Microsoft Surface Studio Teardown

Teardown of the Microsoft Surface Studio performed on Monday November 28, 2016.

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INTRODUCTION

Good news, everyone! Microsoft made their first desktop ever. The Surface Studio is big, expensive, powerful, and most importantly, it's on our teardown table. Is this a machine for creative pros, or a me-too entry in the modern wave of fashionably disposable hardware? If it survives this teardown, we'll have our answer. Let's tear down the Microsoft Surface Studio.

Need a window on the teardown world? Follow us on Facebook, Instagram, or Twitter for high-def updates.

[video: https://www.youtube.com/watch?v=rNk0yTKj0oU]

🔧 TOOLS:

- iOpener (1)
- iMac Opening Tool (1)
- T10 Torx Screwdriver (1)
- T8 Torx Screwdriver (1)
- T6 Torx Screwdriver (1)
- T2 Torx Screwdriver (1)
- Tweezers (1)
- 5mm Nut Driver (1)
- Phillips #2 Screwdriver (1)

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Step 1 — Microsoft Surface Studio Teardown

- It's no stocking, but we're thinking this machine is still stuffed with goodies:

  - 28-inch adjustable PixelSense Display with 4500 x 3000 resolution (192 DPI)—supporting sRGB, DCI-P3, and Vivid color profiles, plus 10-point multi-touch

  - 6th-Generation Intel Core i5 or i7 CPU with 8 GB, 16 GB, and 32 GB RAM configuration options

  - NVIDIA GeForce GTX 965M GPU (paired with 2 GB GDDR5) or GTX 980M (paired with 4 GB GDDR5)

  - 1 TB and 2 TB hybrid storage options

  - 802.11ac Wi-Fi / Bluetooth 4.0 / Xbox Wireless built-in

 - Supports Surface Pen and Surface Dial

Step 2

- At 21 lbs, it takes some effort to spin this thing around—but it pops down to 20º with the push of a finger.

- (i) The angle is an [intentional one](#)— not only is it a common angle for artists and animators, but you can't set a coffee down on this slope, minimizing spills.

Step 3

- The display is this PC's party piece, but we aren't throwing any confetti just yet. First, we'll take a look at what kind of portage it's packing. From left to right:
  - Four USB 3.0 ports
  - Gigabit Ethernet jack and power inlet
  - Mini DisplayPort
  - SD card slot *and* 3.5 mm audio jack
- Meanwhile, along the bottom edge of the display, we note a wide strip of speaker grille—we'll soon see how functional those dots are.
- Oh, and a whole sensor array worthy of the Federation, including: facial recognition sign-in camera with IR projector (probably), 5 MP camera, and two microphones.

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Step 4
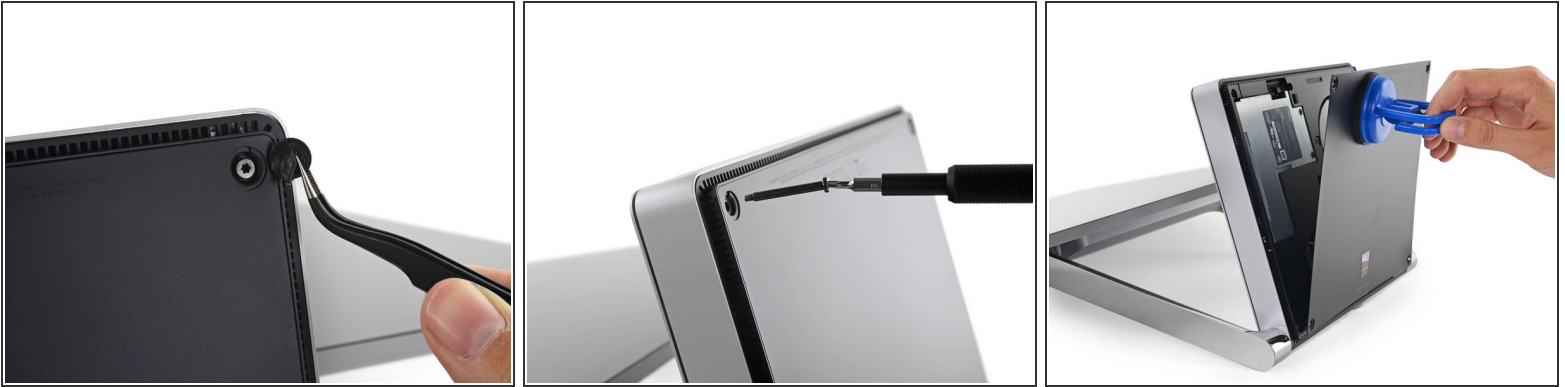
- Enough of the outside, we're here to see what's on the *inside*. We tip the Studio onto its back and inspect the base, hoping to find our way in.

