ENABLED-CONTROLLER INSTRUCTIONS MANUAL

An accessible adaptive switch interface box

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https://github.com/milador/Enabled-Controller

Contents

Components List

1.   ADAFRUIT ITSY-BITSY **x 1**

        A. USB Version: Adafruit ItsyBitsy M0 Express

        B. Wireless Version: Adafruit ItsyBitsy nRF52840 Express

2.   ADDRESS LED DISC SER RGB 5MM **x 1**

3.   14 POSITION HEADER **x 2**

4.   CONN JACK STEREO 3.5MM R/A **x 8**

5.   CONN JACK 4COND 3.5MM **x 2**

6.   ANALOG 2-AXIS THUMB JOYSTICK WIT **(Optional) x 1**

7.   HEX NUT 0.245" STEEL 6-32 **x 2**

8.   MACH SCREW PAN HEAD SLOTTED 6-32 **x 2**

The bill of materials can also be downloaded from GitHub repository under main directory.

https://github.com/milador/Enabled-Controller/blob/master/Components/Enabled_Controller_BOM.csv

Software

The Enabled-Controller software can be downloaded from the GitHub repository under software directory.

https://github.com/milador/Enabled-Controller/tree/master/Software/Arduino

There are three flavors of Enabled-Controller and each one requires different hardware. The Enabled-Controller software is offered in the following flavors:

1. USB Version: Adafruit ItsyBitsy M0 Express

2. Joystick Version: Adafruit ItsyBitsy M0 Express

3. Wireless Version: Adafruit ItsyBitsy nRF52840 Express

Installing Arduino IDE

The Arduino IDE is required to compile and upload the source code to the MCU in your Adafruit ItsyBitsy board. You can download and install the Arduino from official Arduino website that you can find using following link:

https://www.arduino.cc/en/software

Installing Arduino Libraries

The following instructions on how to install additional Arduino libraries helps you to get started with setting up Arduino IDE with required libraries and dependencies.

https://www.arduino.cc/en/guide/libraries

USB Version

Board Support Packages

You can find the official instructions to install Board Support Packages on Adafruit website using following link:

https://learn.adafruit.com/introducing-itsy-bitsy-m0/setup

Alternatively, you can perform following instructions to install Board Support Packages:

1. Open and start the Arduino IDE
2. Go to *File > Preferences*
3. Add following link as a new line under *Additional Board Manager URLs*
   - *https://www.adafruit.com/package_adafruit_index.json*
4. Restart the Arduino IDE
5. Open the Boards Manager option from the *Tools > Board* menu and install *Adafruit SAMD Boards by Adafruit*
6. Wait until the IDE finishes installing the cross-compiling toolchain and tools associated with Board Support Package. This may take few minutes.
7. That's it! The installation of Board Support Packages is finished.

Required Software and libraries

The USB version of the software requires the following files and libraries:

- [StopWatch.h](#)
- [EasyMorse.h](#)
- [Adafruit_NeoPixel.h](#)
- [Enabled_Controller_USB_Software.ino](#)

StopWatch library helps to calculate the reaction time and timeout in the morse code interface.

The EasyMorse library is used to enable the end user to use morse code or a sequence of dots and dashes as input method.

Enabled-Controller is using Adafruit_NeoPixel library to provide visual feedback using RGB LED.

Uploading Software

Note: Make sure all files are included in your local copy of Software directory before uploading it to the Adafruit ItsyBitsy board. The libraries can be installed in Arduino libraries.

You can go ahead and upload the downloaded *.ino* code to Adafruit ItsyBitsy board using Arduino IDE once all the necessary libraries are installed.

1. Start the Arduino IDE
2. Open *Enabled_Controller_USB_Software.ino*
3. Select the Board under *Tools > Board* as *Adafruit ItsyBitsy M0 Express*
4. Select the correct port number under *Tools > Port* which should show *COM XX (Adafruit ItsyBitsy M0 Express)*

Note: It's very important to make sure the correct Board and port number are selected as selecting the wrong board may result problems with bootloader of Adafruit ItsyBitsy board.

5. Press the Verify button to make sure there is no problem with the software and libraries
6. Press Upload button

You can now go ahead and upload the software. Arduino IDE will show you a *Done Uploading* message indicating the software is uploaded to your Enabled-Controller.

The LED on the Enabled-Controller main board blinks two times in *teal* to indicate the start of initialization process has been started and it will blink again two times in green to indicate end of the initialization process.

You can also open the Serial Monitor in Arduino IDE on 115200 baud-rate to read initialization information about the version of software.

Joystick Version

Board Support Packages

You can find the official instructions to install Board Support Packages on Adafruit website using following link:

https://learn.adafruit.com/introducing-itsy-bitsy-m0/setup

Alternatively, you can perform following instructions to install Board Support Packages:

8. Open and start the Arduino IDE
9. Go to **File > Preferences**
10. Add following link as a new line under **Additional Board Manager URLs**
    - *https://www.adafruit.com/package_adafruit_index.json*
11. Restart the Arduino IDE
12. Open the Boards Manager option from the **Tools > Board** menu and install **Adafruit SAMD Boards by Adafruit**
13. Wait until the IDE finishes installing the cross-compiling toolchain and tools associated with Board Support Package. This may take few minutes.
14. That's it! The installation of Board Support Packages is finished.

Required Software and libraries

The Joystick version of the software requires the following files and libraries:

- StopWatch.h
- Joystick.h (SAMD Version)
- Adafruit_NeoPixel.h
- Enabled_Controller_Joystick_Software.ino

StopWatch library helps to calculate the reaction time and timeout in the morse code interface.

The joystick library is used to turn Enabled-Controller into a joystick USB HID device which can be used for gaming. Please make sure you install the SAMD version of the joystick library.

Enabled-Controller is using Adafruit_NeoPixel library to provide visual feedback using RGB LED.

Uploading Software

Note: Make sure all files are included in your local copy of Software directory before uploading it to the Adafruit ItsyBitsy board. The libraries can be installed in Arduino libraries.

You can go ahead and upload the downloaded **.ino** code to Adafruit ItsyBitsy board using Arduino IDE once all the necessary libraries are installed.

7. Start the Arduino IDE
8. Open **Enabled_Controller_Joystick_Software.ino**
9. Select the Board under **Tools > Board** as **Adafruit ItsyBitsy M0 Express**
10. Select the correct port number under **Tools > Port** which should show **COM XX (Adafruit ItsyBitsy M0 Express)**

Note: It's very important to make sure the correct Board and port number are selected as selecting the wrong board may result problems with bootloader of Adafruit ItsyBitsy board.

11. Press the Verify button to make sure there is no problem with the software and libraries
12. Press Upload button

You can now go ahead and upload the software. Arduino IDE will show you a ***Done Uploading*** message indicating the software is uploaded to your Enabled-Controller.

The LED on the Enabled-Controller main board blinks two times in ***teal*** to indicate the start of initialization process has been started and it will blink again two times in green to indicate end of the initialization process.

You can also open the Serial Monitor in Arduino IDE on 115200 baud-rate to read initialization information about the version of software.

Wireless Version

Board Support Packages

You can find the official instructions to install Board Support Packages on Adafruit website using following link:

https://learn.adafruit.com/adafruit-itsybitsy-nrf52840-express/arduino-support-setup

Alternatively, you can perform following instructions to install Board Support Packages:

15. Open and start the Arduino IDE
16. Go to ***File > Preferences***
17. Add following link as a new line under ***Additional Board Manager URLs***
    - ***https://www.adafruit.com/package_adafruit_index.json***
18. Restart the Arduino IDE
19. Open the Boards Manager option from the ***Tools > Board*** menu and install ***Adafruit nRF52 Boards by Adafruit***
20. Wait until the IDE finishes installing the cross-compiling toolchain and tools associated with Board Support Package. This may take few minutes.
21. That's it! The installation of Board Support Packages is finished.

Required Software and libraries

The wireless version of the software requires the following files and libraries:

- StopWatch.h
- EasyMorse.h
- Adafruit_NeoPixel.h
- Enabled_Controller_Wireless_Software.ino

StopWatch library helps to calculate the reaction time and timeout in the morse code interface.

The EasyMorse library is used to enable the end user to use morse code or a sequence of dots and dashes as input method.

