Twitter Thread by Tube Time

Tube Time
@TubeTimeUS

Tube Time: a 2020 retrospective ■

i started off the year by releasing a new Micro Channel sound card, the Plaid Bib CPLD edition. little did i know that this would not be the only sound card i would release this year.
https://t.co/kE88lL24ik

> i'm happy to announce a new sound card clone, the Plaid Bib CPLD Edition! this is a version of the Ad Lib clone I designed for MCA bus machines, now with a CPLD instead of the hard-to-find bus interface chip: https://t.co/UCi1vT4QyD

> happy new year! \U0001f600 pic.twitter.com/aUPrtFhwh5
>
> — Tube Time (@TubeTimeUS) January 9, 2020

later, i took apart my apple II and found a capacitor inside. and inside that through-hole capacitor, i found a tiny surface mount capacitor!
https://t.co/4t9b7SYaqQ

> so i took apart this axial-lead ceramic capacitor and found a tiny 0805 surface mount capacitor inside!
>
> (i put a regular 0805 next to it for scale.) pic.twitter.com/JfY73fYO84
>
> — Tube Time (@TubeTimeUS) January 25, 2020

at my favorite electronics surplus store (the only one left in silicon valley!) i found an incredibly cute computer, and fixed it up and got it working.
https://t.co/3UMpCyfbPi

> whoa, what have we here? pic.twitter.com/aZSiEJnZe7
>
> — Tube Time (@TubeTimeUS) January 31, 2020

in february, i played with some tone reeds, an unusual electronic component. https://t.co/B68pFUbqep

> here's some unusual electrical components. these are tone reeds. they're used in older radio equipment, such as public safety radios and ham radios. they are used to send or receive CTCSS tones. let's take one apart! pic.twitter.com/rgWOvnv2VZ
>
> — Tube Time (@TubeTimeUS) February 2, 2020

also at the surplus store i bought a light pen and got it working! it's a really archaic input device that is seldom used now.
https://t.co/4SBR1Hx1JU

> this is a somewhat obscure computer input device called a "light pen." im going to try and get it working. (thread) pic.twitter.com/DIyGFk3mqm
>
> — Tube Time (@TubeTimeUS) February 9, 2020

i installed OS/2 2.1 (quite early!) on my PS/2 Model 50Z. it was a challenge that involved modifying memory SIMMs!
https://t.co/OXEYlbc6zo

> picked up an interesting SCSI card. it's not PCI, nor is it ISA. it is MCA, and it's gonna go into my PS/2 model 50Z! pic.twitter.com/AI9n0sn8VD
>
> — Tube Time (@TubeTimeUS) February 19, 2020

in march, i plugged the MOnSter 6502 into my AIM-65 and it worked!
https://t.co/k4i8gTxU2y

> this is a Rockwell AIM-65 computer. it uses a 6502 CPU. i wonder if i can swap out the 6502 with the MOnSter 6502...
> \U0001f9f5 pic.twitter.com/f6Zlv10aYB
>
> — Tube Time (@TubeTimeUS) March 6, 2020

sometimes it *really is* a hardware problem!
https://t.co/fRhlEy50NL

> it's not always a software problem.
> it's not always a hardware design problem.
>
> sometimes it's just a copper trace that broke and shorted against an adjacent trace and nobody noticed and then it got covered by solder mask. \U0001f602 pic.twitter.com/JTG9pkpiXW
>
> — Tube Time (@TubeTimeUS) March 9, 2020

i even did a cross section! wow, i ought to do more of these.
https://t.co/QM4NjztkDR

> it's been a while since i've done one of these! this is a cross section of an unusual thermistor in a glass package. pic.twitter.com/YkkJXhPPKQ
>
> — Tube Time (@TubeTimeUS) March 27, 2020

i explored how people simulated fields before software field solvers existed. fascinating stuff!
https://t.co/5suSD0Ahuy

