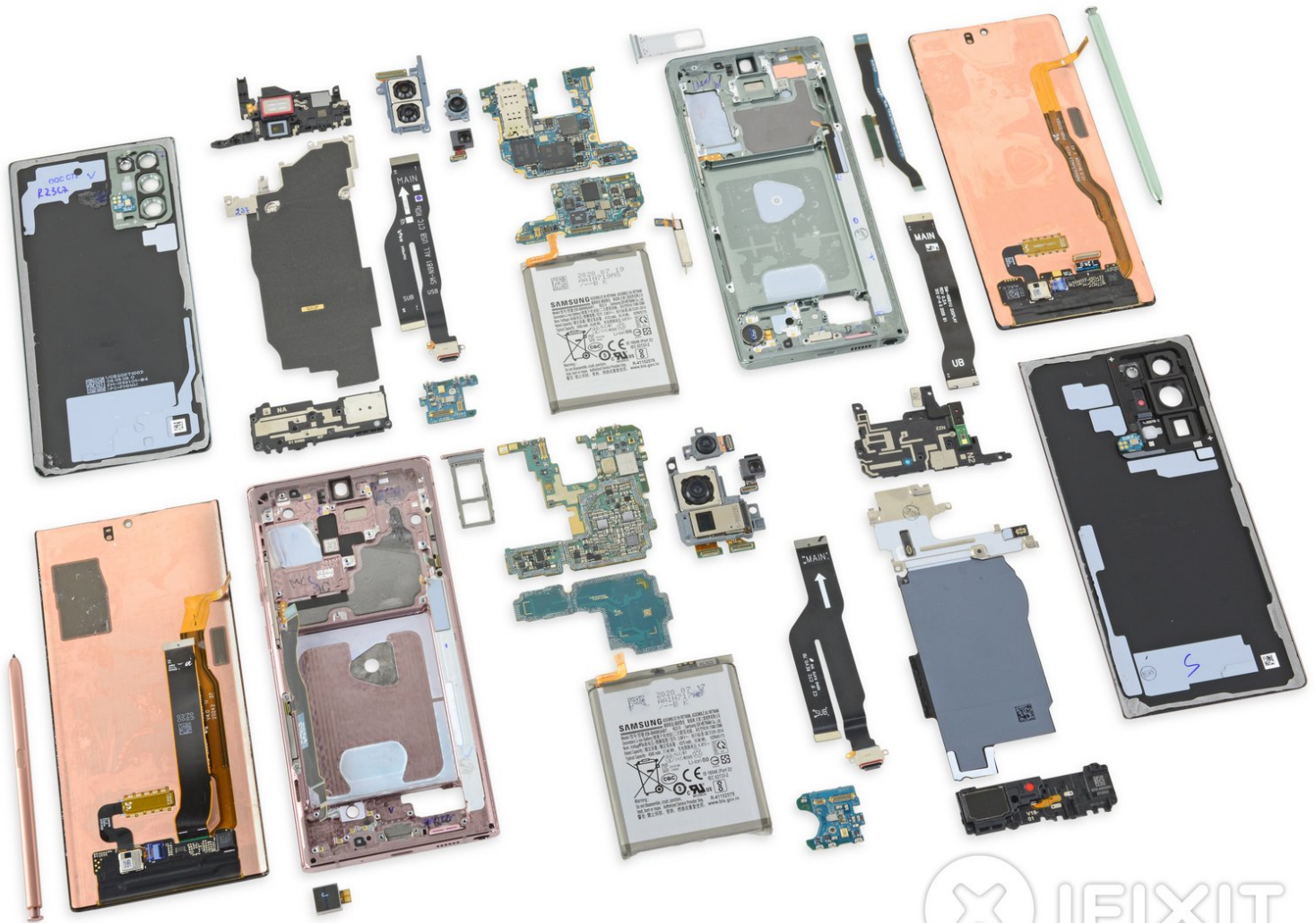




# Samsung Galaxy Note 20 and Note 20 Ultra Teardown

iFixit teardown finds Samsung taking a brand-new approach to cooling in its newest flagship smartphones, the Galaxy Note20 and Note20 Ultra 5G.

Written By: Taylor Dixon



## INTRODUCTION

We're on a mission to tear down all the Galaxy Things that Samsung released at Unpacked this month. Beans? [All chewed up](#). Watch? [All wound down](#). Next on the teardown table: the Galaxy Note 20 and 20 Ultra. It's a side-by-side teardown-athon that we won't be doing twice, so grab your S-Pen and follow along as we scribble out these Notes.

