



# Apple Watch Series 2 Teardown

Teardown of the Apple Watch Series 2 on September 16, 2016.

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## INTRODUCTION

Our iPhone 7 Plus is still on the chopping block, but we just can't help ourselves—it's time to look at Apple Watch Series 2. The Series 2 looks all-but-identical to the newly rechristened "Series 1"—but is it the same on the inside? With added features such as built-in GPS, waterproofing, and a variety of new bands and cases, Apple's new wearable was destined for the teardown table. It's time to see if this "ultimate device for a healthy life" has what it takes to go the distance in terms of repairability.

**Did you miss our first look at the "best, most advanced iPhone ever"? Hop over to our [iPhone 7 Plus teardown](#) and just try to keep up!**

Ready to dive in? Keep pace with the latest news from the repair world by following us on [Facebook](#), [Instagram](#), or [Twitter](#).

[video: <https://www.youtube.com/watch?v=yAE3Q5adDWA>]



### TOOLS:

- [64 Bit Driver Kit](#) (1)
- [iOpener](#) (1)
- [Curved Razor Blade](#) (1)
- [iFixit Opening Picks set of 6](#) (1)
- [iFixit Opening Tool](#) (1)
- [Spudger](#) (1)

## Step 1 — Apple Watch Series 2 Teardown



- Our watches are getting smarter every day. Let's see what the newest generation of Apple wrist accessories has to offer:
  - Second-generation OLED Retina display with Force Touch
    - ⓘ Consistent with the [original Apple Watch](#), the Series 2 comes in two sizes: 38 mm (272 × 340 pixels, 290ppi) and 42 mm (312 × 390 pixels, 302 ppi).
  - Custom-designed Apple S2 [SiP](#) (System in Package)
  - Built in GPS + NFC + Wi-Fi 802.11b/g/n 2.4 GHz + Bluetooth 4.0
  - Accelerometer + gyroscope + heart rate sensor + microphone + speaker + ambient light sensor
  - Water resistance rating (up to 50 meters)
  - WatchOS 3

## Step 2



- With the release of the Apple Watch Series 2, the original Apple Watch has been replaced with the "Series 1"—a new model with a snappy dual-core processor.
- The back of the Series 2 is adorned by a familiar quartet of optical polymer lenses protecting a set of LEDs and photodiodes.
- ❗ Both series offer the same set of interchangeable bands for easy customization. If only every component could be this easy to replace...

## Step 3



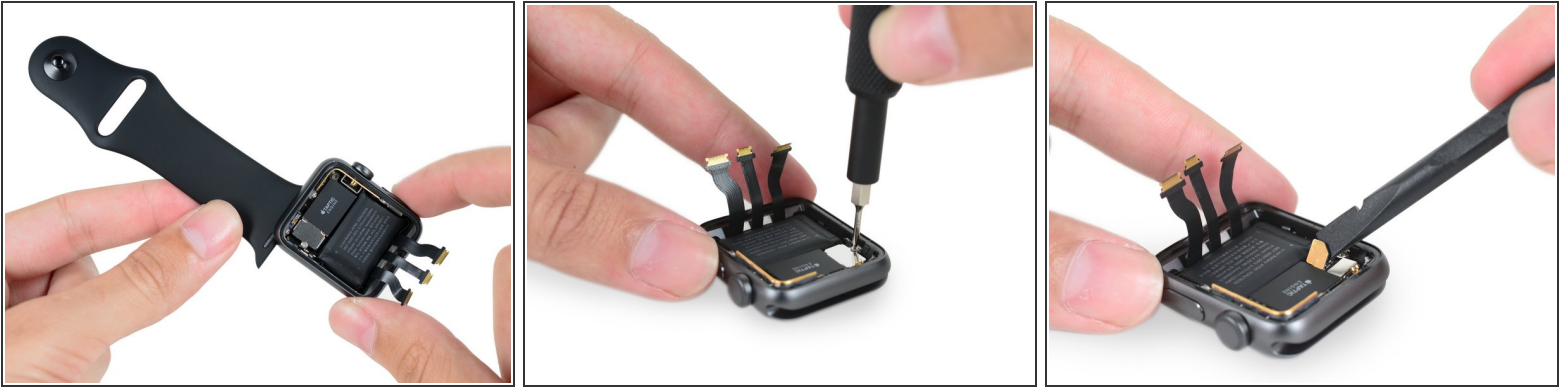
- Armed with knowledge gleaned from the [original Apple Watch](#) and our expertise wielding an [iOpener](#), we're ready to bust through the adhesive and pop off the screen.
- ❗ Alas, as we pick up the display, we notice that the adhesive is much stronger than what we found in the 2015 model. We assume this change is for the purpose of added [water resistance](#).
- A knife, a pick, and a spoon full of gumption later and we're in!