> ever wonder how people simulated heat transfer, fluid flow, and electric fields before we had fast computers and advanced simulation software? pic.twitter.com/w7VKFbwbFd
>
> — Tube Time (@TubeTimeUS) March 29, 2020

while working on another project, i ran into some counterfeit chips. here's how to tell if your chip is fake.
https://t.co/MIJtlu4Be3

> these chips look innocent, but some have had their markings altered! here are some ways you can tell a chip\u2019s been re-marked. (\U0001f9f5) pic.twitter.com/D5sFXj1qQ1
>
> — Tube Time (@TubeTimeUS) March 31, 2020

in april, i investigated how the Vectrex produces text and graphics: https://t.co/aGQHwvU8S1

> let's talk about how the Vectrex renders text. \U0001f9f5 pic.twitter.com/DWhwOxJqw1
>
> — Tube Time (@TubeTimeUS) April 2, 2020

i discovered why the schematic symbol for a transistor looks the way it does. https://t.co/HEEEw6fZRt

> ever wonder why the schematic symbol of a bipolar transistor looks the way it does? the two angled lines look particularly odd, but there is a fascinating historical reason for it! \U0001f9f5 pic.twitter.com/85H7fOOtj0
>
> — Tube Time (@TubeTimeUS) April 11, 2020

also in april i tried to rick roll Archillect. https://t.co/qiH06IRRQ3

> oh hey I have one of those computers! take a close look at the screen... pic.twitter.com/EA2qngC4Ox
>
> — Tube Time (@TubeTimeUS) April 12, 2020

the big news in may was when i released the Scopetrex, an open source clone of the Vectrex game console that uses an oscilloscope as the display.
https://t.co/JV0SBjEdJw

> announcing the SCOPETREX -- the vector gaming console for your oscilloscope or XY monitor!
>
> ever wanted to buy a Vectrex, but can't afford the high prices on auction sites? well now you can build your own!
>
> full design files at https://t.co/hHAbFwwePE pic.twitter.com/gXCkW5w1YQ
>
> — Tube Time (@TubeTimeUS) May 7, 2020

oh almost forgot...in april i also bought a Fischertechnik robotics kit that came with a computer interface...for a Commodore 64!
https://t.co/7zqo1hNItp

> when I was a kid i badly wanted one of these Fischertechnik robotics kits. well, now I have one! pic.twitter.com/6Uk3ZsEStd
>
> — Tube Time (@TubeTimeUS) April 28, 2020

IBM made a PC expansion card with a prototyping area! i explored a few other obscure details about the joystick card.
https://t.co/BX9O2WzTPE

> here's something interesting: an official IBM game control adapter (IBM-speak for "joystick card"). it's got an unusual feature--actually several unusual features. \U0001f9f5 pic.twitter.com/m8peMEPHNr
>
> — Tube Time (@TubeTimeUS) May 8, 2020

talking about weird old IBM hardware, did you know that people wrote PC demos for the EGA graphics card? https://t.co/tij5KtsSXd

> here is an IBM EGA card from 1984. kinda boring, limited to 16 colors from a palette of 64...BUT did you know people wrote demos for it? pic.twitter.com/XWGEkUtp6Q
>
> — Tube Time (@TubeTimeUS) May 9, 2020

digging through my stuff, i found a keyboard keyswitch with a built-in transformer! https://t.co/nR6UgyHz3w

> now here is a very unusual keyboard keyswitch. let's examine it closely... pic.twitter.com/5gXndDqcoU
>
> — Tube Time (@TubeTimeUS) May 13, 2020

why do Amiga computers make a ticking sound while they're powered up? https://t.co/G8nS11ub4K

> you ever wonder why Amiga computers (from the 80s and 90s) have this weird tic? (\U0001f50a so you can hear it yourself.) turns out there's a really strange reason for it, and it has to do with their floppy drive. \U0001f9f5 pic.twitter.com/r3VZgFOcuk
>
> — Tube Time (@TubeTimeUS) May 13, 2020

that same computer came with twice as much memory as advertised! but why would they hide half the RAM? https://t.co/JPcdVjR29s

