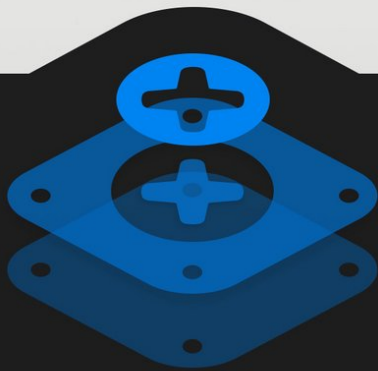




# Apple Analog Watch Teardown

Torn down on April 1, 2015.

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# TEARDOWN

# INTRODUCTION

The moment we've all been waiting for is finally here. Apple's first foray into wearable electronics has arrived on our teardown table, in all of its high-fashion glory.

When our engineers got their hands on the Apple Watch, they were mesmerized. Transfixed, even. Truly swept away by its beauty, grace, and elegance. We're sure you'll have a similar reaction. Read on.

As always, be the first to know by keeping up with all of our social media outlets: [Instagram](#), [Twitter](#), and [Facebook](#).

[video: <https://www.youtube.com/watch?v=KYrpfmRX1GM>]


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## TOOLS:

- [Tweezers](#) (1)
  - [Spudger](#) (1)
  - [Flathead 3/32" or 2.5 mm Screwdriver](#) (1)
  - [Nylon Tipped Tweezers](#) (1)
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## Step 1 — Apple Analog Watch Teardown



 You know what time it is. (Teardown time).

- A brief overview of the noteworthy specs and features of the Apple Watch:
  - Tells time in hours, minutes, and seconds
  - Colorful Apple logo
  - Wacky hands that will amuse and confuse your friends
  - Adjustable wrist strap
  - Sporty elastomer band option
  - Sleek chrome and anodized aluminum exterior

## Step 2



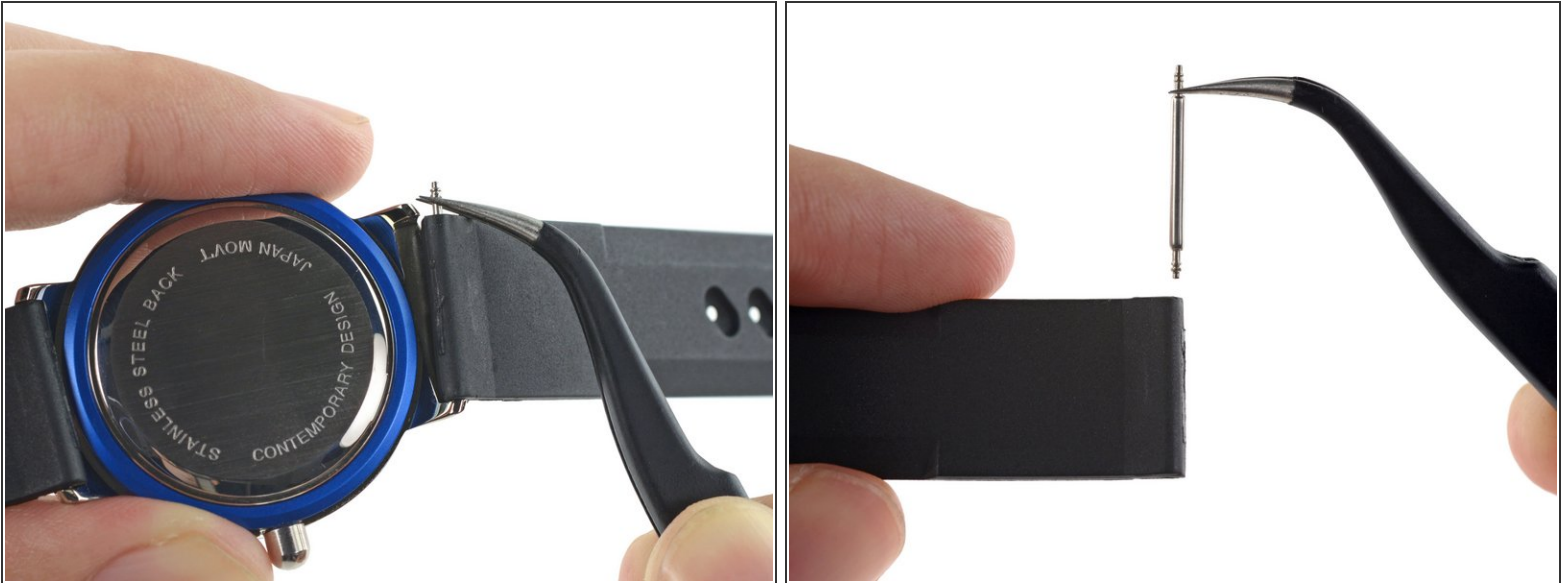
- The Apple Watch fits snugly and securely around your wrist—a convenient location to keep your most important information just an arm gesture away.
- But at the same time, the Apple Watch manages to remain unobtrusive; it doesn't bother you with unnecessary information or notifications—prioritizing what you need, ready when you need it.
- We're already starting to get a feel for the level of craftsmanship and care that went into the design of this incredible piece of technology. The anodized aluminum buckle perfectly matches the smooth, chamfered display bezel.
- Show your friends that you Think Different with the strikingly colorful hands, carefully selected to be as different from each other as they are from conventional watch hands—making reading the time (to the nearest 3 hours) fast and efficient.

