



Bluetooth Headphone Team #62880A

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ROBOTICS**

We took apart a Google GID6B Bluetooth headphone, and found a battery, a motherboard, a microphone, a processor. We selected this device because it was already broken, and because we wanted to see the Bluetooth part. Because of quarantine, one team member opened the device in a Zoom meeting, while everyone else helped research the parts. We all wrote the essay together.

The two sides of the headphone have very different parts. The right side of the headphones has a small circuit board without any major components, but it contains the battery. Unfortunately, when opening the headphones, we accidentally punctured the battery, and released a puff of white smoke so it is probably not good anymore. The battery part number is 453046. It is a 3.7V battery and has a lifespan of 600mAh meaning it can output 600mA of current per hour. The REC means it is a rectangular battery. Based on researching of the battery part number, it is a polymer lithium battery. There wasn't much else about the battery.

The motherboard is the main circuit board that contains most of the important pieces, and connects them together. The motherboard in this case contains the ports, the processor, and the Bluetooth chip with noise cancelling. It connects the pieces, so that they can work together. The processor was a Texas Instruments WL1831MOD chip. The job of a processor is to take in information as inputs, and decide the appropriate action as an output. This processor is also a WiFi and Bluetooth module, which would explain why the headphones are Bluetooth capable. Bluetooth allows electronics to communicate over short distances without wires. There is also a secondary processor, a Qualcomm CSR8645 which has an audio platform with noise cancelling capabilities. Noise cancelling works by using ambient sound input from a microphone, and outputting an opposite soundwave to cancel the previous soundwave out. The CSR8645 also incorporates the charger and probably the digital signal processing to make sure the audio is correct and doesn't have something called noise which is a distortion of a signal.

The microphone goes into a Sonix chip. The microphone takes in sound waves, and turns them into electrical currents. The electrical currents go into the processor, which uses that information for noise cancelling. It can also be used to collect sound waves and audio data and converts it for the headphones to send to a phone or some other Bluetooth device.

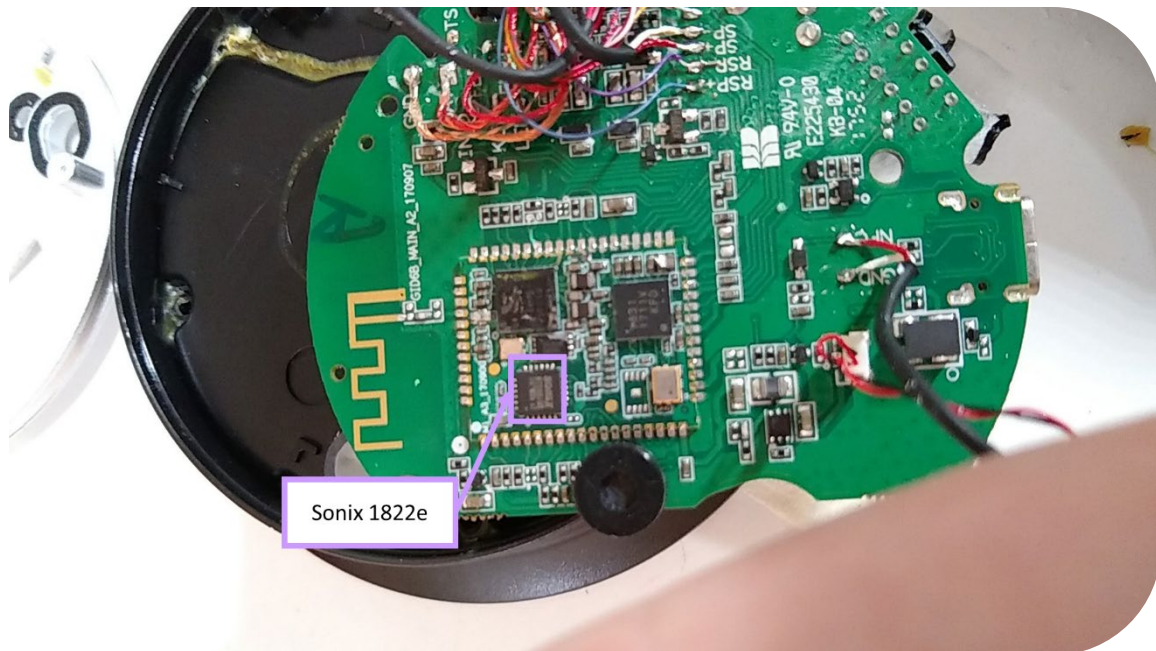
There were 5 main electronic pieces that we found inside the headphones. When we did research on them we found that some of them had things called datasheets that described the inner workings of the device. We also found a lot of graphs and tables inside the datasheet that were pretty interesting to look at and we will probably look at them more in the future. Taking the headphones apart showed our team how small, and powerful computer chips are, and how we must work together to achieve things.



