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# INTRODUCTION

It's been two years since the first AirPods teardown, and in those two years AirPods have become both [surprisingly popular](#) and [infamous for their short lifespan](#). These second-generation 'pods look the same on the outside, but have a couple notable internal upgrades. The real upgrade we've got our hopes up for is repairability—it would be great if these didn't end up in the landfill after a couple years of use.

Is this upgrade worth the price increase? What does the *H* in *H1* stand for? Will these AirPods be the RepairPods evolution we are hoping for? There's only one way to find out: with a teardown!

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## TOOLS:

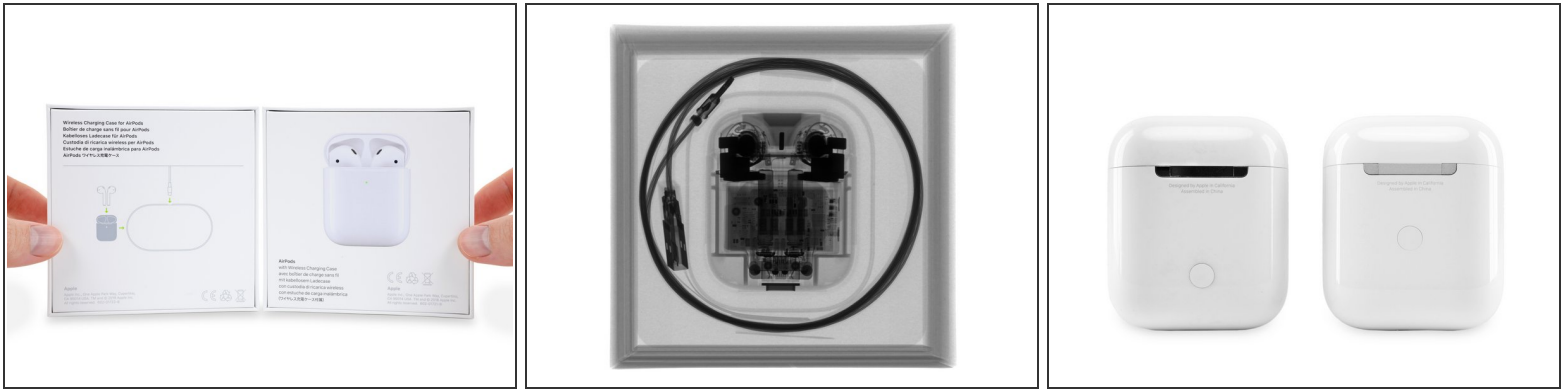
- [iOpener](#) (1)
  - [Curved Razor Blade](#) (1)
  - [Tweezers](#) (1)
  - [Ultrasonic Cutter](#) (1)
  - [Isopropyl Alcohol](#) (1)
  - [Probe and Pick Set](#) (1)
  - [Halberd Spudger](#) (1)
  - [Small Vise](#) (1)
  - [Heat Gun](#) (1)
  - [Spudger](#) (1)
  - [Phillips #00 Screwdriver](#) (1)
  - [Large Needle Nose Pliers](#) (1)
  - [Mini Locking Pliers](#) (1)
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## Step 1 — AirPods 2 Teardown



- This fancy dental floss looks very familiar, but according to Apple it's worth \$40 more than its predecessor. Here's the story the spec sheet tells:
  - Two AirPods weighing in at 0.14 oz (4 g) each, with a 1.41 oz (40 g) charging case
  - Each AirPod measures 0.65" × 0.71" × 1.59" (16.5 mm × 18.0 mm × 40.5 mm) while the charging case measures 1.74" × 0.84" × 2.11" (44.3 mm × 21.3 mm × 53.5 mm)
  - ⓘ **TL;DR:** exactly the same size as the [first-gen AirPods](#), but the charging case gained an additional 2.3 g—about the weight of a US penny.
  - New H1 chip featuring [Bluetooth 5](#)
  - Wireless charging case
  - "Hey Siri" support
- ☑ Our last AirPods teardown got pretty messy, so we've partnered with [Creative Electron](#) for some X-treme X-ray guidance. Check out the arrangement of magnets for the case's Zippo-like flip top action, which looks like dark rectangles embedded in the plastic shell.

## Step 2



- We start our examination with these curious markings on the boxes. We're seeing [multiple references](#) to something called "AirPower" ... ?
  - ❗ Wonder what that is, @apple?
- Next we X-ray the box to confirm if it's safe to open. Oh, who are we kidding—we're opening it regardless. *Safety third*, we always say.
- ✦ Meanwhile, we rummage through our ancient tech drawer and pull out a set of first-gen AirPods for a quick comparison.
  - While you may not think of two-year-old products as *ancient*, reports say these first-gen AirPods (left) are aging fast.
  - The new case (right) looks *shinier*, but that might just be due to wear on the Gen 1.
  - We also note a relocated pairing button, and a newly placed external LED charging indicator.