### Step 3



- The digital crown represents a crowning achievement in Apple's engineering portfolio.
- This single knob fluidly and effortlessly combines the styling of old with the functionality of new, to bring Apple's renowned intuitiveness to your fingertips.
- Simply pull out on the knob and rotate to adjust the time. Push it in when you're done, and Apple Watch does the rest. Interfacing with technology has never been easier.
- Flipping the Apple Watch over, we find its fashionable and functional brushed stainless steel rear cover, featuring "Contemporary Design."
- Apple made an excellent design choice with stainless steel—it is highly corrosion resistant, and a fairly safe alloy for people with [nickel allergies](#), as it keeps the alloyed nickel tightly bound within its structure.

## Step 4



- The band is held in place with standard [18 mm spring bars](#), meaning replacing or upgrading your band is a simple task—provided you have the right tool.
- We found that our [angled pro tweezers](#) work great for this—but given that the band itself is half of the fashion accessory that is Apple Watch, we're inclined to recommend a more specialized [removal tool](#) for frequent swappers.

## Step 5



- Into the belly of the beast! A thin flathead screwdriver pops the rear cover off, exposing the world's first view inside an Apple Watch.
- We're initially impressed by how much free space is left inside—perhaps Apple is future proofing the external case design, to allow for more and better features in the Apple WatchS.
- A small plastic brace keeps the Taptic Engine and Apple S1 System-in-Package safe and secure inside the watch body.



