

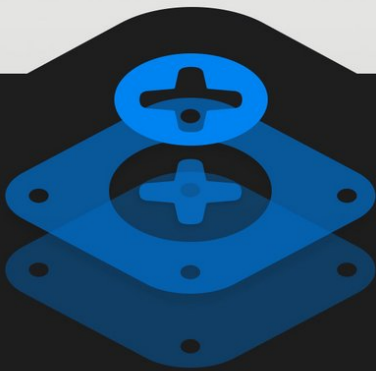


OnHub Teardown

Google OnHub teardown on September 15, 2015.

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Google OnHub



TEARDOWN

INTRODUCTION

Google is on a mission to reinvent the router, and we got our hands on their first foray into the home-networking market—the Google OnHub. With a sleek design, hefty price tag, and a whole host of unique features, we're excited to see what this router is rockin'. It's teardown time!

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TOOLS:

- [Jimmy](#) (1)
 - [iFixit Opening Tools](#) (1)
 - [Spudger](#) (1)
 - [Phillips #1 Screwdriver](#) (1)
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Step 1 — OnHub Teardown



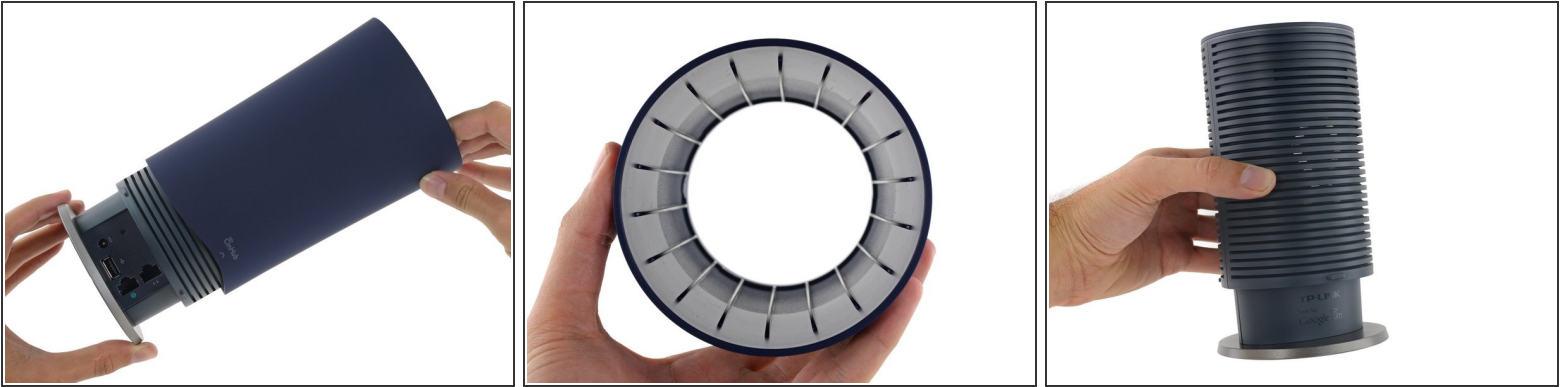
- Google has promised that the OnHub router will give you a new way to Wi-Fi, and with these specs, it looks like they might be onto something:
 - Dual-core 1.4 GHz CPU
 - 4 GB e-MMC flash storage
 - IEEE 802.11 b/g/n/ac
 - Dual band 2.4 GHz and 5 GHz 12-antenna array
 - Congestion-sensing radio and antenna
 - USB 3.0 port + Bluetooth 4.0
 - 1 GB DDR3L RAM

Step 2



- No blinking router lights here; let's hope the constant status light isn't blinding in the dark (it's not).
- ① This LED ring will change colors based on what state the OnHub is in. Blue means you're ready to begin setup. [Orange](#) is for, "Oh snap, something is wrong." Teal means you're good to go!
- This mysterious anomaly in the speaker grille is probably an ambient light sensor enabling dimming.
- We also spy a small cutaway on the bottom of the cowling for the cabling.
- A novel idea for cable management, but not great for ease-of-access. You've got to twist the cowling off to plug anything in.

Step 3



- Luckily the outer cowling comes off with a simple twist. You can't plug any cables in without shucking that shield, it better be simple.
- The rifling fins along the inside of the barrel cowl are perhaps there to encourage air circulation, as this tower has no fan to cool itself.
- Under the hood we see the real branding on this guy. Google has contracted with TP-Link for the first iteration of the OnHub.
- ❗ Smug [TP-Link guy](#) approves of this product. Let's see how he feels once the ASUS OnHub is on the table, "[later this year](#)."
- We also get a peek at some components. Is that an antenna we see? We're itching with anticipation.