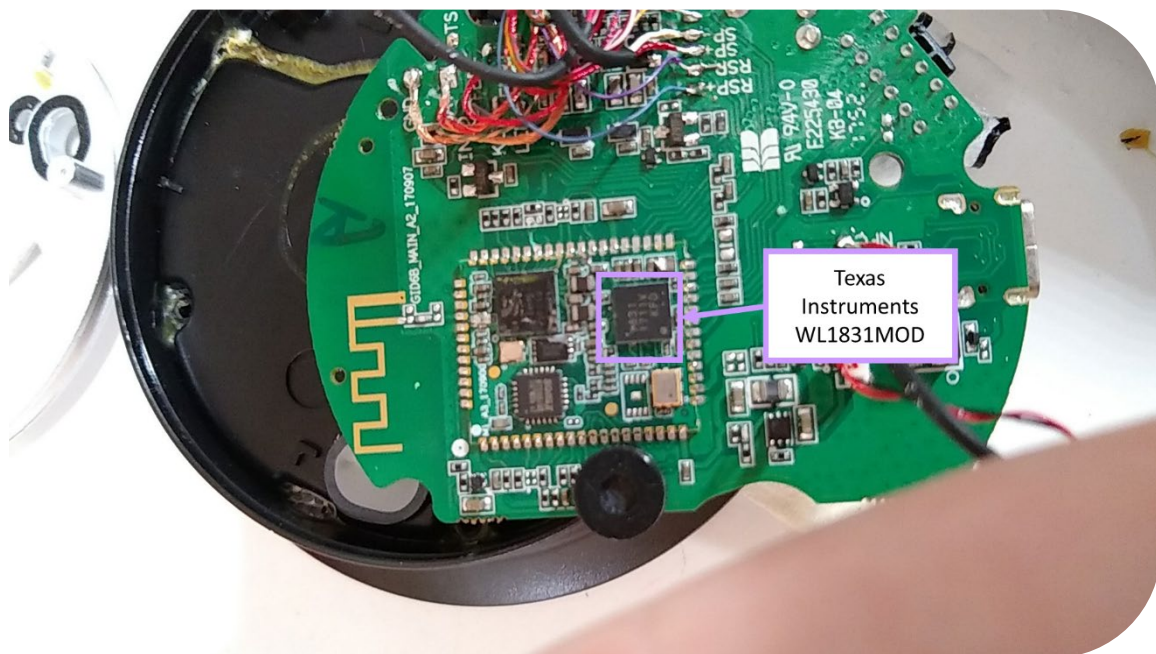
A Full breakdown of the headphones



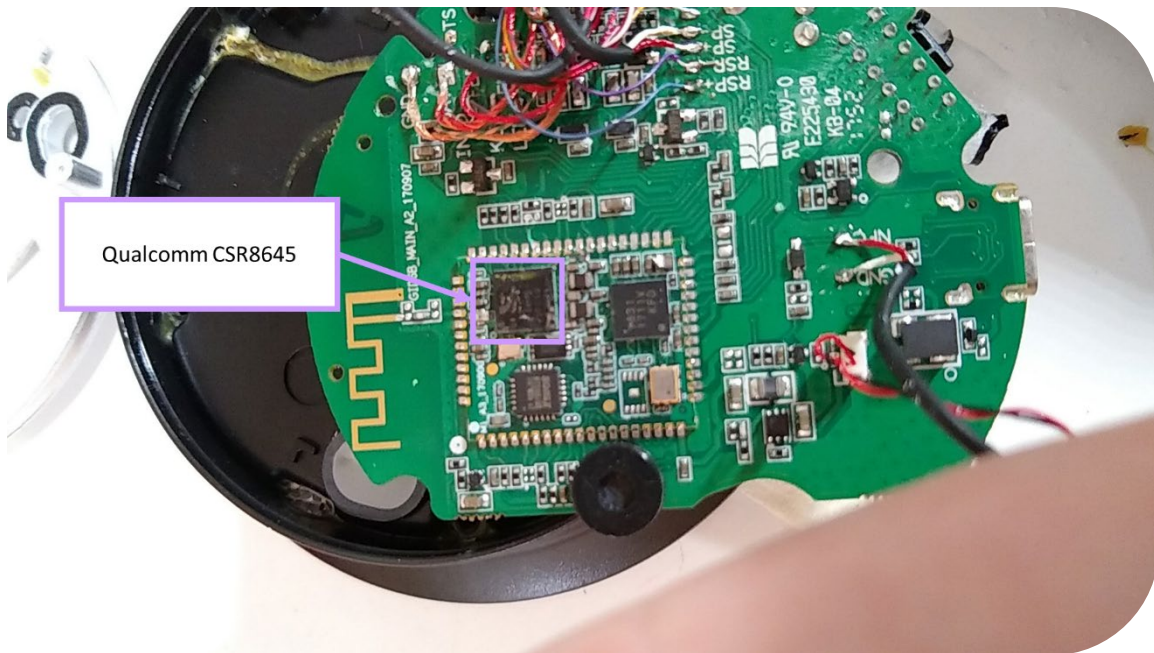
View of Battery