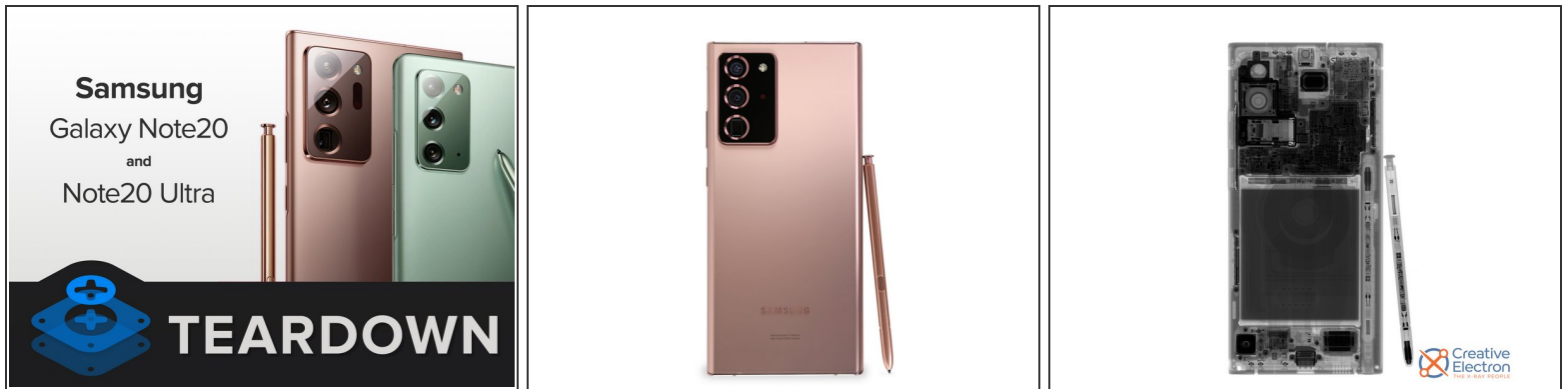
For more teardowns than you can swing a stylus at, follow us on [Twitter](#), [Instagram](#), and [Facebook](#). For iFixit delivered, check out our [newsletter](#).



### TOOLS:

- [iFixit Opening Picks \(Set of 6\)](#) (1)
  - [iOpener](#) (1)
  - [Tweezers](#) (1)
  - [iSlack](#) (1)
  - [Phillips #00 Screwdriver](#) (1)
  - [Spudger](#) (1)
  - [iFixit Adhesive Remover \(for Battery, Screen, and Glass Adhesive\)](#) (1)
  - [Suction Handle](#) (1)
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## Step 1 — Samsung Galaxy Note 20 and Note 20 Ultra Teardown