Step 4



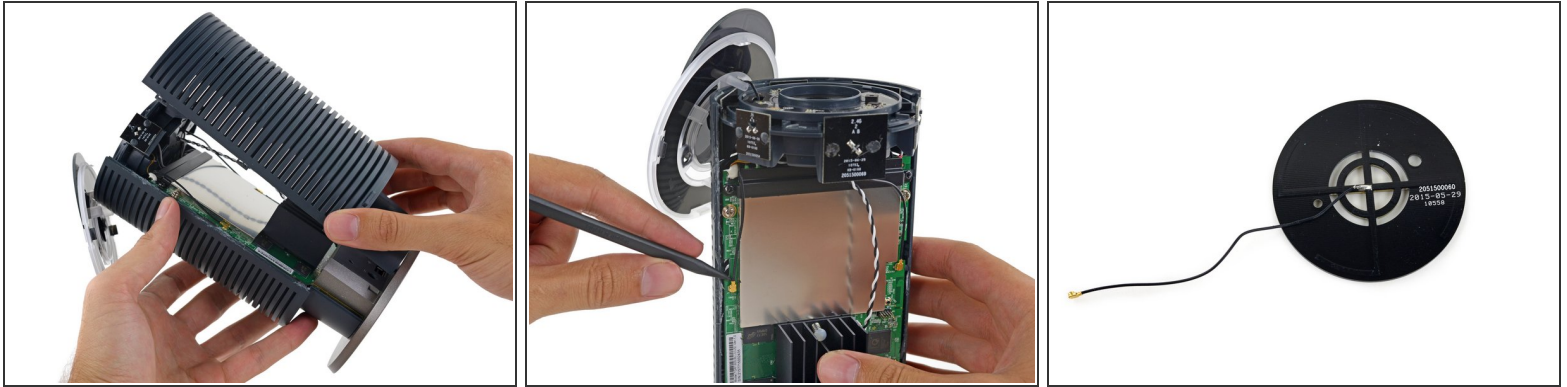
- The rubbery foot seems like a great candidate for hiding screws. Sure enough, we remove a couple. Did that actually accomplish anything? Nope.
- Having been screwed (pun intended), we aim for the tempting seam along the sides of the tower.
 - ❗ Unfortunately, this doesn't seem to be the intended point of entry either. We wound up breaking some clips in the process.
- This thing still won't open...

Step 5



- We turn our attention back to what we thought was a solid top, it turns out this was the way in all along.
- ❗ We really wish this thing came with a repair manual—this cap *should* have been the first to go.
- We finally pop the top off this can of worms, and the first component we spy is the famed congestion-sensing antenna.
- We can't quite remove it yet, so leaving that to dangle gently to the side exposes the LED board with some control hardware:
 - National Semiconductor [LP5523](#) programmable 9-output LED driver
 - Ambient light sensor

Step 6



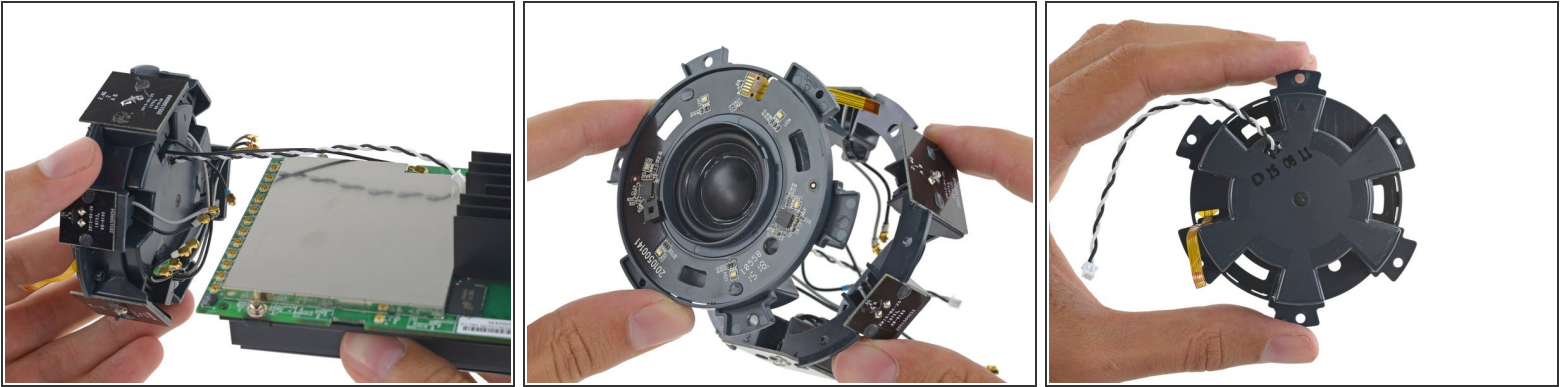
- With the top panel neutralized, some screws are revealed.
- Finally the two halves of the casing are ready to come quietly, revealing the first glimpse of the OnHub's shiny, antenna-filled insides.
- That crazy disk antenna up top, responsible for sniffing out network congestion in the air, is finally free to leave the OnHub.
- Looks like the OnHub intends to keep unbroken Wi-Fi [on target](#) with this bullseye shaped antenna.