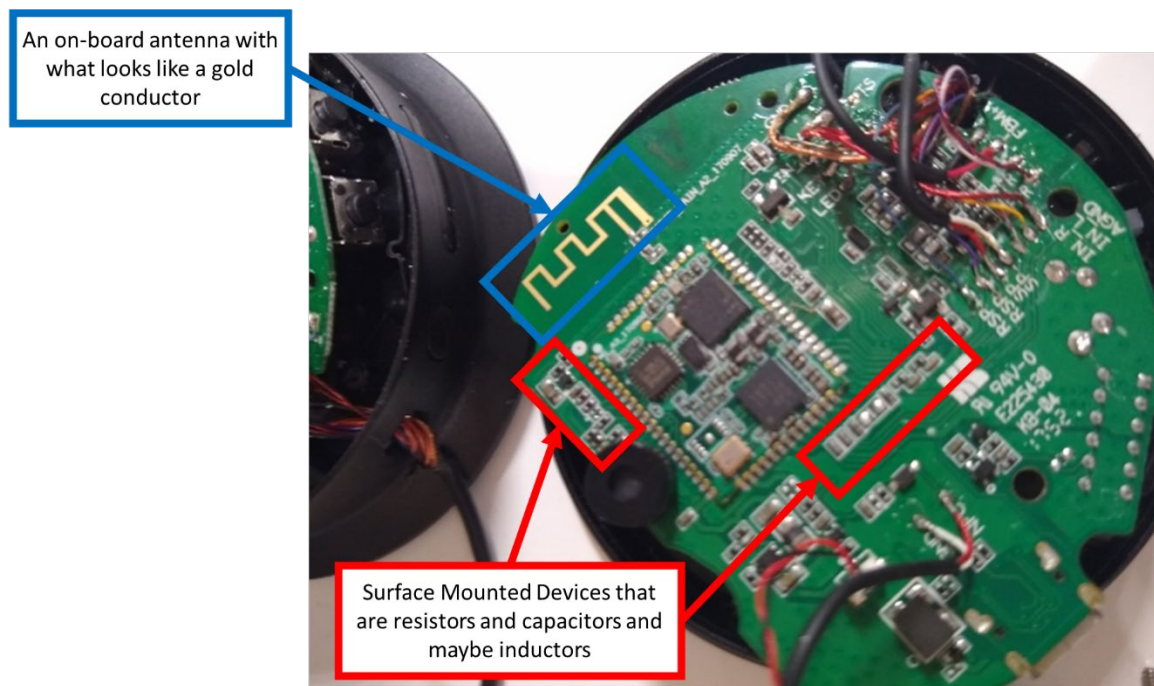
This is the Sonix 1822e chip. We couldn't find a lot of information on the chip itself, but the company makes voice controllers.