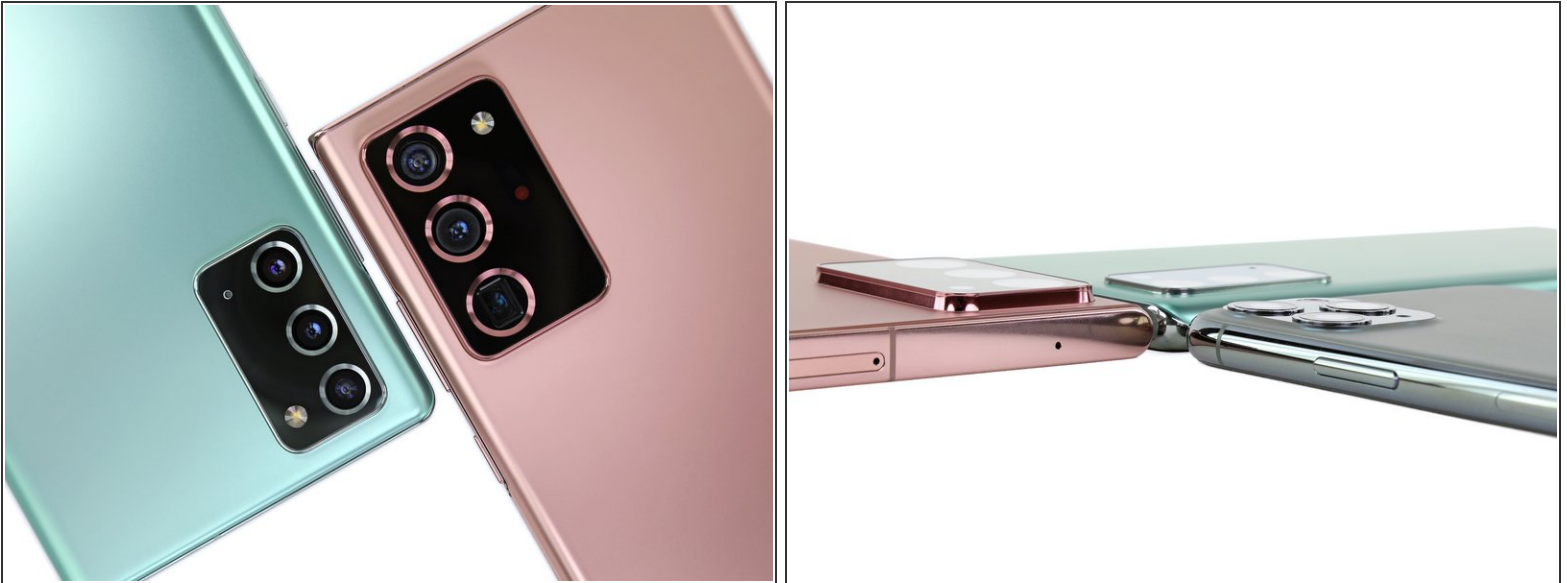
- There are multiple versions of both these phones in circulation—but we opted for US models with 5G mmWave to bring you the most complete-est teardown for your money. Our specs include:
  - Snapdragon 865+ processors paired with 8 GB (Note 20) or 12 GB (Ultra) of LPDDR5
  - Infinity-O AMOLED displays—6.7" (2400 × 1080) on the Note 20, and 6.9" (3088 × 1440) on the Ultra with 120 Hz refresh rate
  - 128 GB of internal storage, plus up to an extra 1 TB on the Ultra via microSD
  - Four cameras each, including a 10 MP selfie and 12 MP ultra-wide. The vanilla Note 20 also gets a 12 MP wide-angle and a 64 MP telephoto, while the Ultra packs a 108 MP wide-angle and a 12 MP periscope telephoto with 5x optical zoom
  - Batteries: 4300 mAh in the Note 20, and 4500 mAh in the Ultra
  - 5G and Ultra Wide Band connectivity, plus 4x4 MIMO LTE, 802.11ax Wi-Fi, and BT 5.0
- ☑ Right off the bat, we'll peer deep into the Ultra with the power of X-rays (hat tip to our ingenious friends at [Creative Electron](#) for these images).

## Step 2



- One important spec we left out: colors! We opted for Mystic Green on the Note 20, and Mystic Bronze on the Ultra. Why? Because there was no Mystic [Blue and Black](#) option.
- ❗ With the two phones now side-by-side in the X-ray cabinet, we've got questions.
  - For instance, why are the wireless charging coils—those concentric rings in the middle of each phone—so different? Samsung hasn't hinted at any major spec differences, but the Ultra has an intriguing double-coil configuration.
  - 🔍 Come to think of it, we saw something similar in the [S20 Ultra](#).
  - It's also striking how much extra real estate the Ultra devotes to its camera modules. That 108 MP peeper in the middle is already enormous, and that's before Samsung throws in the sliding periscope module right next to it.

## Step 3



- First things first, we use our S Pens to jot down a few notes about camera bumps. If you like your glass to have glass sticking out of it, the Galaxy Note 20 Ultra is the phone for you.
  - That sprawling triple-lens bump in the [iPhone 11 Pro Max](#) now seems like the height of restraint. We are officially sorry for all our complaints.
- i** While many smartphone components keep improving while shrinking in size, cameras tend to do the opposite—partly because of hard limits in optics, where capturing better images usually requires bigger sensors and more lenses.
- Google may be the smartphone maker to most convincingly buck this trend, by doing more with less—replacing physical hardware with bleeding-edge software whizbangery. Samsung's approach here is pretty cool, but we'll be keeping our peepers open for the Pixel 5.

