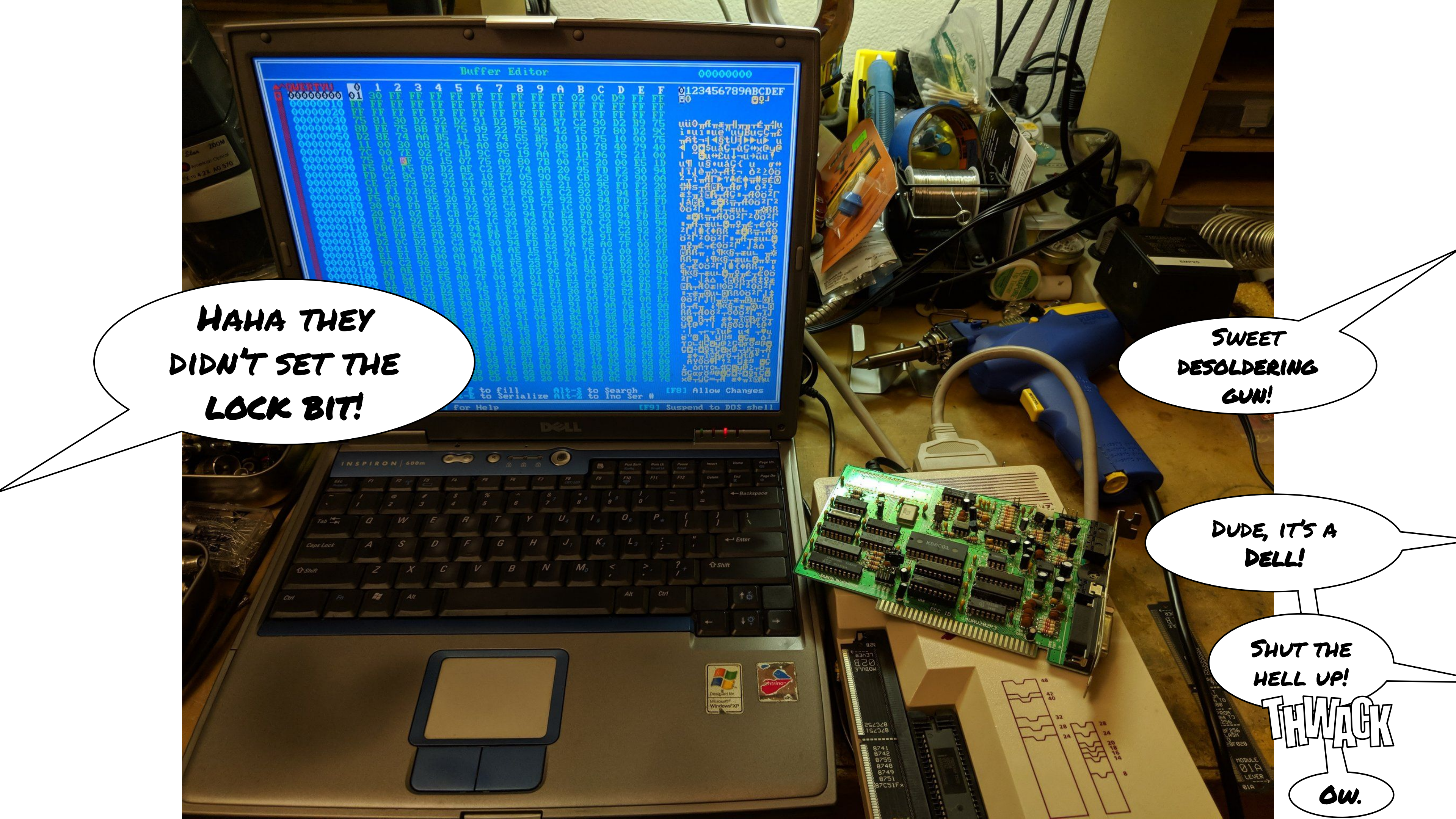


Look! It's a Chinese clone sound blaster!

Wow!

What secrets do I contain?

FOR SURE LEGIT


Haha they didn't set the lock bit!
Sweet desoldering gun!
Dude, it's a Dell!
Shut the hell up!
THWACK
Ow.
Buffer Editor
[F8] Allow Changes
[F9] Suspend to DOS shell
DELL
INSPIRON 600m

So how to disassemble...?

It was a bit easier than I thought.

```
;
;  D52 V3.4.1 8052 Disassembly of chinasb.bin
;  2018/09/06 15:38
;
        org     0
;
RESET:  ajmp    start
;
        org     0bh
;
TF0_VECTOR:
        ljmp    timer_isr
;
        org     30h
;
start:  mov     sp,#30h
        setb    pin_dsp_busy
        setb    pin_dma_enable1
        setb    wr
        setb    rd
        clr     pin_drequest
        setb    pt0
        mov     th1,#0feh
        mov     tl1,#0feh
```

```
;
; D52 configuration file for chinasb.bin
; Generated by D52 V3.4.1 on 2018/08/27 22:14
; Modified by @TubeTimeUS
;
c 0000-0001     ; Code space
i 0002-0009     ; ignore data
i 000a          ; ignore data
c 000b-000d     ; Code space
i 000e-002e     ; ignore data
i 002f          ; ignore data
c 0030-06ca     ; Code space
c 06cb-07ca     ; jump table here, possibly for commands (#1)
c 07cb-07e0
c 07e1-07e8     ; Code space
i 07ea-07fe     ; ignore data
i 07ff          ; ignore data
t 0801-0820     ; Copyright text
d 0821-08a0     ; Weird counting up binary data. Maybe ADPCM data table?
c 08a1-0acd     ; code space
c 0ace-0bcd     ; jump table here, possibly for commands (#2)
c 0bce-0bdd     ; jump table
```

It has "copy protection."

```
X0ee8:  mov     r1,a
        clr     pin_dsp_busy
        nop
;
        db      '(C)1992 Anchor Electronics Co.,'
```

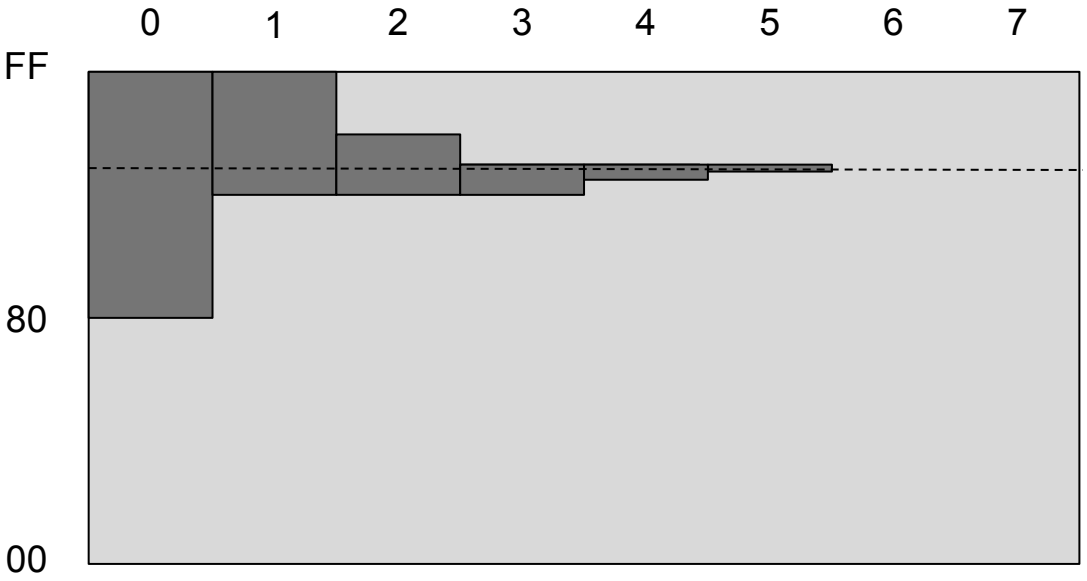
```
X0ee8:  mov     r1,a
        clr     pin_dsp_busy
        nop
        add     a,r0
        orl     29h,#31h
        addc    a,r1
        addc    a,r1
        reti
;
        db      ' Anchor Electronics Co.,'
        db      0
```

Hey it's missing RETI!

lulz

Wait, isn't Anchor Electronics that place in Santa Clara?

And some interesting code--



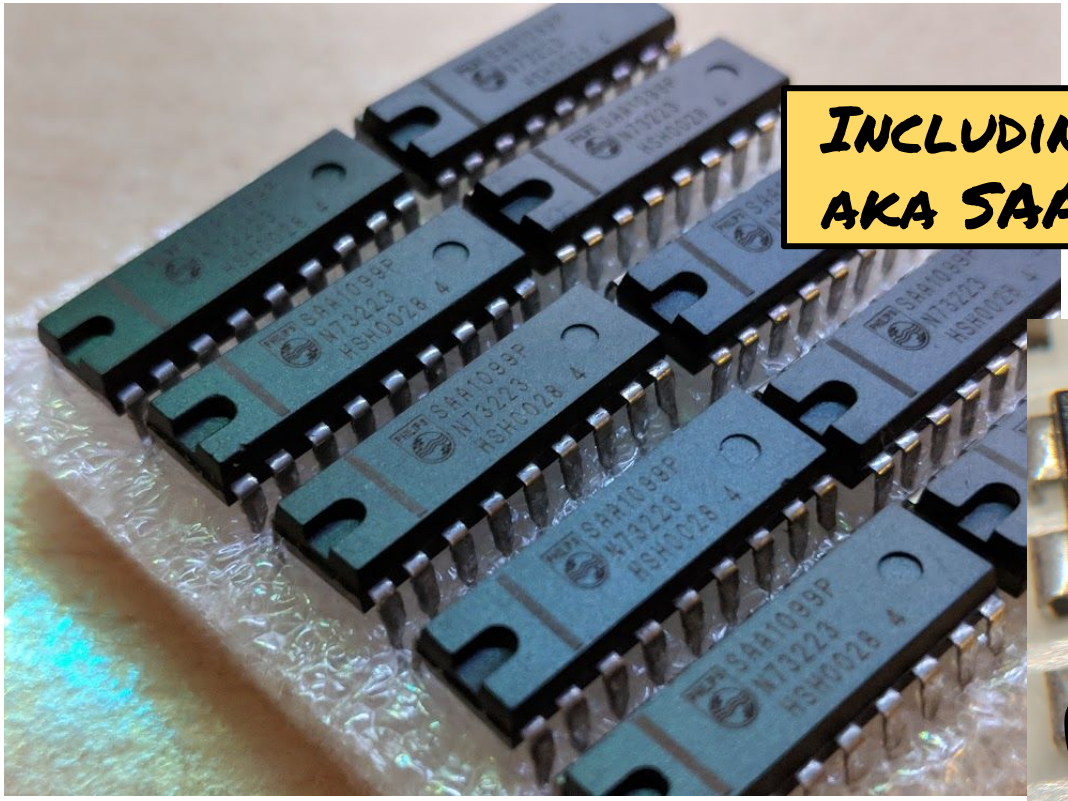

```
get_adc_sample:
        mov     port_dac_out,#80h
        nop
        jnb     pin_adc_comp,X0c9a
        clr     pin_dac_7
X0c9a:  setb    pin_dac_6
        nop
        jnb     pin_adc_comp,X0ca2
        clr     pin_dac_6
X0ca2:  setb    pin_dac_5
        nop
        jnb     pin_adc_comp,X0caa
        clr     pin_dac_5
X0caa:  setb    pin_dac_4
        nop
        jnb     pin_adc_comp,X0cb2
        clr     pin_dac_4
X0cb2:  setb    pin_dac_3
        nop
        jnb     pin_adc_comp,X0cba
        clr     pin_dac_3
X0cba:  setb    pin_dac_2
        nop
        jnb     pin_adc_comp,X0cc2
        clr     pin_dac_2
X0cc2:  setb    pin_dac_1
        nop
        jnb     pin_adc_comp,X0cca
        clr     pin_dac_1
X0cca:  setb    pin_dac_0
        nop
        jnb     pin_adc_comp,X0cd2
        clr     pin_dac_0
X0cd2:  mov     a,port_dac_out
X0cd4:  jb      pin_dav_pc,X0cd4
        movx    @r0,a
        ret
```

--That can record audio with no ADC!

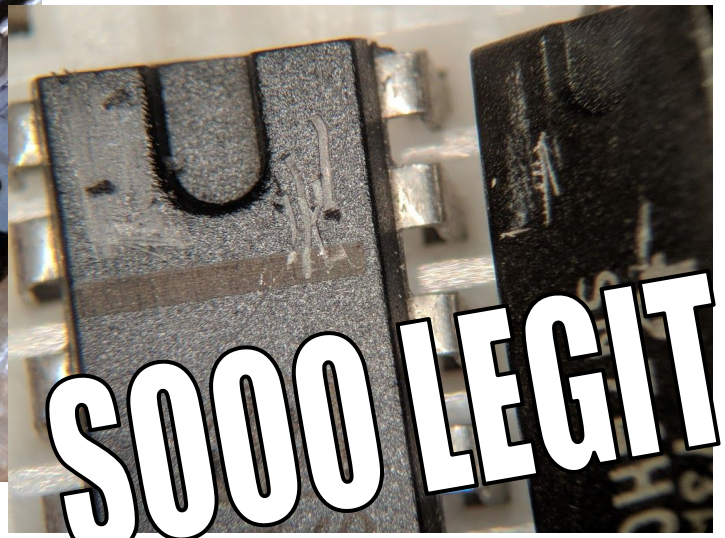
More goodies arrive from China...

Oh! Yamaha OPL2 chips!

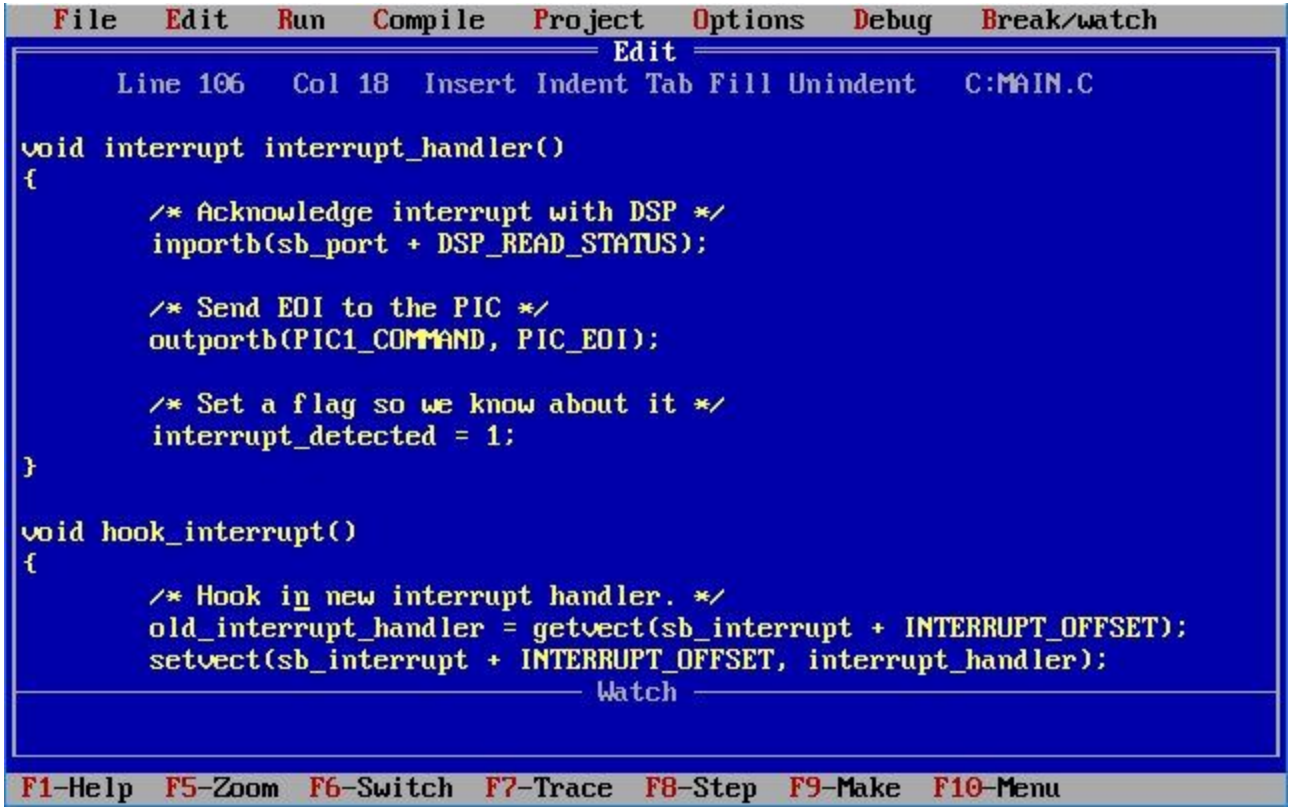
And audio amplifiers!