Step 7



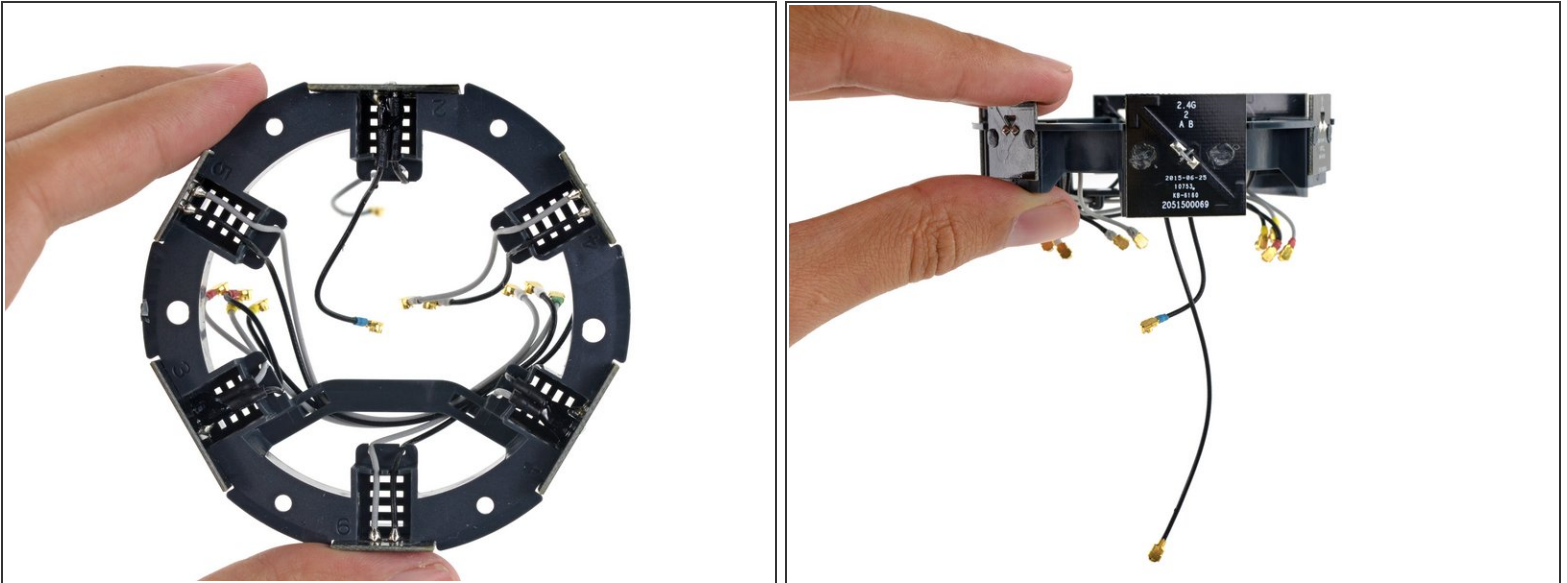
- There are 12 cables across the top of the device (six 2.4GHz antennas and six 5GHz), plus the congestion antenna along the side, and a final coax cable along the other side.
- Google seems to have some kind of color coding system, which might help for repair, but the board markings don't give us any hints just yet.
- Peeling off the second half of the outer shell, we find an interesting antenna arrayed in a double diamond. More on this guy later.
- The OnHub's antenna array is revealed in all its Lovecraftian glory, the antenna leads looking spookily like tentacles.