- A strip of air vents borders the entire bottom panel, and at each corner we find a round rubber foot —concealing a Torx screw.

  - ⓘ The two on the front corners were of the extra-long variety. As manufacturers continue the fight against visible screws, we're okay with this solution—it's certainly better than gluing the entire thing shut.

- Screws jettisoned, the heavy bottom cover still holds on by way of several clips. So, we apply a little suction power to help yank it free.

- With that, we're inside the ~~Actors~~ Surface Studio.

Step 5

- Pulling the back cover off reveals a myriad of components ...

  - (i) ... most of which we can't actually access just yet.

- ⚠ There's a strict and slightly perilous order of operations here. First out are two fans, but they remain anchored by wires with hidden leads. That midframe will have to come out before we can proceed further.

- As we lift away the midframe, it brings an attached speaker out with it, along with a *third* wire tether to the motherboard.

- It's a teardown, not a space walk! Cut us some slack here, ~~Houston~~ [Redmond](#).

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Step 6

- With a bit more finagling, we extract the two brushless, Delta-made exhaust fans.

  - They're sized quite differently. Is there a dedicated fan for the CPU, and a second for the GPU? Because that would be *cool*.

- With the speaker wire disconnected, the midframe finally falls away, with the speaker still attached.

- ⓘ Notably, the speaker itself is anchored and vibration-proofed by way of some (very Apple-esque) rubber screw gaskets.

- Finally, we have access to some guts—this Studio is chock-full of 'em. But we need to delve a little deeper to see if it has the glory.

Step 7

- Dig in! We start with the high-powered half of this machine's hybrid storage: a standard, removable, 64 GB SanDisk Z400s M.2 SSD. And on board we find:

  - SanDisk 05466 032G 32 GB NAND flash storage module (x2 for a total of 64 GB)

  - Silicon Motion SM2246XT SATA III 6 Gb/s DRAM-less SSD Controller

- Amusingly, someone must have decided it'd be better to slap down two 32 GB chips (perhaps leaving room for the 128 GB models), rather than four 16 GB chips—hence this pair of empty solder pads.

  - (i) If you happen to have a couple flash storage modules and a hot air rework station lying around, the SSD controller should happily take up to four NAND flash devices.

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Step 8
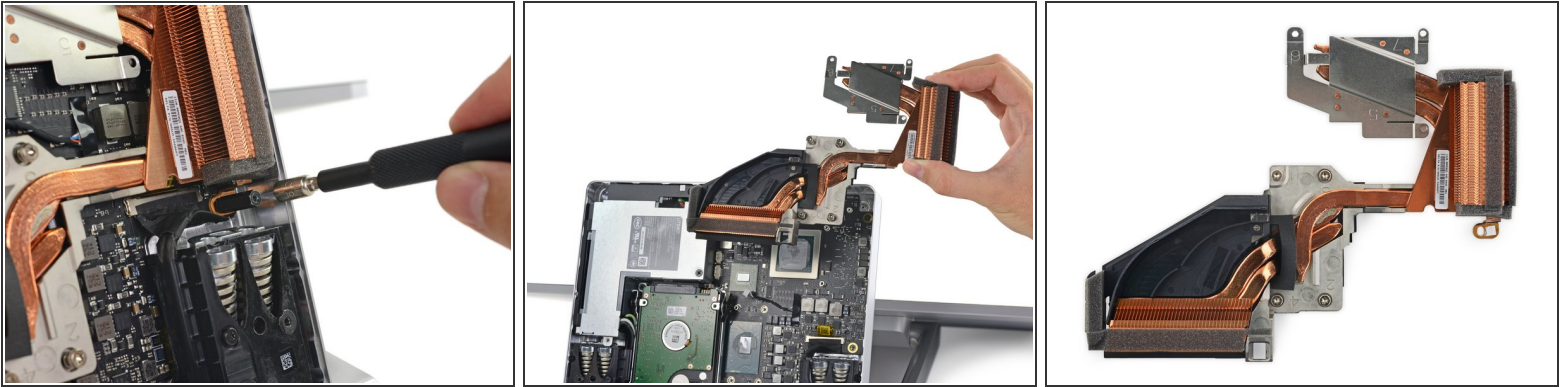
- Next, we mine for copper, extracting the shiny heat sink. A tall standoff spacer, reminiscent of those found in 27" iMacs, holds this beast in place.

- The heat sink offers quite a bit of cooling power in a tiny package:

  - Heat pipes coming off of each processor (CPU and GPU) flow out to exhaust radiators, each of which has a dedicated fan to blow all that hot air out of the system.

    - ⓘ The CPU fan, being positioned not-quite over the radiator, blows down a plastic channel.