> nearly 35 years ago the Commodore Amiga 1000 shipped. it was sold with 256KB RAM, standard. not many know this, but Commodore secretly equipped it with 256KB of *additional* RAM that could not be used by programs! let's take apart this Amiga and find this secret RAM.\U0001f9f5 pic.twitter.com/7mlxsQ5t14
>
> — Tube Time (@TubeTimeUS) May 14, 2020

june rolls around, and i try to upgrade a 486 motherboard. with me, this stuff never goes smoothly! https://t.co/CSTVbtM3pd

> so i got this 486 motherboard, and it came with a 486DX2-66. i happen to have a couple of 486DX4-100 chips, so let's give it a little upgrade! pic.twitter.com/e7k85u93Dl
>
> — Tube Time (@TubeTimeUS) June 6, 2020

i managed to resurrect this very beat up Amiga 2000 motherboard without shotgunning it (replace all caps, etc) https://t.co/hZNmXH6SNL

> for entertainment, I'm going to try to resurrect this Amiga 2000 motherboard. (thread) pic.twitter.com/P7CRM5Kgfg
>
> — Tube Time (@TubeTimeUS) June 10, 2020

apparently during the lockdown everyone started baking bread. so i decided to try it! i've been baking a loaf of sourdough every week ever since. https://t.co/BKrUNq8y3v

> today i baked a loaf of bread for the first time ever! since i always seem to do things the hard way, this is a whole wheat sourdough using a wild yeast starter i've been working on the past few weeks. pic.twitter.com/485HQle1Yj
>
> — Tube Time (@TubeTimeUS) June 15, 2020

i acquired a new computer that looks like a stereo component. getting it working naturally involved some epic debugging, like proving that a CDROM drive works by snooping the data interface and comparing the bits with the ISO image! https://t.co/xFsyp5aM30

> it's a Commodore...stereo? actually it's an Amiga computer in disguise! pic.twitter.com/trn7jx3fhN
>
> — Tube Time (@TubeTimeUS) June 13, 2020

while working on that computer, i explored electrolytic capacitors in great detail to figure out how they work and *why* they fail. https://t.co/VSEWJtVm4B

> today i took apart some electrolytic capacitors, and learned some surprising things. i wanted to review the manufacturing process, but let's first take apart this capacitor. \U0001f9f5 pic.twitter.com/TGbGT98FkS
>
> — Tube Time (@TubeTimeUS) June 29, 2020

then i discovered you can still pick up analog TV on channel 6 - called a Franken-FM station! (and not because of al franken) https://t.co/m4UAPijcCj

> fired up my Sony Watchman today, and I actually found an analog TV broadcast (for real this time, not a Rick roll) pic.twitter.com/8RHD7X7Xqe
>
> — Tube Time (@TubeTimeUS) June 30, 2020

july: i release Clock-In-A-Can which is an open source substitute for the old-style oscillator cans. https://t.co/kqhm4qGVVD

> i'm proud to announce the release of my latest project -- Clock In A Can! can't find a metal can oscillator with the frequency you need? build one of these!https://t.co/msBT0XkDNS pic.twitter.com/jkJcy95Kxu
>
> — Tube Time (@TubeTimeUS) July 3, 2020

ever hear a dot matrix printer printing a whole line of "#" symbols? it's awful! https://t.co/y2pbzXpoxe