## Step 4



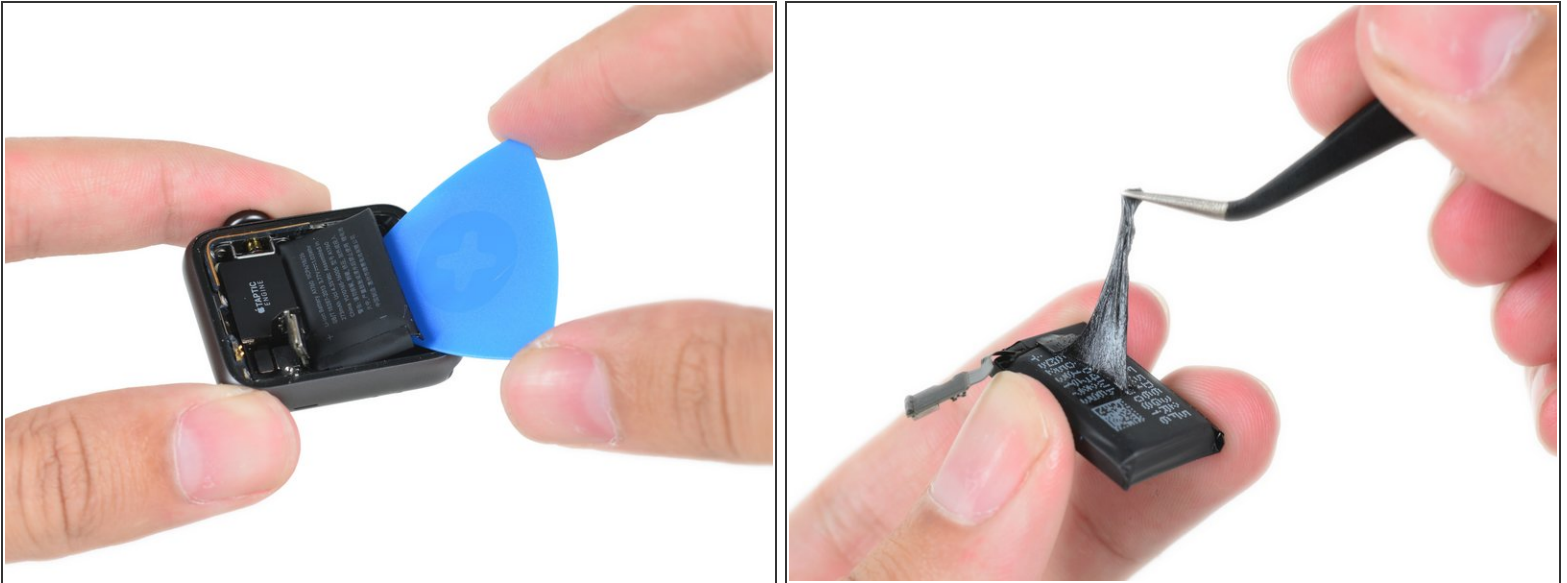
- Externally, the Series 2 bears a strong resemblance to its older sibling—but once inside, we find a set of ZIF connectors in place of the [awkward press connectors](#) of yesteryear.
  - ⓘ This refinement is great news for repair. Easily opened and secured connectors increase the likelihood of a successful fix.
- And tucked away on the back of the display we find a whole host of control hardware:
  - Apple 343S00092
  - 20211CP TD1628A
  - NXP 67V04 NFC Controller (also found in the [iPhone 7 Plus](#))