Enabled-Controller is using Adafruit_NeoPixel library to provide visual feedback using RGB LED.

Uploading Software

Note: Make sure all files are included in your local copy of Software directory before uploading it to the Adafruit ItsyBitsy board. The libraries can be installed in Arduino libraries.

You can go ahead and upload the downloaded ***.ino*** code to Adafruit ItsyBitsy board using Arduino IDE once all the necessary libraries are installed.

1. Start the Arduino IDE
2. Open ***Enabled_Controller_Wireless_Software.ino***
3. Select the Board under ***Tools > Board*** as ***Adafruit ItsyBitsy nRF52840 Express***
4. Select the correct port number under ***Tools > Port*** which should show ***COM XX (Adafruit ItsyBitsy nRF52840 Express)***

Note: It's very important to make sure the correct Board and port number are selected as selecting the wrong board may result problems with bootloader of Adafruit ItsyBitsy board.

5. Press the Verify button to make sure there is no problem with the software and libraries
6. Press Upload button

You can now go ahead and upload the software. Arduino IDE will show you a ***Done Uploading*** message indicating the software is uploaded to your Enabled-Controller.

The LED on the Enabled-Controller main board blinks two times in ***teal*** to indicate the start of initialization process has been started and it will blink again two times in green to indicate end of the initialization process.

You can also open the Serial Monitor in Arduino IDE on 115200 baud-rate to read initialization information about the version of software.

Hardware Assembly

Printed circuit Board design

The printed circuit boards (PCB) can be downloaded from GitHub repository under Hardware directory.

https://github.com/milador/Enabled-Controller/tree/master/Hardware/PCB

Enclosure design

The enclosure/housing files in STL format can be downloaded from GitHub repository under Hardware directory.

https://github.com/milador/Enabled-Controller/tree/master/Hardware/Enclosure
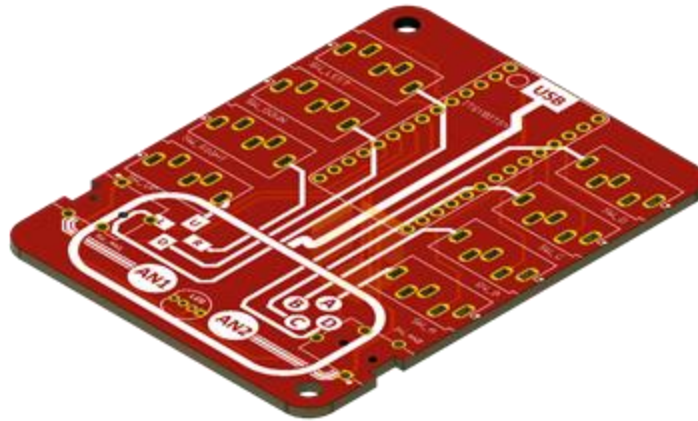
| Step 1: Enabled-Controller board x 1 |
| --- |
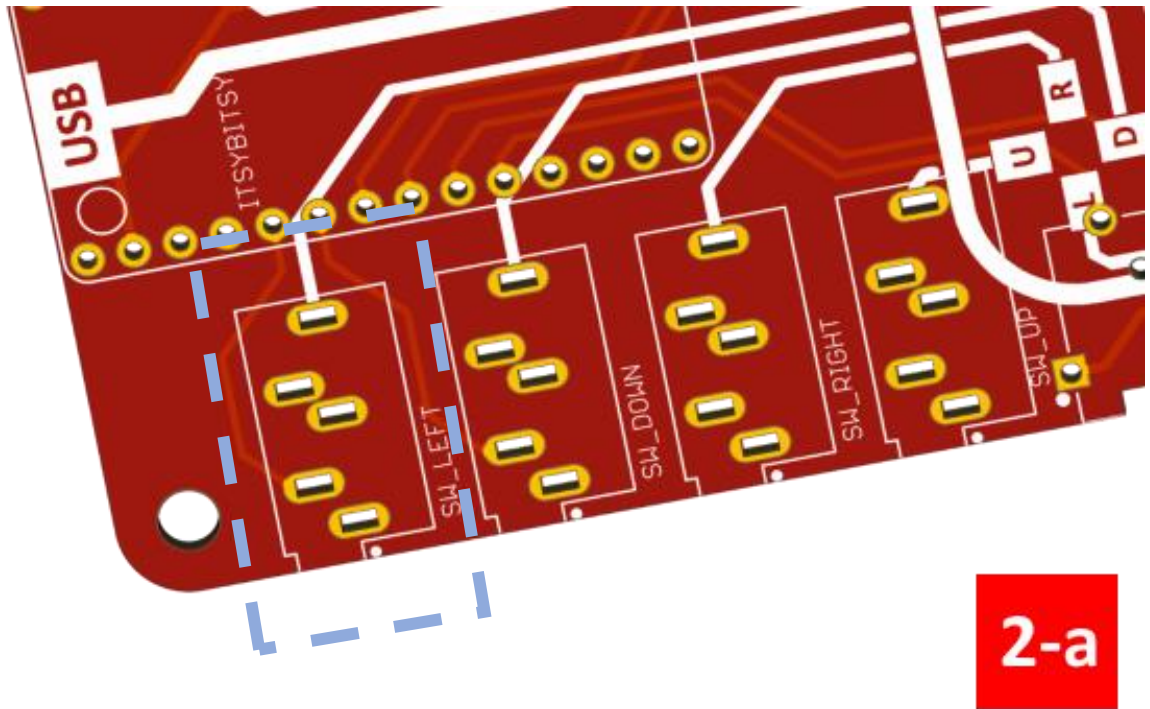
2-a