> there's nothing quite like the ear piercing screech of a dot matrix printer generating a line full of '#' symbols. pic.twitter.com/OQiFS7qsVB
>
> — Tube Time (@TubeTimeUS) July 4, 2020

oh yeah we got visited by a comet. that was cool. https://t.co/wdIuRIO8jZ

> good morning. i went for a walk and saw #NEOWISE \u2604\ufe0f pic.twitter.com/54tf5zSmPC
>
> — Tube Time (@TubeTimeUS) July 10, 2020

dug out my old Handspring Visor for nostalgia's sake. https://t.co/C8883YdfCp

> today i dug up my first mobile computing device. i bought this over 20 years ago. i wonder if it still works... \U0001f4f1 pic.twitter.com/HZlqSjJROc
>
> — Tube Time (@TubeTimeUS) July 13, 2020

ooh another cross section! this one is of an unusual DIP IC that has embedded surface mount parts! https://t.co/LP5g15TxQf

> here's a cross section of the MAX233 RS-232 driver and receiver. this part doesn't need external capacitors--because there are four of them built right in! pic.twitter.com/QYJ4mNiqZX
>
> — Tube Time (@TubeTimeUS) July 23, 2020

also in july was the 35th anniversary of the Amiga computer! https://t.co/hcxSn9Y3BC

> 35 years ago today, the Amiga 1000 was born! \U0001f382 pic.twitter.com/LVnkkGfta6
>
> — Tube Time (@TubeTimeUS) July 23, 2020

wrapping up july, i released my COMIX-35 open source 1802 computer. https://t.co/og8kSZHMbu

> i'm happy to announce the release of my COMIX-35 computer! it's an improved clone of the '80s COMX-35 home computer which used the RCA 1802 microprocessor.
>
> the design is open source and all the files are available here:https://t.co/DHcwktokYP pic.twitter.com/zqJvyjUIiH
>
> — Tube Time (@TubeTimeUS) July 26, 2020

neat repair thread on a Nixie tube multimeter. spoiler: it was a bad hex inverter chip. https://t.co/im5jMaib56

> the other day I picked up this neat Dana 4700A digital multimeter. but before I power it on, I need to check some things pic.twitter.com/W2YyYsTbzT
>
> — Tube Time (@TubeTimeUS) July 28, 2020

neat repair thread on *a different* Nixie tube multimeter. this one had a bad JFET. https://t.co/9cTGrULWhD

> today i also fixed my Fluke 8400A digital voltmeter. the display digits weren't refreshing correctly, but it was flaky when i pushed the front panel buttons. so i cleaned the contacts. pic.twitter.com/nyu8Elgi5B
>
> — Tube Time (@TubeTimeUS) July 26, 2020

in august: i fired up a rare electroluminescent display made by Finlux. it looks really cool! https://t.co/WP3n4GHPXD

> here's a somewhat unusual flat panel display. this is not an LCD, nor is it plasma. this is electroluminescent, made by a company called Finlux. pic.twitter.com/ugQHWjrd6D
>
> — Tube Time (@TubeTimeUS) August 1, 2020

more bread experiments. this time i tried making ancient Roman bread. it was good. https://t.co/f1DtTbkoBI

> here's my latest attempt at baking ancient Roman-style panis quadratus. i used a different, more accurate, recipe this time, using whole wheat flour, fennel, poppyseed, and Italian parsley, and my wild sourdough yeast. it smells *amazing* and tastes great! \U0001f917#YeastMasters pic.twitter.com/VHxR0RsFn9
>
> — Tube Time (@TubeTimeUS) August 6, 2020

oh hey another neat cross section! https://t.co/zX1EICSyAn

> here is half of an axial-lead aluminum electrolytic capacitor. you can see the foil layers inside! pic.twitter.com/uq7vmHQGpI
>
> — Tube Time (@TubeTimeUS) August 11, 2020

oh and another one too! https://t.co/ElMjgYfsrk

> nourish your ocular orbs on this cross section of a carbon composition resistor. pic.twitter.com/y32caQduix
>
> — Tube Time (@TubeTimeUS) August 11, 2020

and a third! https://t.co/nYM5i7YBXs

> here's another cross section for you folks. this one is the tantalum capacitor that failed in my Fluke 8400 DVM. it's got some fascinating details inside! pic.twitter.com/CRcYaCwRRh
>
> — Tube Time (@TubeTimeUS) August 11, 2020

then i fired up a weird old color video card that supports video overlays. https://t.co/bvJCoziYPS