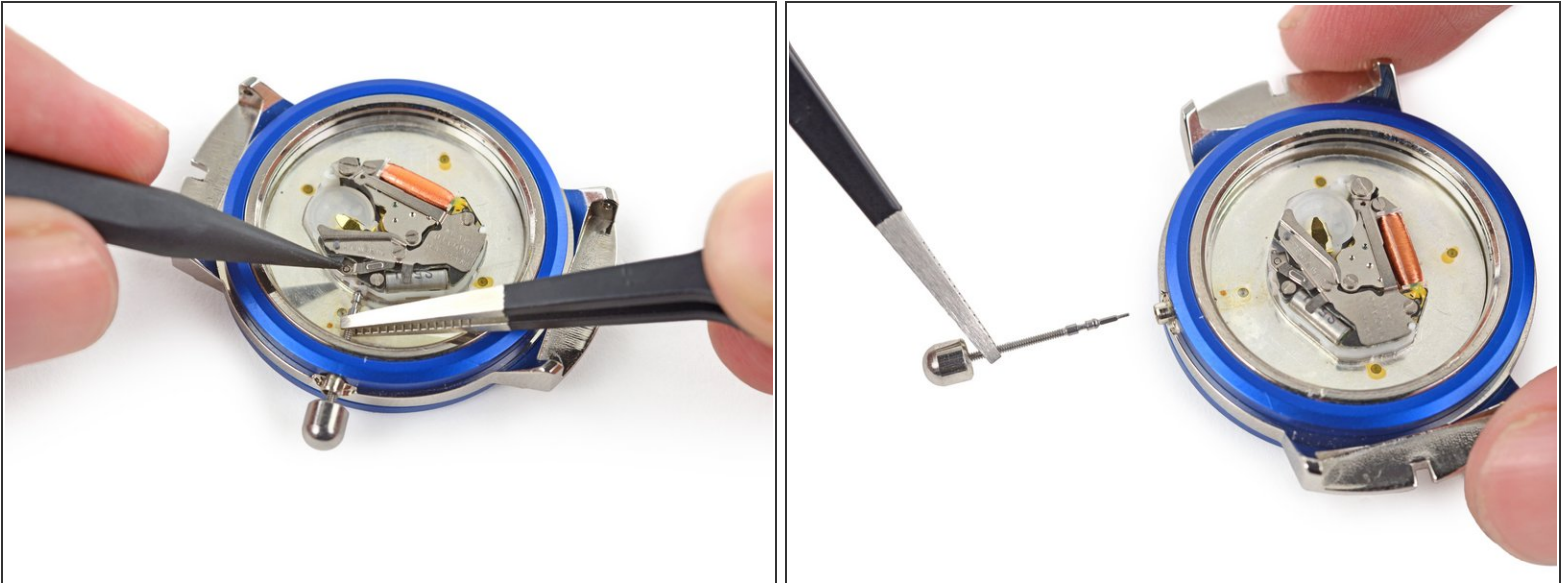
## Step 6



- Before we go any further, we'll disconnect and remove the battery, to avoid shorting out and damaging any of the internal circuitry.
- This is an AG4 alkaline battery cell, with a typical capacity of 12-18 mAh. At 1.5 V, that's around 0.0225 watt hours.
- Alkaline? What's up with that? Button cell batteries are typically available in [alkaline or silver oxide](#) chemistry. Silver oxide batteries are better in every way—recycleable, slower voltage drop during discharge, less leakage, and typically 50% higher capacity. Maybe we caught Apple trying to save a buck?
- ❗ We tried to weigh the battery on our scale—and read 0.0 grams. It's probably completely weightless.



## Step 7



- The digital crown interfaces with the Apple S1 computer via a long stem, locked in place. Depressing this tiny lever releases the crown and stem for further scrutiny.

## Step 8



- ⓘ With the crown removed, the display and internals are easy to remove. Thanks to a non-fused display, if you crack your display glass, you'll be able to replace just the glass without buying a new display.
- The exterior case, a sporty aluminum, is certainly one of the most interesting components of this Apple Watch.

- With that, we'll set the internals aside for a moment and see what more we can learn about the ins and outs of the outside of the Apple Watch.