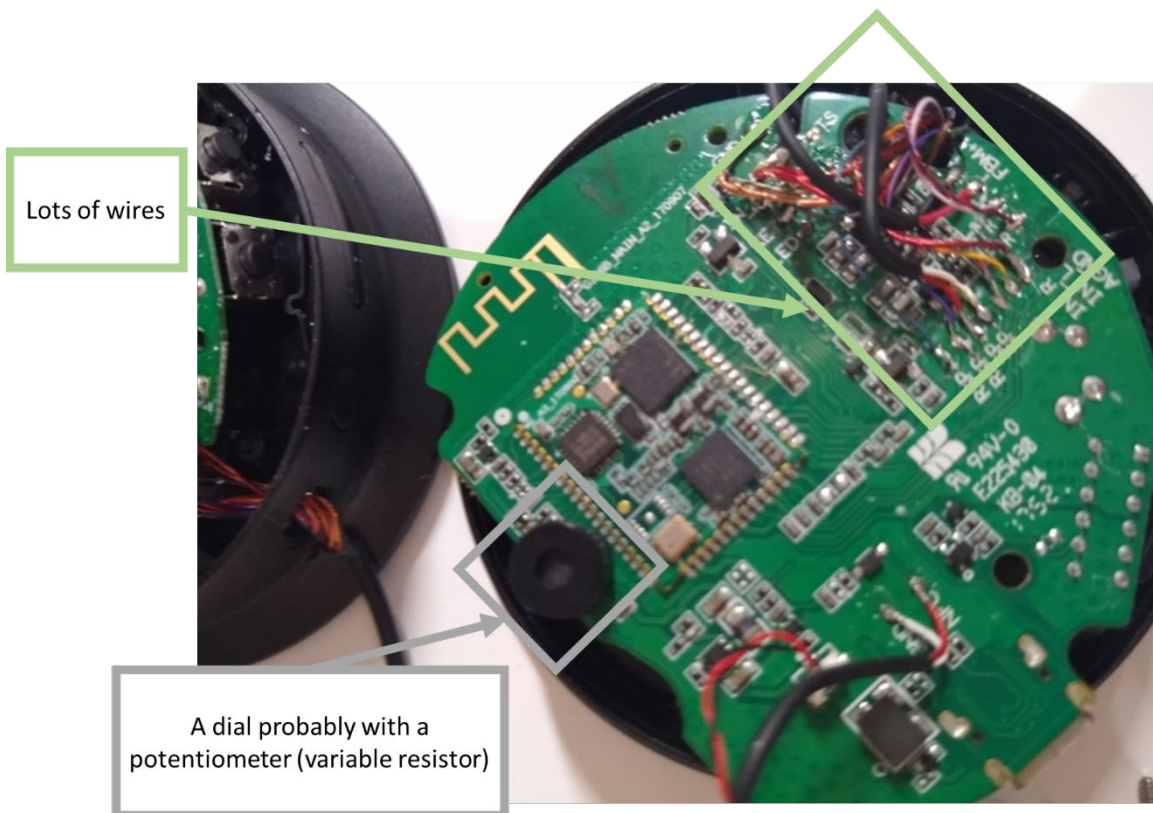
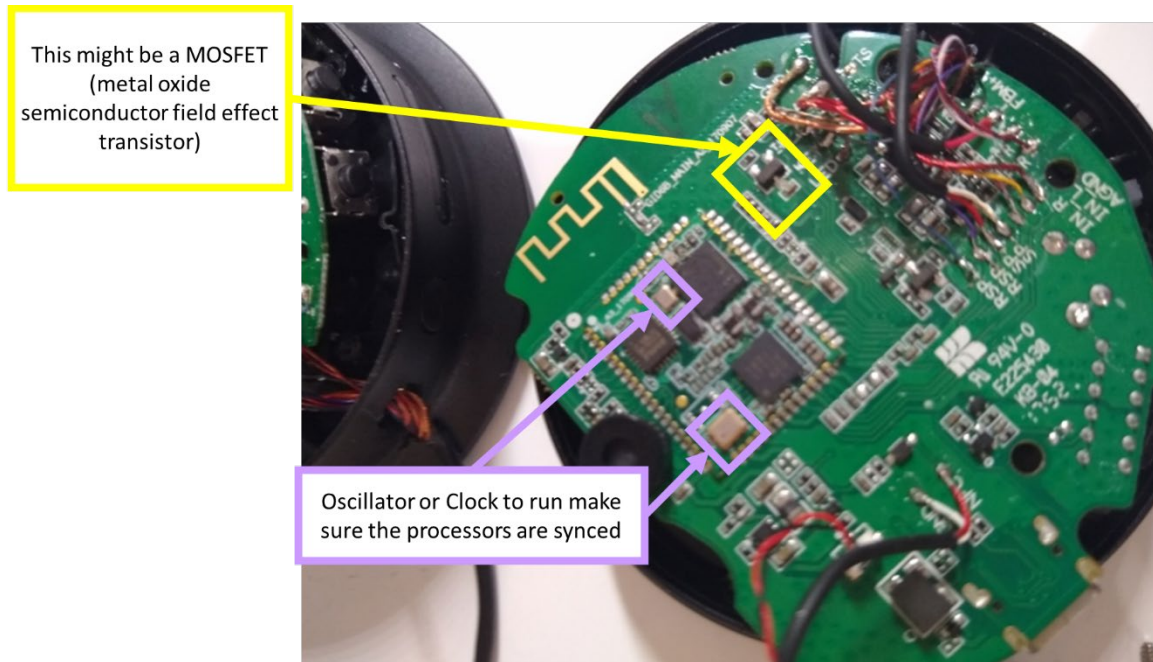