  - The GPU fan is the larger of the two, and its radiator gets a bonus heat pipe that runs from both the CPU *and* GPU, which may allow for some thermal load leveling.

- ⓘ It looks like Microsoft is getting quite a bit *cooler* than its late 2000s reputation, if you know what we mean.

Step 9
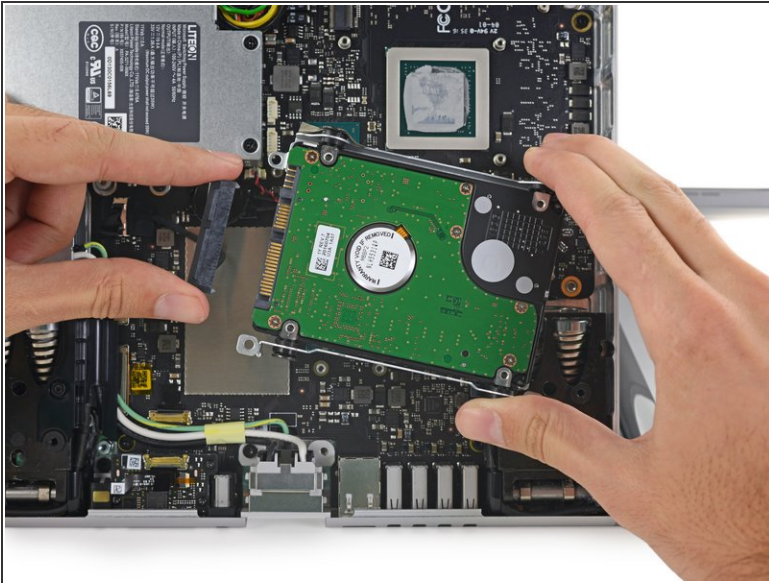
- We're pleased to report that there's a standard SATA hard drive connector in here—and attached to it, a standard SATA hard drive.

- 📌 It took a little work to get here, but it seems there is indeed a complete storage upgrade path for your $3,000-4,000 desktop machine. As there should be.

- It's nothing fancy, but here are the specs on this 2.5" laptop hard drive:
  - Seagate Spinpoint M8 ST1000LM024 5400 RPM, 1 Terabyte, SATA 3.0 Gb/s hard drive
  - ⓘ Yep, the spec sheet says this is a SATA II drive. Surprising? A bit. Lame? Kind of. Fixable? Probably—but someone will need to swap in a SATA III drive and run some read/write tests to verify.

Step 10
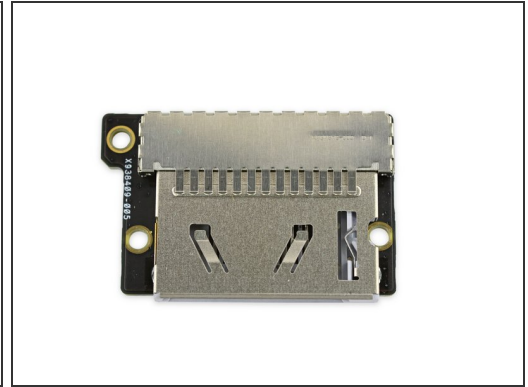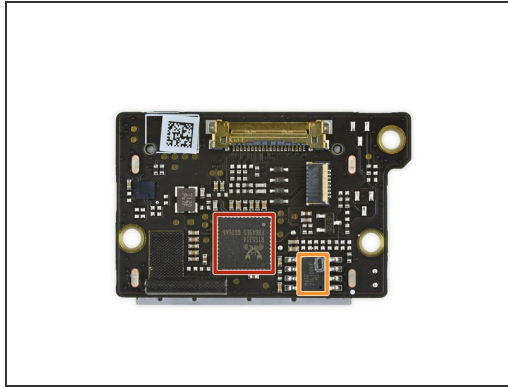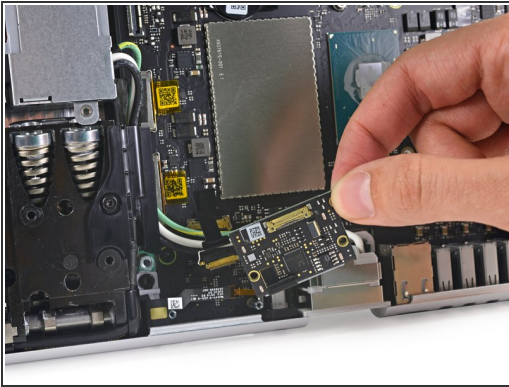
- Not only does the Studio *have* an SD card slot, but it's on its own modular board! Other barnacles include:

  - Realtek RTS5314 SD card reader controller

  - Macronix [MX25L1006E](#) 1 Mb CMOS serial flash

Step 11
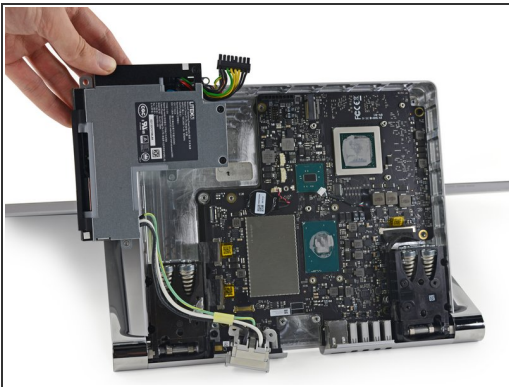
- From here we're able to pull out the power supply, a custom Lite-On unit with a dual-voltage (100-240 V) rating.

- The power supply features its own small, internal cooling fan. Our button fingers twitch involuntarily; we're having [Xbox One](#) flashbacks.

- Overall impressions: it's a power supply. It's a beefy, well-insulated power supply. Are you happy? Alright then. Moving on.

Step 12
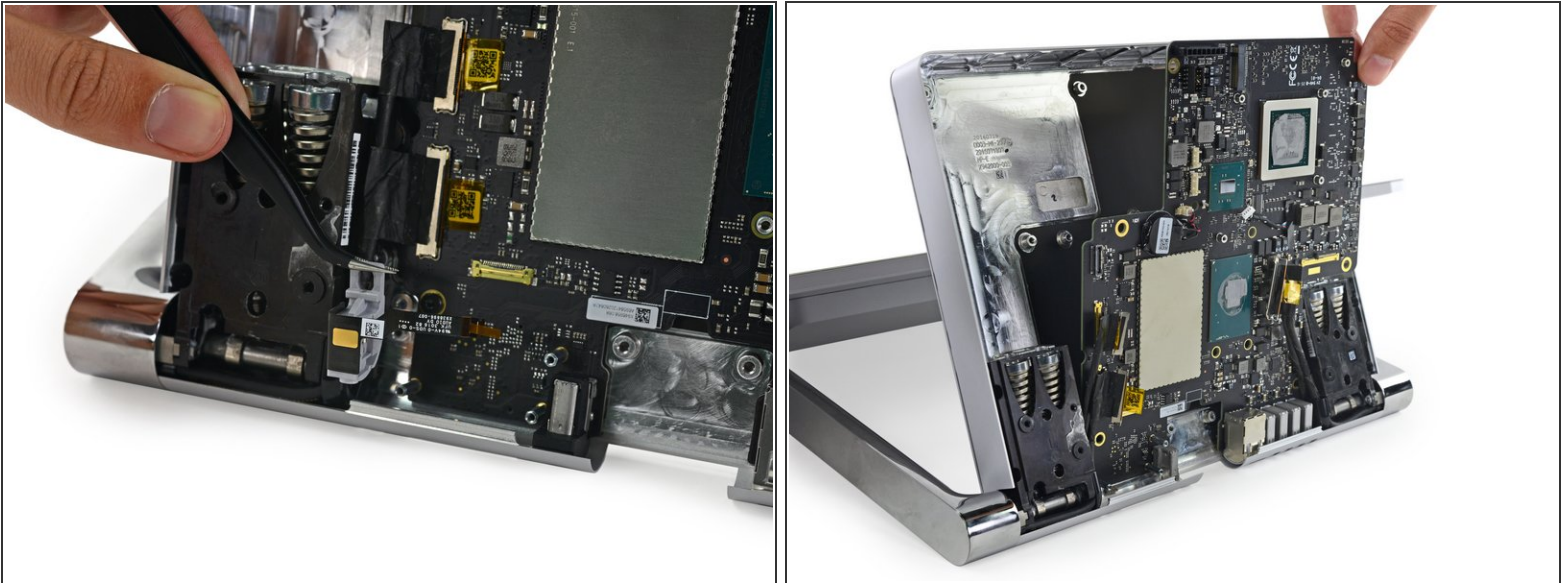
- We're so close to the motherboard we can almost taste it. Best guess: it will taste like fiberglass and copper.

- Meanwhile, one last component stands in our way: this little headphone jack.

- (i) We're not sure if the headphone jack's days are numbered, but we're pleased to see it make an appearance here—even if it's somewhat inconveniently located alllllllll the way in the back, where you can plug in *if* you brought a [dental inspection mirror](#).

- More importantly, this little guy is completely modular—so you can swap it out with a little patience, should the need arise.

- With that, the motherboard is free. Huzzah! Let's inspect those chips.