> hey so remember this really weird video card i have? the Targa 16? well, i got it working today! \U0001f61dhttps://t.co/xB7ny7kwVq
>
> — Tube Time (@TubeTimeUS) August 13, 2020

...and i used that same card to get a triple monitor setup on an ISA-bus PC. https://t.co/sxK365w6QF

> is it possible to have three separate ISA graphics cards with three separate monitors on a PC?
>
> why yes, yes it is! pic.twitter.com/Uy0GKAXsWl
>
> — Tube Time (@TubeTimeUS) August 13, 2020

here's an unusual floppy drive i found. https://t.co/fmVm0Q6pVH

> here's a very unusual Okidata gm3315b 5 1/4" floppy drive. it's thin! nearly the same height as the 3 1/2" drive i've placed underneath. but that's not all... pic.twitter.com/SvMqsPlLBd
>
> — Tube Time (@TubeTimeUS) August 13, 2020

oh and look a cross section of a chip in an IC socket! https://t.co/3EOFxAzCHK

> cross section of a DIP chip in a socket. the spring contacts curl back on themselves. pic.twitter.com/qTJfGPa8j9
>
> — Tube Time (@TubeTimeUS) August 16, 2020

and another one! https://t.co/H4DFbA8wrW

> here's the cross section of a DIP chip in a machined pin DIP socket. pic.twitter.com/sHzDBqlkK0
>
> — Tube Time (@TubeTimeUS) August 19, 2020

also i forgot but back in july i started doing a little Twitch streaming. it's been a few weeks, i ought to do another one soon. https://t.co/oQS4a2JDA4

> okay a one-off experiment for you folks out there: a Friday Tube Time twitch stream! https://t.co/NctbLriKL8
>
> let's see how well this works.
>
> — Tube Time (@TubeTimeUS) July 17, 2020

then i tore apart a pet tracking tag that i found at the local surplus store. https://t.co/HqW4QlxHxR

> let's take apart this pet tracking tag. pic.twitter.com/VzafJRAwkG

— Tube Time (@TubeTimeUS) August 22, 2020

an old video card created a neat rainbow shimmering effect on their boot logo. how did they do it?
https://t.co/YqIojw6yNR

> so my friend @compgeke has this computer with a really neat VGA BIOS screen: there's a rainbow shimmering effect on the logo! \U0001f308 but how does it work? (\U0001f9f5...) pic.twitter.com/LjbJqvZjsv
>
> — Tube Time (@TubeTimeUS) August 23, 2020

another epic troubleshooting thread, this time of one of my logic analyzers. spoiler: it was a bad zener diode in the power supply and a bad capacitor in the monitor. https://t.co/ZaMFGEqImN

> it's time to take a crack at fixing my other logic analyzer, this one is an HP1661A. pic.twitter.com/zZpU2DnsSE
>
> — Tube Time (@TubeTimeUS) September 1, 2020

wrapping up august, i made a ridiculous chain of adapters just for fake internet points. https://t.co/CFtOMHeKP3

> i didn't have a terminator for a 1/4" audio jack, so i had to improvise a bit with some adapters pic.twitter.com/8VNutAThOR
>
> — Tube Time (@TubeTimeUS) August 29, 2020

starting september off with a bang, i reverse engineered this neat video capture device that transfers data over the parallel port! it has an early Xilinx FPGA inside, too.
https://t.co/uw9eCjXcZM

> here's a fun piece of (very) 1990s hardware: the Snappy Video Snapshop, from a company called Play, Inc. it is a video digitizer, so video goes in one end... pic.twitter.com/SNsW566NuL
>
> — Tube Time (@TubeTimeUS) September 4, 2020

built a clever little FM radio transmitter from plans in an old book. https://t.co/MnZDQPO494

