



# Bluetooth Signal Combiner

Andrew Burns, Geoffrey Dylan, Ben Youngquist

Contact Info: [geoffrey.dylan@gmail.com](mailto:geoffrey.dylan@gmail.com)  
[youngquistbenjamin@gmail.com](mailto:youngquistbenjamin@gmail.com)  
[andrewburns830@gmail.com](mailto:andrewburns830@gmail.com)

## Abstract

The Bluetooth Signal Combiner aims to create a hub device that merges audio from multiple Bluetooth-connected devices (e.g., laptops, smartphones) and transmits it to one or more sets of Bluetooth headphones. This solution allows simultaneous audio playback from various sources through the same pair of headphones. Unlike existing Bluetooth multipoint technology, this hub facilitates a seamless connection and mixing of Bluetooth Classic audio devices.

## Background

The Bluetooth Signal Combiner was designed to achieve these goals:

- Simultaneous playback of two or more wireless devices
- Hassle-free audio carry-over between devices

The backbone of this project uses **Bluetooth Classic**. This is the legacy version of Bluetooth that has been used for all but the newest Bluetooth headphones. This would mean we would have **better compatibility** with even the more recent devices.

## Bluetooth Challenges

**Fragmented support for Bluetooth Classic.** Around the planning phase of our project, most manufacturers stopped selling all their Bluetooth Classic modules in favor of Bluetooth LE. This limited our options greatly, which meant that **documentation was unnecessarily difficult to find**. Therefore, development for this chip was harder than it should have been.

**Electrical noise on the signal line.** During our testing, we found that our clock and audio communication traces were noisy. This is caused by an **oversight in the code**, and a quick revision easily solved the issue. Due to the timing that this issue came up and the circumstances surrounding it, we were initially unsure whether this could be solved. However, once we determined it was a software problem, this made solving the issue much more manageable.

## Equipment Used

### Hardware:

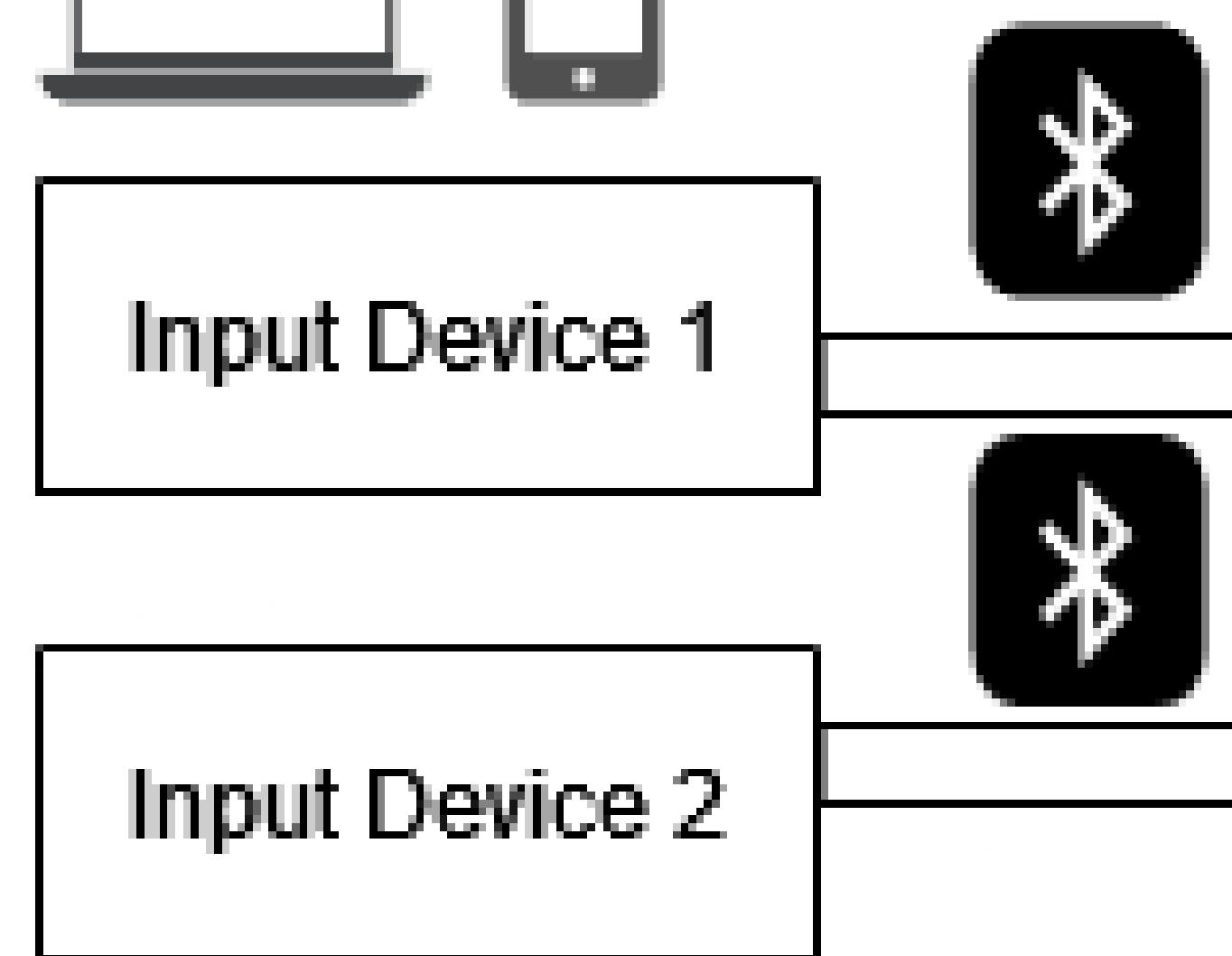
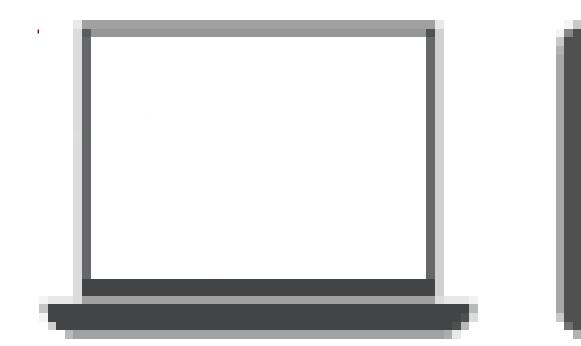
- Oscilloscope