Step 13
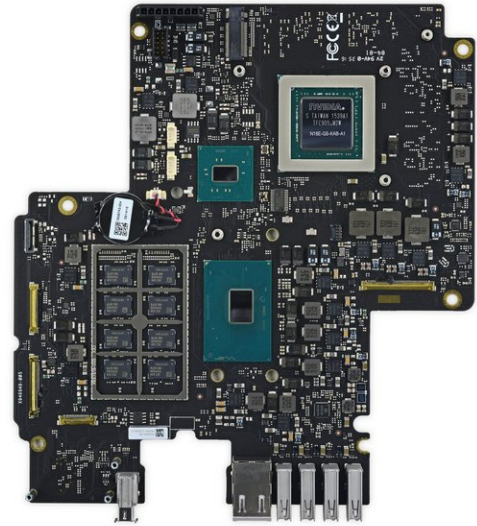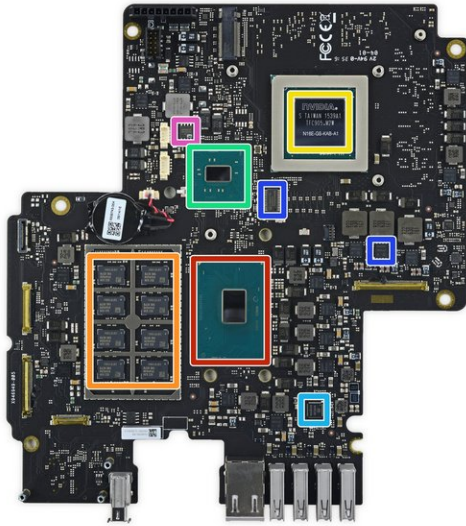
- Top side, we have the following ICs:

  - Intel Core i5-6440HQ Processor (6M Cache, up to 3.50 GHz)

  - Eight Samsung K4A4G085WE-BCPB 512 MB DDR4 RAM (4 GB on this side and another 4 GB on the reverse)

  - Nvidia GeForce GTX 965M GPU

  - Intel GL82CM236 Platform Hub Controller

  - ON Semiconductor NCP81205 3+3+1 Phase Controller

  - Infineon SLB 9665 TT 2.0 TPM (as seen in the Surface Book) and Infineon 0812ND HBE613 (x14)

  - Winbond W25Q128FV 128 M Serial Bit Flash Memory

Step 14
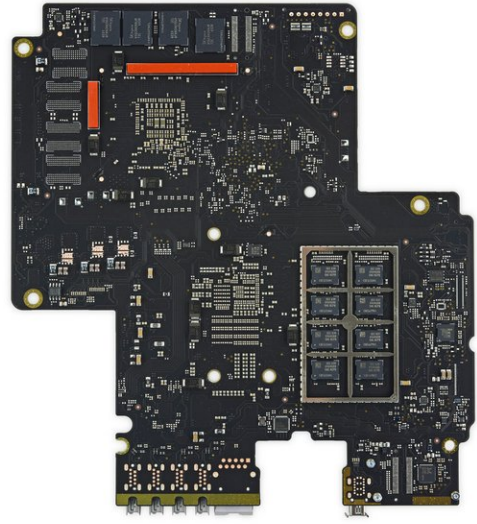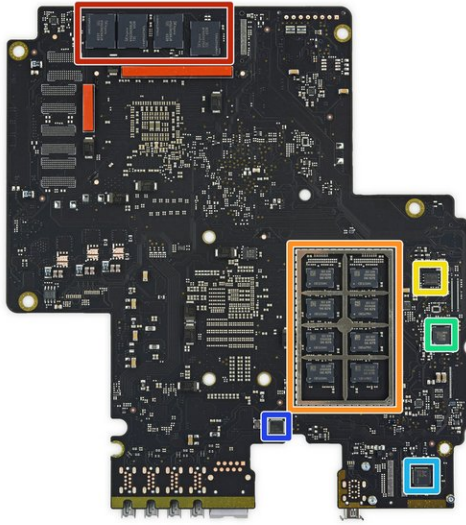
- Side two:

  - Four SK Hynix [H5GC4H24AJR](#) 512 MB GDDR5 SDRAM (for a total of 2 GB)

  - Eight additional Samsung [K4A4G085WE-BCPB](#) 512 MB DDR4 (for a grand total of 8 GB)

  - Winbond [W25X40CL](#) serial flash memory

  - ITE IT8527

  - Realtek ALC3269 Audio Codec

 - Intel [I219-LM](#) Gigabit Ethernet Controller

Step 15

- As promised, it's time to return to that huge 28" glass display. *Gulp.*

- Unsure what kind of adhesive lies in wait (nasty [Surface](#) adhesive? Nice [iMac](#) adhesive?), we throw down a pair of iOpeners to soften it up.