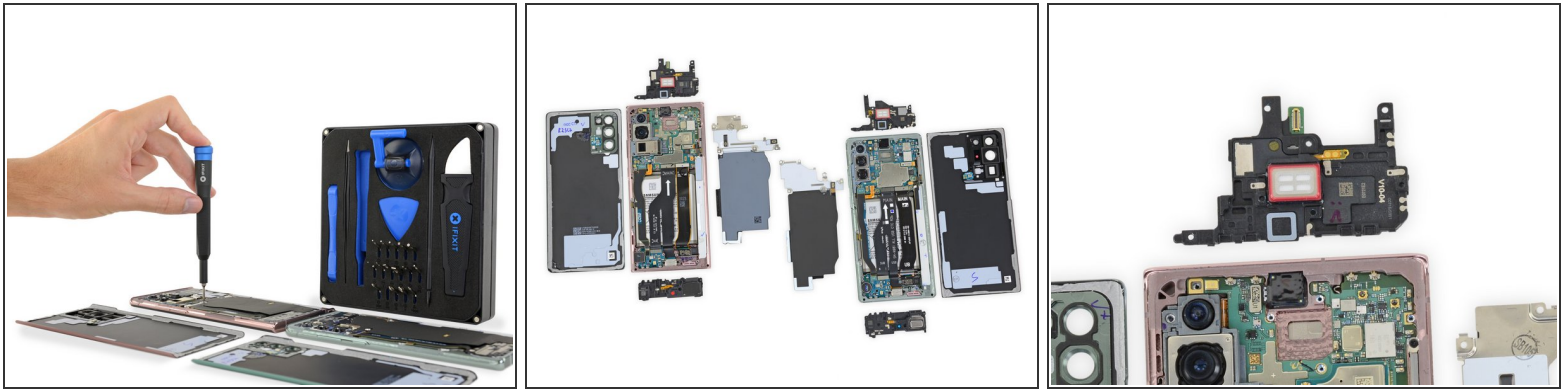


## Step 4



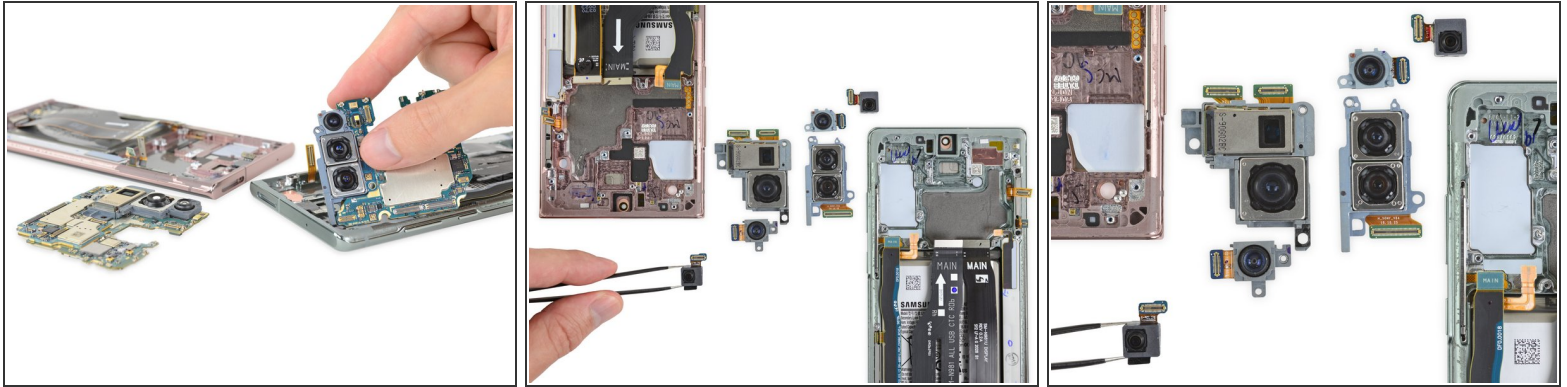
- With that, we go to work. Our iOpener was nearly rendered irrelevant by the heat wave here on the west coast—we probably could've just left both phones outside for a spell to soften the adhesive.
  - ★ While the adhesive remains annoyingly tough, the stakes are a little lower with the plastic back on the base Note 20—it feels more pliable and less likely to accidentally shatter under stress.
  - You can debate in the comments whether a \$1,000 phone should be clothed in plastic, but repairability-wise, it's probably a net win.
- ⚠ That said, if you favor a heat gun for repairs, check your settings carefully. Glass can take a lot of hot, but this plastic will soften and warp unless you're careful.
- Next, some careful [iSclack](#) and opening pick action—and both back covers lift free cleanly, without booby-traps. This teardown is officially underway.

## Step 5



- As with most phones, the screws are the first to go once we're inside. And our [Essential Electronics Toolkit](#) is here, ready and waiting to take them out.
- ❗ Despite their other non-repair-friendly tendencies, one thing Galaxy phones always score points for are the standard Phillips #00 screws.
- A few *extremely* tight midframe screws later, here's our first good look inside (in the visible-light spectrum, anyway).
- Each phone gets its earpiece speaker mounted to the upper antenna assembly, which contains a dedicated speaker enclosure—that's a first! The speaker is the rectangular bit framed with a bright red gasket. It still fires through a channel in the midframe, much like it did on the [Note10](#) and [S20](#)—but the new larger enclosures ought to boost audio quality a bit.
- Both phones also get a rear-facing mic that piggybacks directly onto the back cover. Thankfully they connect via repair-friendly spring contacts, which is why we didn't encounter any booby traps opening these things up.