Step 8



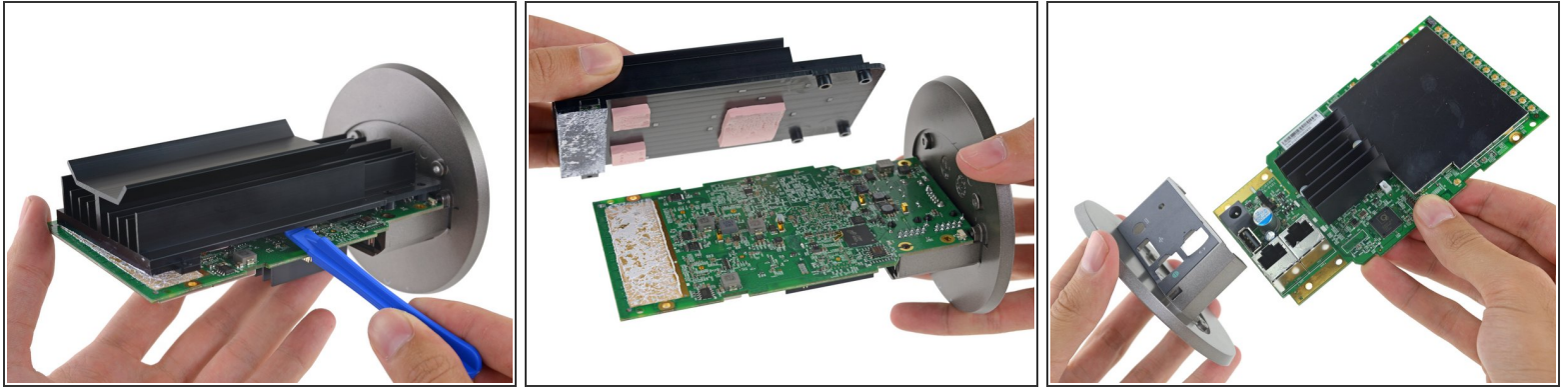
- With a dozen connectors dispatched, we can finally separate the antenna assembly from the motherboard.
- Look at that enormous speaker. [Alexa](#), why does Google's router need a 3-watt speaker?
 - ❗ Turns out, OnHub uses a loud tone to pair with [ultrasonic tones](#) to configure Android devices running Google's companion app—but will it feature sick beats in the future?
- ⚠ The hexagonal speaker enclosure has disturbing similarities to the [Galactic Empire's logo](#).

Step 9



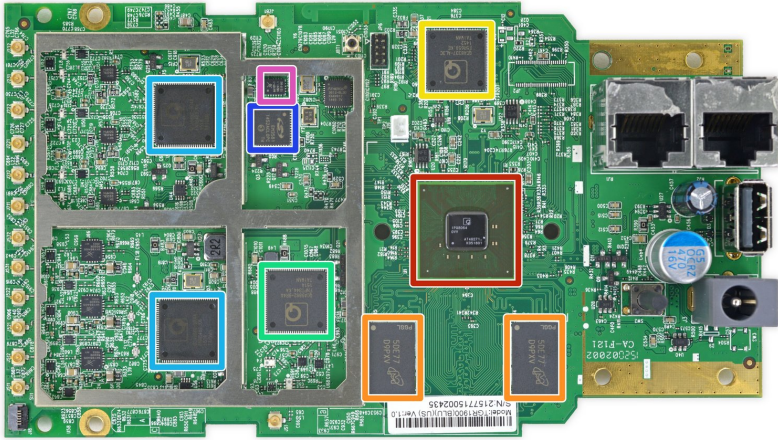
- With a flick of the spudger, the remaining antenna connectors come free—releasing what we theorize to be a miniature Stargate. That, or the omnidirectional antenna array.
- ❗ Each of the six PCBs is a pair of antennas. The smaller boards are 5 GHz, and the larger are 2.4 GHz, alternating around so that each antenna pair is 120° offset from the other two pairs of the same frequency.
- Some engineer was probably pretty excited to design antennas in an arrow shape. Looking snazzy!
- That one extra-long cable runs a bit lower on the motherboard, where it connects next to a ZigBee network co-processor—hello [802.15.4](#) (coming soon).

