Oculus Rift Constellation Teardown

Teardown of the Oculus Rift Constellation performed on April 4, 2016.

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INTRODUCTION

Alright, Palmer—you asked, and we answered. Last week we tore down the Oculus Rift CV1, and today we turn our heads to Constellation—Rift's counterpart IR camera. Did Oculus shoot for the stars like in their high-powered headset, or will their design decisions leave the Constellation virtually unrepairable? Only a teardown will tell.

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TOOLS:

- Rotary Tool (1)
- Jimmy (1)
- iOpener (1)
- Spudger (1)
- Phillips #0 Screwdriver (1)

Step 1 — Oculus Rift Constellation Teardown

- We don't know too much about the Constellation sensor itself, but here are some specs:
  - Infrared sensor
  - Sweet stand
  - Standard USB 3.0 cable

But look how far we've come—from ugly webcam, to cute lil' Pixar lamp!

Step 2

- Separation of the crew capsule complete!
- We locked our keys in the Constellation, so we're gonna try to Jimmy the door open.
  - And with just a few plastic clips holding the back panel in place, it pops off with in a snap.
- And look! Promising screws... that go nowhere.

Step 3

- Let's try to smoke it out the other end. iOpener to full!
- Hats off to the [smallest suction cup] we could find! With one good tug, the modestly adhered visible-light filter gives way to reveal the eye of the IR camera.
- Because the Constellation sensor's job is to track LEDs that only give off infrared light, any other wavelength is just noise, making it harder for it to operate. This filter blocks out everything but IR, making it easier to pick out the LEDs.

  Without the visible light filter, the sensor would see what our fancy IR camera sees—and would have a hard time picking out just the pattern of LEDs to determine the Rift's position and orientation in space.

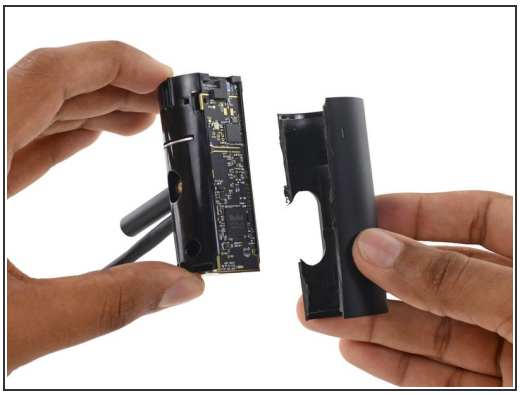
Step 4

- Never missing a chance to play with our IR camera, we hop outside and stack on the Constellation's visible-light filter to get a glimpse at the stars—or downtown San Luis Obispo.

  The visible light filter restricts the light coming in to the image sensor to the IR spectrum, meaning the IR LEDs on the headband will shine bright like ~~a diamond~~ stars.

Even without the filter, there's plenty of infrared to see outside. That's why ordinary cameras need a filter, so they see what you see!

Step 5


- Okay, we asked nicely twice, but the components *still* won't budge—time for some aggressive negotiations.

  The Constellation's lone eye seems to stare pleadingly. Let's hope it doesn't start singing "Daisy Bell."

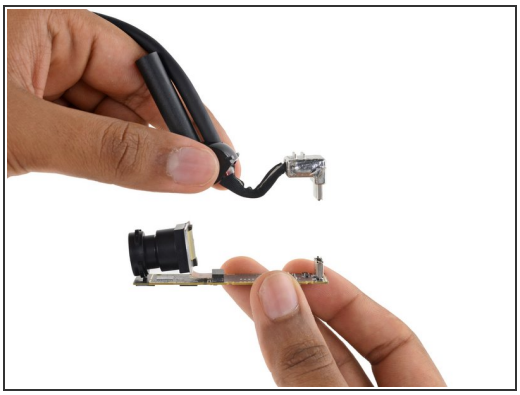
- We shuck the (well-rotary-tooled) outer casing and find an inner shell secured with some fiercely-glued screws.

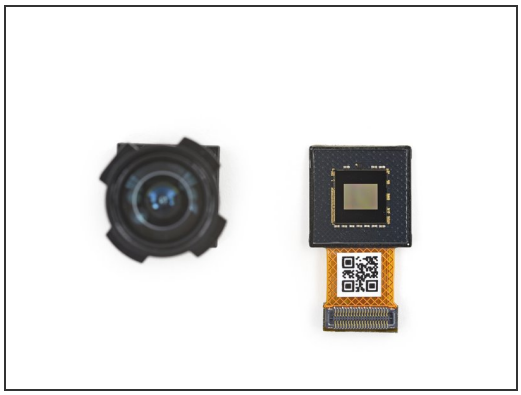
- Whipping that away in short order, all that's left are the real guts of this sensor.

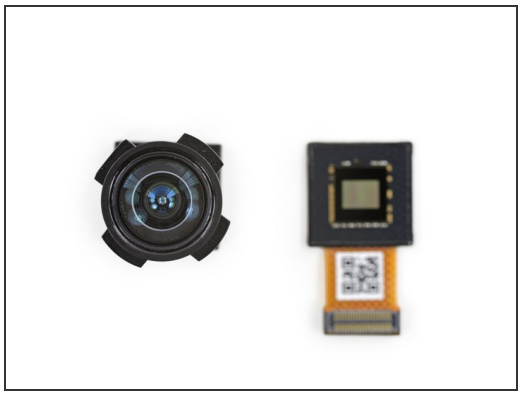
Teardown Update: Whoops! According to Oculus, you can shuck the IR sensor's cowling by pulling the stand hardware off. When we got our second unit we took some channellocks and a vice grip to it and were able to free the hardware from the camera assembly.

Still, some disassembly instructions would have been nice!

Step 6

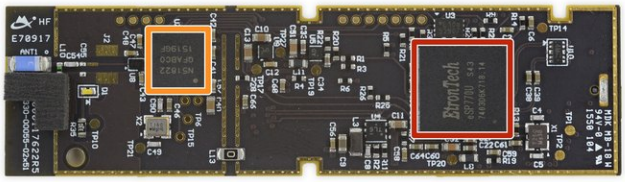


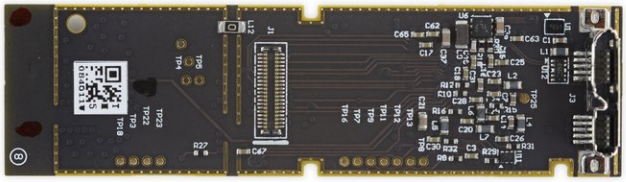




- First out: that USB 3.0 Cable.
  - Despite being embedded in the heart of the Constellation, this is a standard USB 3.0 peripheral connector, swappable in the event of catastrophic failure. (Though we're at a loss as to how you'd put everything back together).
- We remove the camera from the board, and the heat sink from the camera, and then the lens from the image sensor, and well, here we are.

Step 7





- We're at the end of the line—let's take a peek at the silicon!
  - EtronTech eSP770U Webcam Controller
  - Nordic Semiconductor nRF51822 Bluetooth Smart and 2.4GHz proprietary SoC (also found in the Oculus Rift Headset)

Step 8

- Oculus Rift Constellation Sensor Repairability Score: **7 out of 10** (10 is easiest to repair)
  - Stand and visible light filter are removable and can be replaced if damaged.
  - All main components (motherboard, camera, lens, and filter) are discrete and modular, making repairs fairly low cost and straightforward.
  - The USB cable plugs directly into the motherboard and can be swapped out quickly.
  - Strong adhesive holds the visible light filter in place.
  - Stand hardware takes significant force to remove and is not obviously removable without instructions.