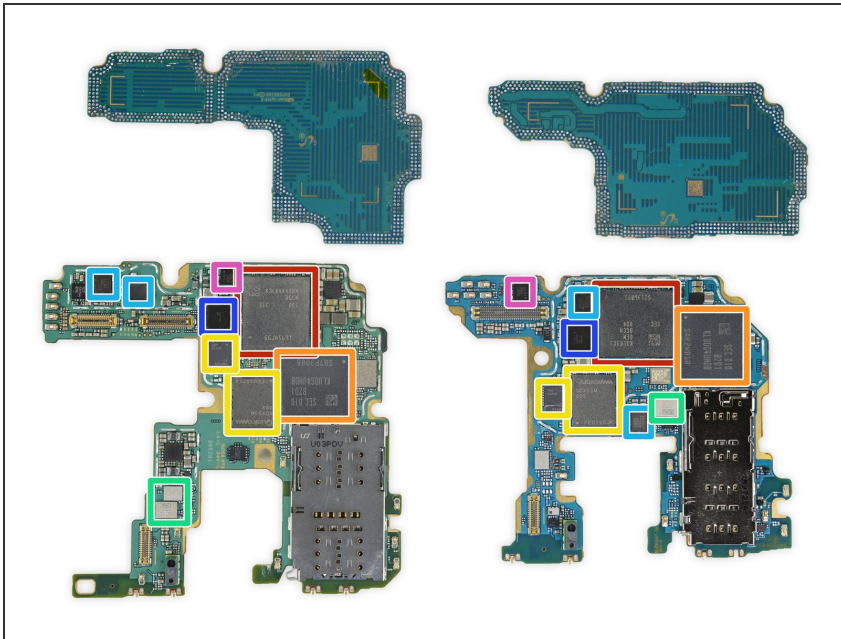
## Step 6



- Next up: cameras. Both motherboards have to come out first.
- i** These two camera arrays differ mainly in how they zoom, and how many pixels they pack:
- The Ultra inherits the super-cool optical [Space Zoom module from the S20 Ultra](#), but with a smaller 12 MP sensor behind it. (Click the link for a detailed take-apart of the periscope mechanism.) The regular Note 20 doesn't "space zoom," instead relying on a dense 64 MP sensor and some cropping magic.
  - The situation reverses for the wide-angle module, where the Ultra gets a gigantic 108 MP sensor—which, [like the S20 Ultra](#), usually bins down to 12 MP. Meanwhile, the regular Note packs a more modest 12 MP sensor here.
  - Neither Note gets the S20 Ultra's 40 MP front-facing camera—instead, both pack 10 MP selfie sensors, which appear to come bundled with some [unfortunate smoothing effects](#).
- ★** Oddly, the standard Note 20 releases its selfie module with gentle prying—but the Ultra's comes firmly hot-glued in place.