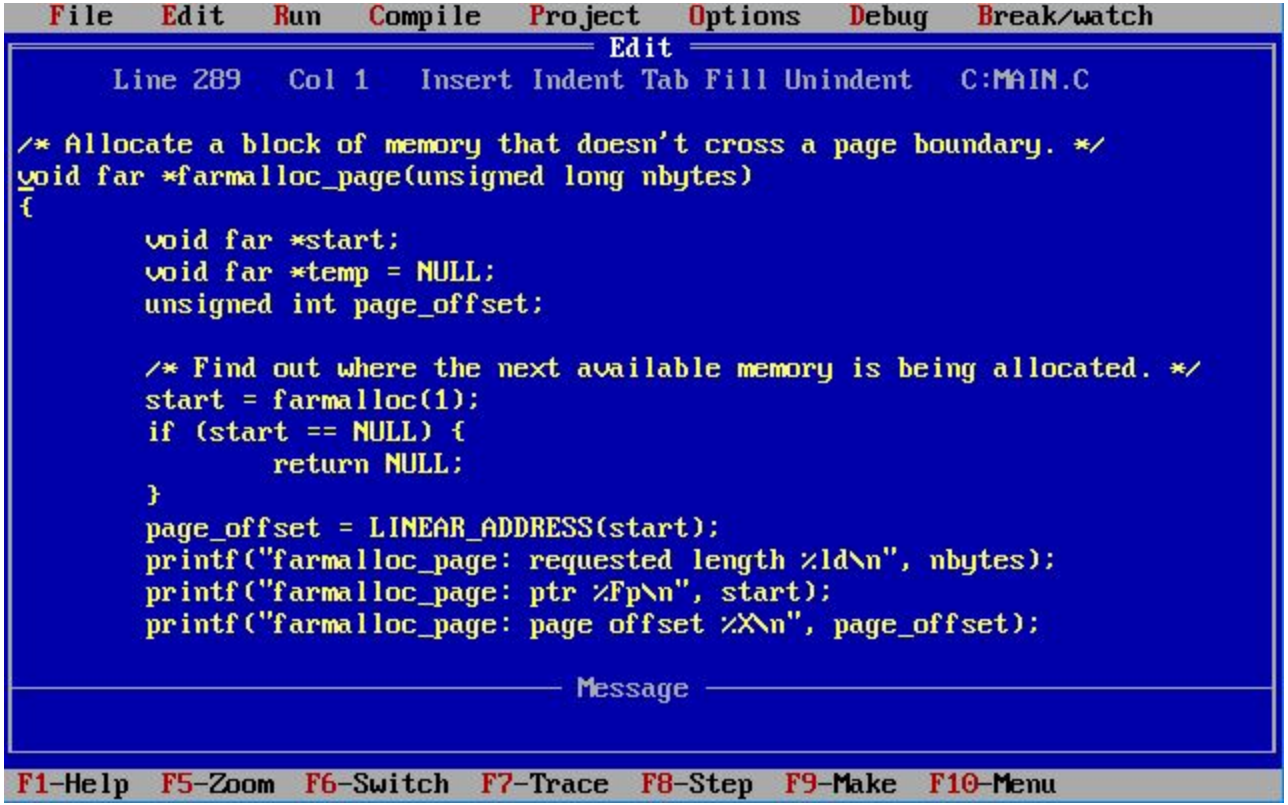
Including CMS sound chips, aka SAA1099 chips.



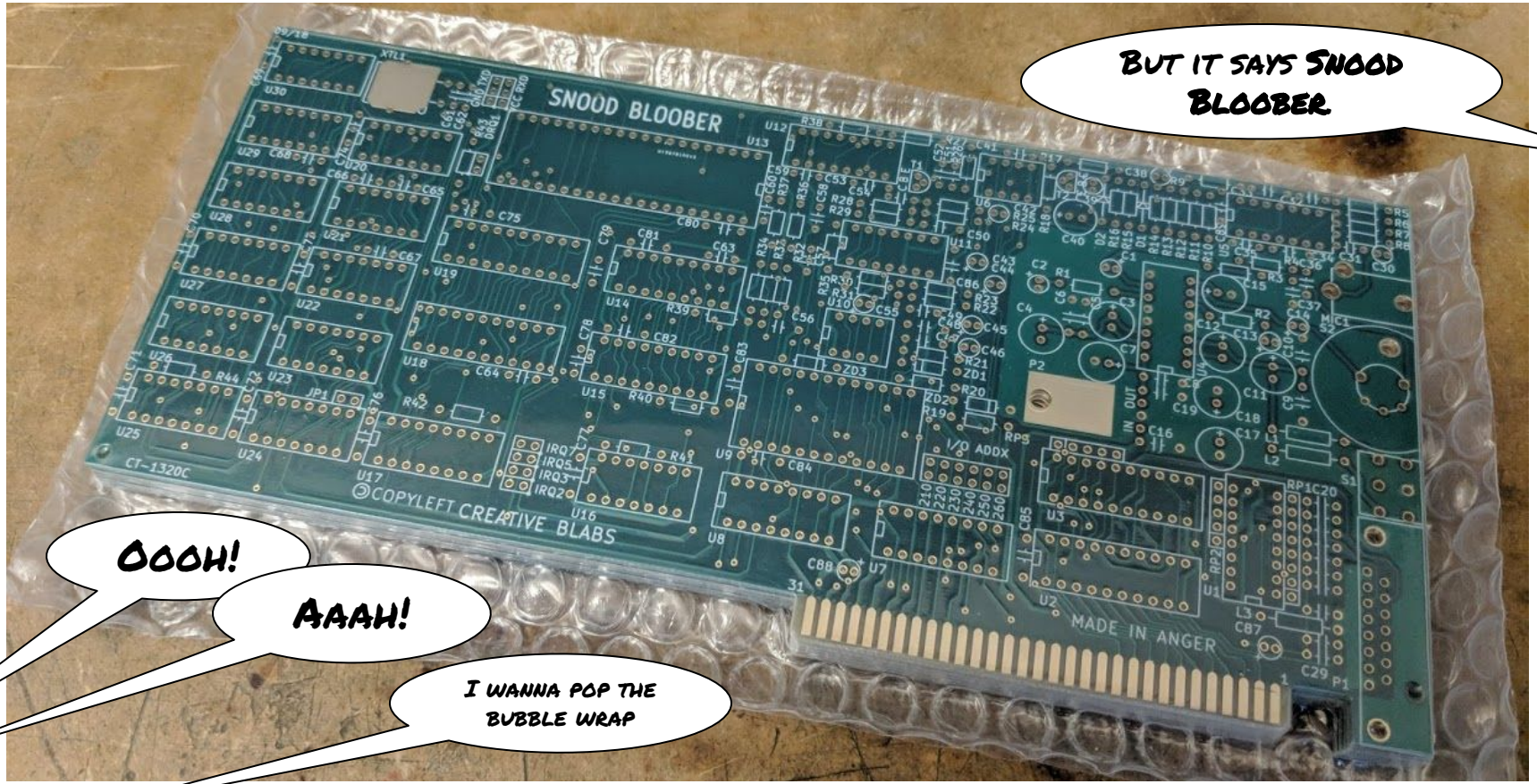
I also wrote a little test program in Turbo C



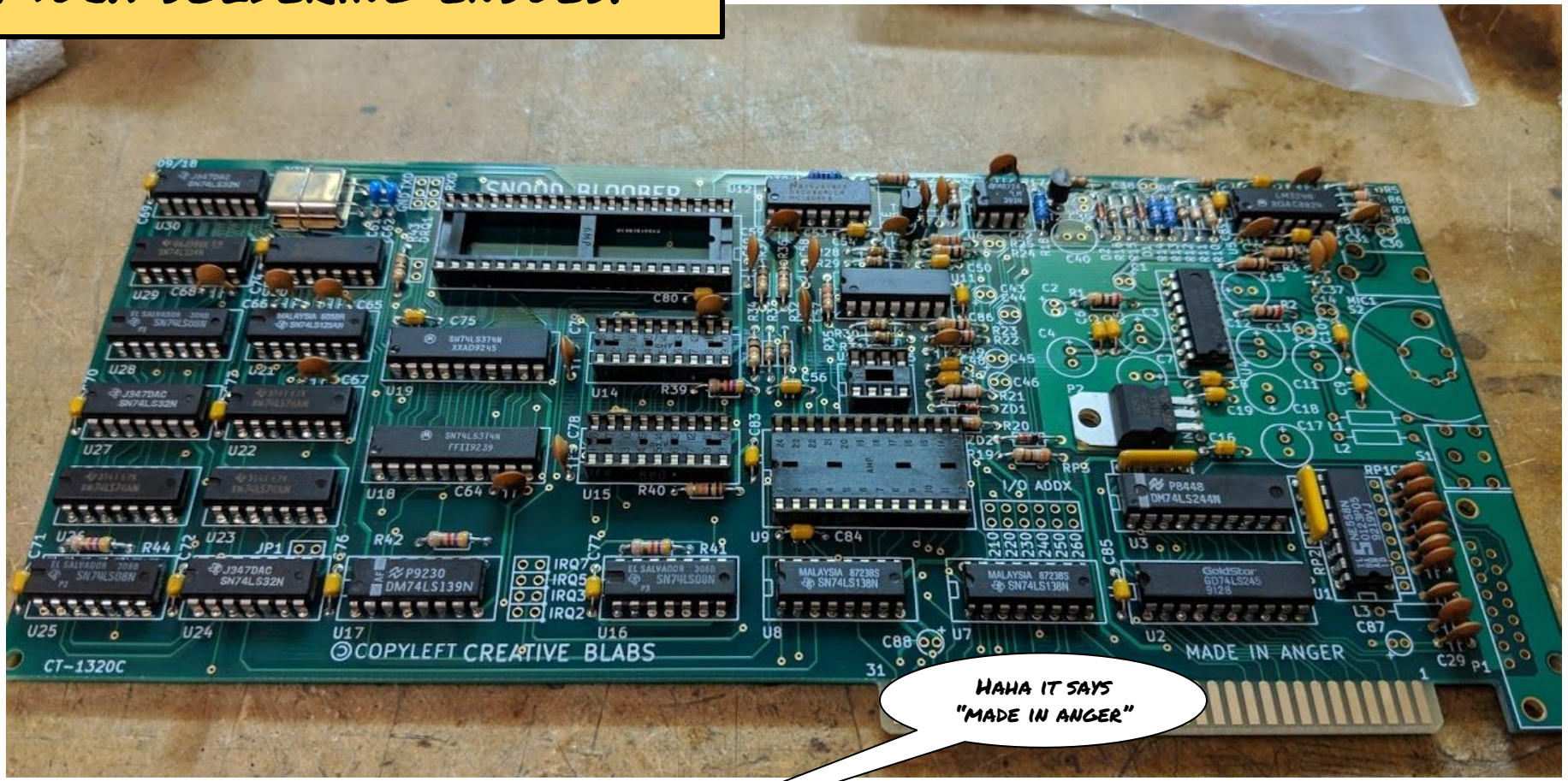
Ugh, far pointers.

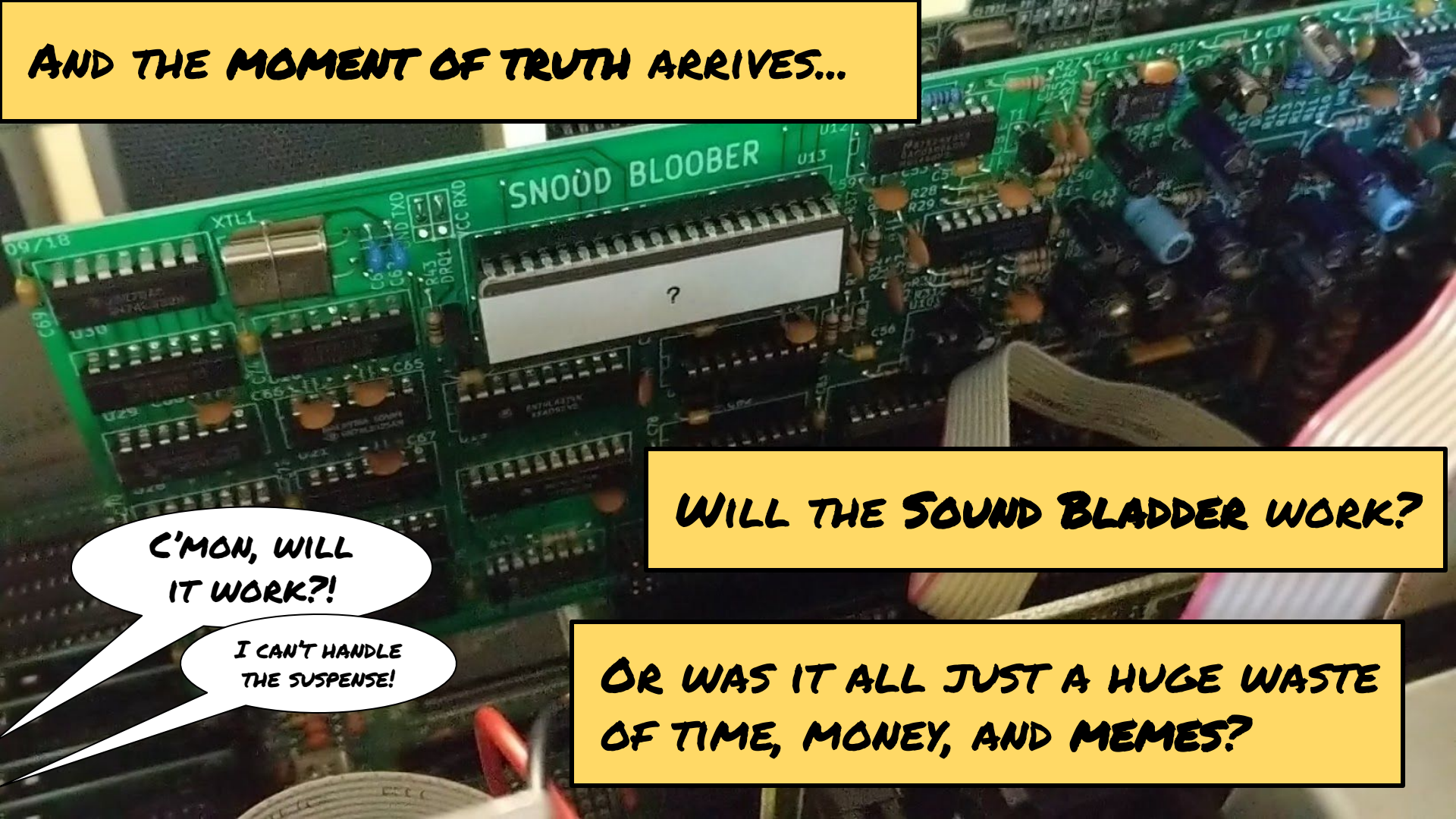


Finally the Snark Barker boards arrive!



Much soldering ensues!




And the moment of truth arrives...
SNOOD BLOODER
Will the Sound Bladder work?
C'mon, will it work?!
I can't handle the suspense!
Or was it all just a huge waste of time, money, and memes?

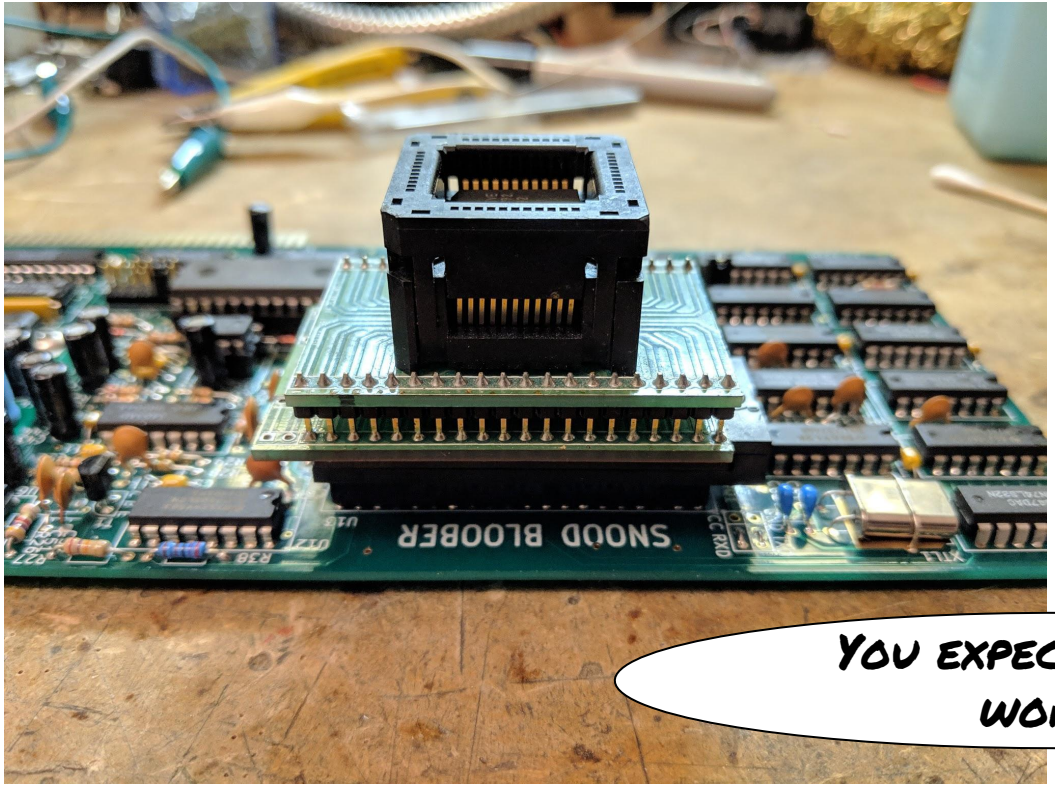

TADA.WAV

TADA.WAV

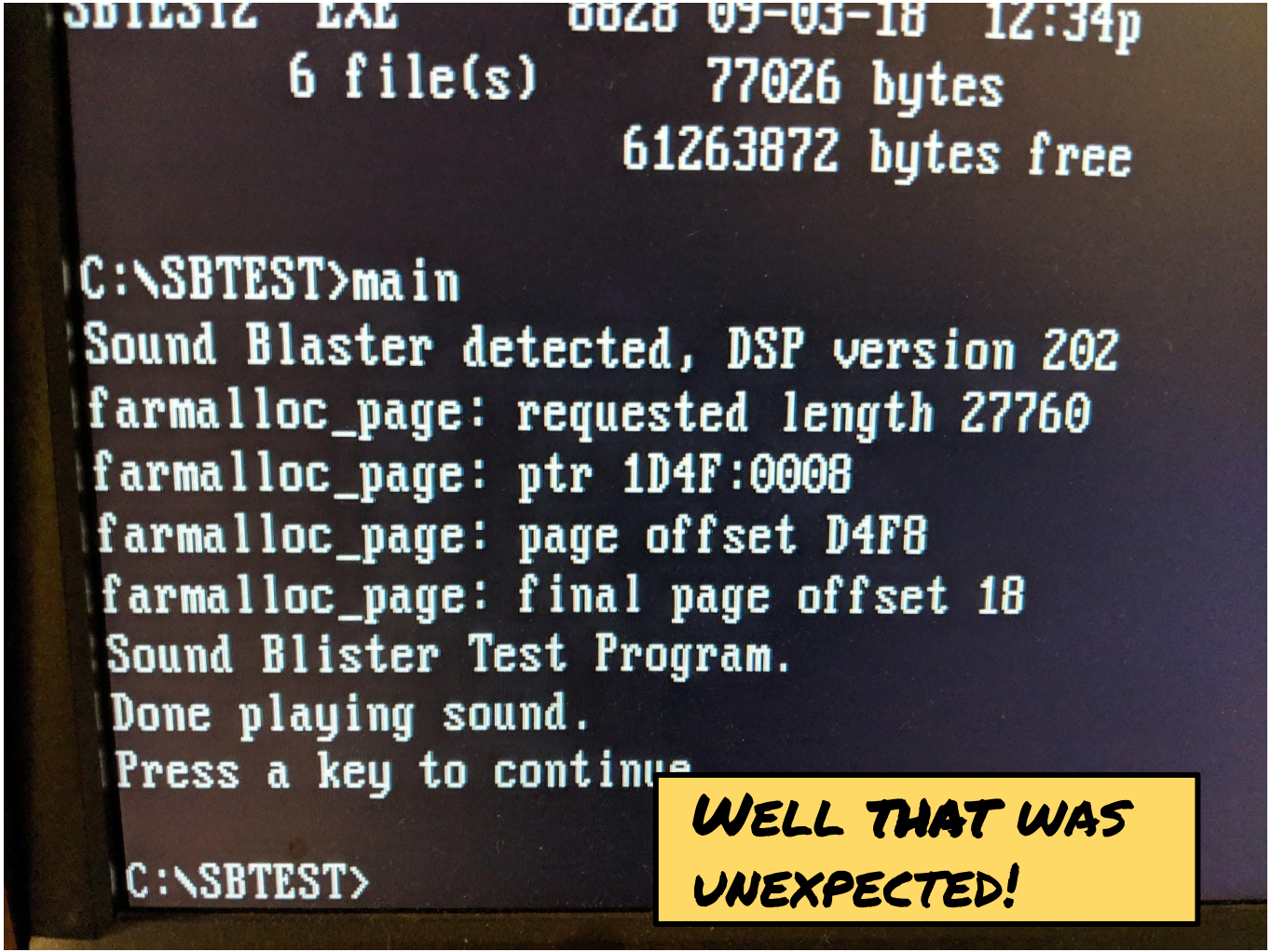
(NO, REALLY)

But what about those totally legit DSP 2.02 chips from China?