Requirement Testing



- Multimeter

Requirement Testing



### Software:



Revision Control



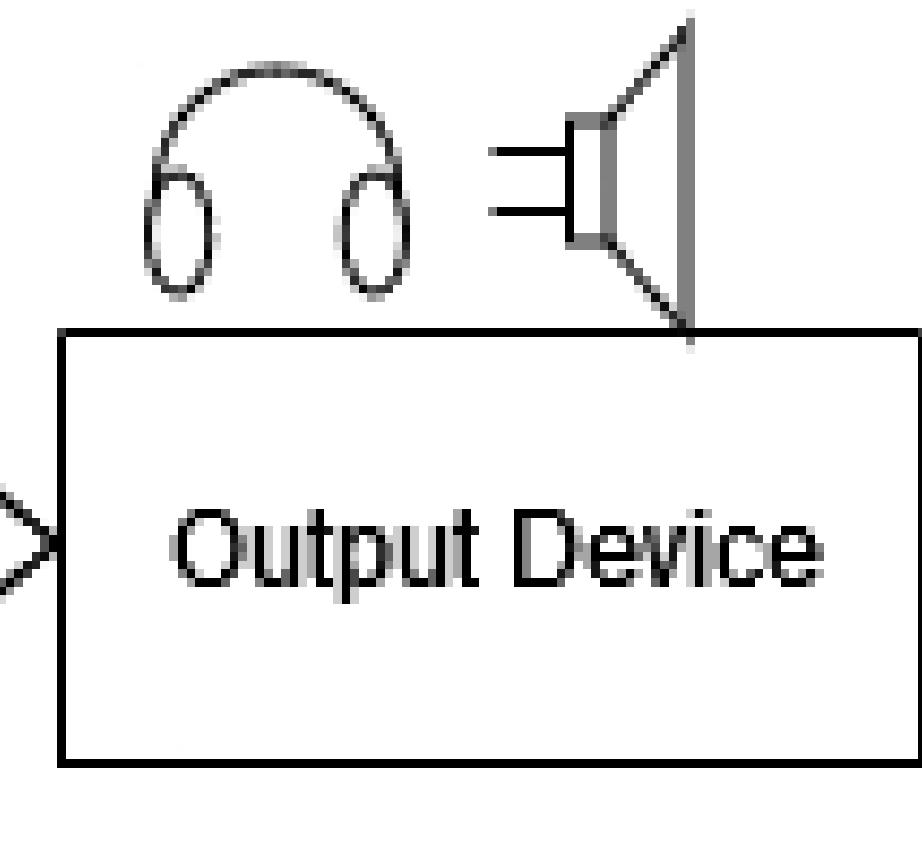
MCU Development



PCB Design



Bluetooth Development

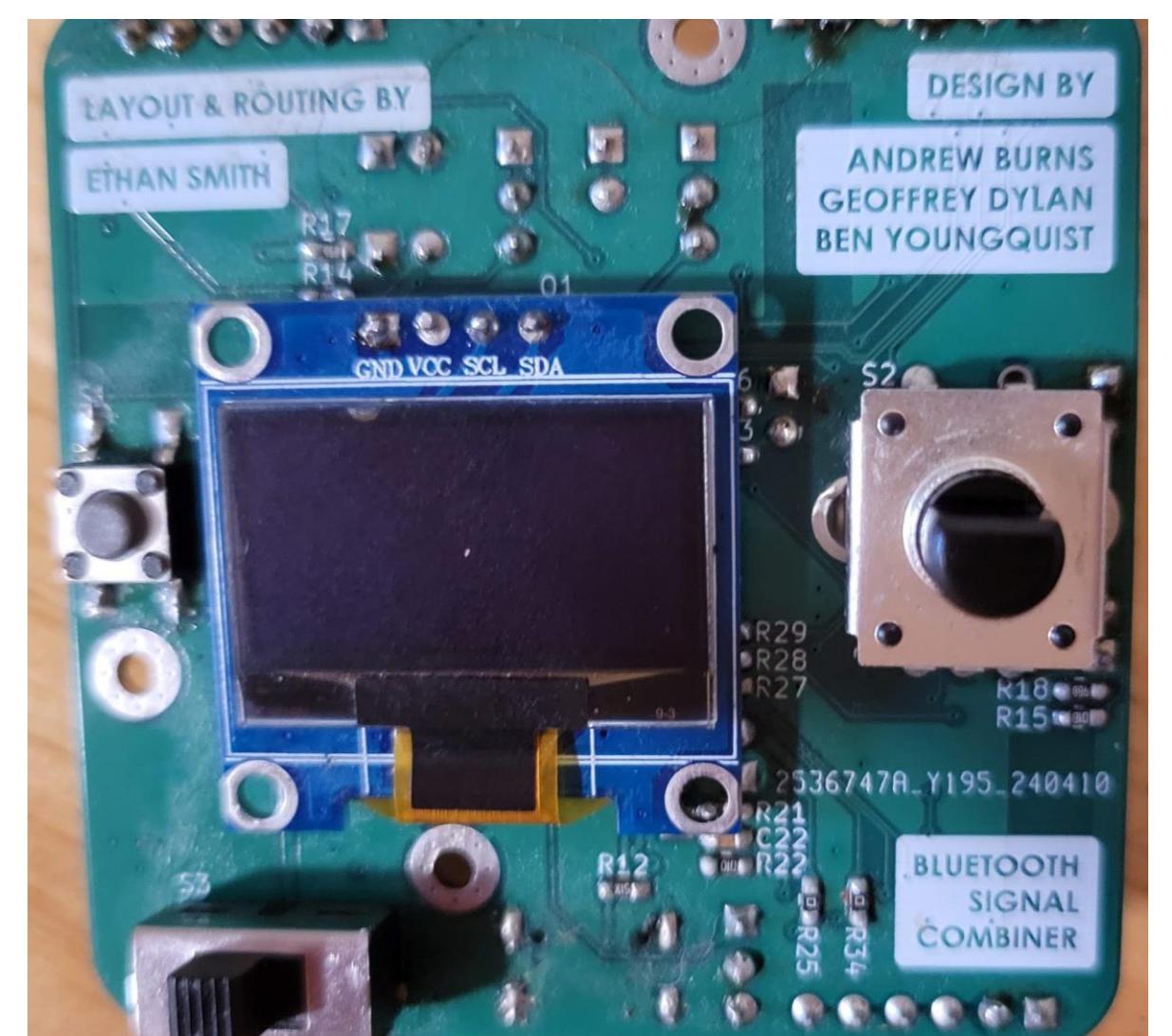


## Results

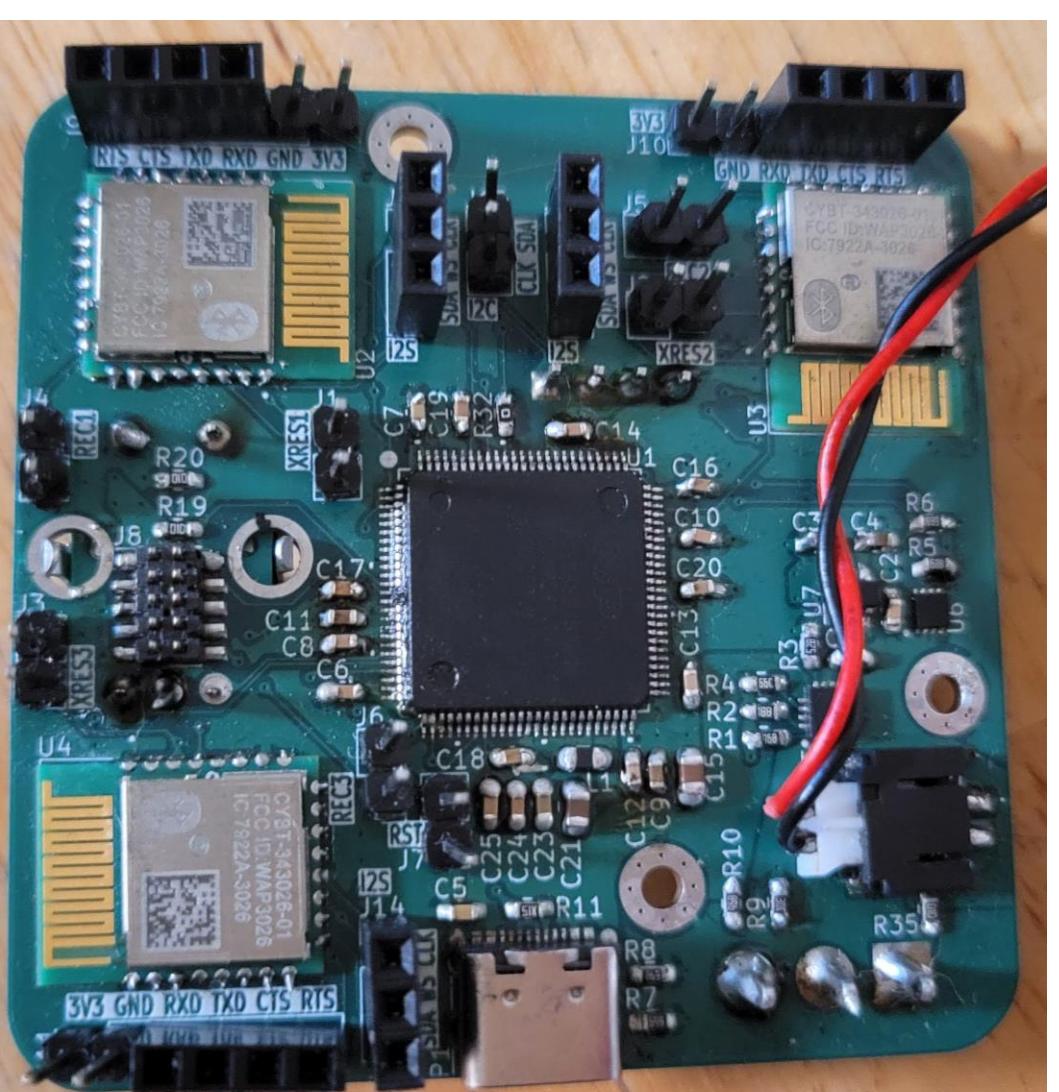
This project was a **success**. We managed to achieve our goals with this project just before the end of the quarter. **Major features** such as Bluetooth communication, battery management, and the user interface are **functional**. The **audio quality** the device transmits is **acceptable**, to the point where the average user would be fine when using it daily.



BSC inside the case



PCB Front



PCB Back

## Conclusion

Overall, we are happy with the way this project came out. The product as a whole works, given our robust PCB design and thorough testing and verification throughout the quarter.

With more time, we could easily polish the code, fix any errors in our PCB, and add more features to enhance the quality of this project.

## Acknowledgements

Special thanks to **John Lund** and **Todd Morton**