

ECE 480 Application Note

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Executive Summary:

Design team one was tasked with improving airport luggage tracking and retrieval through the use of RFID technologies. The team was given 11 weeks to integrate RFID technologies into the airline luggage tracking systems as well as a mobile app. The final design and presentation is scheduled to be demonstrated on the 11th of December. The current luggage system, involving barcodes, is prone to failure as evidenced by the 15% failed scan percentage. By replacing the barcode system with an RFID tagging and tracking procedure, successful identifying and routing of luggage would increase to a rate near 100%. The project will be centered around the ability to differentiate RFID tags attached to luggage with a handheld scanner. The handheld scanner gives the user the ability to scan and verify that the luggage on the return carousel is theirs without needing to open each bag individually.

Keywords:

- Universal asynchronous receiver/transmitter (UART)
 - Hardware used for serial communication between a computer and a peripheral device, in this case the RFID reader
- Blended Micro
 - Arduino development board with built in low power bluetooth capabilities
- RFID
 - Radio frequency identification
- UHF
 - Ultra high frequency, 300MHz-3GHz
- Codebender
 - Online development platform for Arduino devices

Introduction/Objective:

After successfully assembling and programming the UHF RFID reader to a computer, a short range handheld RFID reading device was required for the next phase of the project. Both the larger long range reader and the handheld systems consist of the same basic hardware: RFID tags, reader, and antenna. However, the handheld system required bluetooth capability to connect with a cellular device. To accommodate this function a blended micro was acquired to receive and transmit data from the RFID reader to a bluetooth enabled device. The objective of this application note is to provide the reader with an in depth guide on how to connect the RFID reader and blended micro for the purpose of handheld RFID tag scanning.

Procedure:

The first step in integrating the blended micro and the RFID reader was the physical hardware connection. The blended micro did not come with any pin headers so those were soldered on separately. While the user can solder a pin header to every pin hole on the board, only the V33, GND, D1/Tx and D0/Rx pins were needed for this application. A pinout for the blended micro can be seen in figure 1 of the appendix. Unlike the blended micro, the RFID reader came with pre-soldered pin heads for the GND, Tx and Rx pins. These pins are located next to the power connector as seen in figure 2 of the appendix. The GND pins of both boards were connected to each other, while the Tx of one board was connected to the Rx of the other.

The second phase of the project consisted of programming the blended micro to receive and output the data picked up from the RFID tags by the reader. The Red Bear Lab blended micro was chosen due to its ability to connect with both iOS and android devices. There was also a step-by-step initial setup guide provided by Red Bear Labs. The link to this initial setup can be

Conclusion:

To this date we have yet to be able to get the bluetooth to pick up the values from the reader. Individually the reader can read and store information from the tags and the blended micro can receive and send strings of characters to and from a mobile device. Through research the team has found that the integration of the blended micro and a bluetooth device is not previously conceived application of either pieces of hardware. This combined with the relatively short amount of time the team has had with the hardware, 3 days are some of the major contributing factors to the incomplete status of this application thus far. The code to date can be seen in the useful links section. There were other stumbling blocks that lead up to this point of the project that will now be addressed as to be avoided by others attempting projects similar to this.

Initially the team planned on using two separate boards, an arduino mini to take data from the reader and a bluetooth connector to send the data from the arduino mini, instead of the combined blended micro. This proved to be an issue because the bluetooth connector was not compatible with the phones we used for testing. Another problem the team ran into was the micro USB cable. Initially the team was using a charging cable which would not load the drivers for the various components. This caused a lot of frustration and unneeded troubleshooting modifications to the programs used to run the hardware. The issue was resolved by switching to a micro USB cable with data transferring capabilities.

Appendix:

Figures and Tables:

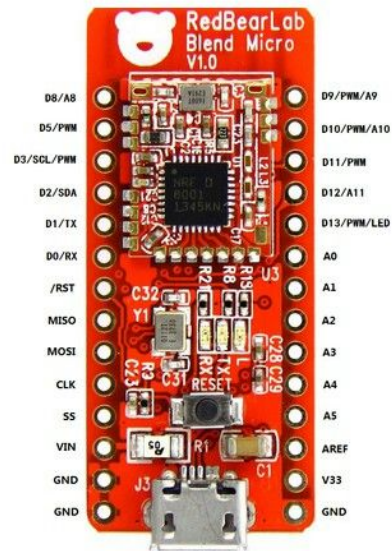


Figure 1: Blended Micro Pinout

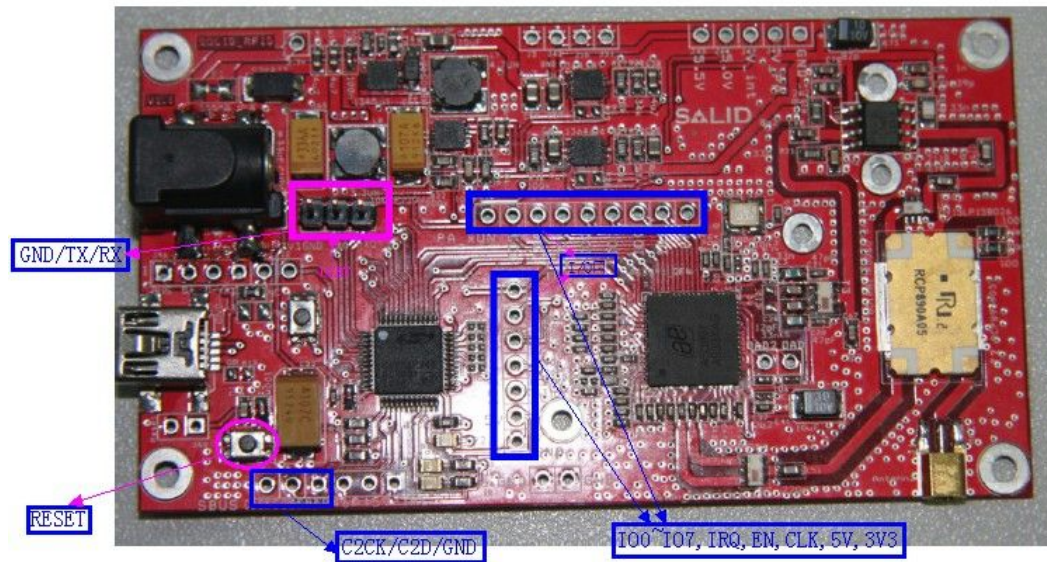


Figure 2: RFID Reader Layout

Component	Hardware Specifics
RFID Reader	Cottonwood as3992 reader
Bluetooth	Red Bear Lab Blended Micro

Table 1: Hardware

Useful Links:

1. Initial set-up
 - a. <http://redbearlab.com/getting-started-blend/>
2. Codebender Program/Hello World code
 - a. <http://redbearlab.com/quick-start-codebender/>
3. Open source code
 - a. <http://forum.linksprite.com/index.php?/topic/4063-cottonwood-rfid-reader-and-ar-duino-mega/#entry11615>
4. Developed Code Thus Far
 - a. <https://codebender.cc/sketch:184199#Blend%20Micro%2033V8MHz.ino>