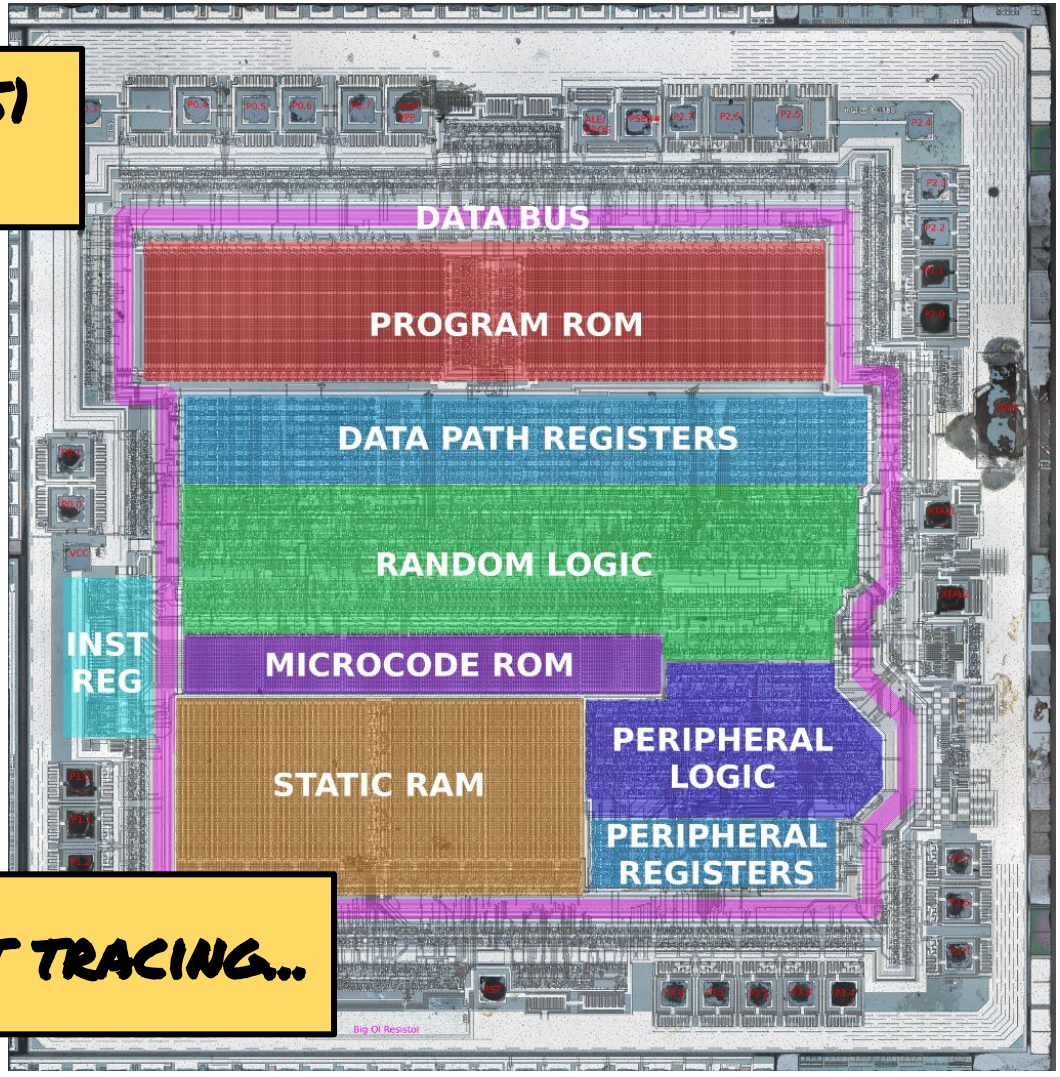
Let's test one!



You expect that to work?

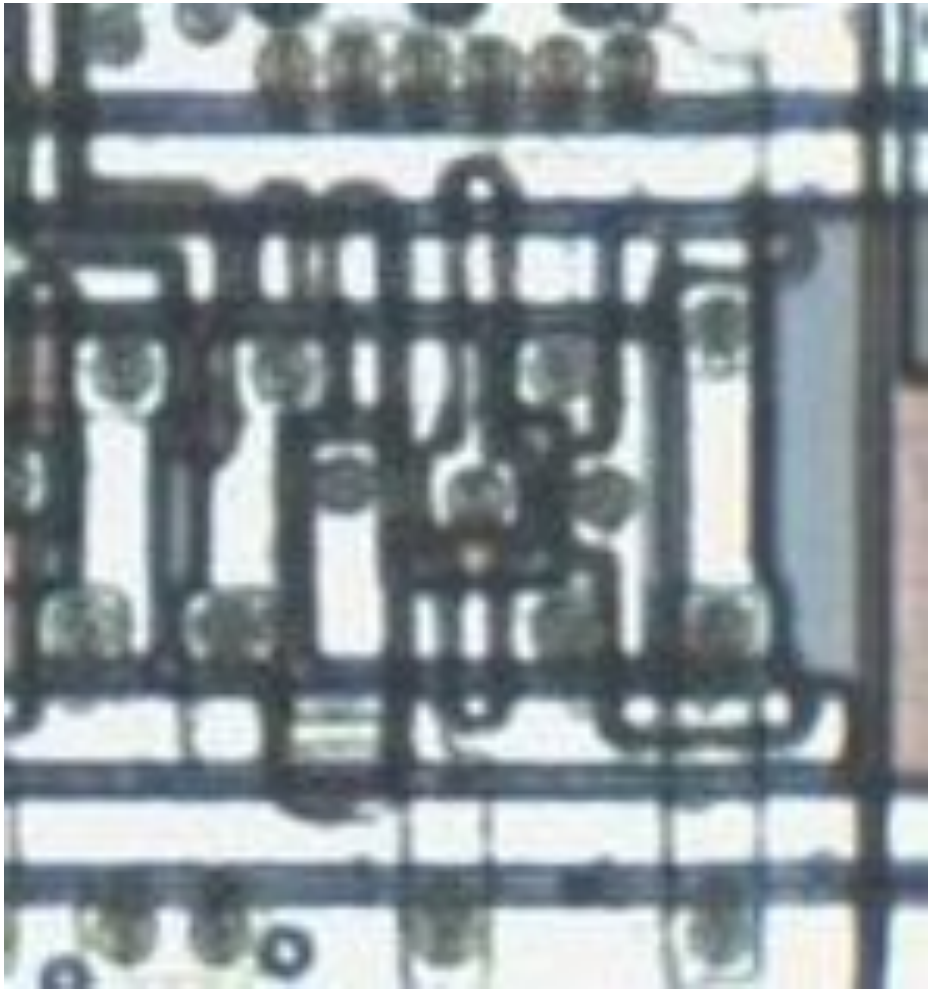

SBTEST2 EXE 6828 09-03-18 12:34p
6 file(s) 77026 bytes
61263872 bytes free
C:\SBTEST>main
Sound Blaster detected, DSP version 202
farmalloc_page: requested length 27760
farmalloc_page: ptr 1D4F:0008
farmalloc_page: page offset D4F8
farmalloc_page: final page offset 18
Sound Blister Test Program.
Done playing sound.
Press a key to continue
C:\SBTEST>
Well that was unexpected!

Can we make the 8051 give up its secrets?



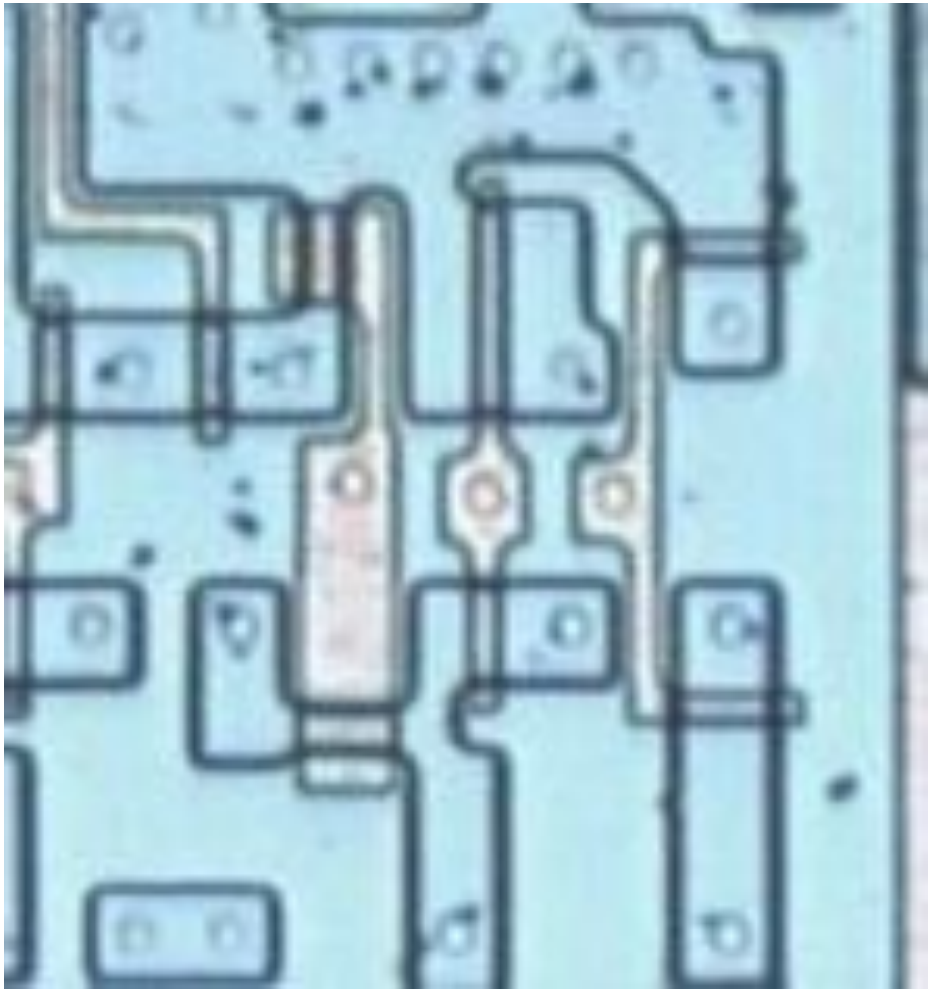
Time for some circuit tracing...

HERE'S A LATCH.



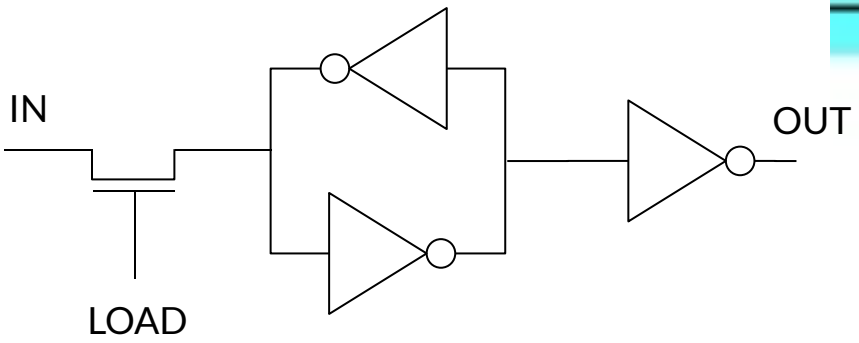
I'M NOT SEEING IT.

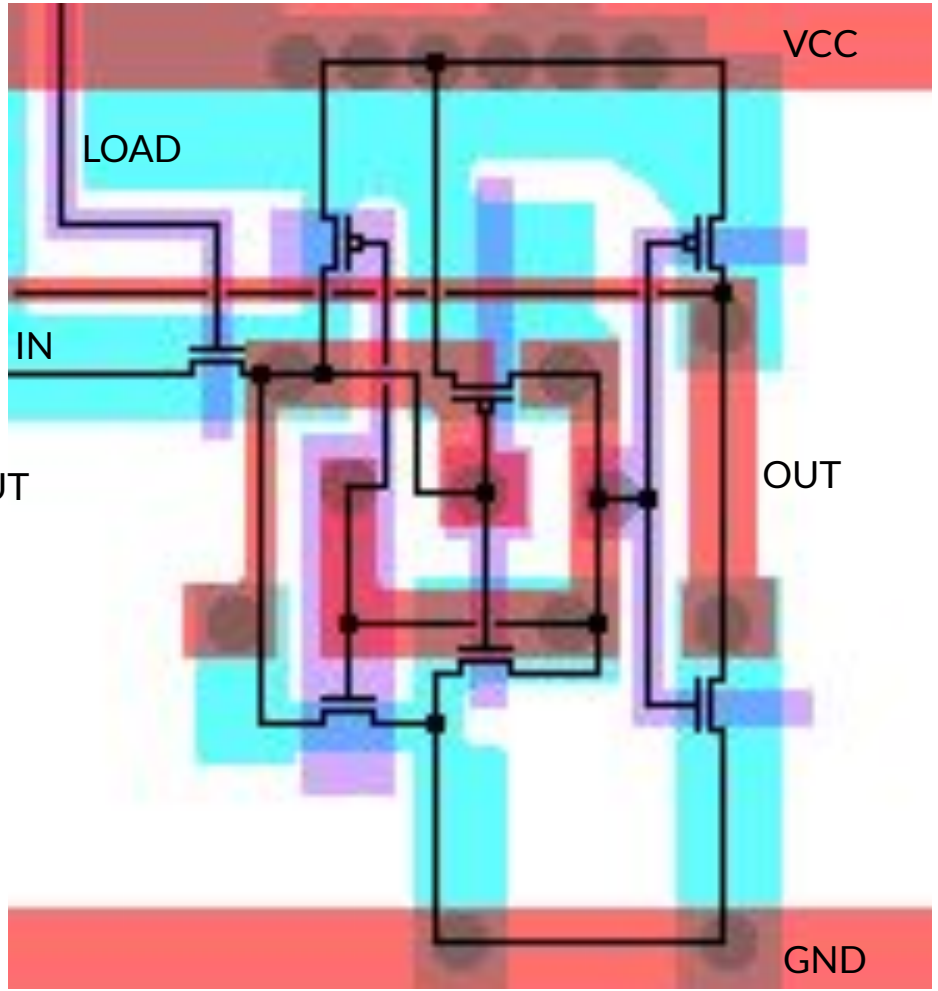
Confusing? Let's strip away the top metal layer.