2-b
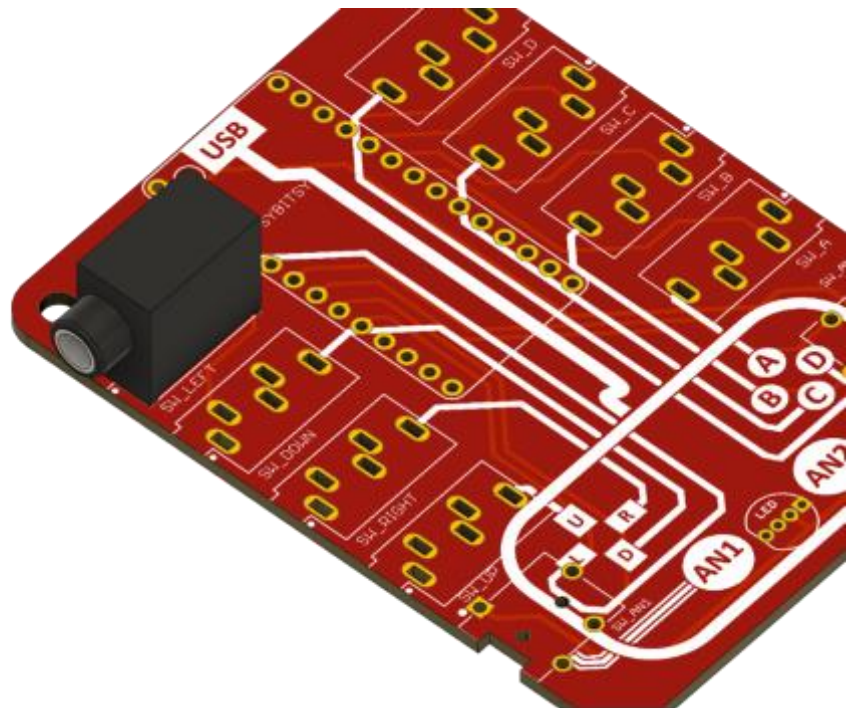
Step 2: Position a 3.5mm jack on the Left switch outline and solder the pins x 1
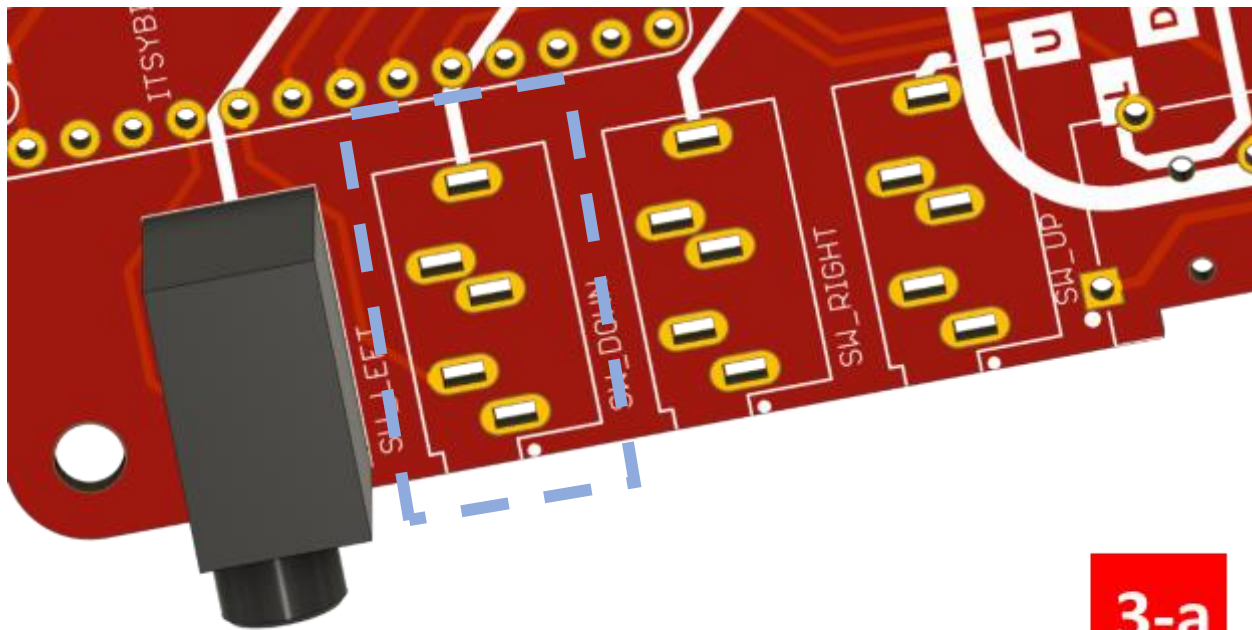
3-a
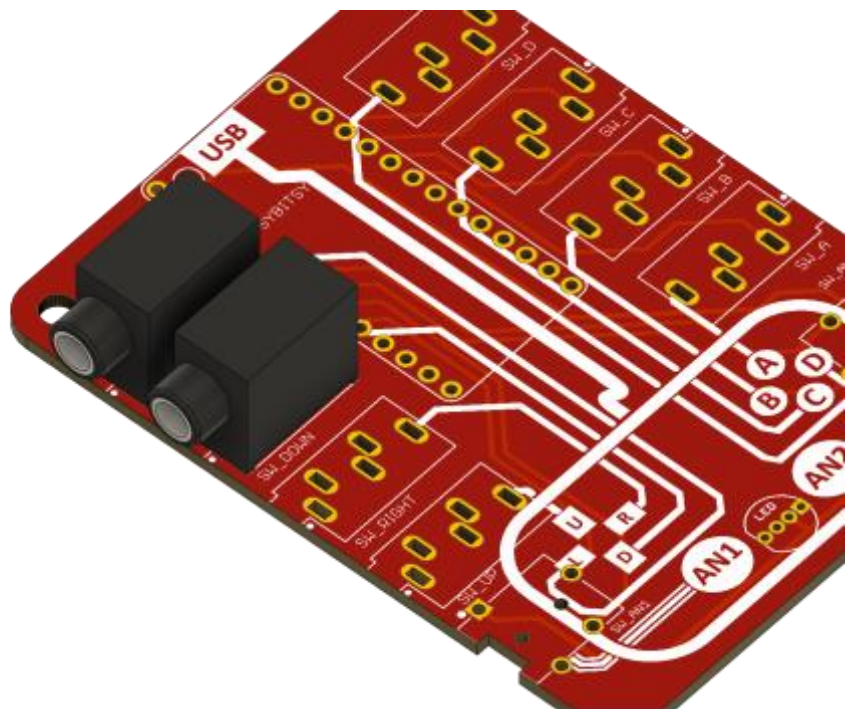
3-b

Step 3: Position a 3.5mm jack on the Down switch outline and solder the pins x 1

4-a
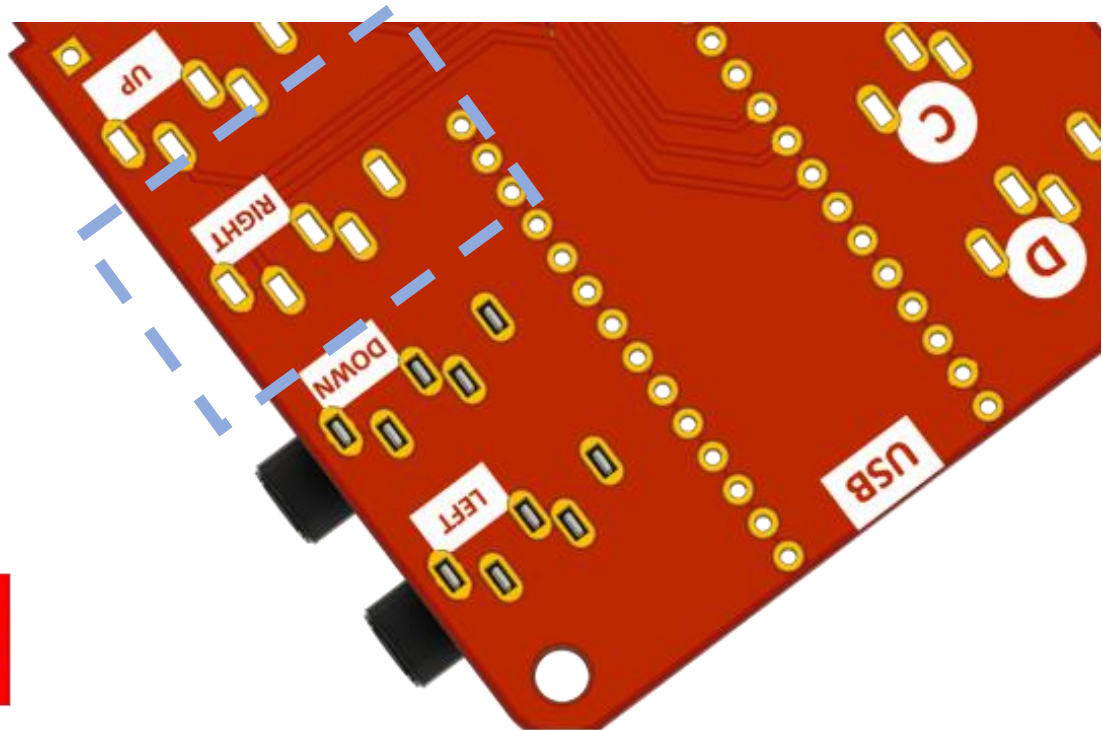
4-b
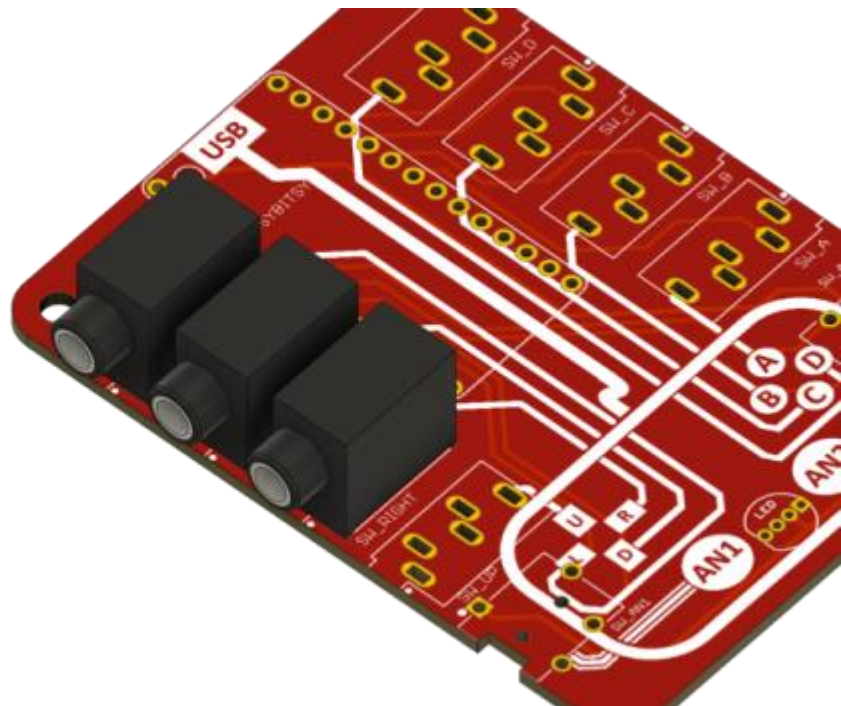
Step 4: Position a 3.5mm jack on the Right switch outline and solder the pins x 1