### Step 3



- On the other end of the wireless earbud arena, we have the new Samsung Galaxy Buds—which we recently [tore down](#) and found to be surprisingly repairable! The ball is in your court, AirPods.
- ⓘ Time to get up close and personal: the AirPods have model numbers A2031 (left ear) and A2032 (right ear).
- We have some real gripes with the AirPods' design priorities, but there's no denying the engineering talent that goes into them. Peer into this X-ray and you can pick out batteries, microphones, antennas, speaker drivers, circuit boards—all in something that fits in your ear.

### Step 4



- Inside the flip top, we find a new model number, **A1938**—with the same indicated 398 mAh battery capacity for the case.
- ⓘ And next to that, we find the [no whee bin](#) icon, indicating that these are not to be thrown away in two years when the batteries start to fail.
- What *should* you do with them, then? [Good question](#).

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## Step 5



- Okay, enough talk! On to the good stuff. Having been [down this road before](#), we start with some heat to soften the adhesive. Does it help? Honestly ... maybe.
- Next, some careful blade work.
  - ⓘ Don't try this at home, kids.
- After slicing open the buds, we give them a nice relaxing isopropyl alcohol bath in hopes that they will let their (adhesive) guards down a bit.

## Step 6



- While the alcohol helped us get one foot in the door, we caught our tweezers in the jamb. A good firm pry opens up the driver for inspection.
- Sweat beads as we make an incision down this AirPods's belly using an ultrasonic ~~scalpel~~ knife, slicing the shell without damaging the battery underneath ... mostly.
- Flex cables, antennas, and microphones are all carefully folded together like origami and cemented in place with glue. We cut away as much of the outer casing as we dare, and painstakingly scoop out the rest with a fine dental pick.
- Our badges say *Teardown Engineer*, but today we feel more like surgeons, or [paleontologists](#). *Paleosurgeons?*

## Step 7



- With these delicate fossils extracted, it's time to examine the brains:
  - Apple 343S00289 (likely Apple's new H1 chip)
  - Dialog Semiconductor (Formerly Adesto) [AT25SL128](#) 128 Mb serial flash memory
  - Apple 338S00420 (likely a low-power stereo audio codec)
  - T 8 36 (likely STMicroelectronics inertial sensor)
  - Bosch Sensortec [BMA280](#) 3-axis accelerometer (likely)
- Turning our attention to the brawn, we find the [familiar](#) 93 milliwatt hour battery in each bud.
  - ① That's less than half the capacity of the [button-cell batteries](#) in the Samsung Galaxy buds. We're curious to see what will be powering the rumored [Powerbeats Pro](#), but we'll have to wait for that comparison.



## Step 8



- We learned last time around that the AirPods case is a tough nut to crack, so this time ( [with some guidance from a community member](#) ) we turn to something with a bit more clamping force.
- The vise deforms the outer shell just enough for us to wedge a blade into the seam, slicing through the adhesive underneath and freeing up the AirPods docking tubes.
- ❗ It'll never look *quite* the same, but the case suffered a lot less damage with this technique.
- Next, we spudger away the status LED, which is nestled between the AirPods tubes at the front of the case.

## Step 9



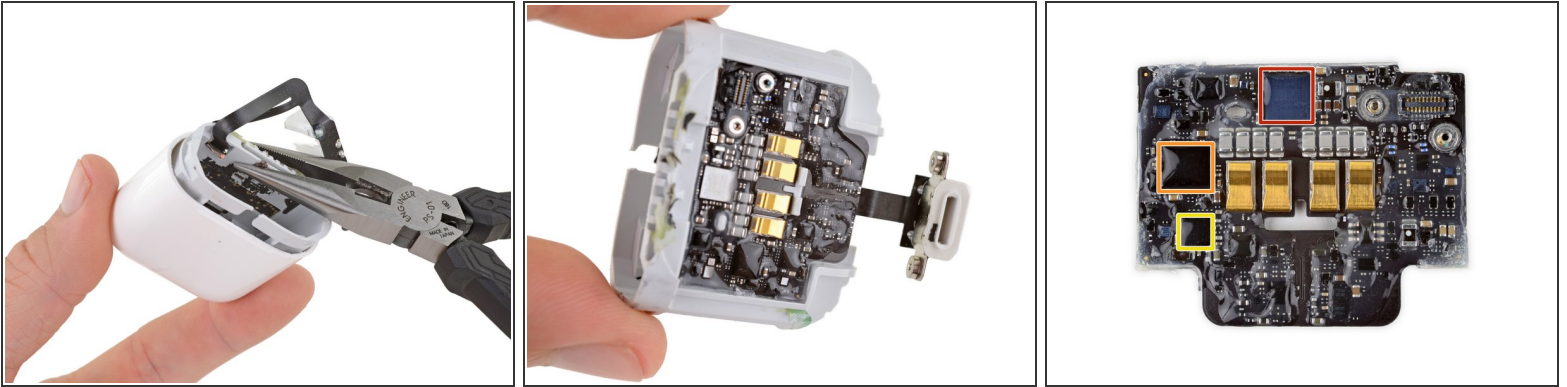
- This machined metal hinge looks sturdier [compared to the last generation's](#), and it definitely has the adhesive to match.
  - ❗ After giving the case almost more heat than it can handle, we still need vise grips to pull this thing out.
- We go for the battery next, but the battery's adhesive has other ideas. Against our better judgement, we crank the heat to eleven, watch for swelling, and cross our fingers that the battery doesn't go [Galaxy Note 7](#) on us.
- Despite the effort, one spudger still can't lever this battery out. Fortunately, [we found some more](#).