## Step 5



- We slide the remaining band away from the body of the watch and start digging for the battery.
- Just like the battery bracket in its [cellular-capable counterpart](#), this piece is held in by a less-than-friendly tri-point screw. Thankfully, our [64 Bit Driver Kit](#) is up to the task!
- With a deft flick of our spudger this watch is rendered powerless.
  - ❗ Is it just us, or is this disassembly off to an easy start?

## Step 6



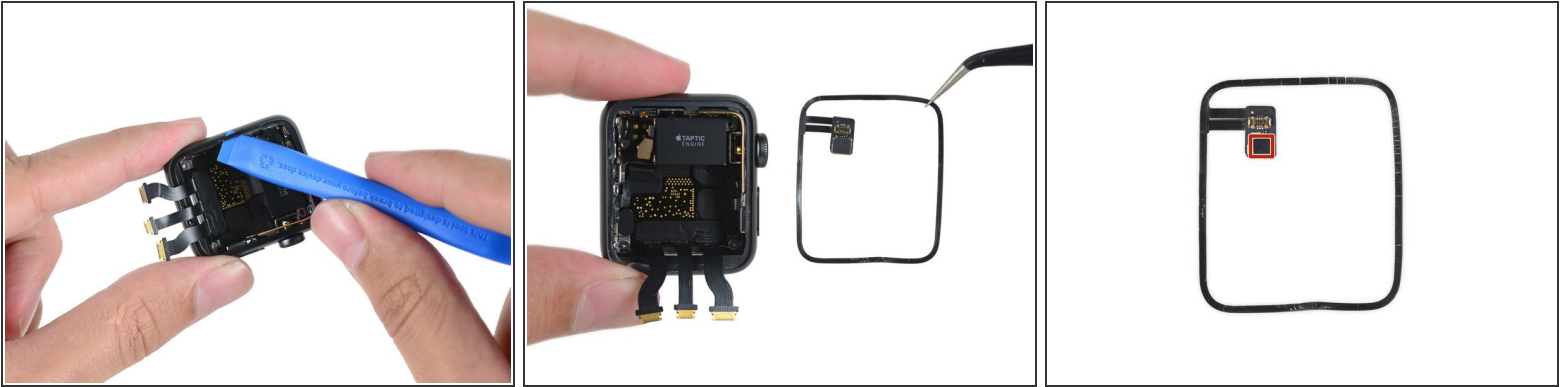
- Welp—as they say—if it seems too good to be true, it probably is.
- Compared to [last year's Apple Watch](#), the underside of the Series 2 battery reveals enough chewing-gum adhesive to hold an iPad screen in place.
- ❗ We hate to see this much adhesive on a tiny battery, but this time we'll give the adhesive on this [swim-proof watch](#) a break—after all, it lives on your wrist, not in your pocket.
- We've never backed down from a sticky situation before, and this is no exception. We pick and prod, peel and pull the adhesive off the little power pack—with enough coaxing, it will come clean and reveal its secrets.