## Step 9



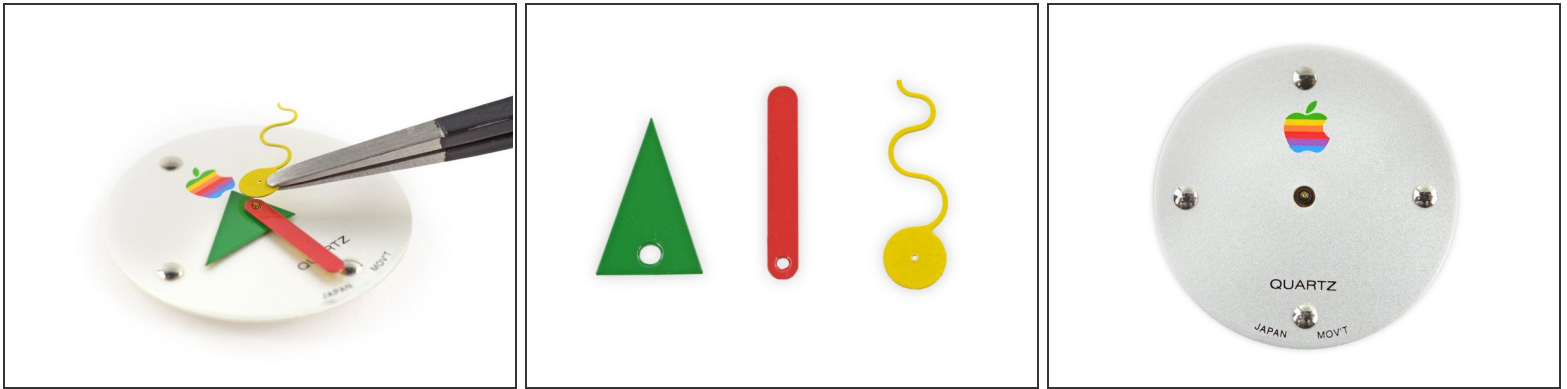
- Combining the best of both worlds, our version of the Apple Watch features a chrome-plated stainless steel body, sandwiched in stylish anodized aluminum rings.
- While the rear ring is press fit onto the body, and snaps on and off, the front doubles as a retaining ring for the display glass, and is adhered in place.
- A bit of careful prying is all that's needed to lift it up and off, decorative rivets and all.

## Step 10



- With the front bezel removed, we're able to safely extract the glass.
- While the fancier stainless steel and gold variants of Apple Watch come with sapphire crystal, we personally favor this high-tech aluminosilicate Ion-X glass.
- ❗ Compared with sapphire, it's both lighter and more resistant to impact. Throw your hands in the air, Apple Watch don't care!
- The chamfered edge fits in the body to make a tight seal, giving this watch its [IPXX water resistance rating](#).
- We'll be holding out for the Apple Watch SCUBA Edition, which is waterproof to 500 meters and can suggest seafood recipes based on nearby wildlife, according to rumors that we personally made up.

## Step 11



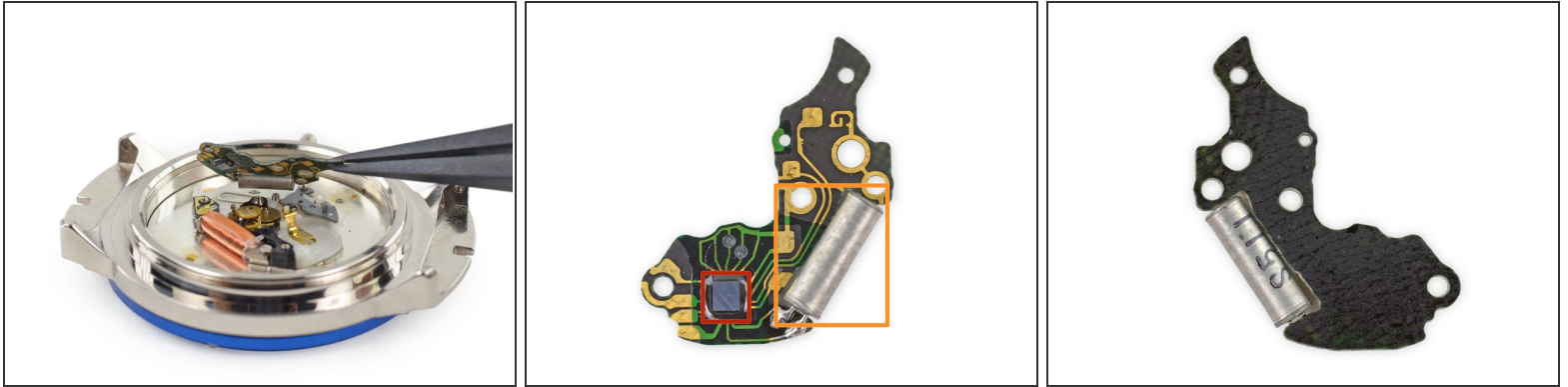
- The display looks amazingly sharp. Even at ultra-close range, we can't see the pixels.
  - ❗ In fact it almost looks like an [e-ink display](#). Even without a battery, the watch still displays the image that was on screen when we depowered it.
- As we begin dismantling the display components, we're pleased to note Apple has revived the [uber-Newtonian](#) rainbow [logo](#) of the 70s, 80s, and 90s.