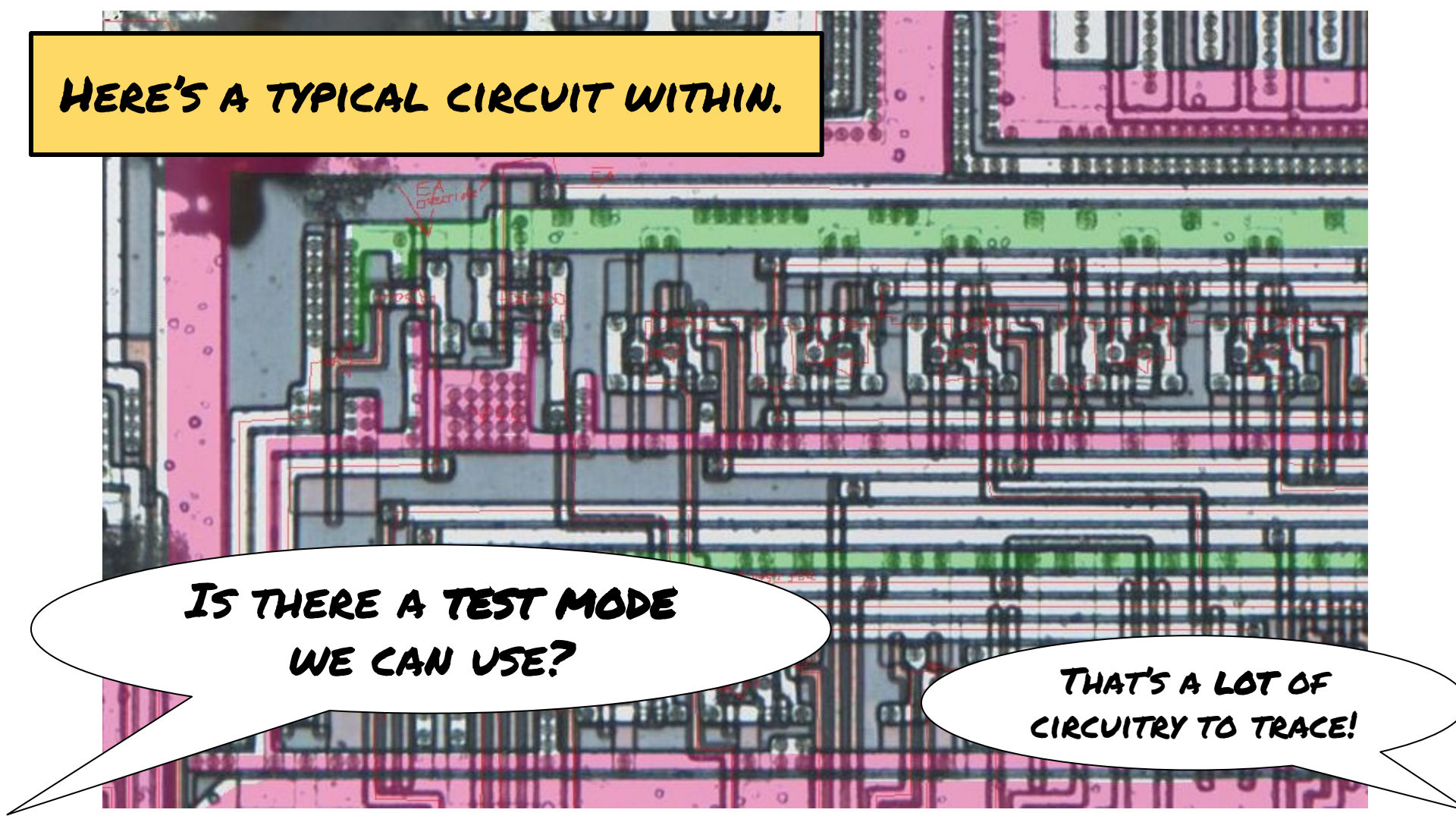


What am I even looking at?

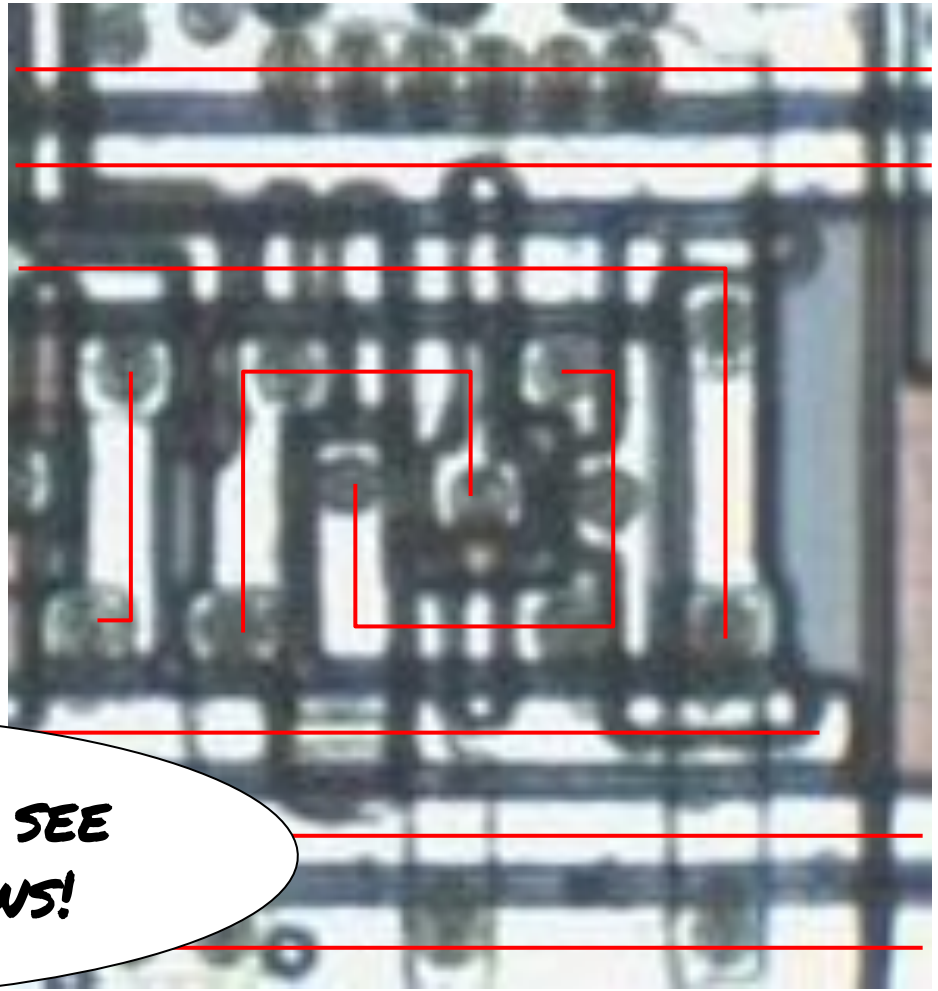
How about this?






Here's a typical circuit within.
Is there a test mode we can use?
That's a lot of circuitry to trace!

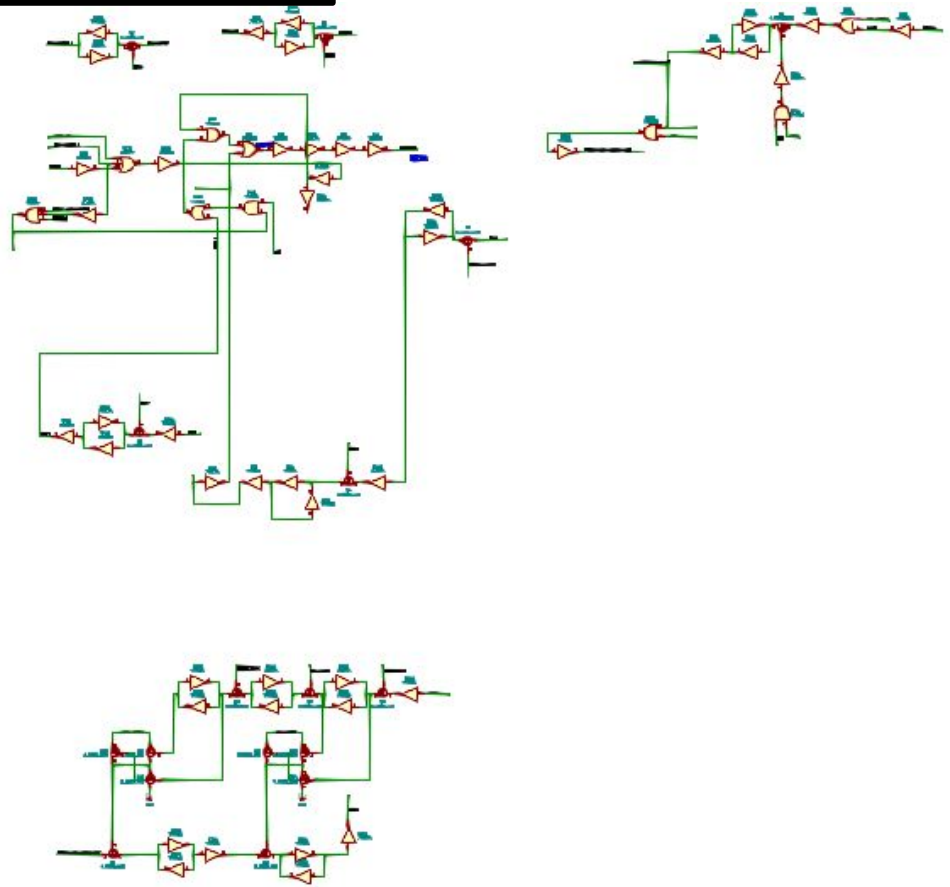
Can we do this automatically?

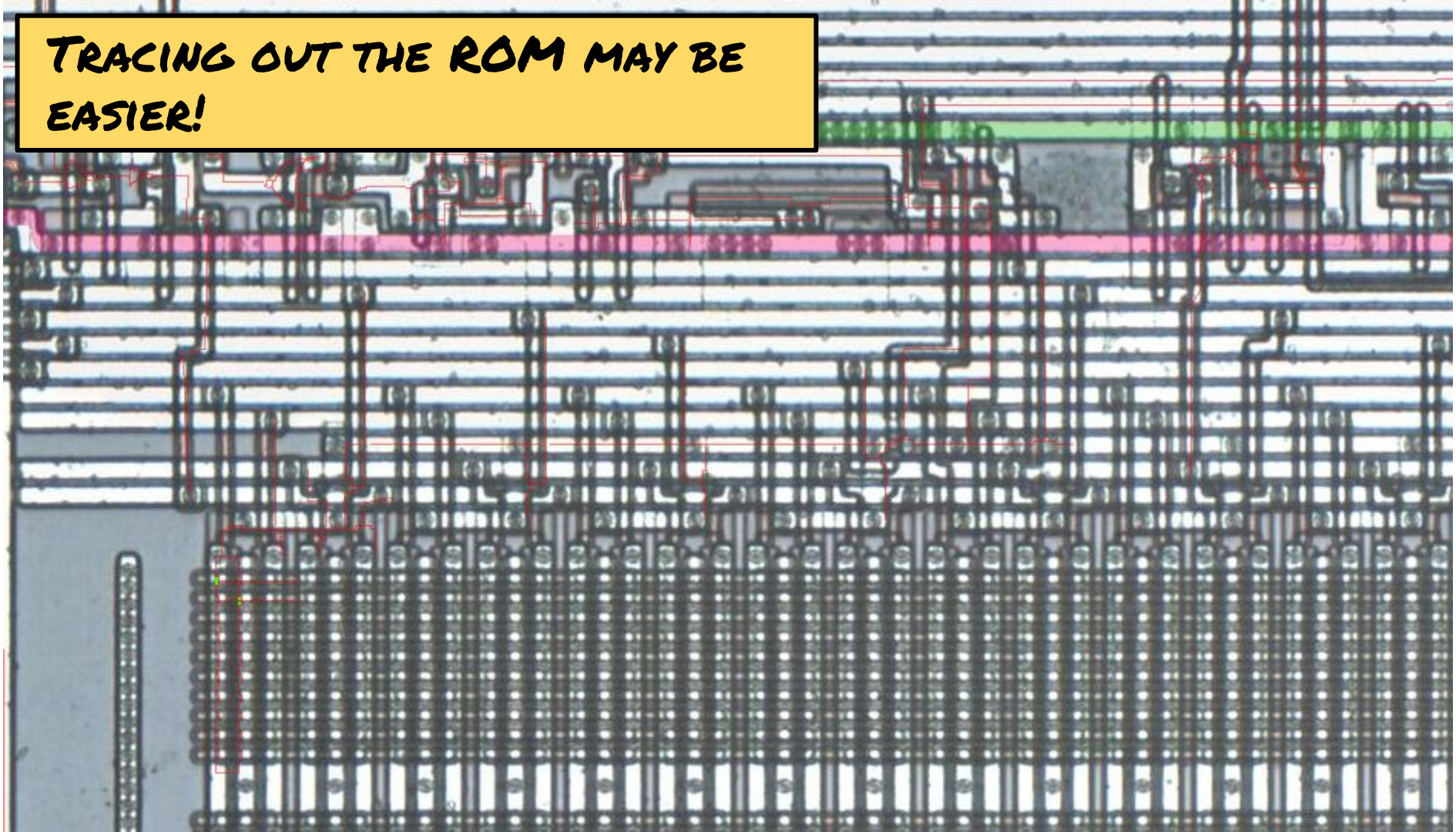


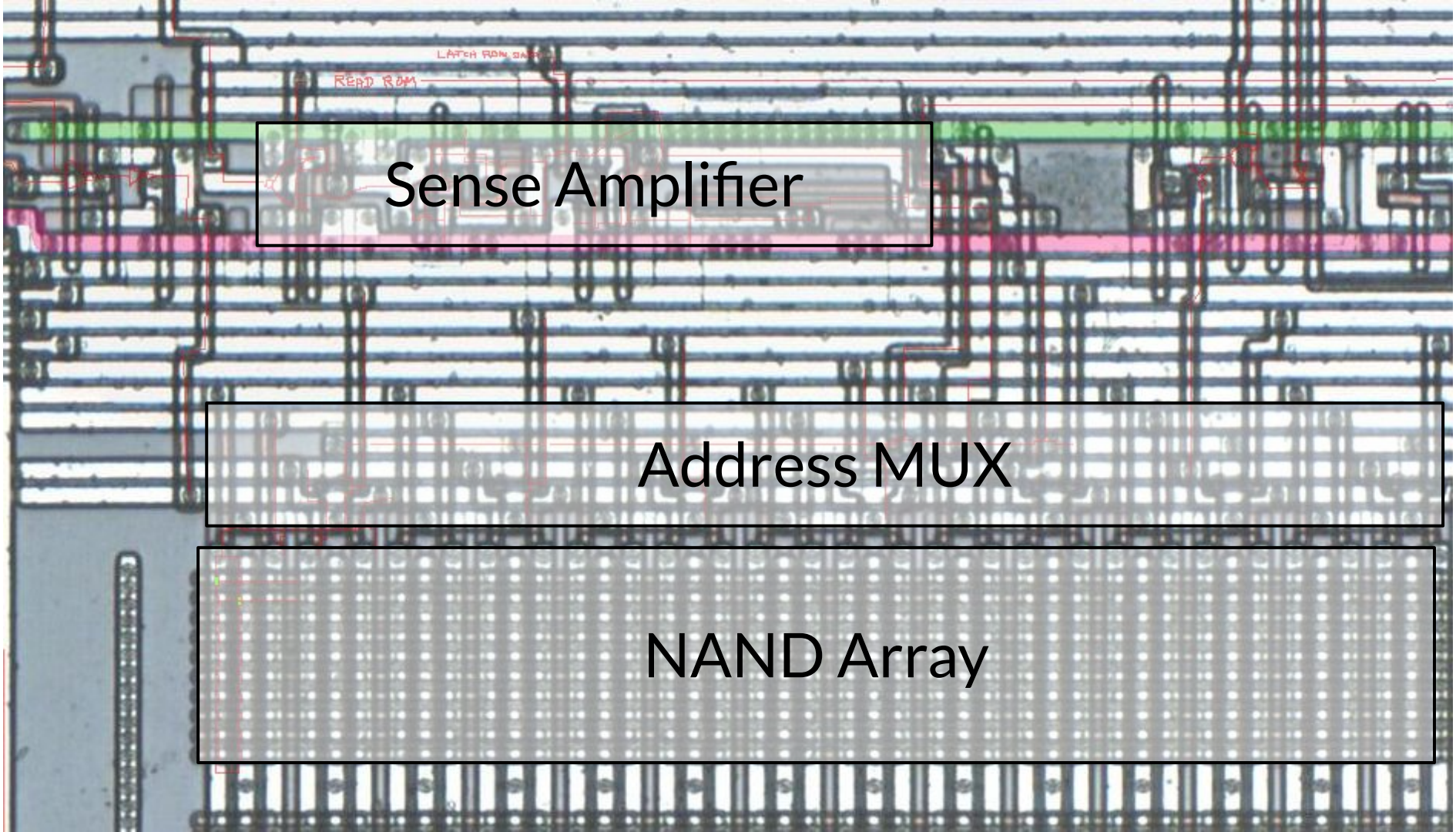
But with a machine learning algorithm that can correla

It's really hard to see with those shadows!

It's a complex circuit!




Tracing out the ROM may be easier!


Sense Amplifier
Address MUX
NAND Array

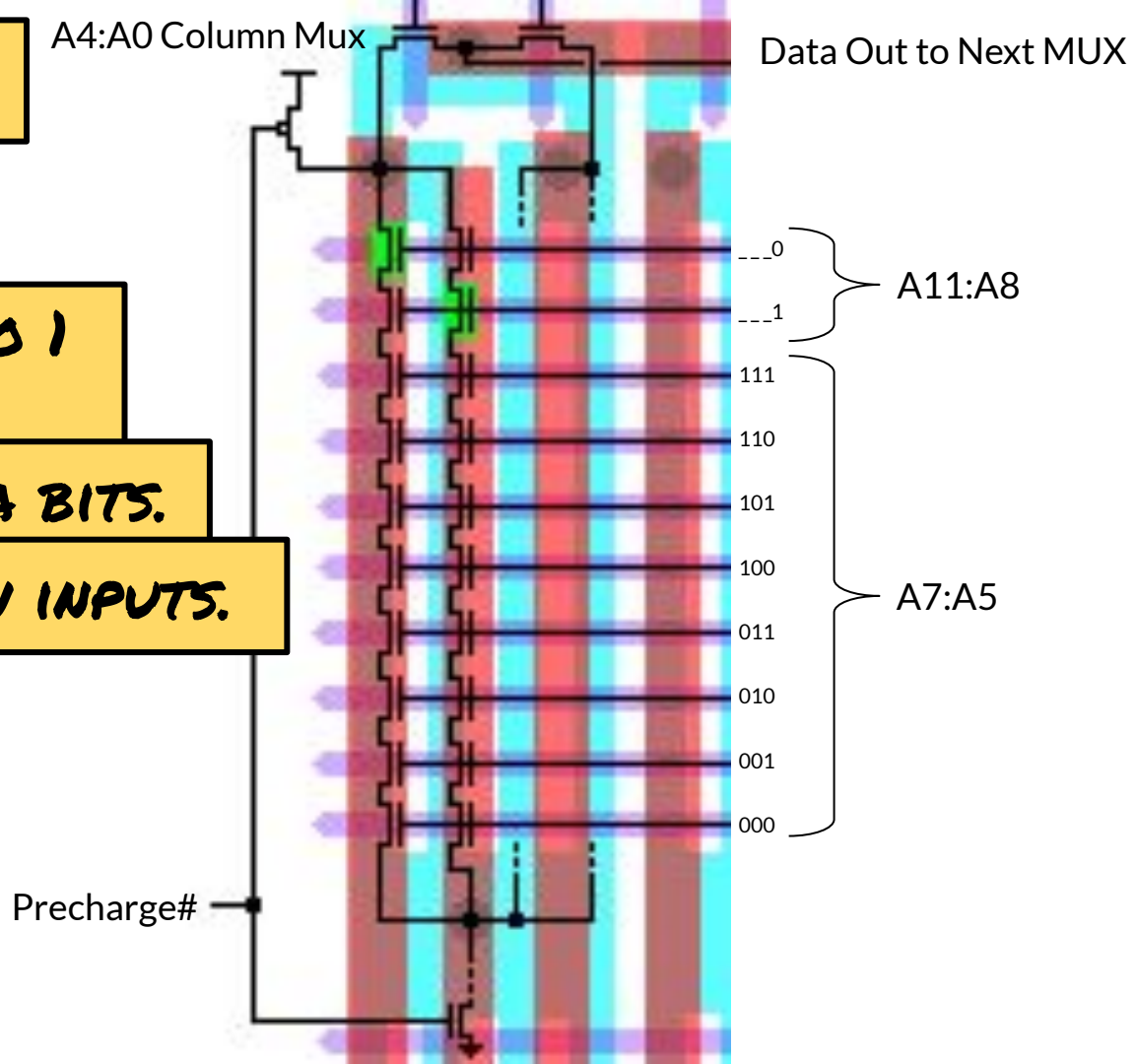
This is a NAND ROM.