> this afternoon i built a really clever radio transmitter using a circuit i found in a book. it's really quite ingenious, so let's dig into it a little bit... pic.twitter.com/1Hp4tIGyOZ
>
> — Tube Time (@TubeTimeUS) September 21, 2020

around this time i also started a very ambitious project. https://t.co/9BEyQGcFi6

> oh look a schematic pic.twitter.com/ZhOO87W89g

— Tube Time (@TubeTimeUS) August 28, 2020

also in september, with the air choked with smoke from all the fires burning in california, i dug into the summary report from the butte county DA's office on the Paradise fire, caused by PG&E back in 2018.
https://t.co/DUj6LwoHh3

> this electrical transmission tower has a little problem. can you spot it? actually, it's not a small problem--it cost us 16.65 *billion* dollars and caused the deaths of 85 people. pic.twitter.com/RgmSwSC5kz
>
> — Tube Time (@TubeTimeUS) September 16, 2020

october: i have a network card with a neon bulb on it. why is it there? https://t.co/IwBCq9MdL2

> this neon lamp should never light up! there's a fascinating reason why... \U0001f9f5 pic.twitter.com/RNHaO2w2m9
>
> — Tube Time (@TubeTimeUS) October 1, 2020

i acquired one of the world's first electronic calculators, and took it apart! https://t.co/N1p3m3pUYW

> this is one of the world's first electronic calculators, the Friden EC-130, which came out in 1964! it's a really fascinating machine, so let's look at it in more detail. \U0001f9f5 pic.twitter.com/aRvySHyHxp
>
> — Tube Time (@TubeTimeUS) October 5, 2020

i got a book on the windows 95 UI guidelines! quite a fun read. https://t.co/lALXFOMLmz

> this book is a paean to the Windows 95 user interface and it is *glorious* so i'll show you a few pages from it... \U0001f9f5 pic.twitter.com/E9ZxWNFN5D
>
> — Tube Time (@TubeTimeUS) October 7, 2020

to my surprise, *fruit* can have a EULA! https://t.co/rakdz7DlLZ

> all right, this is a new one. a EULA on...fruit?!
>
> 'the recipient of the produce contained in this package agrees not to propagate or reproduce any portion of this produce, including "but not limited to" seeds, stems, tissue, and fruit.' pic.twitter.com/4dgiuCZato
>
> — Tube Time (@TubeTimeUS) October 9, 2020

i got into 3D printing. funny, my printer is running as i type this! it's only been a few months but i've printed a few dozen designs already.
https://t.co/R6WRLRaEwH

> welp, i finally broke down and bought my first 3d printer! this one is an Ender 3. \U0001f9f5 pic.twitter.com/s2iO9mBg4T
>
> — Tube Time (@TubeTimeUS) October 17, 2020

found a cursed audio plug. https://t.co/SQ7RADnr1q

> cursed 3mm audio plug. yes, it's an Apple product \U0001f602 pic.twitter.com/fXPW2hK32v
>
> — Tube Time (@TubeTimeUS) October 16, 2020

then i dug into the NTSB report from the 2018 Tesla crash in Mountain View, CA. most important concept i learned? passive vigilance puts humans at a disadvantage and causes accidents!
https://t.co/Gg7AGaZIQN

> this Tesla SUV ran into a traffic barrier at 70mph while on Autopilot. how could this happen? there are 3 major contributing causes, and they're *fascinating* pic.twitter.com/IH78qovdfm
>
> — Tube Time (@TubeTimeUS) October 23, 2020

november rolls around, and so i 3D print a connector.
https://t.co/1Jv7COv6BL

> so i want to connect my Atari 800 to my computer. \U0001f9f5 pic.twitter.com/8cYpVnUcfd
>
> — Tube Time (@TubeTimeUS) November 6, 2020

i finally found a lens for an old TV broadcast camera i have! this thread is a wild ride and ends up with me 3d printing replacement connectors! https://t.co/uLamB7VD82