Step 10



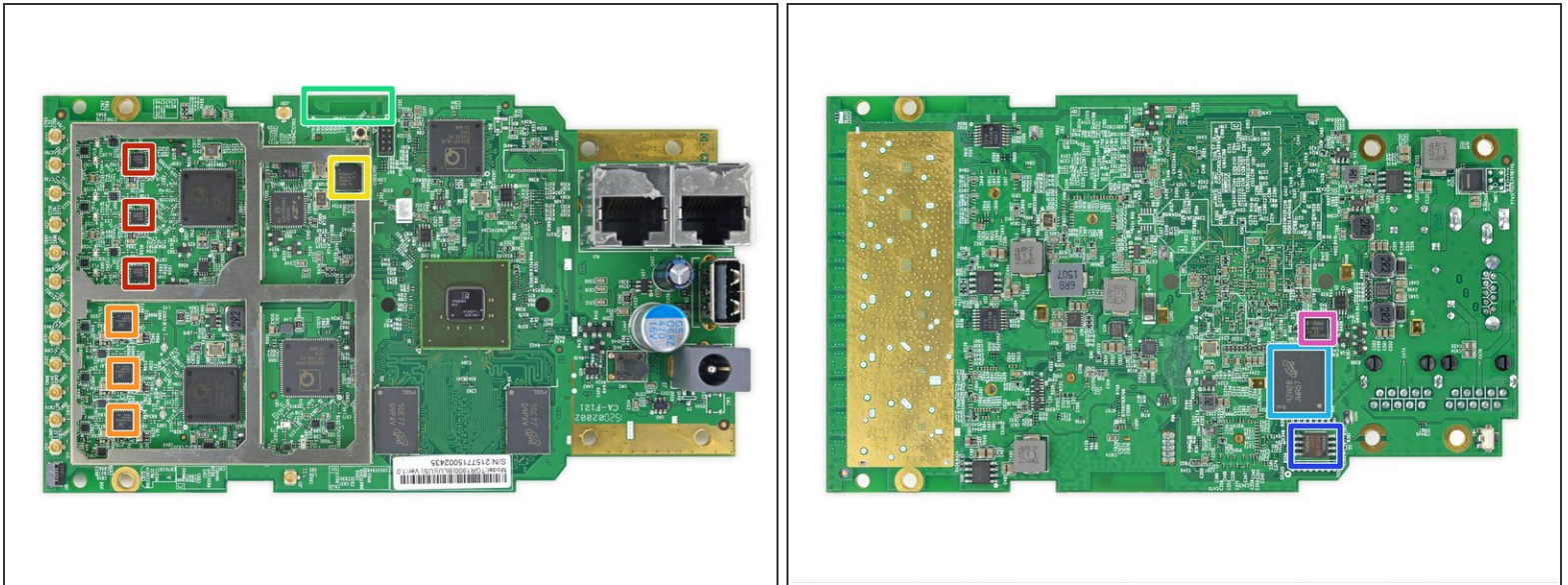
- Remember that diamond shaped antenna a few steps back? Turns out that's the directional antenna, for boosting the signal in a specific direction.
- The heatsink serves as a reflector dish, pushing that extra bit of Wi-Fi to the far corner of your house where you need it most.
- The components in this thing have been pretty big so far, and the heat sink is no different. Prying up the metal mass reveals some equally hefty thermal pads.
- It looks like the heat sink actually draws heat *through* the motherboard—we spy the real heavy hitters heaters on the reverse.
- The plastic base and port cover slides off and the motherboard is free!

Step 11



- With the heat sink off and the chips deshielded, we can get to the meat of the matter:
 - Qualcomm Atheros [IPQ8064](#) Internet Processor with 2 Krait 300 CPUs clocked at 1.4 GHz
 - Micron [MT41K256M16HA](#) 4 Gb DDR3L SDRAM
 - Qualcomm Atheros QCA8337
 - Qualcomm Atheros QCA9882
 - Qualcomm Atheros QCA9880
 - Silicon Labs [EM3581](#) SOC network co-processor for ZigBee
 - Skyworks [66109](#) 2.4 GHz ZigBee/Smart Energy front-end module

Step 12



- But wait, there's more!
 - Skyworks SKY2623L 2.4 GHz WLAN power amplifier
 - Skyworks [SKY85405](#) 802.11ac 5 GHz WLAN power amplifier
 - Atheros [3012-BL3D](#) Bluetooth radio
 - Bluetooth antenna
 - Micron [MTFC4GACAAAM](#) 4 GB NAND flash
 - Micron [25Q064A](#) 64 Mb SPI flash
 - Infineon [SLB9615](#) Trusted Platform Module

[illegible]

- OnHub Repairability Score: **4 out of 10** (10 is easiest to repair)
 - The speaker is replaceable.
 - The device is mostly assembled with clips, which are better than adhesive but can break during disassembly.
 - With all ports on a single board, fixing a loose USB port means a soldering repair.
 - Tiny antenna connectors are fragile and prone to breaking during disassembly.
 - This is a fairly complex device—and with no repair documentation available, disassembly and reassembly are especially difficult.