- Many swipes of the iMac opening tool later, and we're ready to call this glue the in-between. It's not the overkill tar we saw in the Surface Pro, but it's also not slice-it-down-the-middle clean iMac adhesive. It's in between. A bit of a struggle, but not impossible.

  - ... But after that bit of struggle, lifting the glass is fruitless—it won't budge. Looks like we're missing some fasteners in the *center* of the LCD. Where might those be?

Step 16
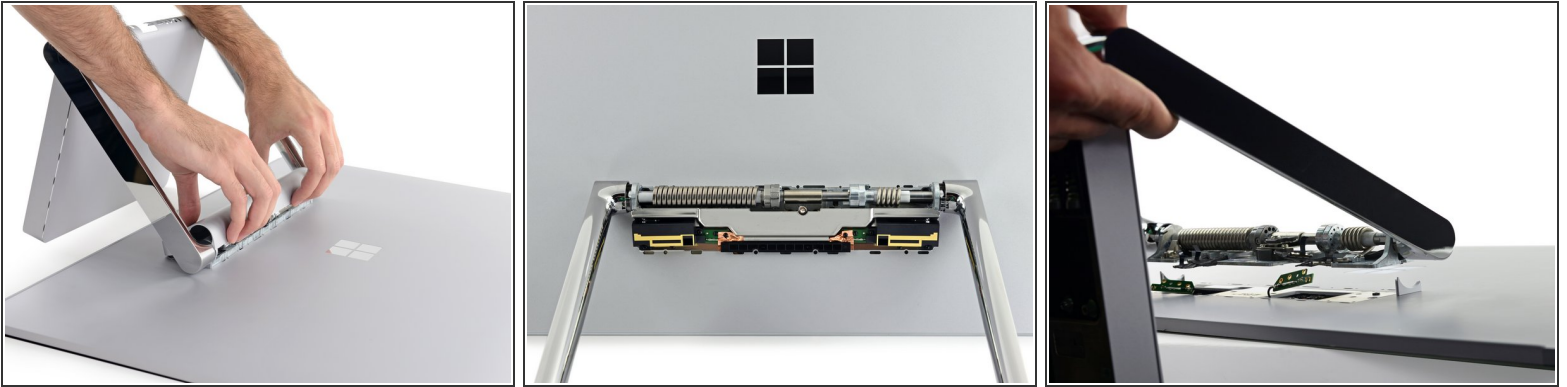
- We temporarily shift our attention to a more screw-y, less glue-y portion of this desktop, in the hopes that we will have more luck in removing it.

- Lacking a specialized tool for the job, we hand-beast the hinge casing off the back of the display. A slew of tiny clips keep it tightly stuck, with no adhesive or screws.

- Underneath lurks a pair of antennas, significantly-more-than-a-pair of springs, and loads of screws.

  - ⓘ The multiple spring mechanisms allow the monitor to transition from vertical to nearly-horizontal with just a light touch.

- Removing the screws securing the hinge to the display is like playing Russian Roulette: some are spring-loaded while others are not. We test our odds, and manage to select all of the correct screws for removal, detaching the base without a springtastic explosion.

Step 17
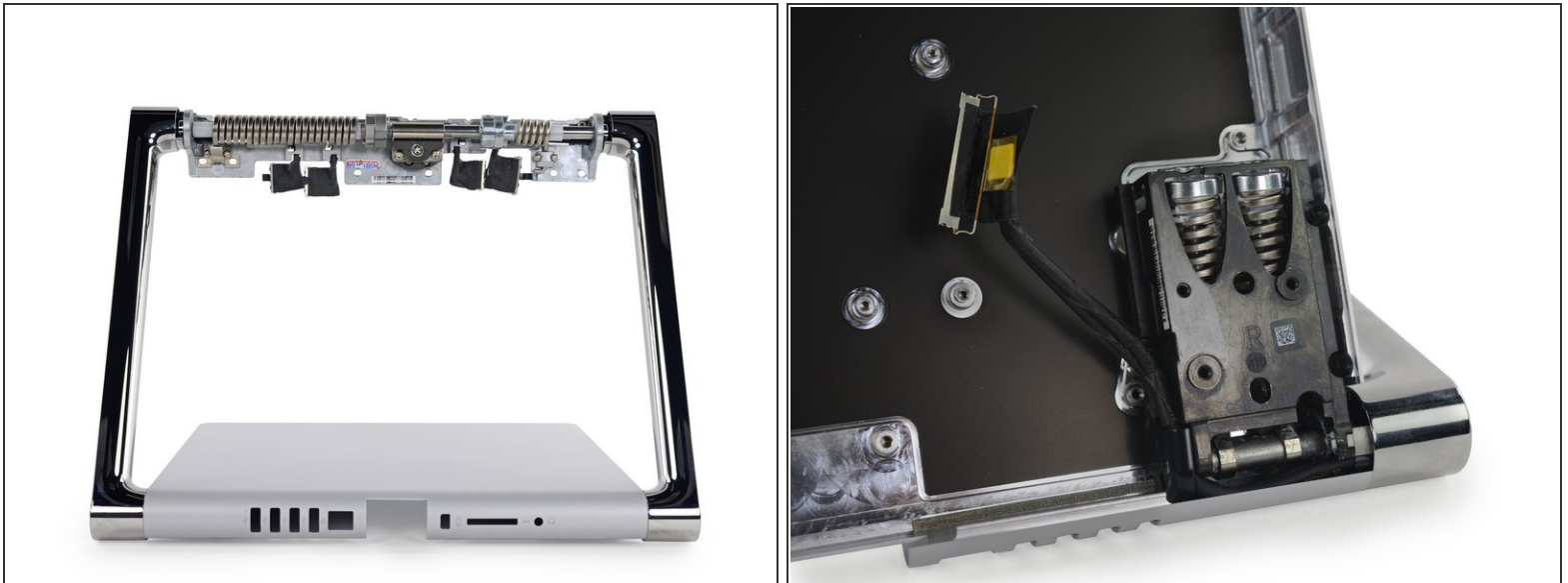
- We took the long way there, but it looks like a simple display replacement is one of the easiest jobs on the Studio. Good news for any folks prone to being a little hamfisted with their Surface Dial.