64 columns MUX to 1 output data bit.

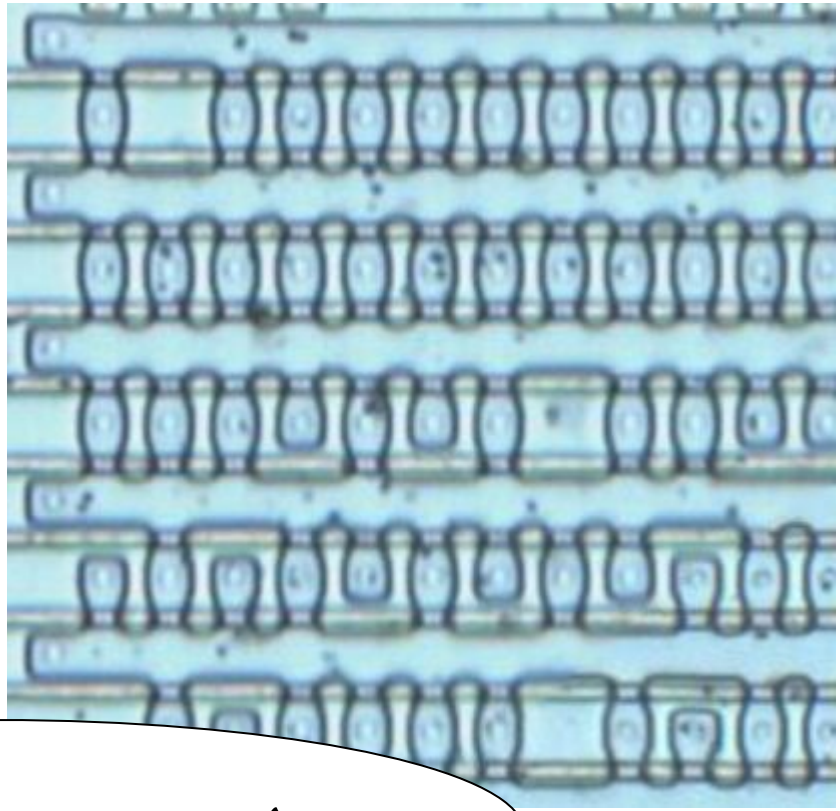
There are 8 data bits.

And there are 64 row inputs.

4096 bytes.

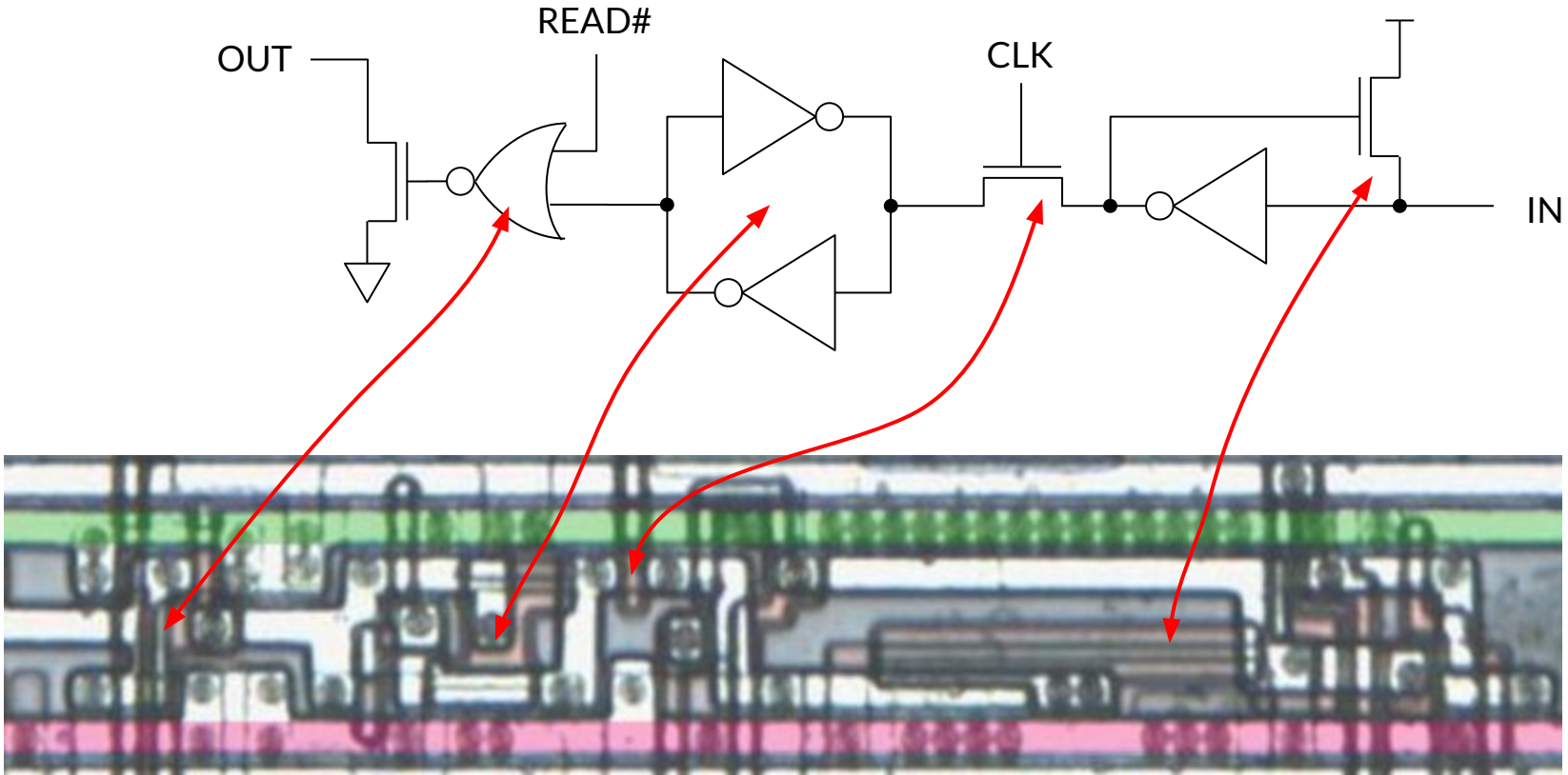


If only it was like the 8051's microcode ROM!



I can see the bits!

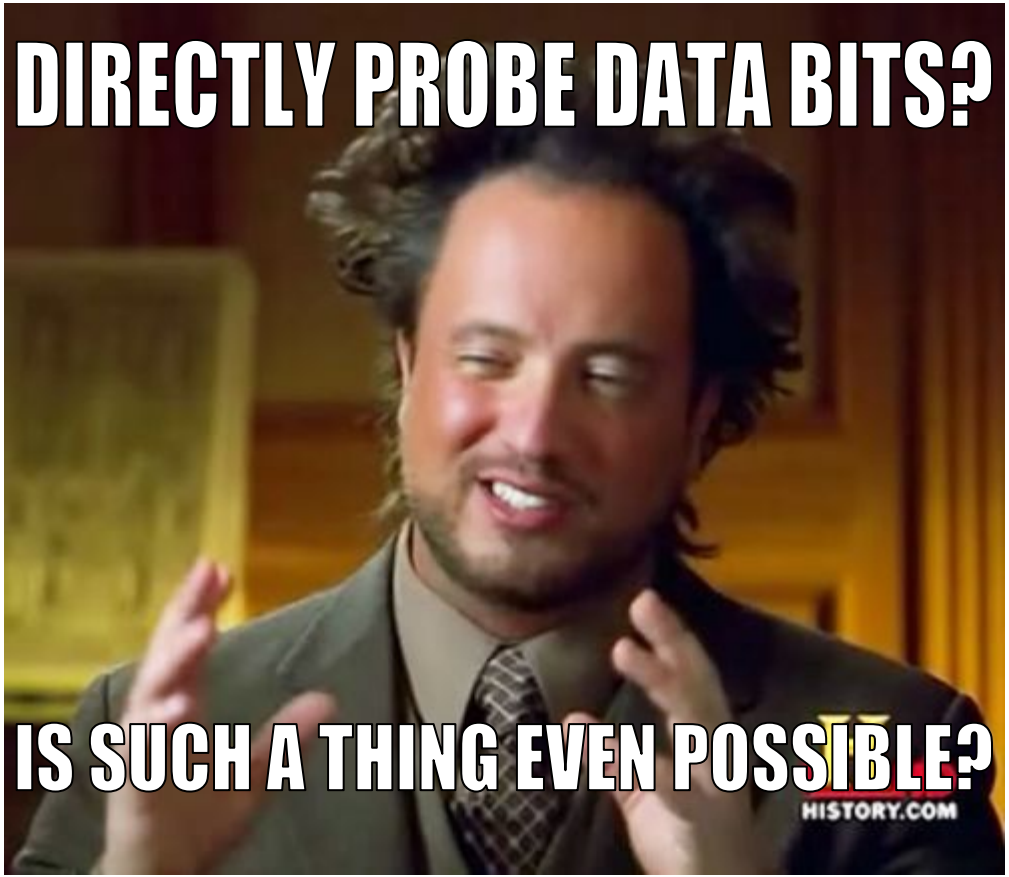
Anyway, this is the sense amplifier.

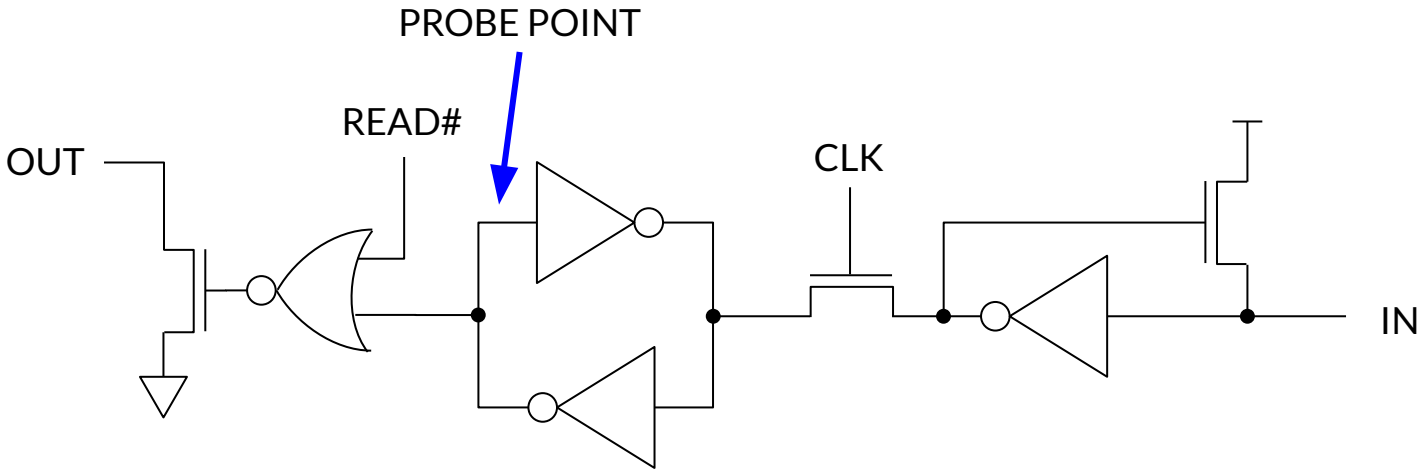


Turns out that the address lines **always** drive the ROM!

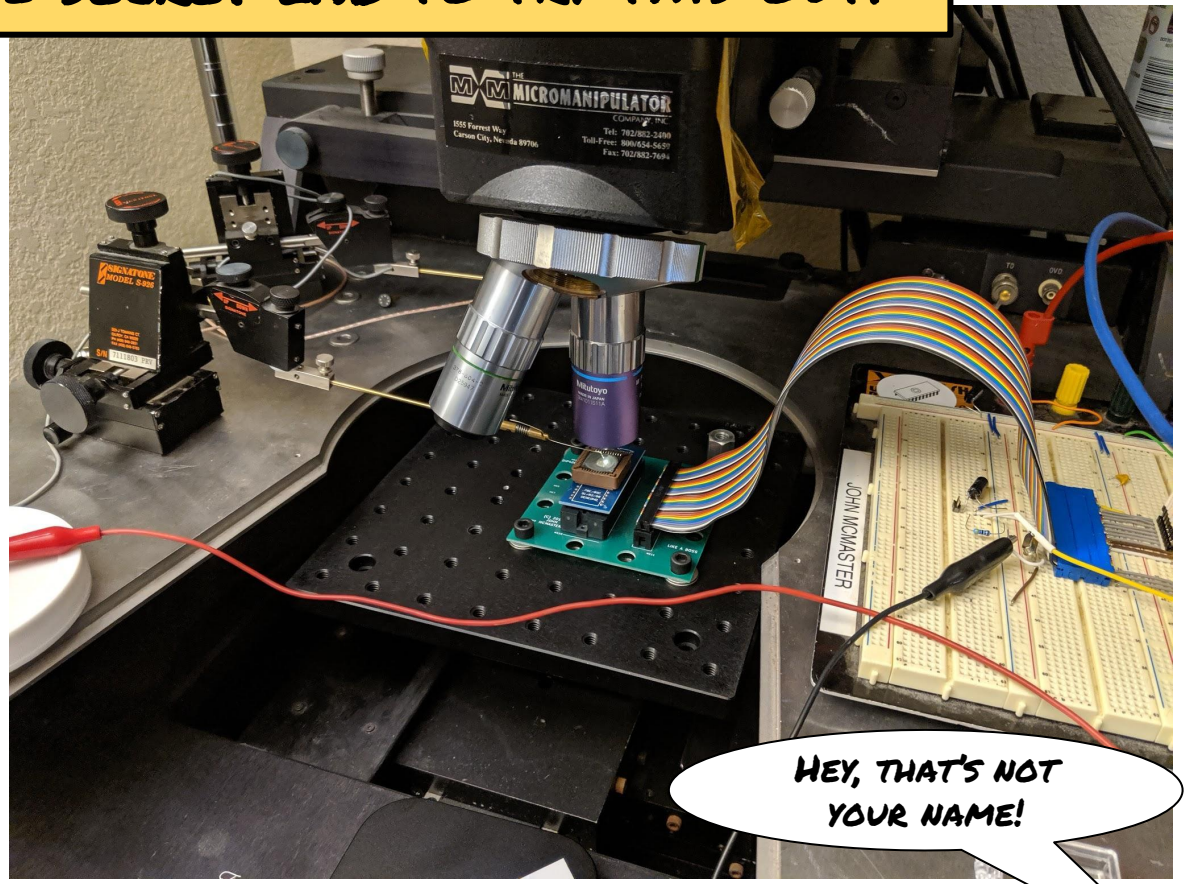
So if you put the 80C51 in external address mode and feed it NOPs...

Yes, it counts up through all possible addresses!

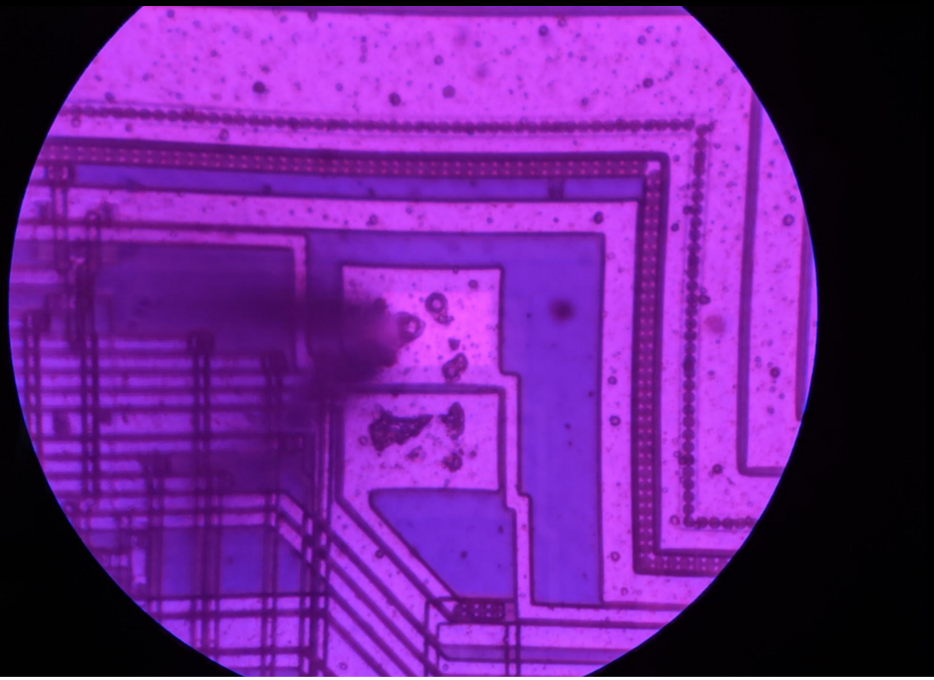

DIRECTLY PROBE DATA BITS?
IS SUCH A THING EVEN POSSIBLE?
HISTORY.COM


PROBE POINT
READ#
OUT
CLK
IN

Off to the secret lab to try this out!