5-a

5-b

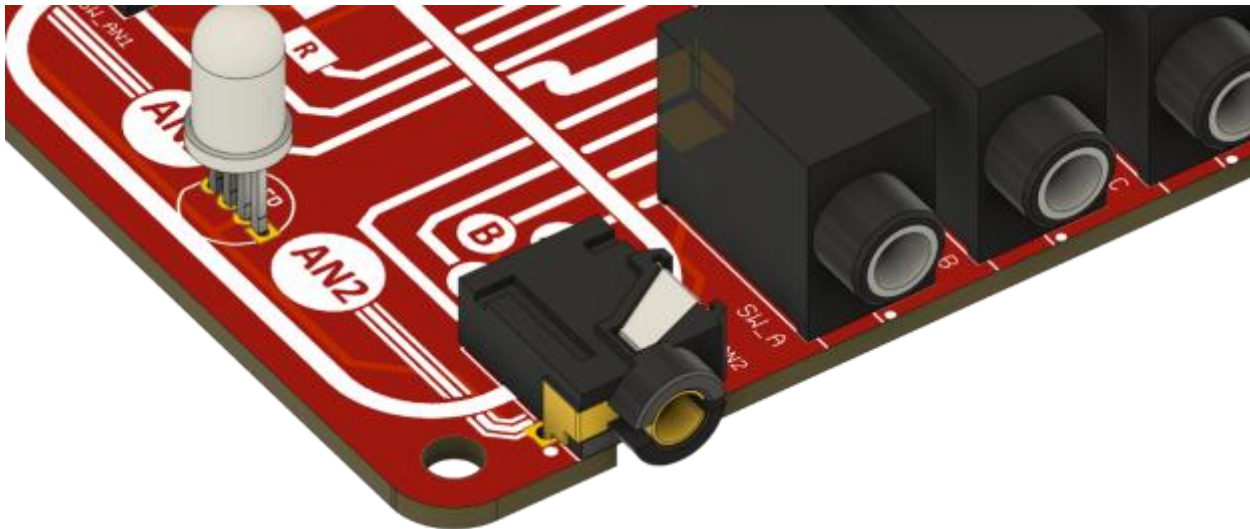Step 5: Position a 3.5mm jack on the Up switch outline and solder the pins x 1
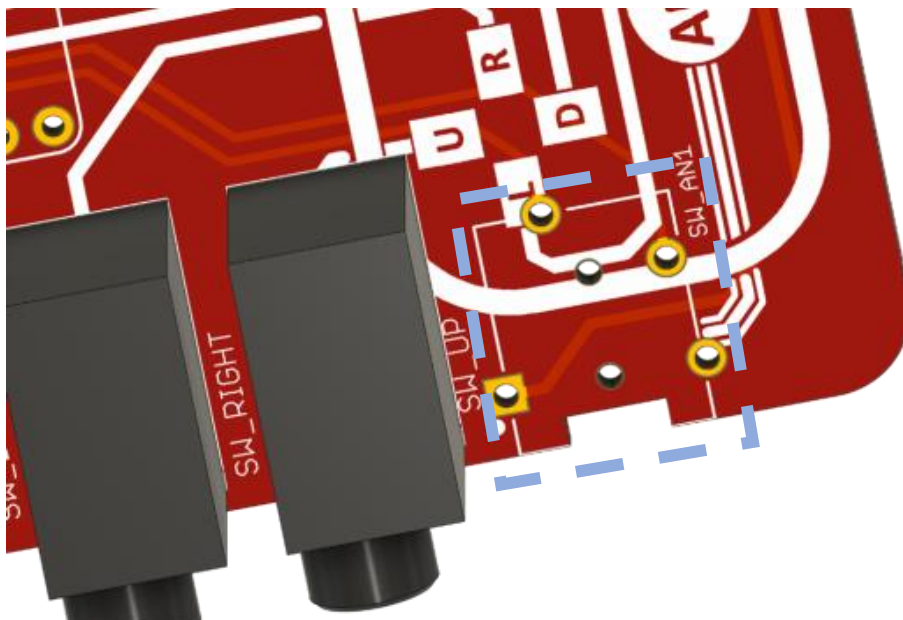
6-a
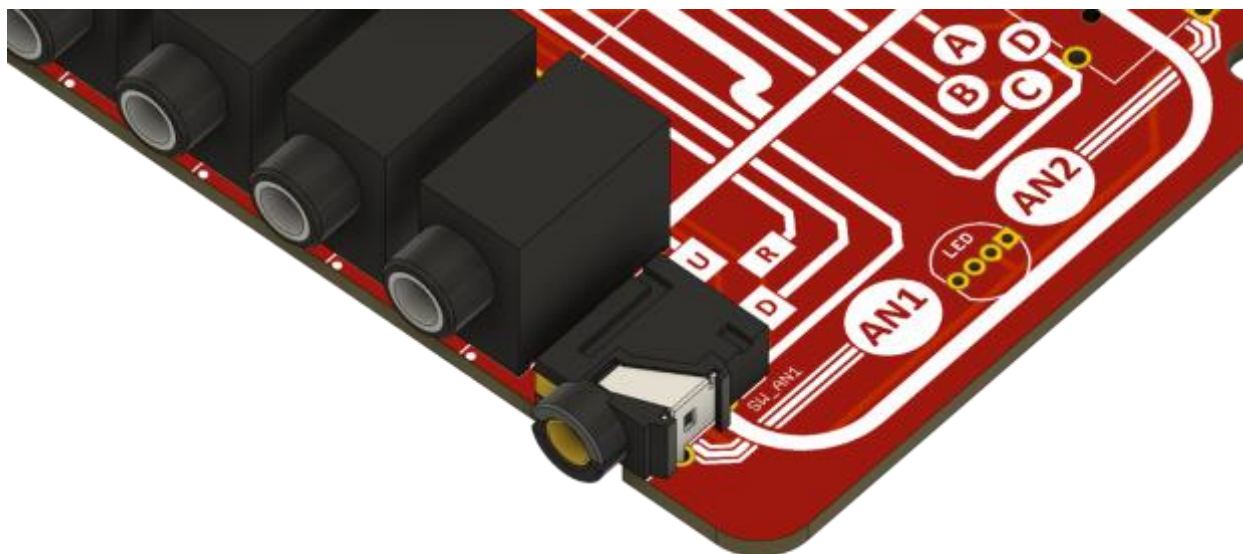
6-b