## Step 12



- Back in your cage! We set the internals back into the body while we're working on them.
- ❗ In classic apple fashion, the best tricks are known only to their repair techs.
  - ☑ We tried to operate on the internals on a table, but almost cracked the display. Turns out the case acts as a perfect repair bench, evenly distributing pressure.
- Look, ma—*no jewels!* We didn't really expect to find [jewel bearings](#) in an Apple Watch anyway.
- These screws are so tiny, it just makes no *cents*.

## Step 13



- We've made our way to the brains of the Apple Watch—the Apple S1 microcomputer, including:
  - Ultra low-power microcontroller
  - [Quartz crystal](#), operating at 32,768 Hz
- When power is applied to the crystal, it oscillates 32,768 times a second, filling a counter register in the processor. When the register fills, it overflows back to 0, triggering a pulse of the motor—and one second on the second hand.
- This incredible processing power is capable of maintaining time accurate to [within 1 second per day](#)!

## Step 14



- Next to come out: the [stator coil](#).
- The timekeeping apparatus is powered by a [Lavet stepping motor](#). This single coil, controlled by the microcontroller to swap its polarity back and forth, rotates the motor armature.
- The times, they are a-changin'.



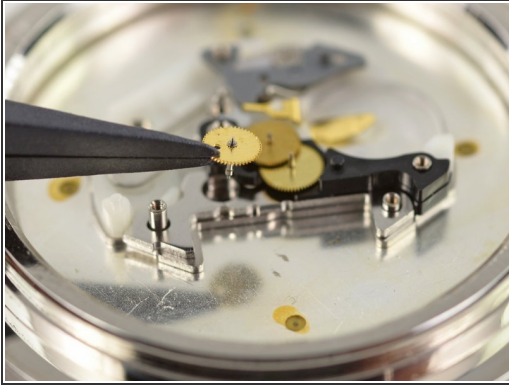
## Step 15



- Taking care not to sneeze, we tweeze out the rotor/drive gear.
- Snuggled up against a penny, this drive gear looks quite inconsequential, but the rotor's permanent magnet enables it to rotate 180 degrees with each pulse of the coil.
- Extreme miniaturization means this watch draws very little power—with this configuration, it should last years on a single charge. Apple's claim of "all-day battery life" seems a mite conservative.



## Step 16



- The intermediate wheel transfers power from the rotor to the [gear train](#).
- From here, ousting the second gear, and the rest of the gear train, is cake.
- The final gear incorporates three concentric shafts to independently control each part of the display.

## Step 17



- We carefully remove the final pieces—the motor stator and click spring.
- As we should expect from Apple's design team, the included click spring provides haptic feedback every second, keeping you up to date on the continual passage of time.
- This is literally the most advanced Apple Watch that we've had the pleasure of tearing down.

## Step 18



- Apple Watch Repairability Score: **9 out of 10** (10 is easiest to repair)
  - The rear case is easy to remove.
  - No adhesive is used anywhere in the Apple Watch, and a combination of Phillips screws and spring contacts makes disassembly fairly easy.
  - The super-standard 18 mm watch band is removable and replaceable—with a wealth of custom options.
  - Non-fused display means the glass can be replaced separately, greatly decreasing cost of repair for a cracked screen.
  - No manufacturer-supplied repair manual.

To reassemble your device, follow these instructions in reverse order.