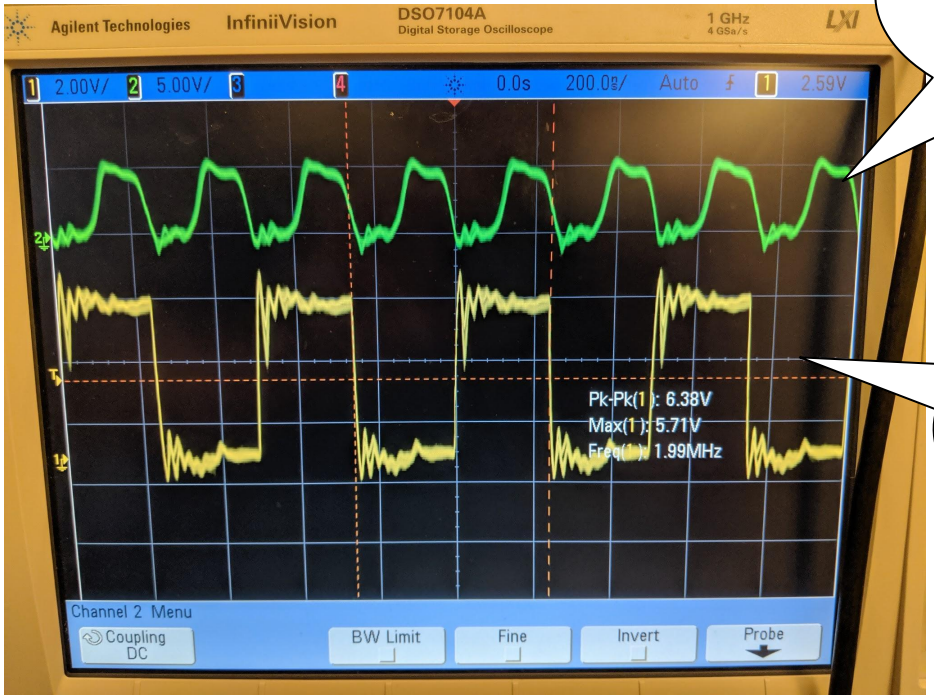
First, I practiced using a clock test pad.



The shadow is the probe tip!

The craters, punched with a laser, expose the top metal to the probe.

Success!

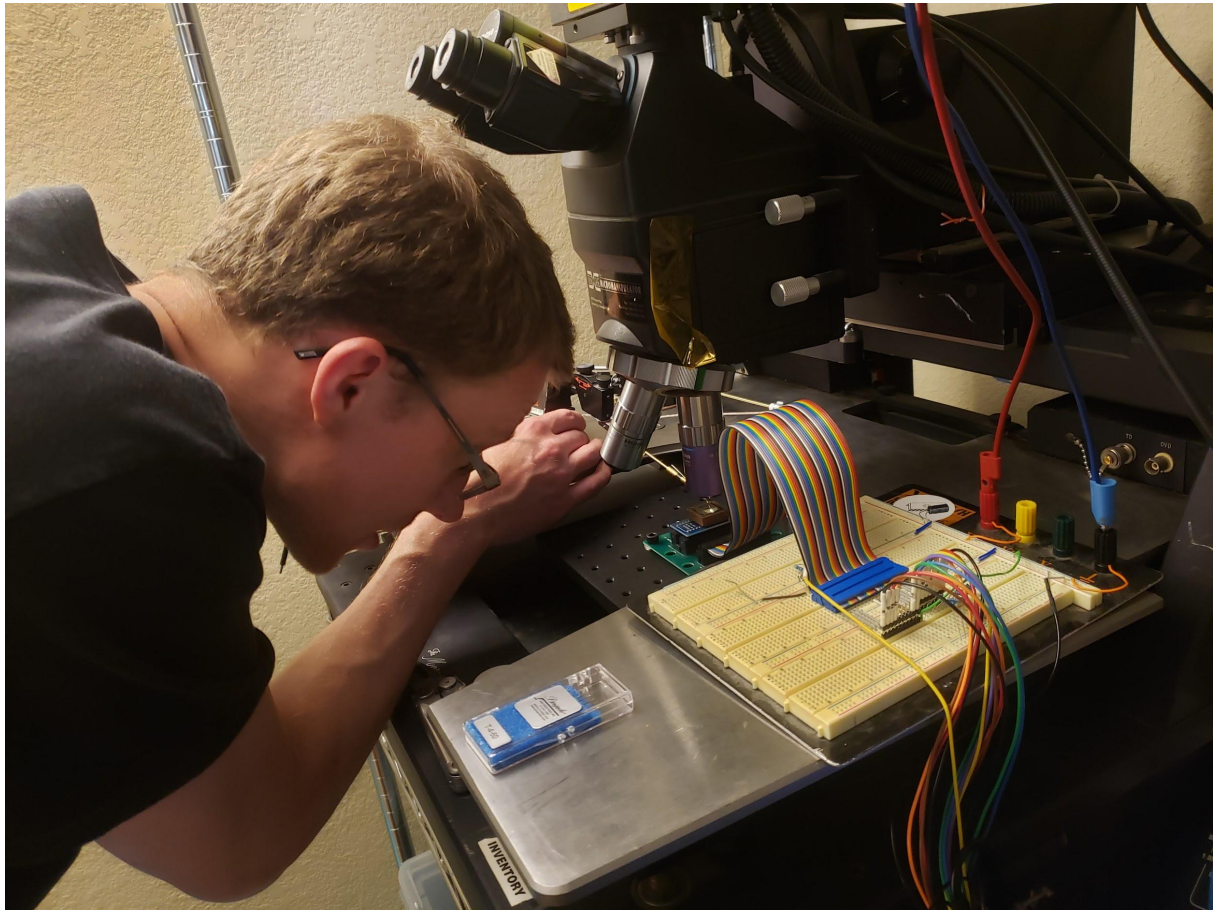


External clock

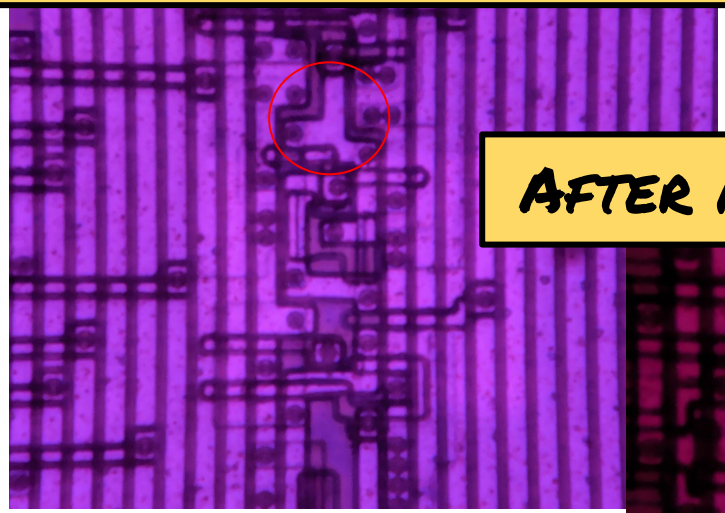
Internal clock phase


Sorry to interrupt, but aren't these tungsten probes tiny?
They're thinner than a human hair!

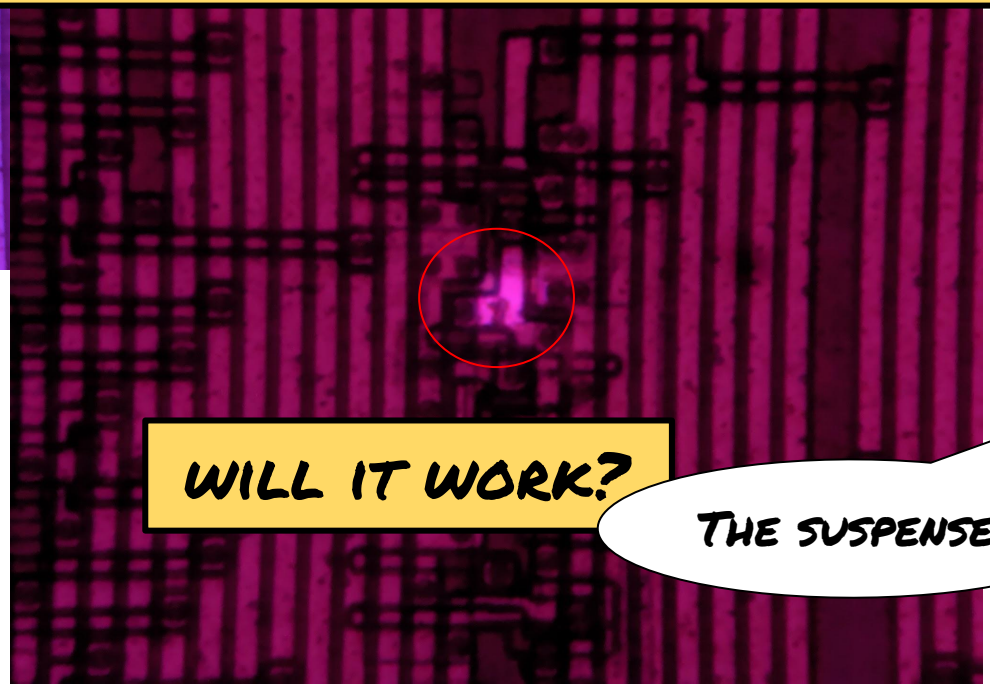
Time to reposition over a data bit!



Here's a ROM bit output.

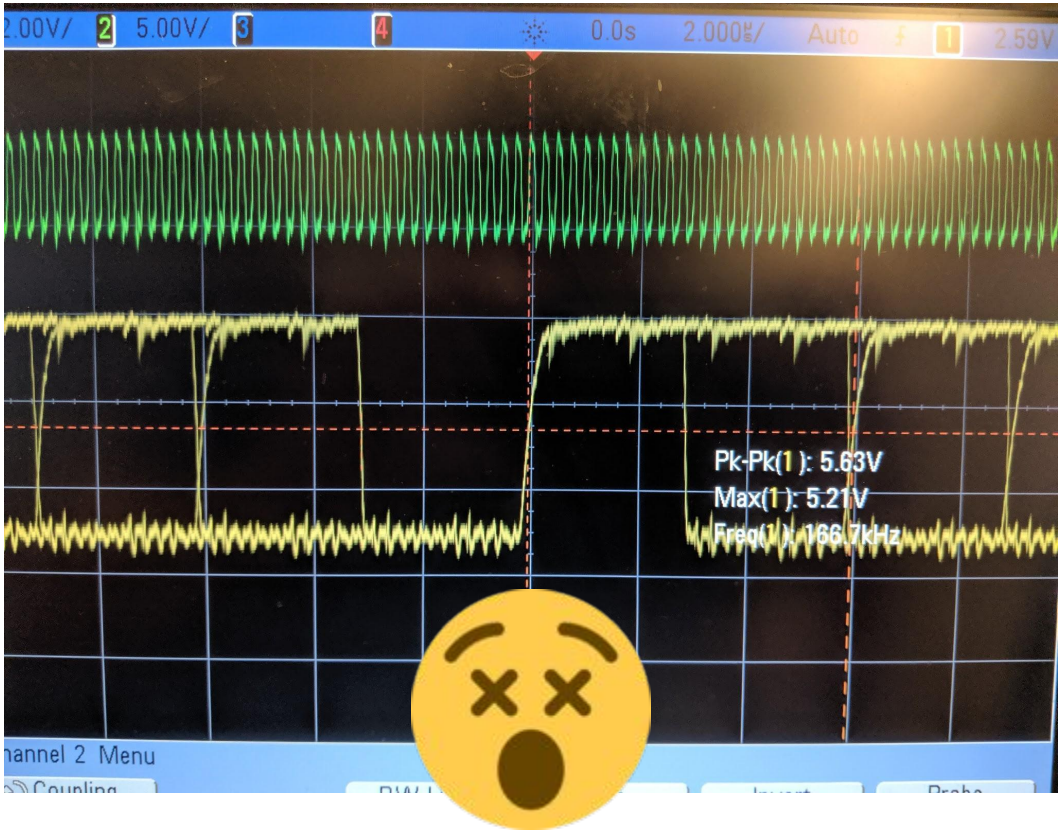


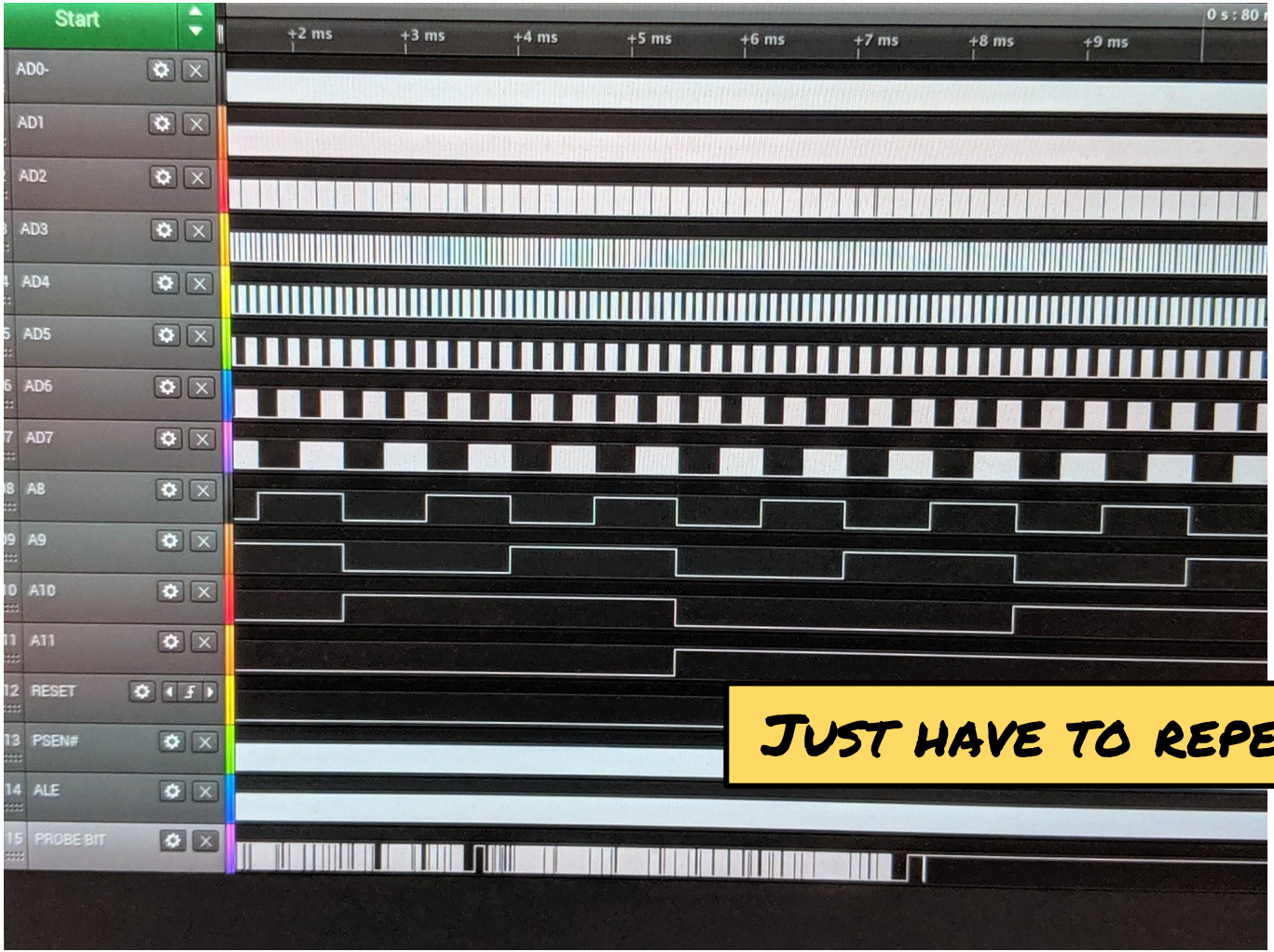
After making a hole with the laser.



Will it work?

The suspense!


2.00V/ 2 5.00V/ 3 4 0.0s 2.000µ/ Auto 1 2.59V
Pk-Pk(1): 5.63V
Max(1): 5.21V
Freq(1): 166.7kHz
hannel 2 Menu
Coupling
Invert
Probe



Address Pins

JUST HAVE TO REPEAT THIS 7 TIMES!

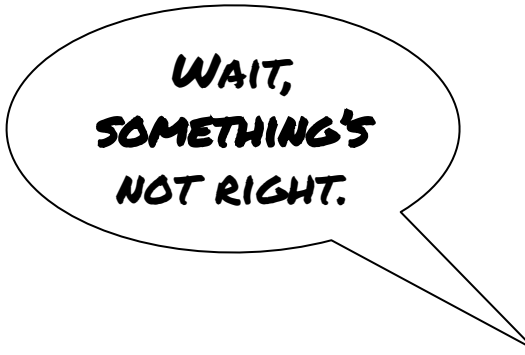
A data bit!

A crappy Python program turned this...

```
Time[s], AD0-, AD1, AD2, AD3, AD4, AD5, AD6, AD7, A8, A9, A10, A11, RESET, PSEN#, ALE, PROBE BIT
-0.100000000000000, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
-0.000064950000000, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1
-0.000064940000000, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0.000000000000000, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0
0.000000010000000, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0.000032450000000, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1
0.000032460000000, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0.000064910000000, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1
0.000064920000000, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0
```

Into this...