- With the case emptied and display removed, this is still a hefty piece of hardware—clearly the crown jewel of Microsoft's burgeoning engineering prowess.

- The top bar features a couple of tightly-wound springs and a calibration screw in the center, along with the termination of four display interconnect cables that run inside of the hinges and press onto the back of the display.

  - ⓘ Inside the foot, the other end of the arms are each tensioned by a pair of extension springs, similar to what you'd find in a garage door.

Step 18

- With the hinge section removed, the display separates cleanly from its housing.

- Stuck to the inside of the housing is an unusual, asymmetrical set of metal butterfly wings—probably serving as stiffeners and/or counterweights for the enormous pane of glass out front.

- (i) The back bit hosts a button board, plus two speakers—and way more grille holes than are strictly "holes."

  - This has been a bit of a trend [lately](#).

Step 19
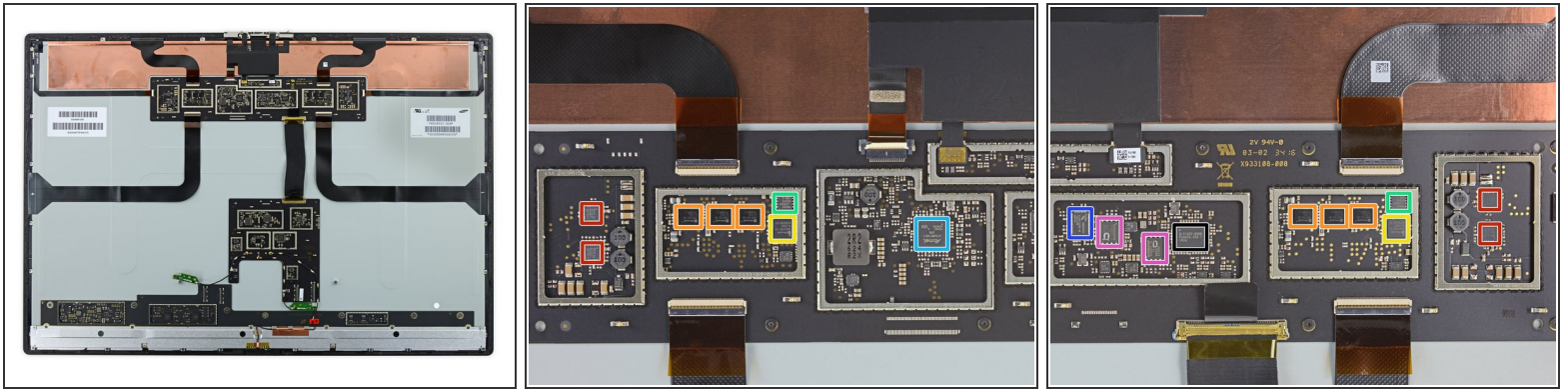
- Hiding behind the display we find the other half of the motherboard. Seriously, there's way more silicon hiding in this unit than in the base. Highlights include:

  - Monolithic Power Systems [M3387L](#) LED driving, step-up converter (x4)

  - Microsoft X904169 05 CL1631 T518907.1 (x6)

  - Microsoft X904163 01 CL1634 4C39290-01 (x2)

  - Micronix [MX25U1635F](#) serial NOR flash (x2)