## Step 7



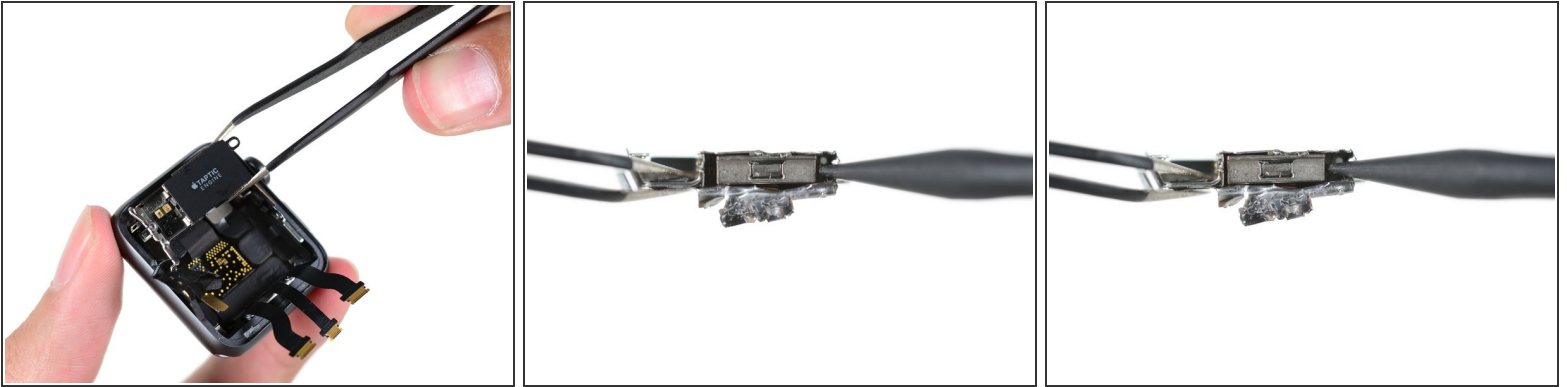
- With the glue stripped from the back of the battery, we get a closer look at its impressive specs. This cell is rated at 3.77 V and 273 mAh to yield a whopping 1.03 Whr of power.
- ⓘ Our watch is the 38 mm—the 42 mm should feature a larger power pack.
- ⓘ For those of you keeping score, this battery offers a full 32% increase in power over the [previous generation](#)—most likely to compensate for the addition of GPS capability.
- Apple says the Series 2 will have about the same 18-hour battery life as the original Apple Watch, so that GPS must be power hungry.
- ⓘ One thing is for sure: this battery, like all batteries, will fail. And when it comes time to replace it, you'll be trading power for resistance—water resistance that is. When the seal is cracked on this watch, all the king's horses and all the king's men probably won't get it watertight again.

## Step 8



- Taking a plastic opening tool to the rim of the watch reveals a Force Touch sensor and gasket similar to the one found in the original model.
- ⓘ Like its 2015 counterpart, the Series 2 uses [Force Touch](#) to sense downward pressure on the screen. We first encountered Apple's use of this technology in the [MacBook Pro 13" Retina Display](#).
- Unlike last year's model, there's a lone IC hiding away on the Force Touch gasket:
  - Analog Devices [AD7149](#) Capacitance Sensor Controller