**Step 6: Position a 4 Conductor 3.5mm jack on the AN1 switch outline and solder the pins x 1**
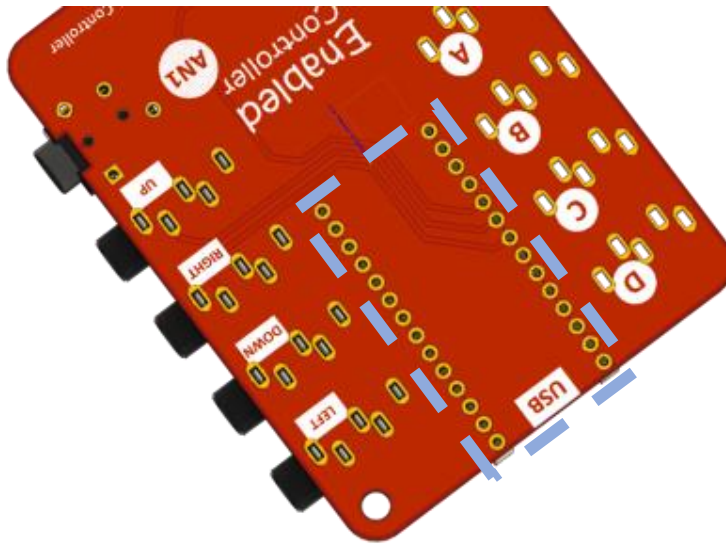
7-a
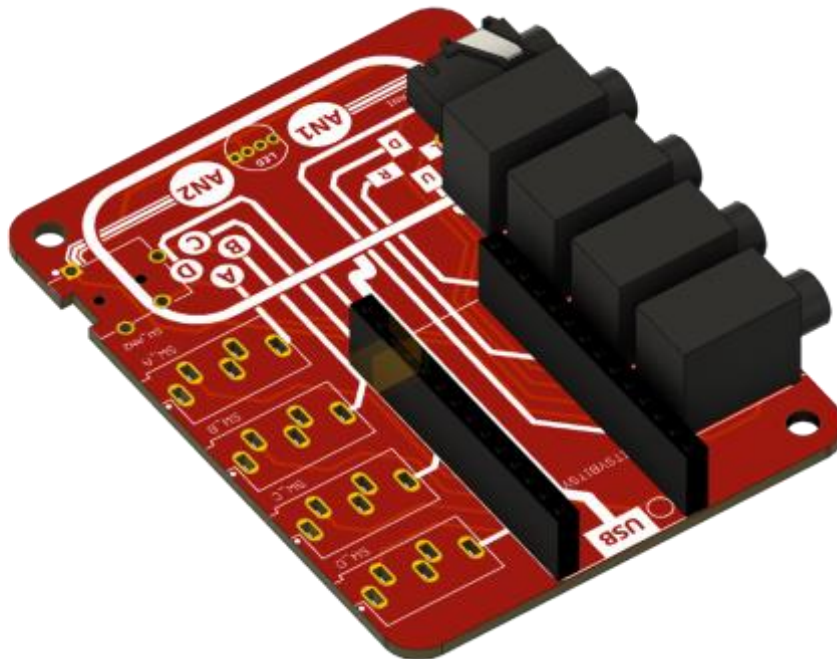
7-b

Step 7: Solder the 14 position female headers over the Enabled-Controller board x 2
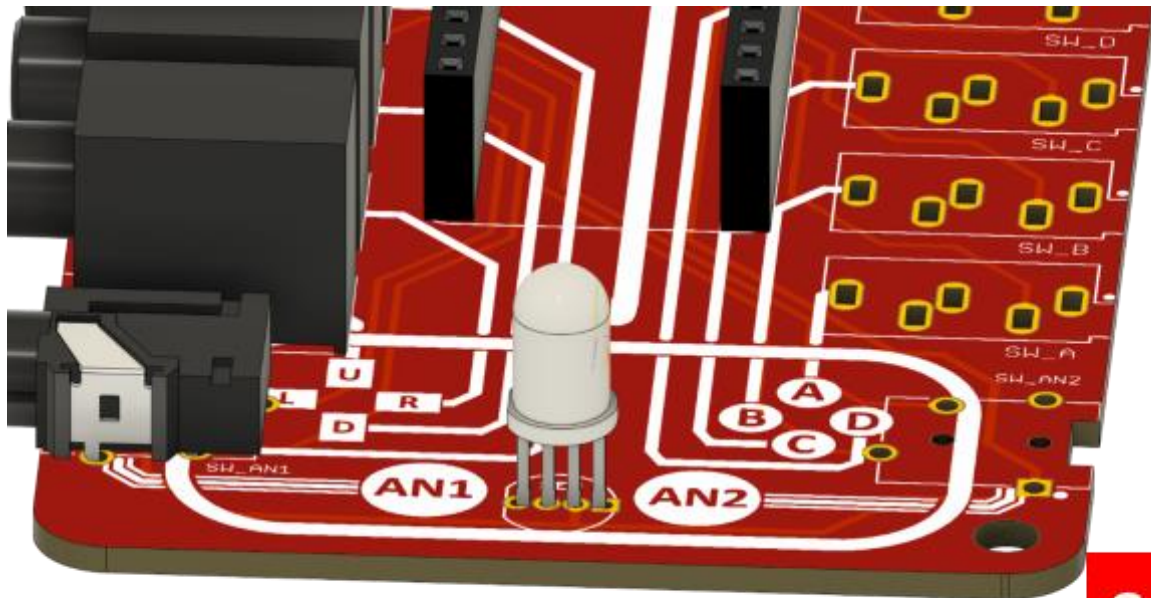
Step 8: Position and solder the RGB Led pins x 1
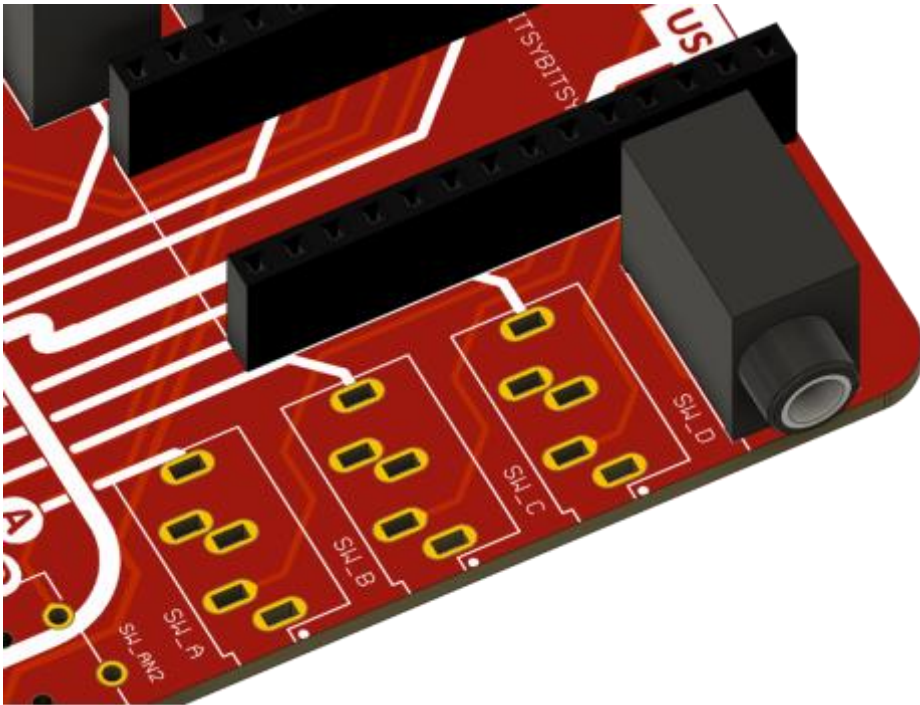
Step 9: Position a 3.5mm jack on the D switch outline and solder the pins x 1
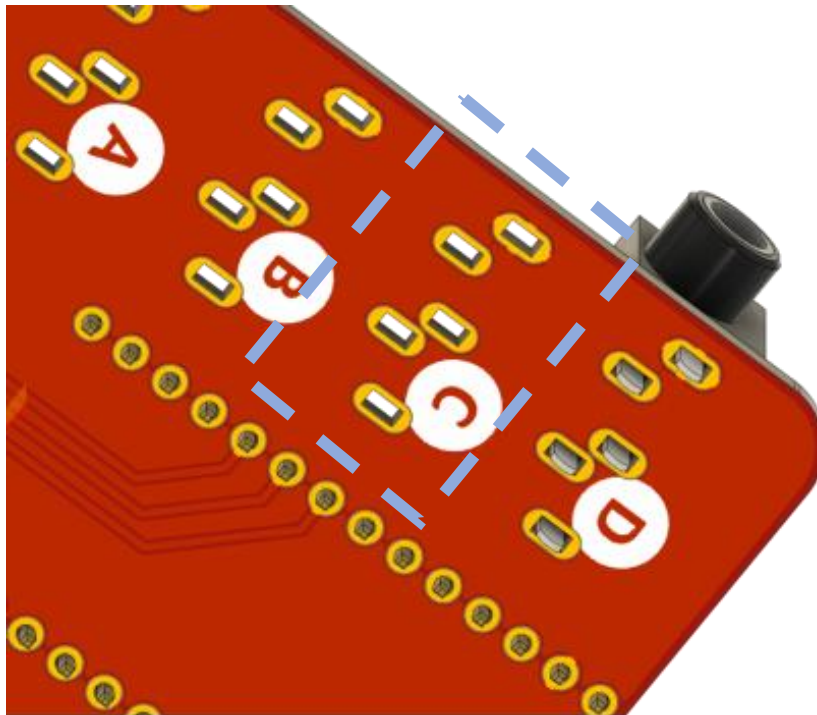
10-a
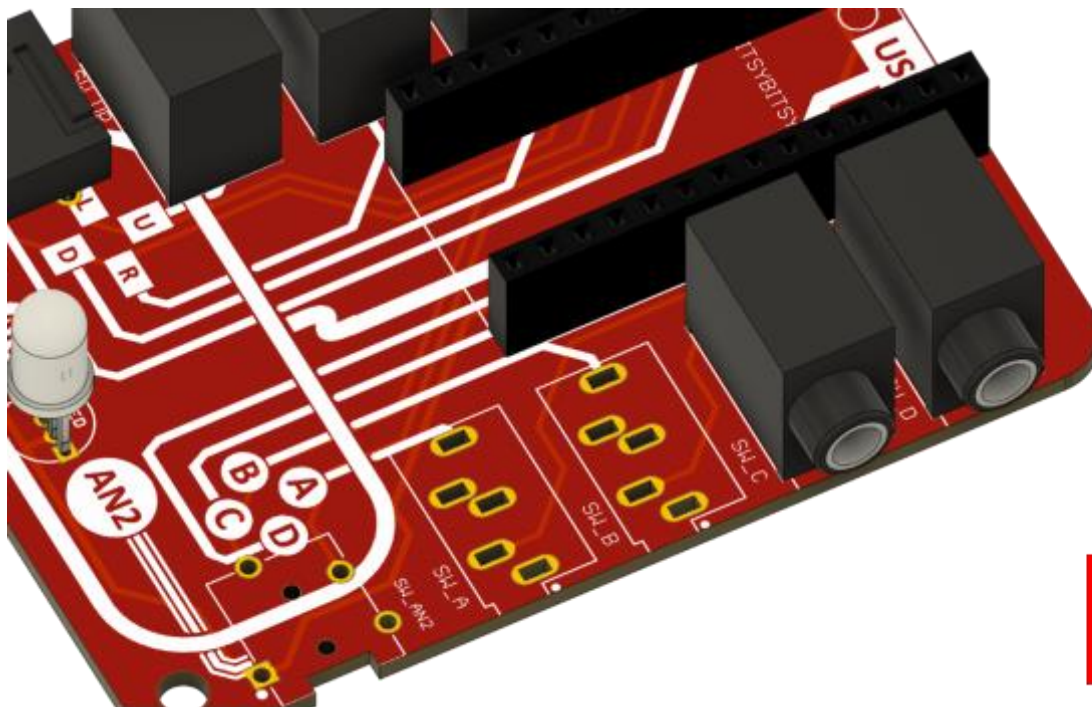
10-b