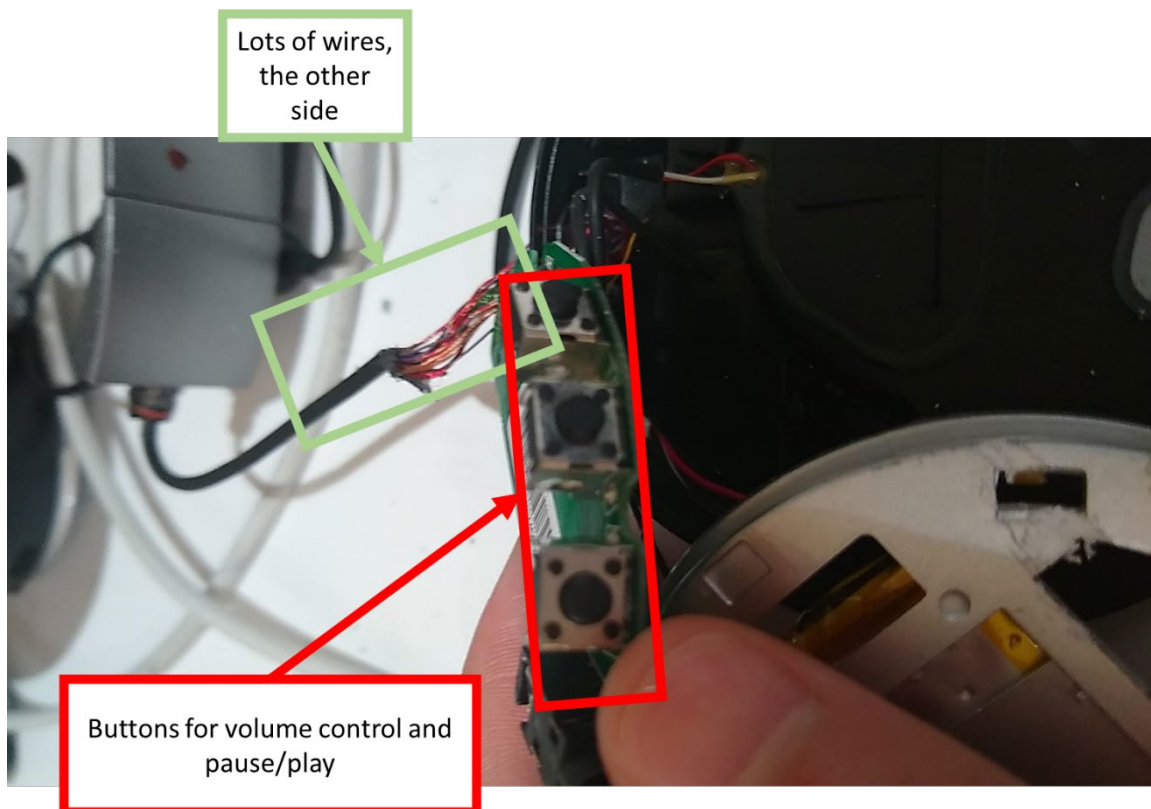
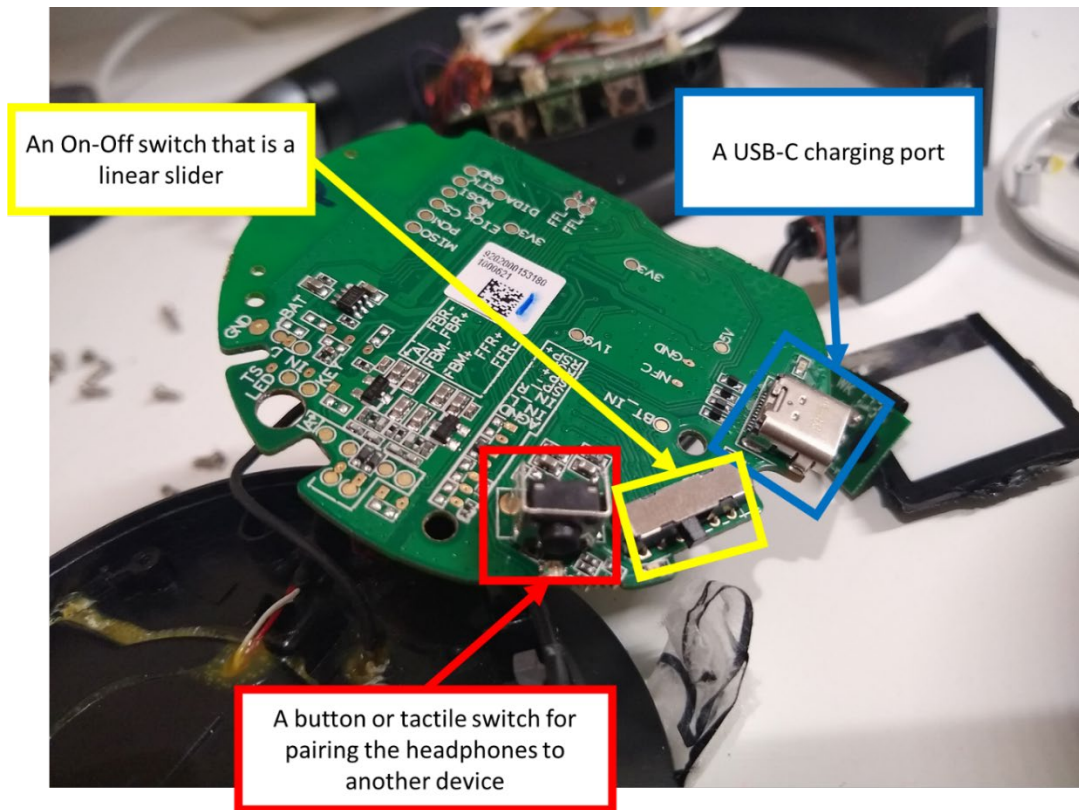
This is a TI [WL1831MOD](#). It can be used for Wi-Fi or Bluetooth for Audio and Video Streaming.