> I got a lens for this camera! pic.twitter.com/brOSyR8lo3
>
> — Tube Time (@TubeTimeUS) November 12, 2020

i bought a laptop with an incredibly strange floppy disk drive. then i fix it up and get it working. https://t.co/nBmnq4P1Ls

> picked up a new laptop today! pic.twitter.com/01ZhNOWDVn
>
> — Tube Time (@TubeTimeUS) November 11, 2020

i bought another Amiga! this one is the rare CD32 game console. i cleaned it up and fixed some damage.
https://t.co/7OoA6u6MUJ

> picked up another Amiga. this one is the CD32 game console. it was the first 32-bit gaming console released in the US and Europe. pic.twitter.com/LSIgkIJKLG
>
> — Tube Time (@TubeTimeUS) November 20, 2020

found some neat photos of the original IBM PC (5150) motherboard prototype. i wonder if the original still exists... https://t.co/byec9t0WYV

> here's the wire-wrapped prototype of the original IBM PC (5150) motherboard! pic.twitter.com/l1BEUM1hjl
>
> — Tube Time (@TubeTimeUS) November 30, 2020

my magnum opus for the year was probably this, the Snark Barker MCA. i still can't believe this was the *second* Micro Channel card i released this year! https://t.co/dPvatlDeVr

> i'm happy to announce the release of my latest sound card, the Snark Barker MCA! this is a Sound Blaster compatible card designed for Micro Channel bus computers, including the IBM PS/2 family.
>
> the full open-source design is available here: https://t.co/d3bsFokzW0 pic.twitter.com/BG1fwNLmLs
>
> — Tube Time (@TubeTimeUS) November 29, 2020

in december, i read another NTSB report. this one was about the Boeing 787 battery fires. https://t.co/cQ6wOBKisn

> this happened to a Boeing 787 while it was parked at Boston Logan back in 2013. yes, the infamous\U0001f50b\U0001f525. \U0001f9f5 pic.twitter.com/szfL8VrsgM
>
> — Tube Time (@TubeTimeUS) December 5, 2020

is it possible to use a 3d printer to repair damaged plastic? yes, yes it is! https://t.co/ij1VAZ5x15

> see, i have this Amiga 500 with a broken case. i want to try and fix it. pic.twitter.com/1VfJrVqFlH
>
> — Tube Time (@TubeTimeUS) December 7, 2020

a cursed connector. https://t.co/vx9CLiMuFa

> cursed D-sub connector. when you see it... pic.twitter.com/KWTkKkCUMF
>
> — Tube Time (@TubeTimeUS) December 4, 2020

oh yeah i finally got a Thingiverse account. it's a little bare now but i'm adding more and more stuff. https://t.co/Pv2KH46Jb0

> i've been making parts and uploading them to Thingiverse! here's one of them: a replacement trapdoor for the Amiga 500. (my beater A500 was missing this part)https://t.co/JADOtxlkHk pic.twitter.com/SkJxhJ0FVr
>
> — Tube Time (@TubeTimeUS) December 11, 2020

another cursed connector. https://t.co/cSmi4KnY3u

> huh, this D-sub connector has *no* pins! what could it possibly be for pic.twitter.com/X5UyybPT2m
>
> — Tube Time (@TubeTimeUS) December 13, 2020

i should start a "cursed connector" business. https://t.co/KlwjK9m5p5

> hmm, manufacturers tolerances aren't what they used to be pic.twitter.com/pFOi4FplYa
>
> — Tube Time (@TubeTimeUS) December 13, 2020

particularly since i have a 3d printer. https://t.co/ZQD2z37s5Z

> for those of you confused and befuddled by my recent "bizarre D-sub connector" tweets, bear in mind that i own a 3D printer.
>
> — Tube Time (@TubeTimeUS) December 14, 2020

i also started developing on FPGAs using the open source toolchain! i think you'll see more of this next year. https://t.co/B4NsV7TwyB