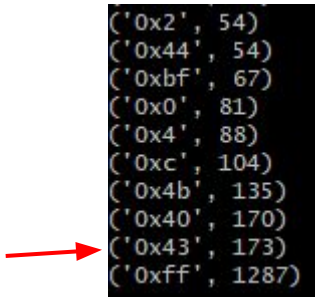
```
80 BF 51 09 44 C2 F2 0A 9A 4A 92 E2 12 2A 14 C2  €¿Q.DÂò.šJ'â.*.Â
94 04 C2 4A A2 82 2A 92 6A A2 04 2A A2 C2 12 72  ".ÂJ¢,*'j¢.*¢Â.r
F2 32 F2 E2 9A 04 0A 2A A2 74 04 32 2A 22 74 04  ò2òâš..*¢t.2*"t.
14 8C 9C 9C 8C 94 04 97 A7 5F CF 1F C7 B7 47 7F  .ŒœœŒ".—§_Ï.Ç·G.
41 97 C1 51 97 1F F7 D7 7F C7 3F F7 51 7F F7 97  A—ÁQ—.÷×.Ç?÷Q.÷—
47 27 A7 67 A7 B7 CF 51 5F 7F F7 21 51 67 7F 77  G'§g§·ÏQ_.÷!Qg.w
21 51 41 D9 C9 49 C9 C1 40 40 FF FF FF FF FF FF  !QAÙÉIÉÁ@@ÿÿÿÿÿÿ
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ
```

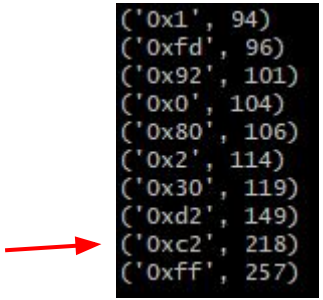


Hmm, wrong bit order?

Time for a quick pop count.

(80C51 reference binary)



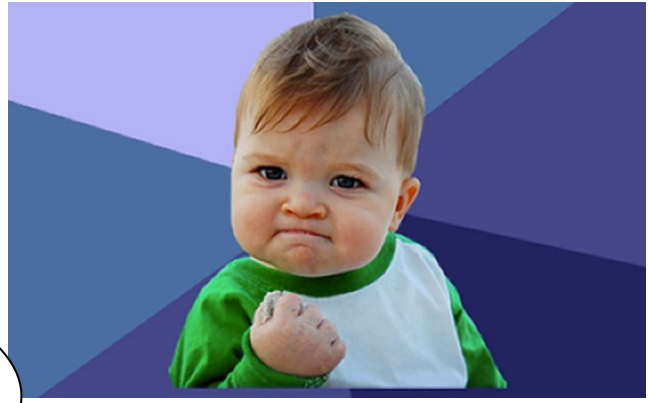


0x43 = 0100 0011

0xc2 = 1100 0010

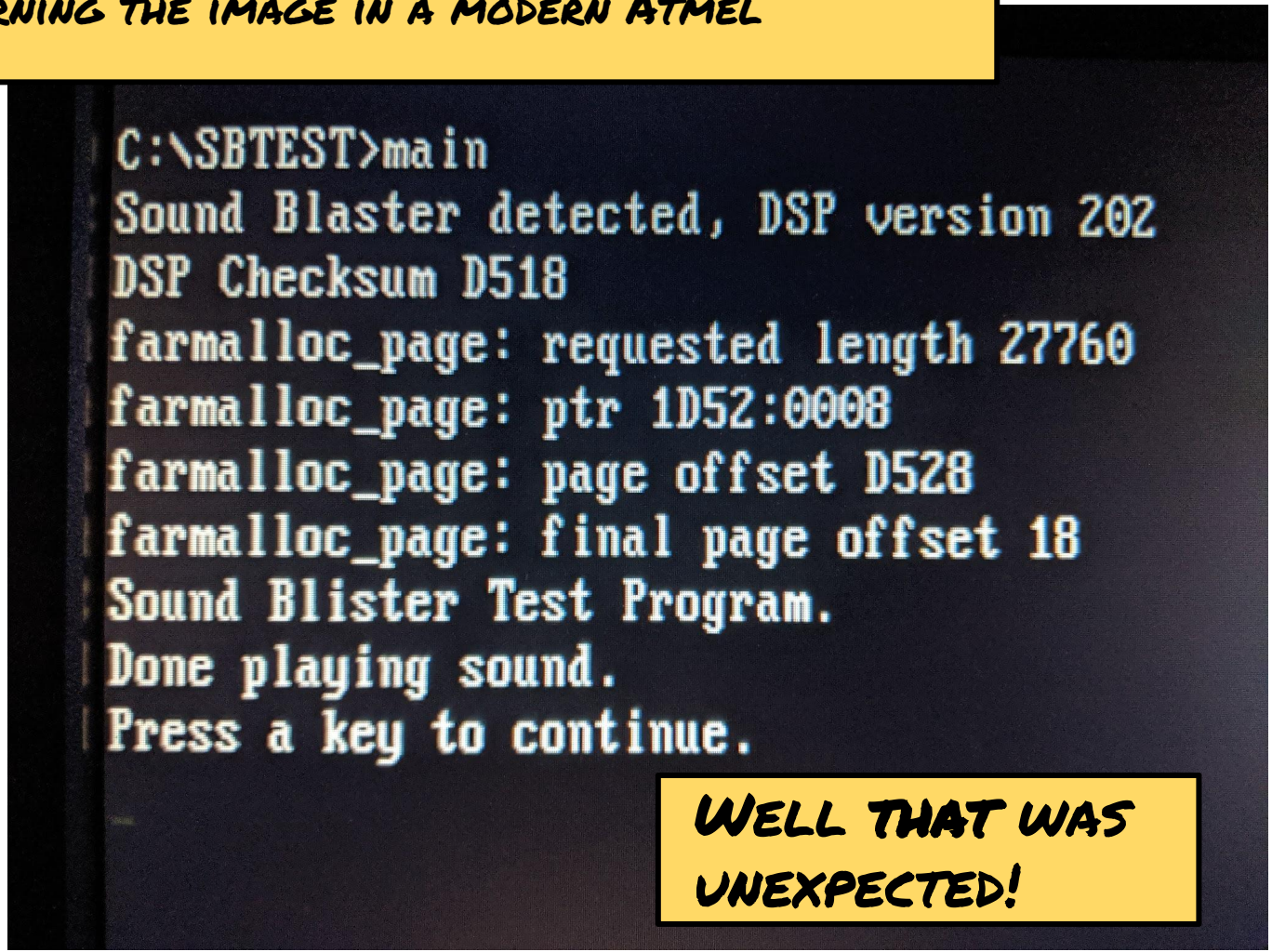
Haha, you got the bit order reversed!

```
FD 8A 90 22 43 4F 50 59 52 49 47 48 54 28 43 29  ýŠ."COPYRIGHT(C)
20 43 52 45 41 54 49 56 45 20 54 45 43 48 4E 4F   CREATIVE TECHNO
4C 4F 47 59 20 50 54 45 2E 20 4C 54 44 2E 20 28  LOGY PTE. LTD. (
31 39 39 31 29 20 E9 E5 FA F3 F8 E3 ED E2 FE 82  1991) éåúóøãíâþ,
E9 83 8A E9 F8 EF EB FE E3 FC EF 8A FE EF E9 E2  éƒŠéøïëþãüïŠþïéâ
E4 E5 E6 E5 ED F3 8A FA FE EF 84 8A E6 FE EE 84  äåæåíóŠúþï„Šæþî„
8A 82 9B 93 92 93 83 02 02 FF FF FF FF FF FF FF  Š‚›“'“ƒ..ÿÿÿÿÿÿÿ
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ
FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF  ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ
```



That's cool, but does it work?

After burning the image in a modern Atmel AT89S51...



I've got some disassembly to do!

```
X03cb:  setb    int1
        setb    pt0
        mov     sp,#30h
X03d2:  clr     t1
        setb    t0
        setb    wr
        setb    rd
        mov     scon,#42h
        mov     th1,#0feh
        mov     tl1,#0feh
        mov     tmod,#22h
        mov     pcon,#80h
        setb    tr1
        setb    ren
        mov     a,#34h
        cjne    a,2eh,X0408
        mov     a,#12h
        cjne    a,2fh,X0408
        mov     2eh,#0
        mov     2fh,#0
        jnb     23h.0,X042b
        mov     p1,#80h
        clr     p2.0
        ljmp    X042b
```

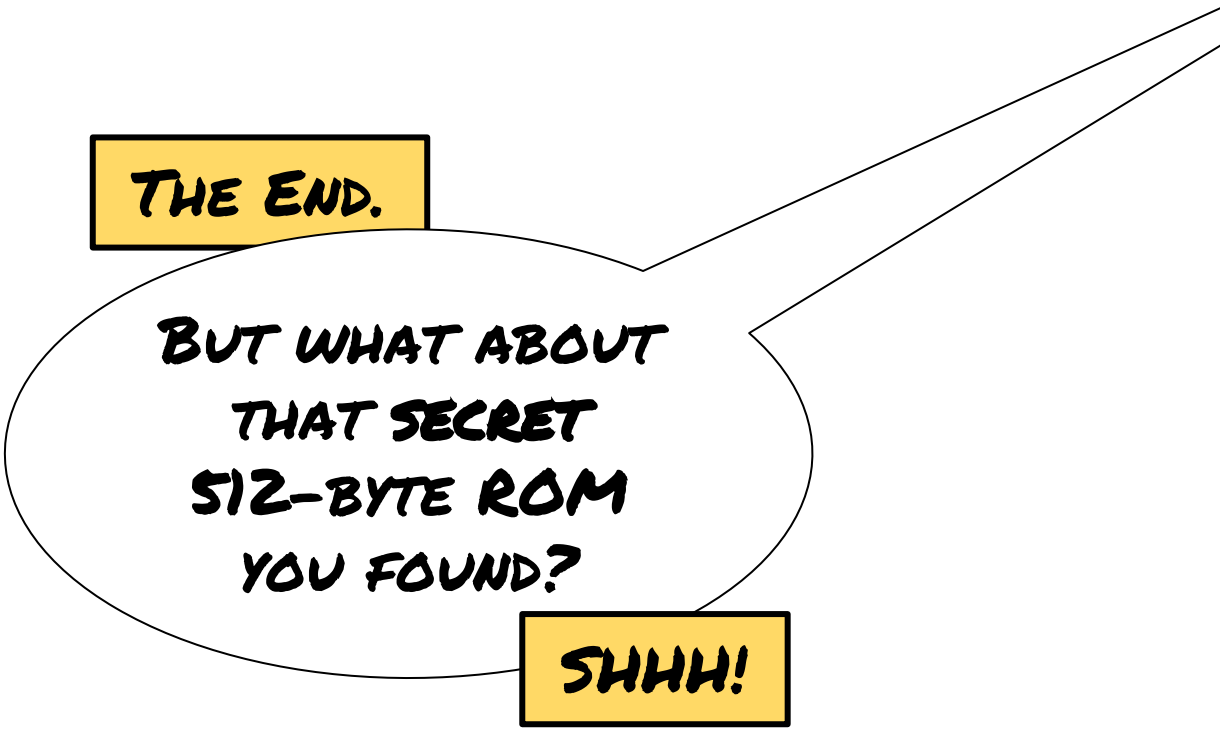
I found some things!

Seven previously unknown DSP commands

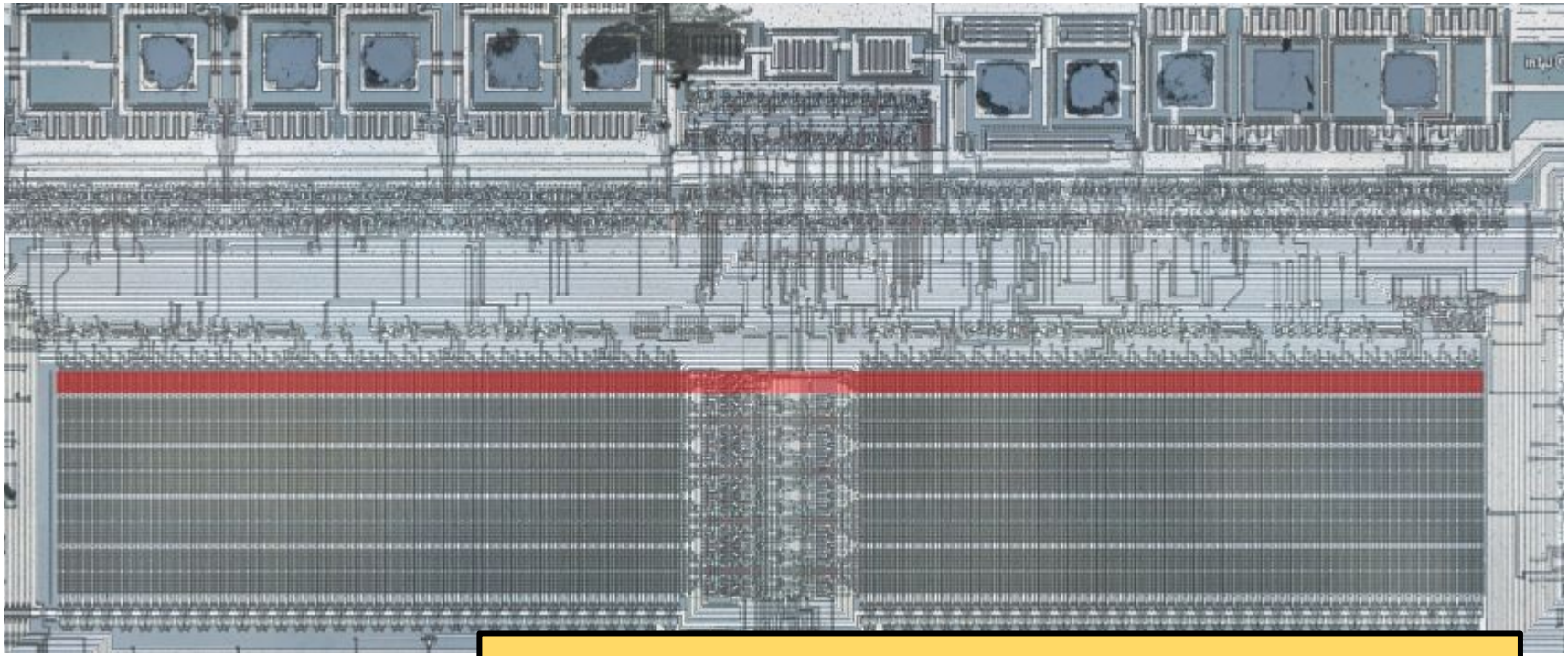
A "Playback from SRAM" mode that doesn't use DMA!

Remnants of some sort of ADPCM lookup table

Someday you need to release that binary!


THE END.
BUT WHAT ABOUT THAT SECRET 512-BYTE ROM YOU FOUND?
SHHH!

Yeah so I found 512 extra bytes.

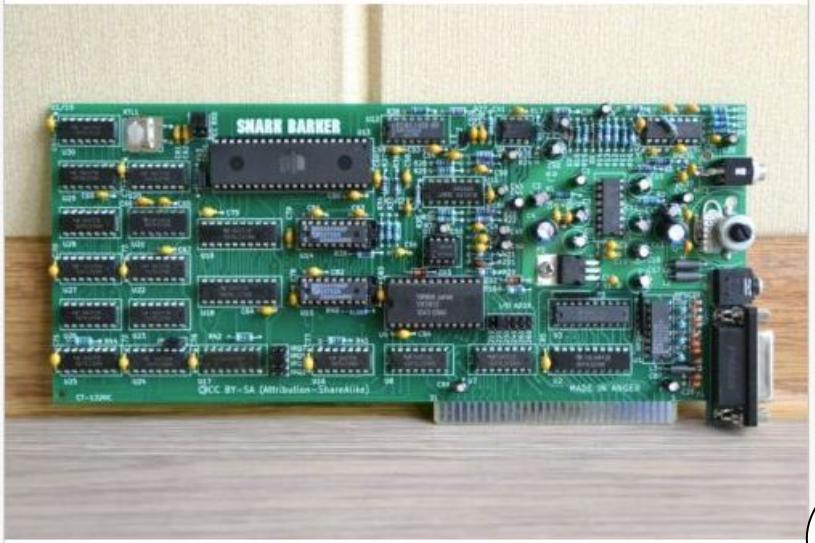


They can be muxed in place of the user ROM. That's all I know!

Meanwhile...

Someone's selling a Snark Barker!

Back to search results | Listed in category: Computers/Tablets & Networking > Vintage Comp...



Replica Rare Creative Sound Blaster 1.0 CT1320A ISA 8-Bit Sound Card

1 viewed per hour

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Best Offer:

WAT.

...een Mon. Jun. 3 and Fri. Jun. 14

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Any questions?

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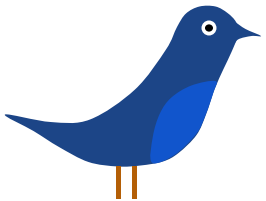
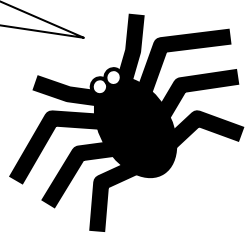
http://tubetime.us





Bonus Slides!

SOUND WARS

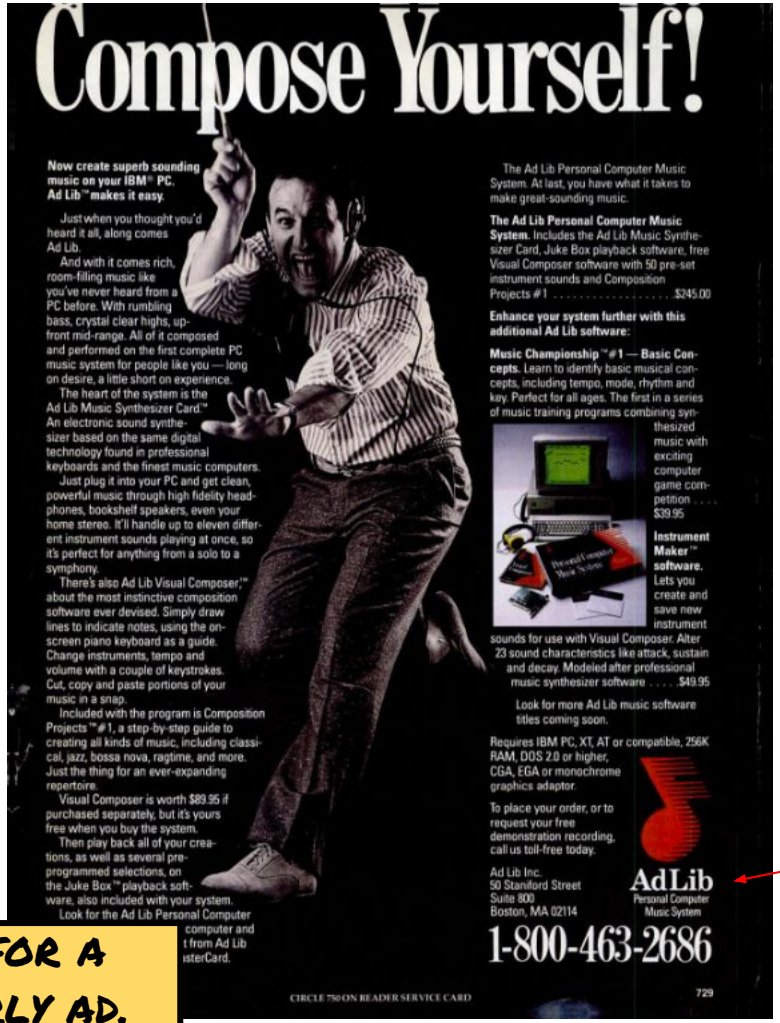
It is a period of sonic war.