Step 10: Position a 3.5mm jack on the C switch outline and solder the pins x 1
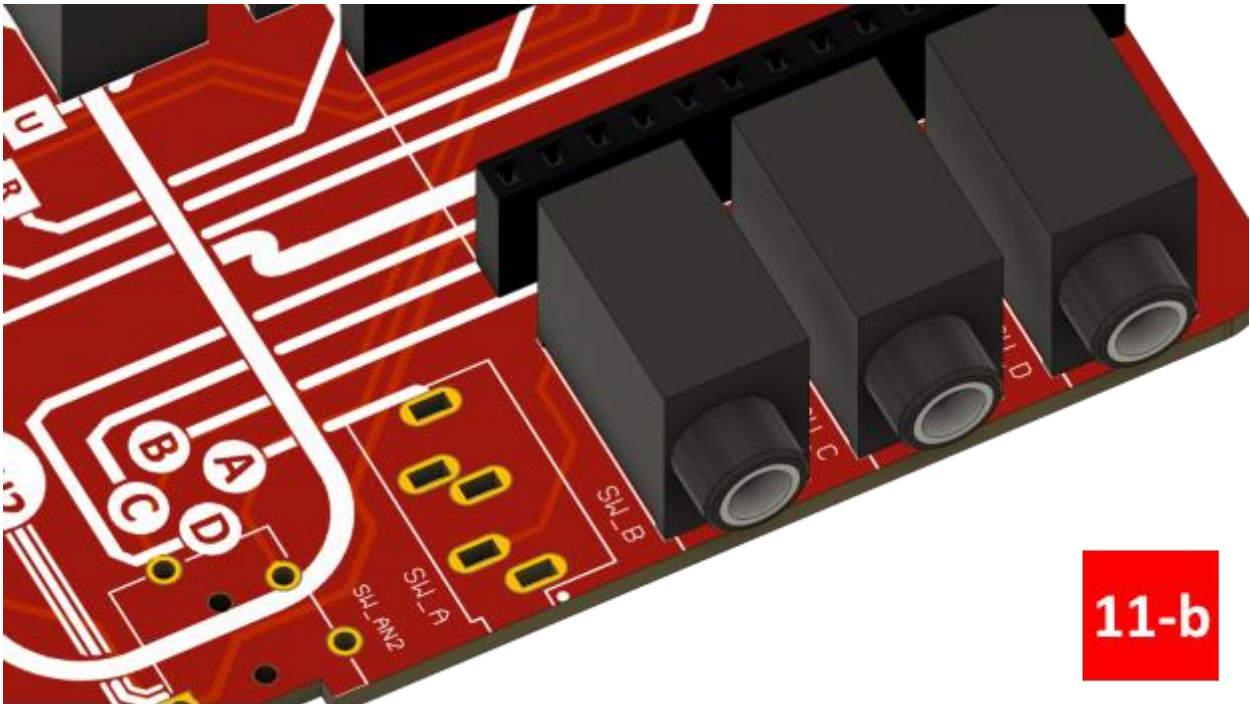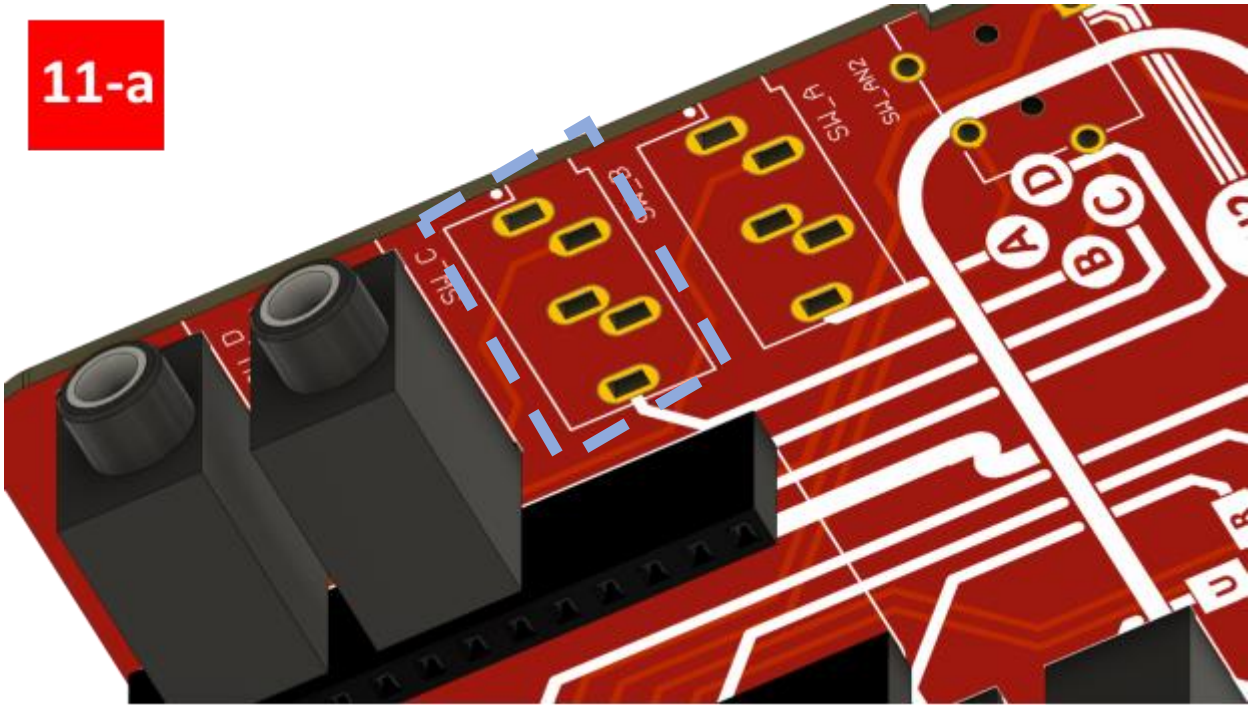
Step 11: Position a 3.5mm jack on the B switch outline and solder the pins x 1
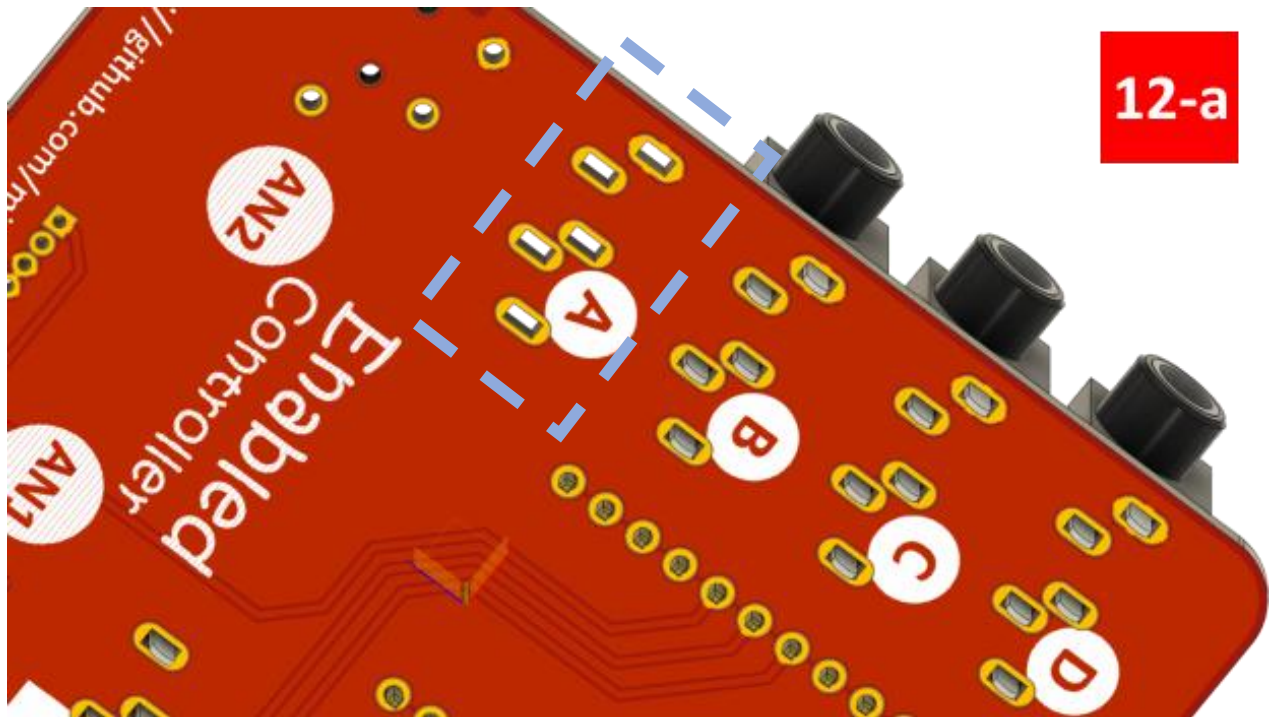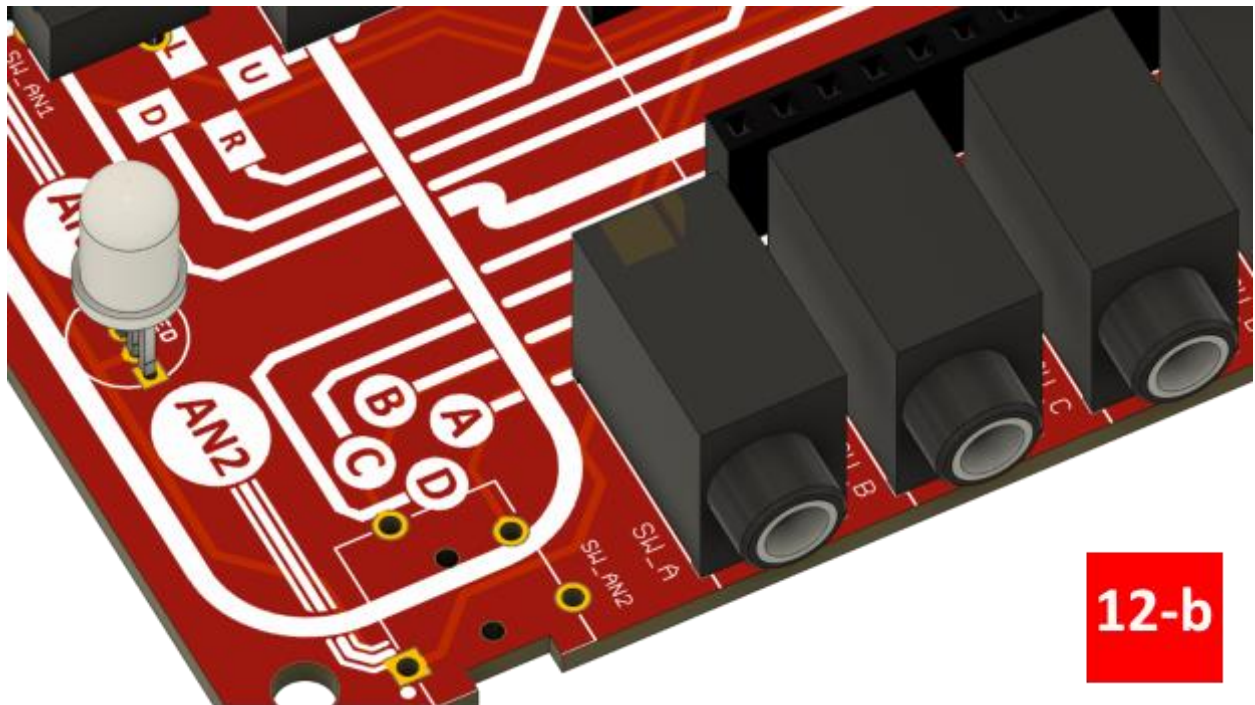
Step 12: Position a 3.5mm jack on the A switch outline and solder the pins x 1
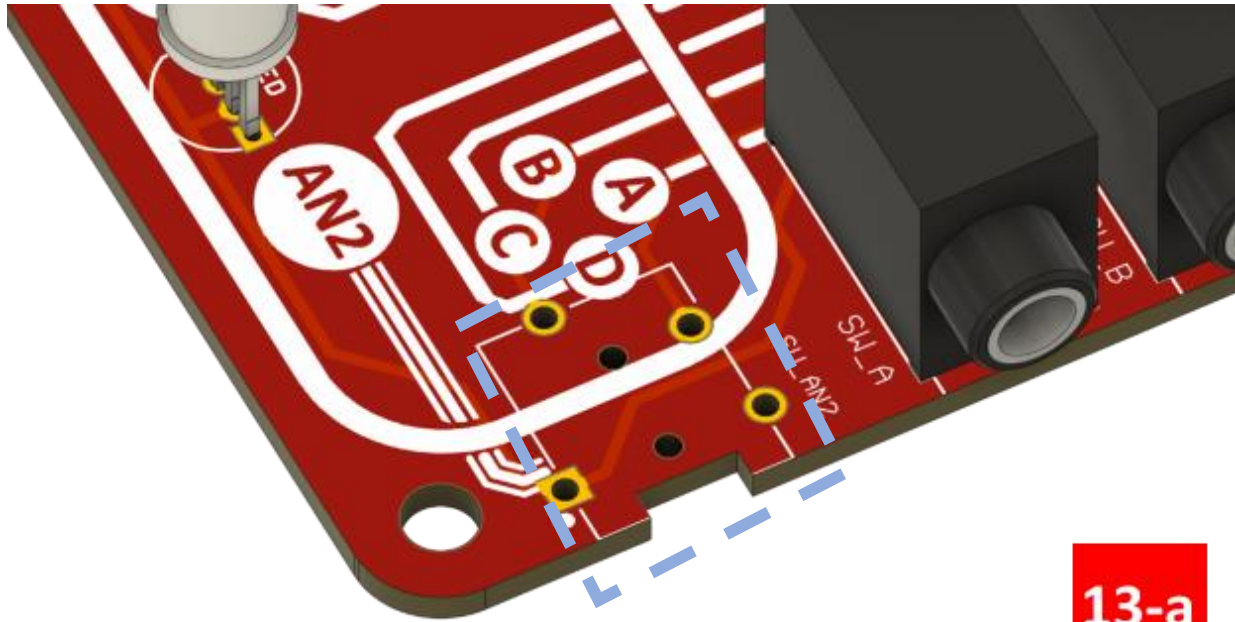
Step 13: Position a 4 Conductor 3.5mm jack on the AN2 switch outline and solder the pins x 1
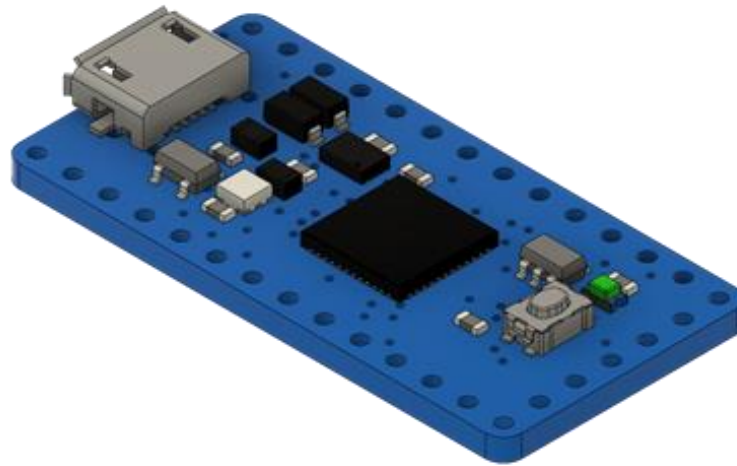
14-a
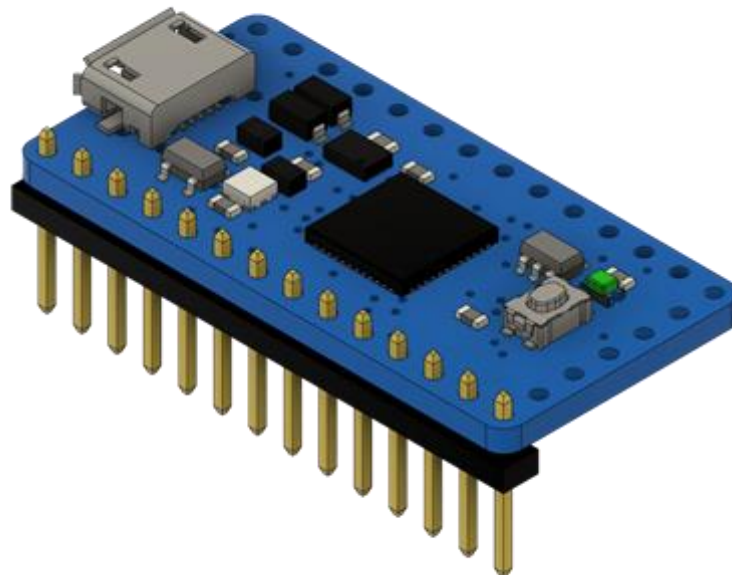
14-b