  - Atmel [ATSAMS70N21](#) 32-bit ARM [Cortex-M7](#) processor

  - Novatech NT96131QG-46

  - Winbond 25X20CL1G 2 Mb Serial Flash Memory (x2)

Step 20
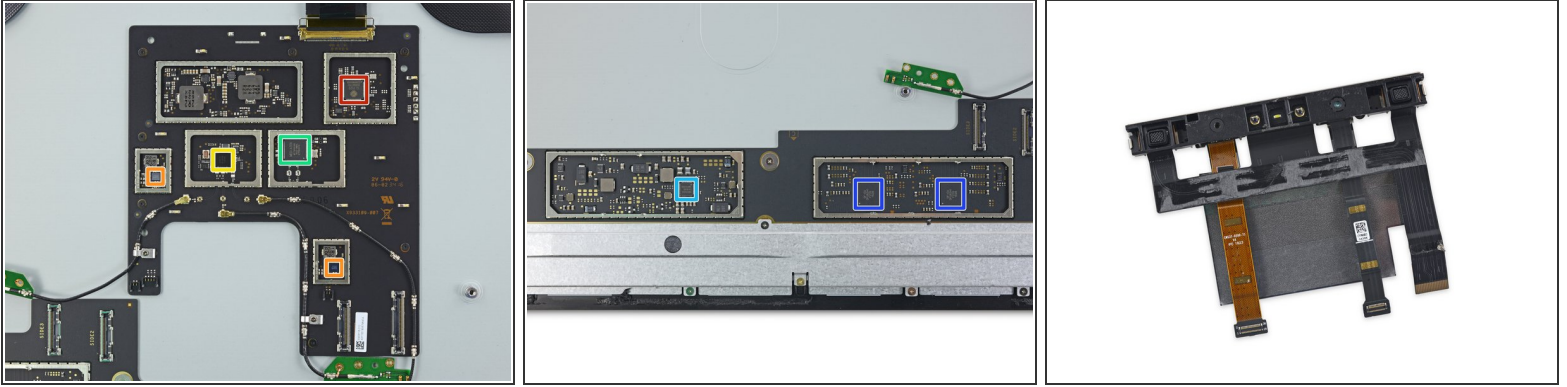
- And the mid/lowlights:
  - Genesys Logic GL3520 USB 3.1 hub controller
  - NXP TFA9890A (x2) high efficiency class-D audio amplifier
  - Marvell 88W8897 WLAN + BT4.0 + NFC Combo Chip (as seen in past Surface devices)
  - Mediatek MT7600UAN (likely integrated Wi-Fi SoC, as seen in the Xbox One Wireless Receiver)
  - SM4142A DA1633 SMHV059
  - GF-EU DFU62H1 F216 1628 (x2)

- ⓘ Last off the display is the sensor bar with microphones, IR projector and camera combination that powers Windows Hello, along with the built-in 5 MP webcam.
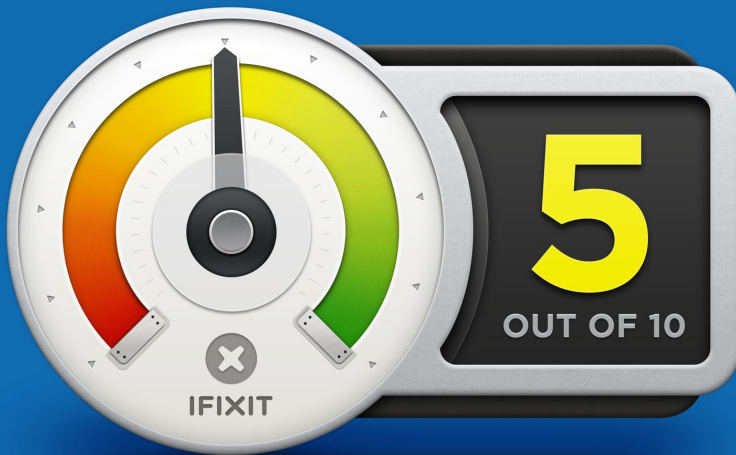
Step 21

- We dug way below the surface of this Studio, and here are all the bits we found! Well. Mostly.

Step 22 — Final Thoughts

REPAIRABILITY SCORE:

5

OUT OF 10

IFIXIT

- The Surface Studio earns a **5 out of 10** on our repairability scale (10 is easiest to repair):

  - The base is easy to open and home to several modular components—including the standard SATA hard drive and M.2 SSD—that can be replaced without disassembling the display.

  - The entire display assembly can be replaced as a piece, without dismantling the display or the base.

  - The RAM, CPU, and GPU are soldered to the board and cannot be upgraded. You may want to think twice about that 8 GB configuration.

  - A few components embedded in the display (buttons, front sensors, and speakers) will be difficult to replace if they fail.

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