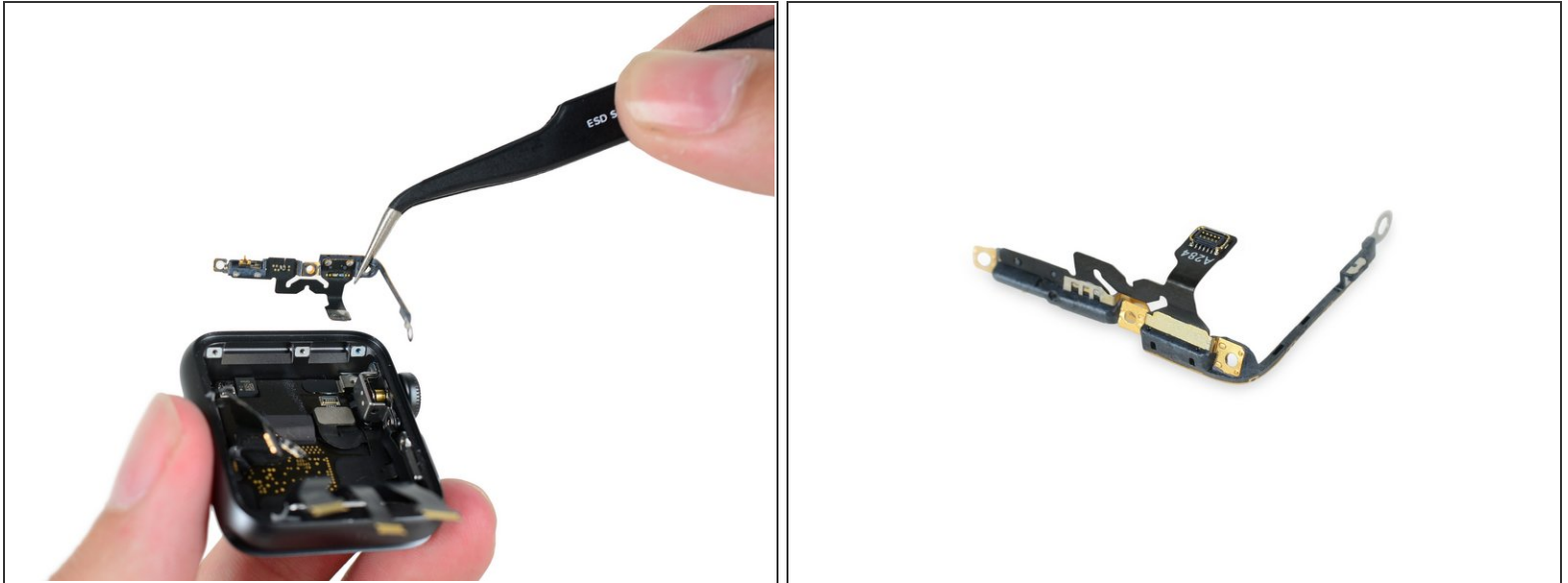
## Step 9



- Next on our disassembly line is the noticeably larger Taptic Engine.

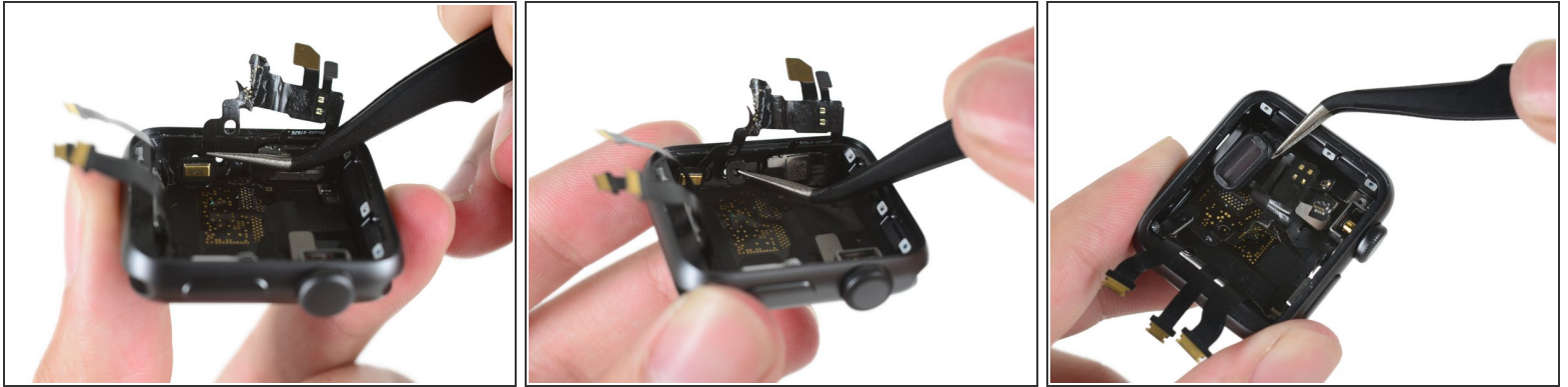
- ☞ The Taptic Engine is Apple's take on the [linear resonant actuator](#). It creates motion in a straight line (as opposed to the circular motion of an electric motor), which in turn provides [haptic feedback](#).
- ⓘ The concept of a linear resonant actuator isn't unique to Apple devices. Pancake-shaped LRAs have existed in electronic devices for years—but the choice to utilize a rectangular z-axis LRA provides Apple with more design freedom and more control over how the user perceives the vibration.