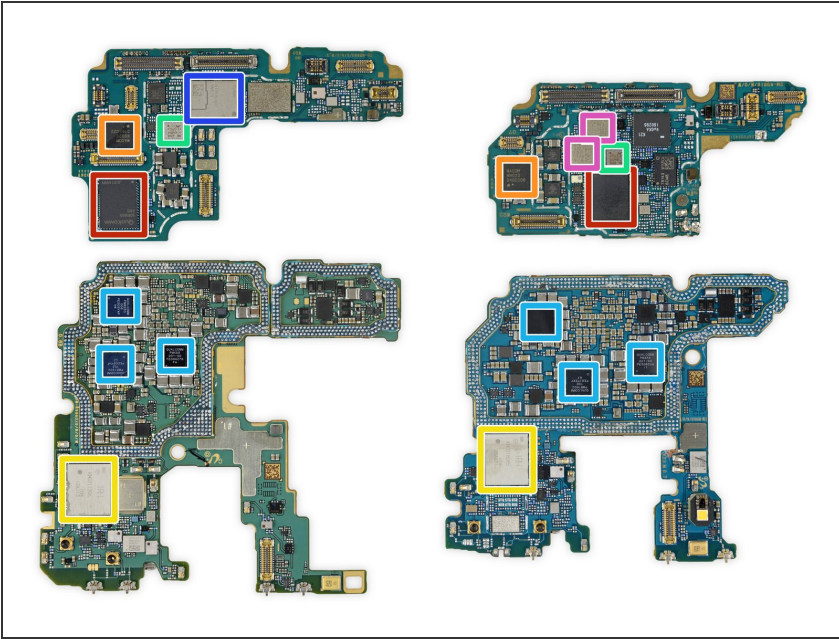


## Step 7



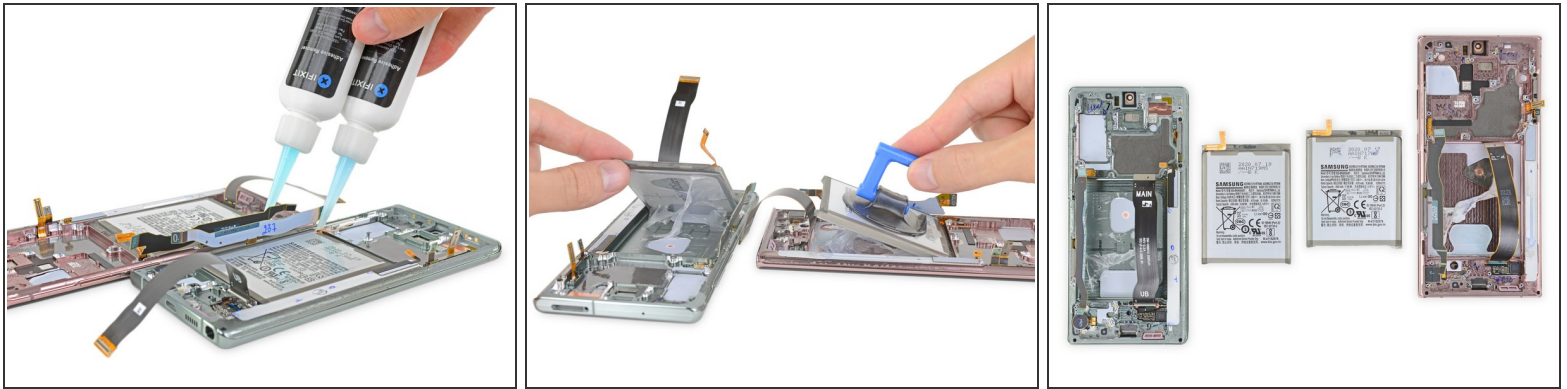
- Thank you, Samsung, for making these motherboards look like [AT-ATs](#). We expect a battle to break out on Hoth any minute now! Here's what these transports are carrying:
  - Snapdragon 865+ layered under Samsung LPDDR5 RAM
  - Samsung KLUDG4UHDB 128 GB universal flash storage
  - Qualcomm [SDX55M](#) 5G modem-RF system and SMR526 intermediate frequency IC
  - Qualcomm QDM4820, QDM5872, and QDM4870 FEMs
  - NXP 11OUV2H and 9468B3, likely a part of NXP's "[industry-first solution to combine UWB fine-ranging, NFC, Secure Element, and embedded SIM](#)"
  - Maxim MAX77705C PMIC
  - Likely ON Semiconductor FPF3788UCX OVP load switch

## Step 8



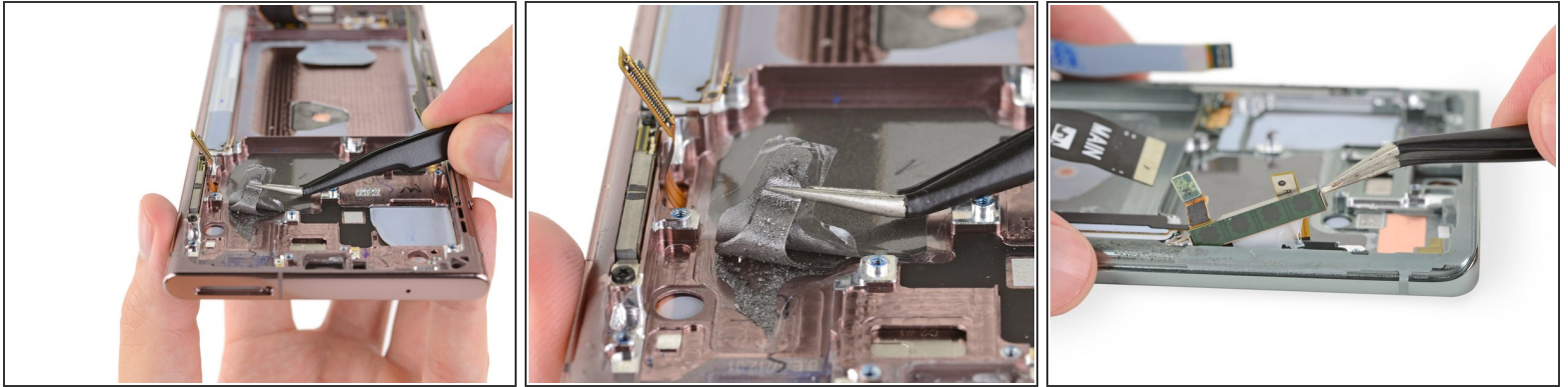
- They've turned around and are now fighting for the rebellion!
- Qualcomm [SDR865](#) 5G and LTE transceiver
- Likely Wacom W9020 digitizer controller
- Murata 1RH WiFi + Bluetooth module
- Skyworks [SKY77365](#) power amplifier module
- Qualcomm PMX55, PM150C, and PM8250 power management ICs
- AVAGO AFEM-9136 front-end modules
- Qualcomm QPA5580 power amplifier module