Ad Lib and Creative Labs

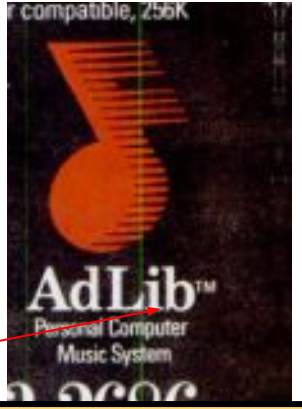
introduce their cards at the

same time: th

Early AdLib ad, October 1987



$245 Price



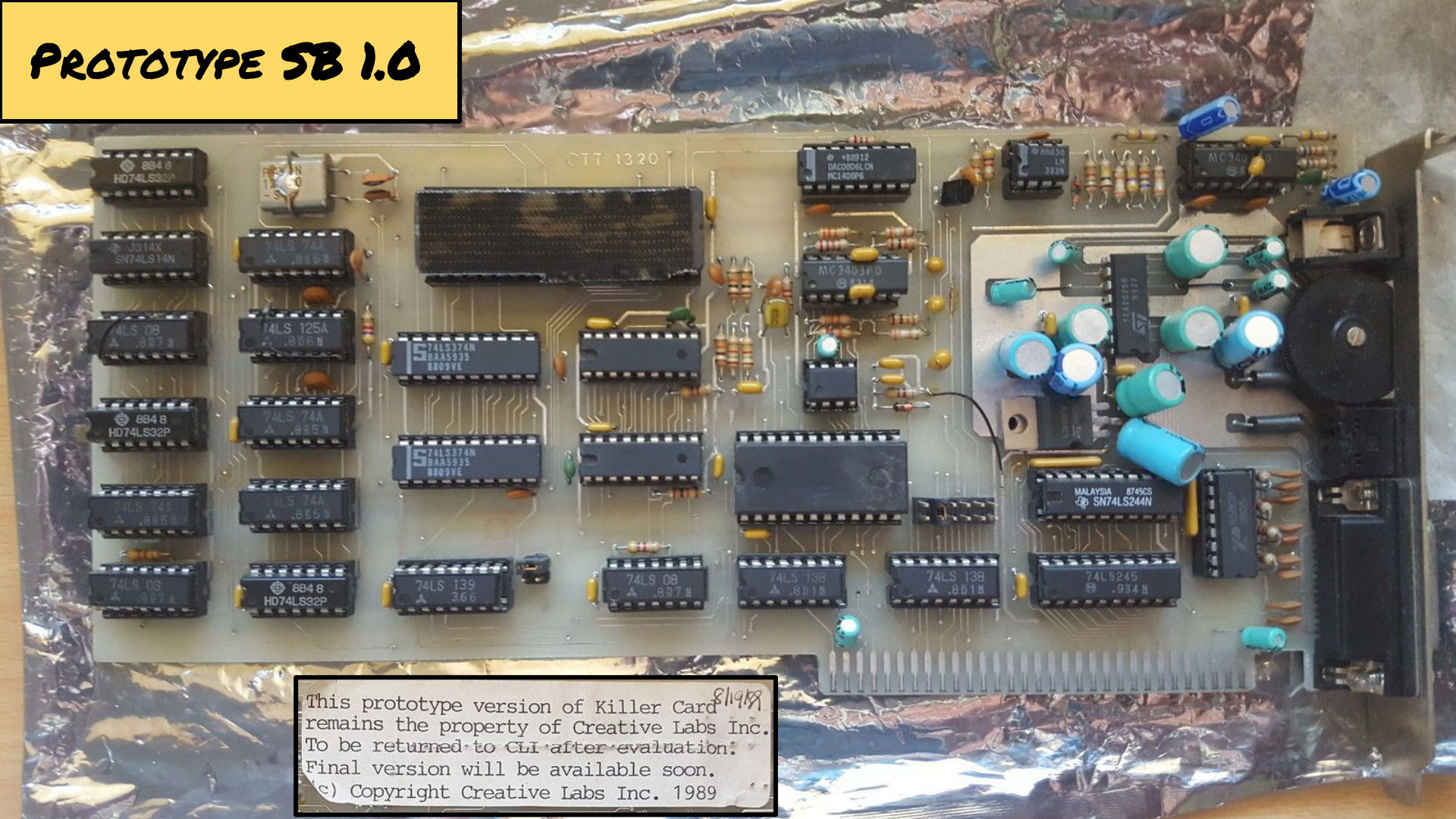
(Later ad.)

They hadn't yet filed for a trademark in this early ad.

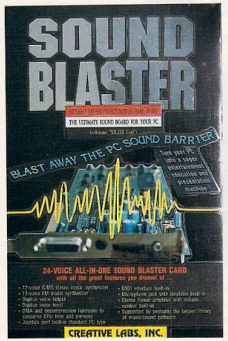
The Creative Music System was Creative's first product, introduced in August 1987.

Radio Shack later sold it as the Game Blaster.

Prototype SB 1.0



ENTERTAINMENT



BLAST THE PC SOUND BARRIER WITH THIS CREATIVE CARD

COMPUTE! CHOICE

RICHARD C. LEINECKER

And now a moment of silence for the PC sound critics. With Creative Lab's Sound Blaster card, IBM-compatible computers have taken the lead in sound and music for personal computers. This single board replaces your PC's beep with 24 separate voices: Eleven of those voices offer 100-percent compatibility with software designed for the Ad Lib music card; 12 are compatible with Creative Labs' Game Blaster software; and the remaining voice replays digitized sound. All these features on one card would be enough to satisfy anyone looking for a dynamite PC sound card, but there's much more.

If your PC setup looks like a kitchen in an Italian eatery, with spaghetti wiring drooping to the floor, you'll appreciate the card's built-in amplifier. It eliminates the need for an external amp and the related wires, cords, and cables. The company has also squeezed a microphone jack (for recording digitized sound) and a MIDI interface onto the back of the card. Rounding out the long list of extras is a joystick port—a real boon for gamers.

Inserting the card into your PC is easy if you carefully follow the simple installation instructions. The Sound Blaster prototype I worked with took me just five minutes to install. (Straight from Singapore, it was one of the first in the country, and there were still some temporary wire bridges visible.) Once I had positioned the card, I was ready to take it for a test drive. Because I suffer from the common "manual-aversion" disease, I opted for an immediate acid test: running the opening of *Space Quest III*. I've listened to this Sierra soundtrack many times on both my Roland MT-32 and Ad Lib cards, and I knew the Sound Blaster would have to live up to some pretty powerful hype. It did.

My speakers aren't the traditional Bose models heard at trade-show demonstrations, but what I got from my setup was extraordinary. None of the aesthetics of a full-blown movie score were lost. Rich, full bass voices laid down the fundamental lines, while instruments thick with harmonics and subtle sonorities wove an accompanying fabric. Energetic percussion drove with impending direction, and exciting melodies came out clearly above it all.

Spurred on by my success, I pulled out every game I had with Ad Lib or Game Blaster sound support. Several were downright disappointing; they sounded like my seven-year-old 8-bit computer. Others, thankfully, had sound as superb as *Space Quest III*. I hope that programmers who support the enhanced sound devices of this card do so to the maximum extent; otherwise they're selling short.

Satisfied with the card's performance with commercial entertainment packages, I went on to explore the Sound Blaster's music-composition attributes using the company's Creative Music System (CMS) software designed especially for the Game Blaster card. Although the hardware capability is present, the CMS package isn't very sophisticated with respect to instrument timbre; however, the aural effect was still quite good. I switched over to Ad Lib's *Visual Composer* and, in minutes, had created superb-sounding charts.

Phillips screwdriver in hand, I spent the next several hours swapping cards and comparing them. Besides perhaps setting a new speed record for installing cards, I came to respect the Sound Blaster as a true breakthrough for the PC. The Roland MT-32 definitely has an edge (and a much higher price tag), but not so the Ad Lib and Game Blaster cards.

Thanks to well-planned hardware compatibility, Ad Lib and CMS software provide a large library of available software. But even better is the fact that programs can now simultaneously combine the 11 Ad Lib voices, the 12 CMS voices, and a digitized component for some terrific audio. Creative Labs aptly illustrated these possibilities on several demos it supplied with the card.

The first demo raised a voice from my computer: "You ain't seen nothing yet. You ain't heard nothing yet," it repeated. Behind the words an increasing fervor grew, with music and arcade-style sounds mirroring the action of graphics images. (The rotating spaceships were amateurish, but they did get the point across.) This particular demo used all 24 voices, and although the music and sound effects were simple in nature, the overall effect was impressive.

Use Creative Labs' *Intelligent Organ* to accompany your melody with chords.

Another demo animated a lip-syncing parrot with digitized sound. A human voice sped up to simulate a parrot's voice provided a glimpse of the card's audiovisual potential. Another digitized demo had two recordings on disk that sounded as good as my stereo and allowed me to change the replay rate and create vastly different effects. The playback quality rivaled any digitized sound I've heard on other personal computers.

A disk of sound effects completed my orientation to the Sound Blaster. Gongs, cars, and brooks accompanied animated graphics.

Aside from its impressive software demonstration, Creative Labs has gone the last mile toward maximizing hardware performance. Not only do the Ad Lib and CMS voices operate as always, but a direct memory access (DMA) chip relieves the processor (for the most part) from the overhead of updating registers from the buffer. Translated, that means your computer can play music and make sounds without slowing down other processing tasks. While your computer runs an application, the DMA chip goes directly to memory and fetches the data. The DMA chip works effectively with digitized data, too.

Recording (or sampling) digitized sound on the Sound Blaster is easy. Just plug in an audio signal (a microphone, stereo, or tape player, for example) and then start and stop the recording from a menu in the card's Voice Kit software. Of course you can't store more data than you have memory for. After you've finished, simply tell the software to replay what you've stored. You can also save your recording to disk.

The Voice Kit program let me digitize at a variety of speeds ranging from 5 to 13 kilohertz (kHz). The hardware itself can sample at rates from 4 to 25 kHz, but the demo software didn't utilize the full range. Less memory is used at the slower speeds, but quality suffers; at the higher speeds the opposite is true—more memory is consumed and the quality is much better. I found, however, that the playback sounded good even at slower speeds. I also created some very interesting effects by speeding up and slowing down the playback speed.

By including hardware-based compression handling, the card's designers are able to save on the amount of memory you need to compose and record. Just how much memory does digitized sound use? At a 5-kHz sampling rate, 64K is eaten up in about 13 seconds. If you maximally compress this, then about 26 seconds' worth of sound data will fit in 64K. You can see how sampling sounds soon fills memory and disk space. Many games that boast digitized sounds optimize by using sounds at different speeds for different effects, which saves considerably on disk space and RAM requirements.

The Sound Blaster has two different types of compression: One packs 50 percent more data into memory with a moderate effect on quality, and the other stores 100 percent more information into memory with a greater effect on quality. Because

An animated parrot shows off Sound Blaster's audiovisual potential.

packing your data significantly affects the sound, you might not want to compress your grand masterpiece.

The sound cababilities are enough to put this card with the leaders of the pack, but its added game port is a great bonus. My PC joystick worked fine; I didn't have any compatibility problems. Price a game card sometime and you'll see the value this one feature adds to the card.

The MIDI interface isn't as easy to use as the joystick port, but its inclusion reflects the serious intent Creative Labs has for offering a single product for a variety of uses. In order to plug in your MIDI instruments, you'll first have to get a special MIDI box from the manufacturer. The box plugs into the card's joystick port. (There's a joystick port on the box itself, so you don't lose the game-control feature.) On the box there are one MIDI-in and three MIDI-out receptacles, making it more useful than the single-plug capacity that I had anticipated.

One other caveat with respect to the card's MIDI capabilities: If you have MIDI software, it won't work with the Sound Blaster. The company is currently trying to standardize MIDI input and output for all software, but until that happens, be advised of this limitation.

A great enhancement to PC sound, with Ad Lib and Game Blaster compatibility, Sound Blaster is wonderful. But when will commercial software take advantage of all that the card has to offer? That's hard to guess, but Creative Labs is doing an admirable job of facilitating developers.

Technical information is readily available for programmers who want to support the card. Creative Labs makes a driver available free of charge. Further, the company can provide an object module for integration into programs where the extra driver file is undesirable.

There are several reasons for such strong company support. Most obvious is the anticipated profits from wide acceptance of the product. Second, Creative Labs claims it wants to achieve a set of compatibility standards for PC sound that will make things easier for everyone—developers and consumers alike. We can only hope that such a standard will arrive in time to prevent the many divergent paths that other PC peripherals and cards have experienced.

Although tools exist for the creation of data files for Ad Lib, Game Blaster, and digitized sounds, there's no single integrated tool for all three. I wish Creative Labs had taken care of this one detail.

With solid support from Creative Labs, developers should soon be writing programs that take advantage of the card. A representative from Sierra told me that the company plans on supporting the card with its new releases. That's good news from one company, and good news for consumers if other companies follow suit.

There is life after games, of course, and the Sound Blaster lends itself to those applications quite well. For education, hypermedia, and aid to the handicapped, new sound capabilities for the PC are a welcome and sorely needed addition. Packages like Optimum Resource's *The New Talking Sticky Bear Alphabet* inspire children to learn. With the availability of the Sound Blaster, your PC can become an effective educational tool on par with the best in the business—provided software companies make the effort to develop supportive programs.

In business and in education, hypermedia presentations that incorporate sound and graphics can become a powerful demonstration of the PC's effectiveness. In addition, speech and advanced sound enhances the PC's usefulness for the disabled.

The Sound Blaster accentuates the attractiveness of its features with a reasonable, if not groundbreaking, price. Listed at $239, the card could be discounted to under $200 by larger computer retail outlets. If you were to total the retail prices for the separate components, the advantage of this one-card solution becomes clear: Ad Lib card, $195; Game Blaster card, $130; joystick port, $40; MIDI interface, $200; digitizer, $90. The sum is $655, almost $420 over the price of the Sound Blaster, which includes all of these features.

Add to that the software that Creative Labs plans to bundle with the card (*Intelligent Organ*, the talking-parrot demo, and the Voice Kit), and a Sound Blaster purchase is even harder to resist. About the only accessories that you'll have to buy are a microphone for recording and the MIDI box, if that's your interest.

A company representative has said that Game Blaster owners will be able to upgrade to the Sound Blaster for $100 and the return of their Game Blaster card. Such a generous upgrade plan will go a long way toward establishing Sound Blaster in the market.

If you want to pursue avenues that require good-quality speech and sound from your PC, whether it be recreation, education, or productivity (such as desktop presentations with sychronized sound), then this one card can quite capably meet all those requirements. For PCs, old beep and boop just got their walking papers.

Sound Blaster
IBM PCs and compatibles—$239.00
MIDI Box—$49.95

CREATIVE LABS
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NOTE THE PROTOTYPE CARD IN THIS DECEMBER 1989 ARTICLE IN COMPUTE!

OOOH, IT'S THE TALKING PARROT!

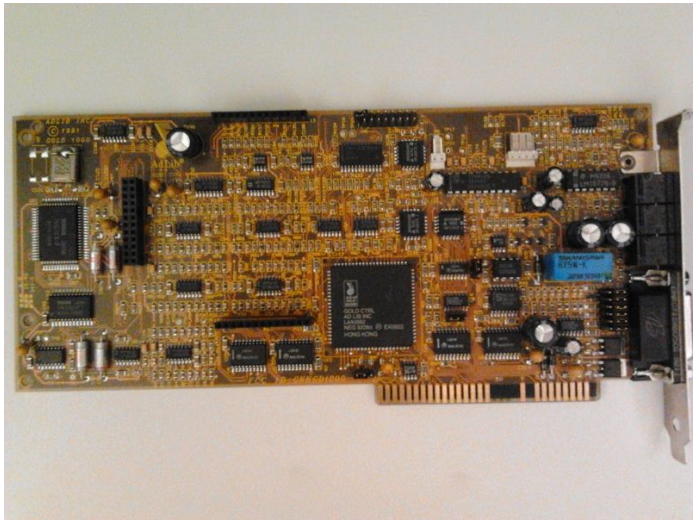
SB ad from October 1990.

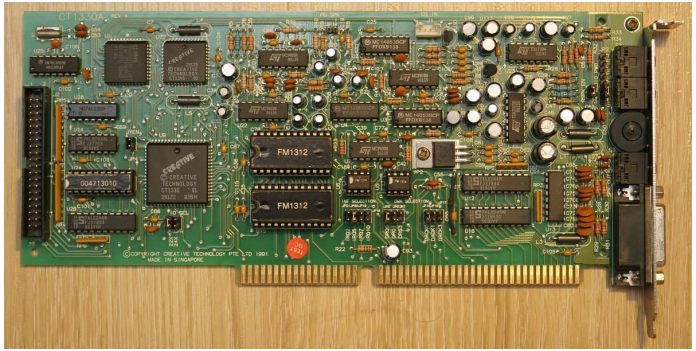
$240 price.

But they paid you $100 for your old Ad Lib card!

By December, the price had fallen to $179!

While Ad Lib struggled to design the Ad Lib Gold, a sound card with advanced digital capabilities...





...Creative Labs was already selling the Sound Blaster Pro which could connect to a CD-ROM drive!

Creative Labs used three important factors to win the market:

Price.

Value.

Software support.