## Step 10



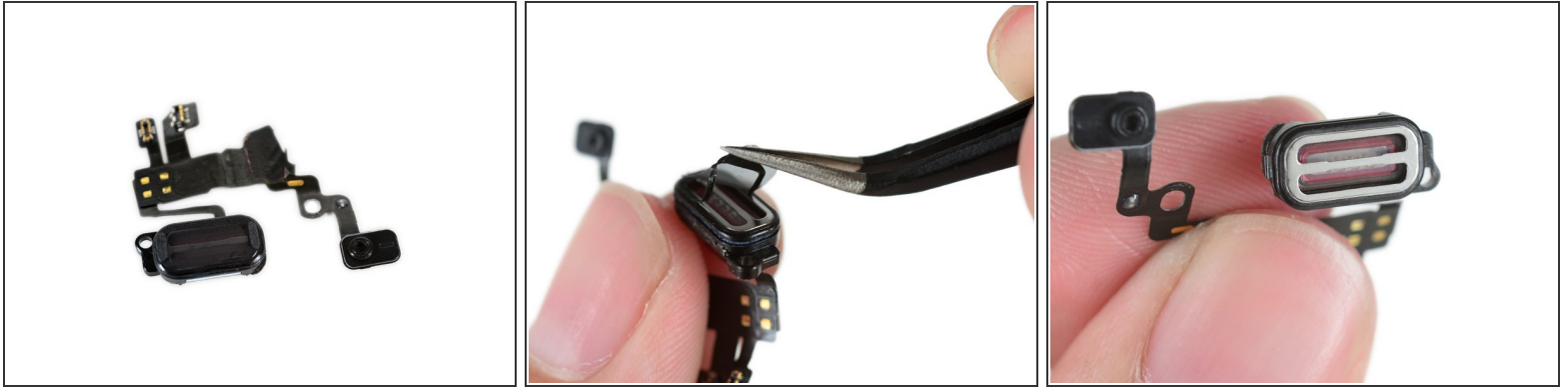
- With the Taptic Engine extracted, we inspect the antenna module found tucked away at the top of the watch.
- ① We suspect that the more complicated look of this small assembly is due to the addition of a GPS antenna. It is a tiny component, but the difference is notable when compared to the [first Apple Watch](#).
- ① What does GPS capability mean? It means this watch is only one step away from being an independent instrument of Pokemon Go—just as soon as it grows up and gets a real data connection.
- Enough gawking—it's time to get our tweezers on what's left of this wearable.