## Step 9



- What's worse than removing a glued-down Note battery? Removing two of them ... at the same time.
- Luckily we've got our adhesive remover handy. A few squirts, some patience, and a little persuasion from a pair of suction cups helps us safely remove both batteries without breaking too much of a sweat.
  - By this point, it feels inevitable that Samsung batteries will always be glued in like this, but we're not ready to give up hope yet. Samsung, if you're listening, [there's a better way](#). (And prior to that, there was [an even better-er way](#).)
- These Note 20 and Note 20 Ultra juice packs weigh in at 16.69 and 17.46 watt-hours, respectively.
- Both beat the [15.04 Wh pack](#) in the iPhone 11 Pro Max, but fall behind the [19.30 Wh monster](#) in the S20 Ultra—which didn't have to make room for a stylus, therefore *moar battery*.

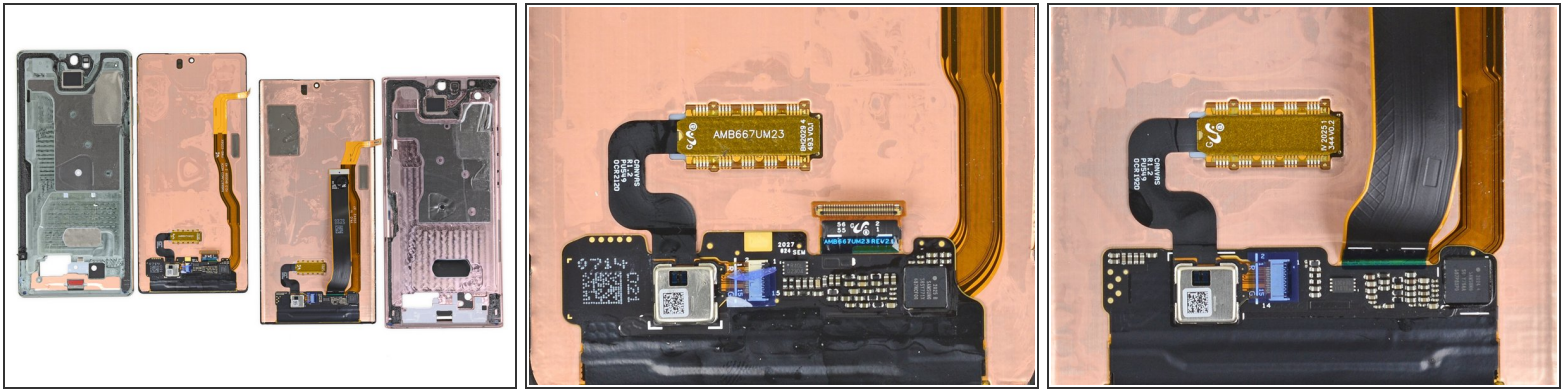
## Step 10



- The strangest thing about these phones so far is, of all things, what lies underneath the motherboards.
- ✦ To soak up all the heat from each phone's octo-core processor, we expect to find a sprawling copper vapor chamber here—the kind Samsung was always quick to brag about in [previous Galaxy Phones](#). But instead, we find a multi-layered graphite thermal pad.
- Stranger still, it seems [some other Note 20 phones](#) *do* have copper heat pipes—but not our US-spec model. Does the Exynos SoC on international models require different cooling hardware than our phones, with their Snapdragon processors?
- Our friend Zack, of *JerryRigEverything* fame, tells us [his South Korea model](#) *also* has graphite. Stay tuned for more details on that.
- Our next thought was, maybe this comes down to heat-prone 5G mmWave hardware, which not all Notes have—but that doesn't line up either. Is it some kind of A/B test on new cooling hardware? There must be some logic here, but we can't figure it out. Let us know if you have ideas.
- ✦ **Update:** We gathered some additional intel on the different cooling systems and some inside dirt on Samsung's design process. [Read all about it!](#)
- Speaking of mmWave modules—both our phones have them, but only two each. In contrast, the [Note10+ 5G](#) and [S20 Ultra](#) got three. Has the hardware improved such that only two are needed, or is something else going on?