Step 14: Position and solder the first 14 position male header connector on ItsyBitsy board x 1
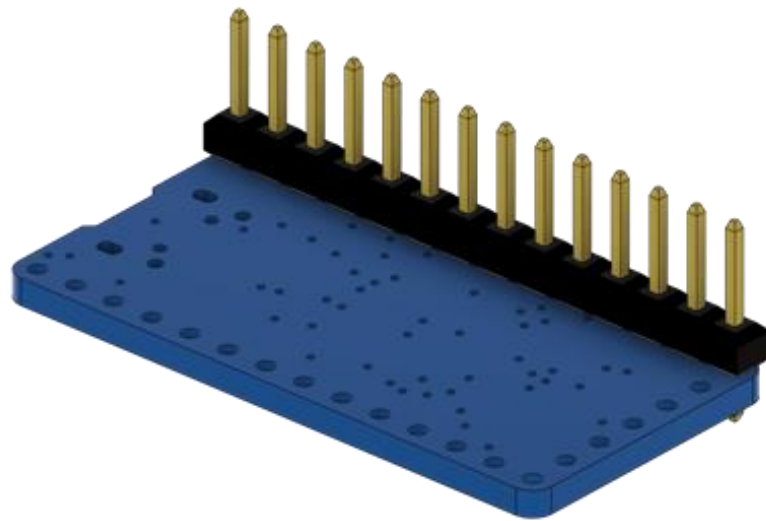
15-a
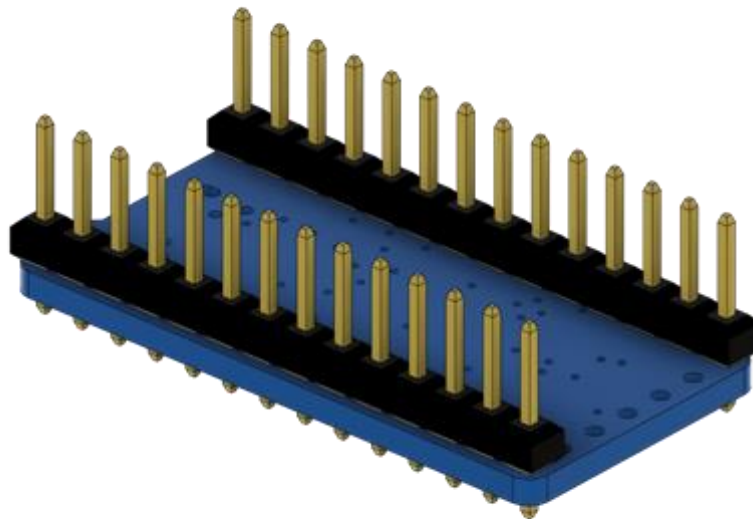
15-b