## Step 10



- As the battery comes free, it's clear there is simply no comparison between this battery and its [predecessor](#) ... because they are exactly the same.
- Model A1596—running at 3.81 V and 398 mAh, for 1.52 Wh.
  - ① That's a fair bit more than the [Galaxy Buds](#) case, which houses a 1.03 Wh battery ...
  - ① ... and also more than the [1.113 Wh li-po](#) we found in the Series 4 Apple Watch (42 mm).

## Step 11



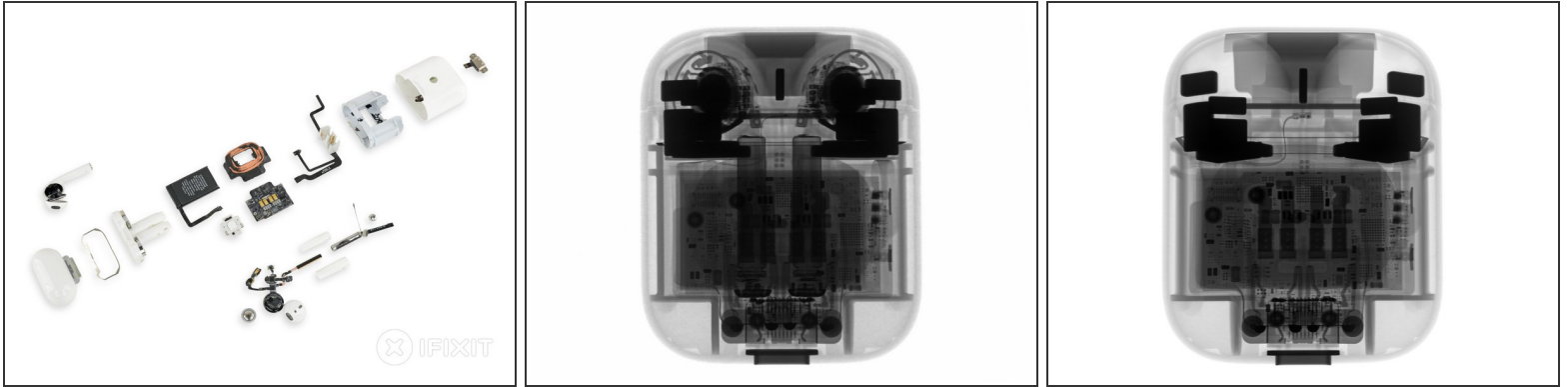
- We're starting to see a trend here. Getting the next layer out of this case requires—you guessed it—heaps of heat, a plethora of prying, and a pair of pliers.
- We immediately notice that this generation's logic board is more ... goopier ... than the [board](#) that emerged from the wreckage of the first AirPods fiasco—probably to help with water resistance.
- Finally, a beacon in the darkness—there's [still](#) a modular charging port!
- ... although if you tunnel this far into the case, there's a good chance you now have more broken parts than just the charging port.
- Beneath that shiny liquid-resistant coating, we make out some chips:
  - Broadcom BCM59356A2KUBG wireless charging module
  - STMicroelectronics [STM32L476MG](#) 32-Bit ARM Cortex-M4 microcontroller w/ 1 Mb flash
  - TI 87A6FP

## Step 12



- Reaching into the almost-empty case, we fish out the slightly modified [\(compared to last time\)](#) sync button—now with two additional solder points for the ends of the wireless charging coil.
  - Finally, the thing we came all this way for: the new wireless charging coil, and a thermal pad to keep it cool under pressure.
  - ... which, despite our best efforts, refuses to come out intact.
- i** This updated case seems designed for increased *durability*, but not *repairability*. That beefier hinge and water-repellent coating on the board probably makes for fewer failures—hopefully *way* fewer, because the rest of this thing is still a hot mess to service.

## Step 13



- Teardown complete! Let's put these back together and sync them up for some tunes.
- Just kidding! These are toast.
- ❗ What did we learn? After two years, AirPods are still disappointingly disposable. Those tiny batteries *will* fail before long, and good luck replacing them (or even [recycling them](#)).
- That said, the construction isn't *entirely* unimproved—this set might survive an extra trip through the washing machine. [It's just, we know Apple can do better.](#)
- If you like [wallpapers](#), here are some bonus X-rays you can print out and skin your AirPods case with!

## Step 14 — Final Thoughts

### REPAIRABILITY SCORE:



- AirPods (2nd generation) earn a **0 out of 10** on our repairability scale (10 is the easiest to repair):
  - AirPods are not designed to be serviced. No hardware components can be accessed without damage to the device.
  - Sealed-in batteries limit the AirPods' lifespan, making them a consumable/disposable item.