## Step 11



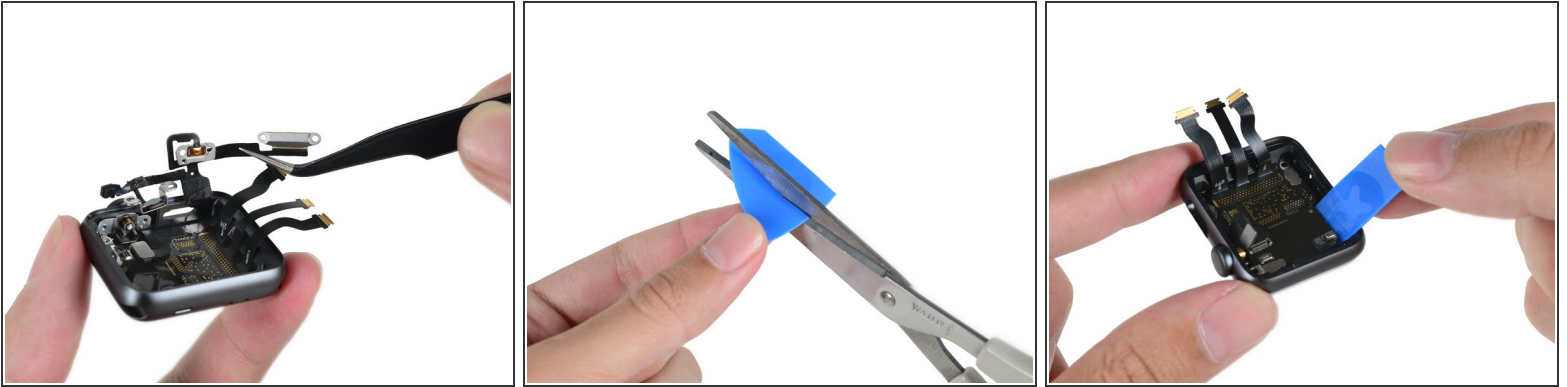
- Hiding out on the outer rim, we find a complex cable assembly—home to the microphone and speaker.
- ① And in between the two, the mystery of the second microphone port is solved. A flexible rubber plug looks like a barometric vent, designed to allow outside pressure to be felt by the internal barometer through the waterproof shell.
- The Apple Watch Series 2 is trying to make a splash while keeping dry. This requires no shortage of gaskets and o-rings.
- How well do these gaskets and o-rings keep water out? The Apple Watch Series 2 resists water intrusion to a depth of 50 meters, under [ISO standard 22810:2010](#). This means it will be fine in a pool, but may fail during certain [activities](#).

## Step 12



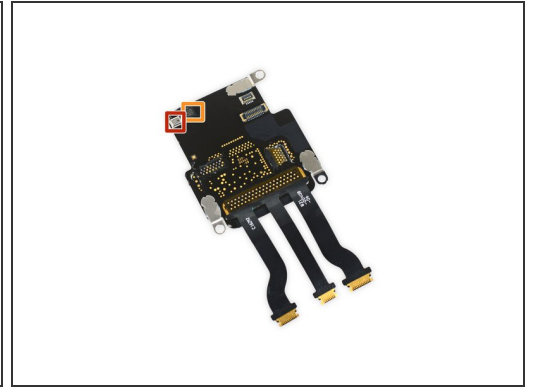
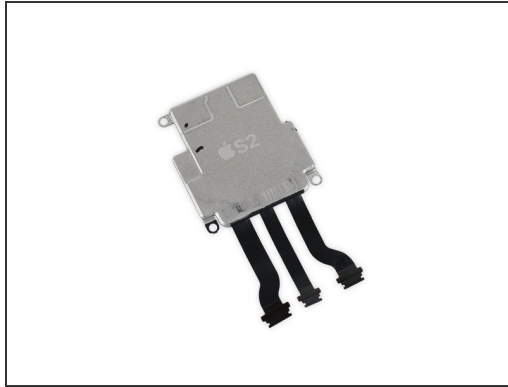
- Did someone say ingress protection? This highly-touted speaker is equipped to deal with incoming water rather than fight it.
- Unlike the original Apple Watch's speaker—which would simply flood when underwater—this module is *designed* to fill with water, then vibrate to pump excess water from the body of the speaker.
- ⓘ This pumping action, along with an automatic display shutoff, enables Apple Watch's swimming modes without risking damage to any critical components.