> w00t! just got yosys, nextpnr, and iceburn built and working so i have officially joined the open source FPGA developer club. pic.twitter.com/20ATkaBS6G
>
> — Tube Time (@TubeTimeUS) December 16, 2020

orientation on the build platform matters when you are 3d printing parts that need to be strong and look good. i'm learning... ■https://t.co/SuJDZpyAPB

> amazing what a difference the orientation makes when 3D printing something. the example on top was printed face down and is ugly and brittle. the bottom was printed with the left edge down -- much nicer! pic.twitter.com/LbNgB5fEJt
>
> — Tube Time (@TubeTimeUS) December 16, 2020

i found a remarkable recording from 1944! https://t.co/Hs5eTAkleS

> celebrate Beethoven's birthday by listening to this *remarkable* recording. why is it remarkable? read on... \U0001f9f5#Beethoven250 https://t.co/KkQoHEAmym

— Tube Time (@TubeTimeUS) December 17, 2020

i hit a personal milestone: something i designed showed up in the Vintage Computing category on eBay! https://t.co/DEWRVDUvxa

> well here's something interesting. it's the Android Accessory Development Kit from 2012, when it came in the shape of a strange-looking clock!https://t.co/SXvvuE6FGR
>
> — Tube Time (@TubeTimeUS) December 18, 2020

in this thread, i explore streamer cassette tapes and drives. https://t.co/dDI1i8LGEV

> here's a UNIX computer that stores data on a cassette. well, technically, this is a special D/CAS cassette, but the form factor is nearly identical to a standard audio tape! https://t.co/VyjMkBCJJH
>
> — Tube Time (@TubeTimeUS) December 4, 2020

did a little reverse engineering work on a very obscure IBM PC variant that can run 370 mainframe software! https://t.co/D4ECToT3Zf

> why am i doing this to myself? pic.twitter.com/e9i3uT4vDD
>
> — Tube Time (@TubeTimeUS) December 23, 2020

made some cookies. https://t.co/YUeNouhCBN

> merry christmas! since it's christmas day, i thought i'd mix things up a bit and bake some very special cookies from an old family recipe. pic.twitter.com/DkDt5kEHV7
>
> — Tube Time (@TubeTimeUS) December 26, 2020

designed some 3d printed parts and a board to let people upgrade the floppy drives in their PS/2 computers. https://t.co/e5sQ4q4H1V

> own an IBM PS/2 model 50, 50Z, or 70 with a broken proprietary floppy drive? here's a way you can make your own replacement out of some 3D printed parts and a standard PC floppy drive!https://t.co/u5e3Z3ednt pic.twitter.com/t7h6IgInVp
>
> — Tube Time (@TubeTimeUS) December 29, 2020

found a very weird IBM graphics card that is not MDA, CGA, EGA, PGC, or VGA! https://t.co/vGa9lI725C

> here's a very weird IBM PC video card. you've probably never seen it before! there's a lot of weirdness here... \U0001f9f5 pic.twitter.com/bjvT0TaOwz

> — Tube Time (@TubeTimeUS) December 29, 2020

fixed my multisync monitor. https://t.co/XCLc3odGPK

> today i'm going to look into fixing my NEC MultiSync. this is the original version, the JC-1401P3A. pic.twitter.com/hQWAFkZuPw
>
> — Tube Time (@TubeTimeUS) December 30, 2020

and we are basically caught up! it's been a wild ride this year, what with lockdowns and pandemics and election insanity.

looking back, i am frankly amazed at how much i was able to accomplish this year. releasing 4 open source electronics projects, getting into 3d printing, investigating fascinating topics in electronics and beyond, and fixing a ton of old crap!

thank you all for coming along with me. this is a two-way street -- i continue to be encouraged and inspired by all your comments and suggestions.

best wishes to you all for a happy 2021. i really hope it's going to be better; 2020 has been very difficult.

anyway i still have the rest of today to squeeze in a last project or two for 2020. stay tuned!