## Step 11



- Last to leave their metal home are the two AMOLED displays. And behind them is some of that copper we were looking for!
- Samsung has long lined their displays with copper to help disperse heat—and that's still the case here, despite the switch to the graphite underneath the motherboard.
- Both these phones share the code name [Canvas](#). Not quite as clever as last year's [Davinci](#), but apt nonetheless.
- The back side of each display hosts an integrated ultrasonic fingerprint sensor. Meanwhile, Corning's new [Gorilla Glass Victus](#) protects the front—promising "*significant improvement in both drop and scratch performance, for the first time ever in the Gorilla Glass family.*"
- ❗ Smartphone glass has become increasingly shatter-resistant in recent years, but generally at the expense of scratch resistance. Will this new formula scratch at a level 6 with deeper grooves at level 7?

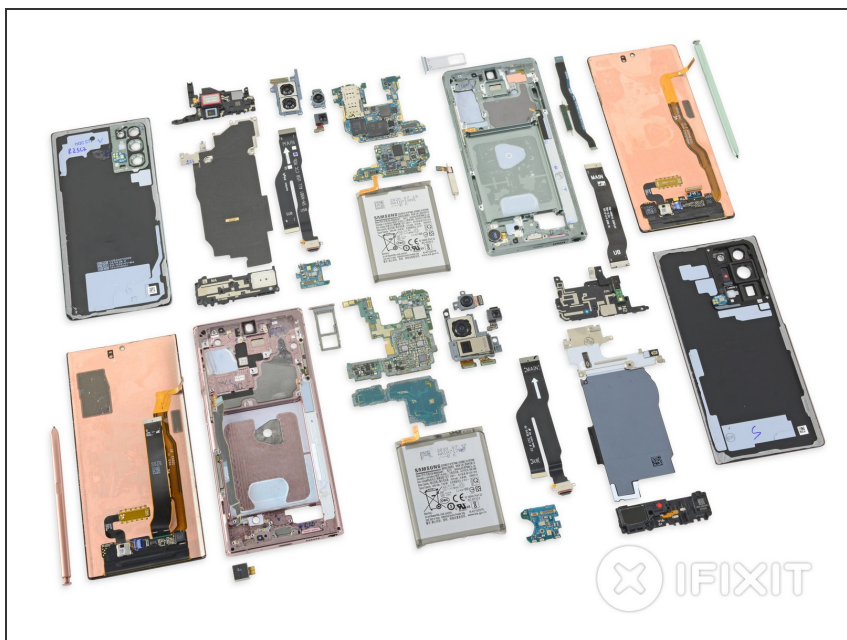


## Step 12



- We're almost done—but if you need one last look, here's the Ultra being bombarded with X-rays from every angle.
- One thing we failed to locate in our teardown: Ultra Wide Band antennas, like we found in the [iPhone 11 series](#). Did we somehow miss it, or is Samsung's implementation completely different?

## Step 13



- That's all she Note!
- ★ Before we wrap, it's time to declare a winner in our [livestream](#) contest—we asked for your most creative reason why Samsung jumped from Note 10 to Note 20, and you gave us lots to choose from.
- User [Space Saga](#) posted our favorite: *Samsung didn't intentionally put the number 20 to this year's Note series—it was just a typo, but before anyone noticed, the leaks had already begun.*
- Congrats! You won yourself a pair of super-repairable [Galaxy Beans](#). (Why didn't *that* name stick?)
- As always, we leave you with the repairability score—a fitting note on which to end, wouldn't you agree?

## Step 14 — Final Thoughts

### REPAIRABILITY SCORE:



- The Samsung Galaxy Notes 20 both earn a **3 out of 10** on our repairability scale (10 is easiest to repair):
  - You'll only need one screwdriver, a standard Phillips.
  - Many components are modular and can be replaced independently, including the charge port.
  - Battery replacement remains far too difficult for a consumable component.
  - Screen repairs are tedious, poorly prioritized, and unnecessarily expensive.
  - All repairs demand battling through tough adhesive, then painstakingly cleaning and replacing it.