## Step 13



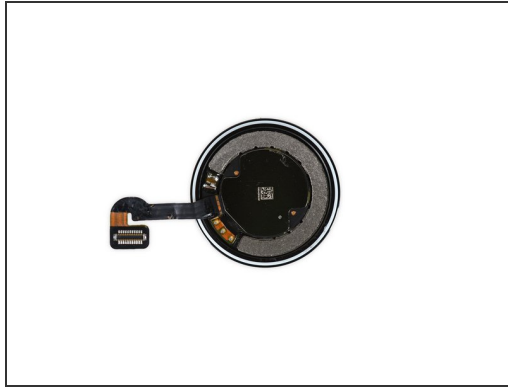
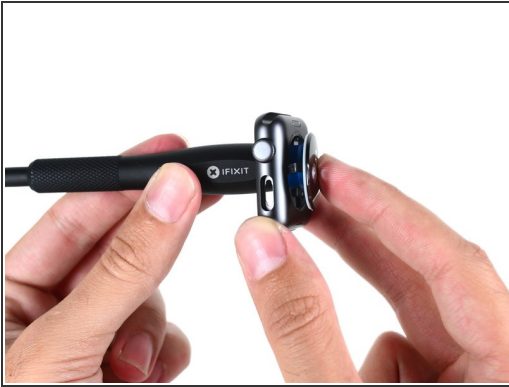
- There's one last piece barring us from reaching the belly of the beast: this ribbon cable assembly, where the Home Button and Digital Crown encoder reside.
- Luckily, no teardown can be thwarted so easily. We quickly move past the gangly assembly to get at the core computer in this little wearable wonder.
- And, in keeping with the tradition of [last-minute tool modifications](#), we make use of our all new Apple Watch Opening Pick to lift the System in Package out of the rear enclosure.

## Step 14



- And we finally reach the much awaited Apple S2 SiP—complete with the dreaded [resin enclosure](#).
- On the top of the SiP, tucked into the upper left corner, we spot a tiny pair of components:
  - Bosch Sensortec [BMP280](#) Barometric Pressure Sensor
  - Likely an iteration of STMicroelectronics C451 gyroscope + accelerometer found in the [original Apple Watch](#)
- ❗ But wait, isn't that the back? Where all the [cables](#) go? Turns out Apple decided to flip the SiP, so all of the connectors are on the same side as the things they connect to. Imagine that!

## Step 15



- All that's left between us and complete teardown glory is the sensor array, housed in the watch's back cover.
- The four-sensor array includes infrared sensors, visible-light LEDS, and photosensors to track your heart rate throughout the day.
- With the sensor assembly removed, we spy what we assume is the inductive charging coil left behind in the cover.

## Step 16

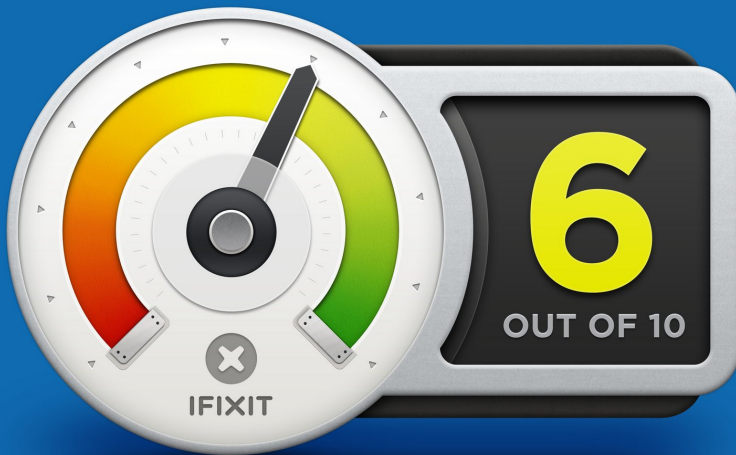


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- And that's a wrap! With our Apple Watch torn asunder on the teardown table we step back to pick up the pieces—and hope it's still waterproof when we put it all back together.
- ① We also want to take a second to thank our friends at Nikkei for joining forces and lending us some space in their Tokyo offices!

## Step 17 — Final Thoughts

### REPAIRABILITY SCORE:



- Apple Watch Series 2 Repairability Score: **6 out of 10** (10 is easiest to repair)
  - While not an industry standard, the watch band is easily removed and swapped out for a replacement.
  - Removing the screen is difficult, but not impossible—it's the first component out, and is connected with easy to use ZIF connectors.
  - Once you're inside, the battery is fairly easy to remove—if you have the proper tri-point Y000 driver.
  - While not proprietary, incredibly tiny tri-point screws are a repair hinderance.
  - Replacing any of the component cables requires microsoldering—but does not require removing the SiP as in the previous generation Apple Watch.
- The fully encased S2 system makes board-level repairs impossible.