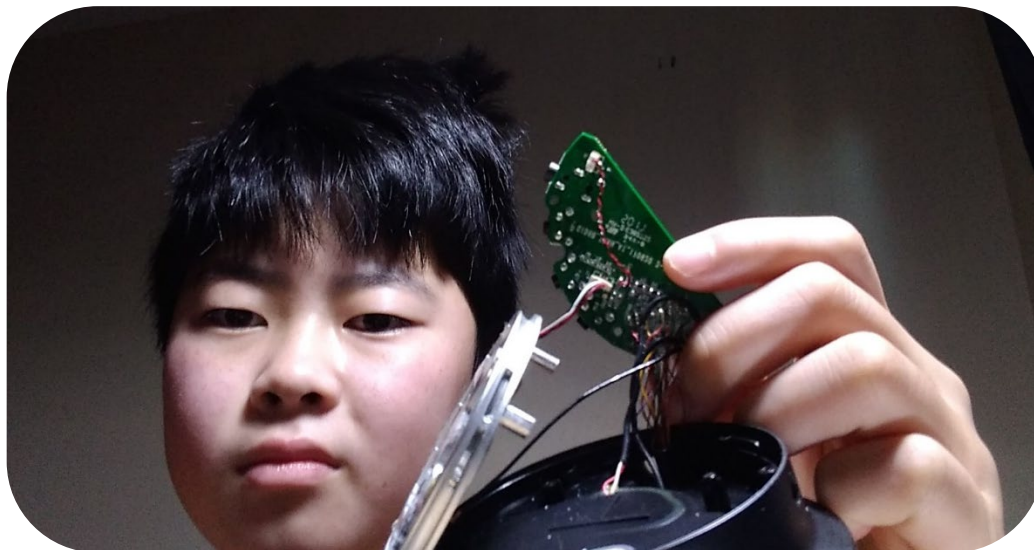
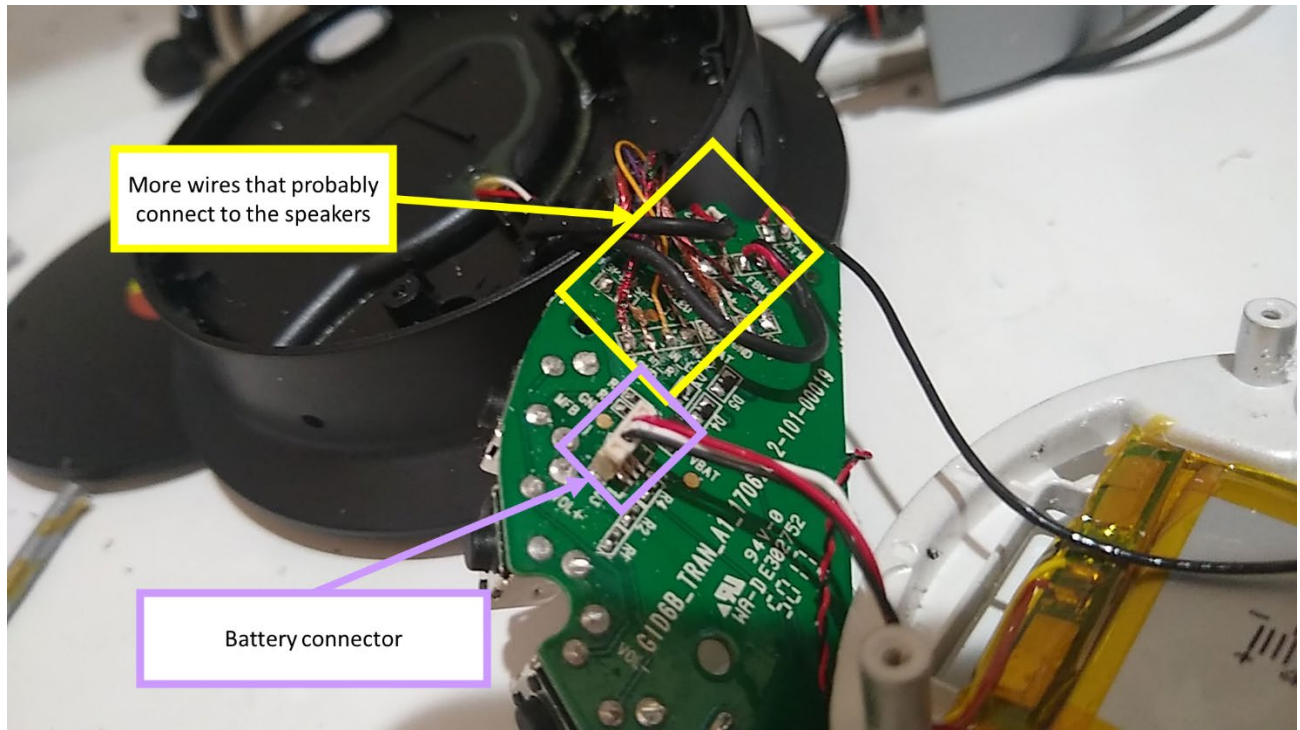


This is a [CSR8645](#). It is a dual-mode Bluetooth radio with a low power DSP, an application processor, a battery charger, memory.









Our Disassembler, Leo.

He who saw the white smoke has started down the path of the EE.