Step 15: Position and solder the second 14 position male header connector on ItsyBitsy board
x 1
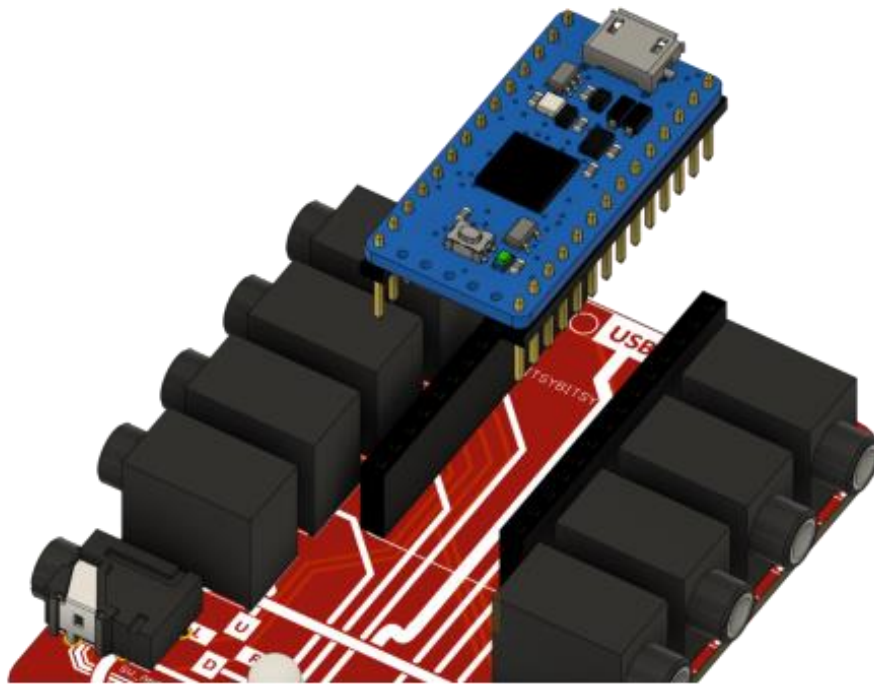
16-a
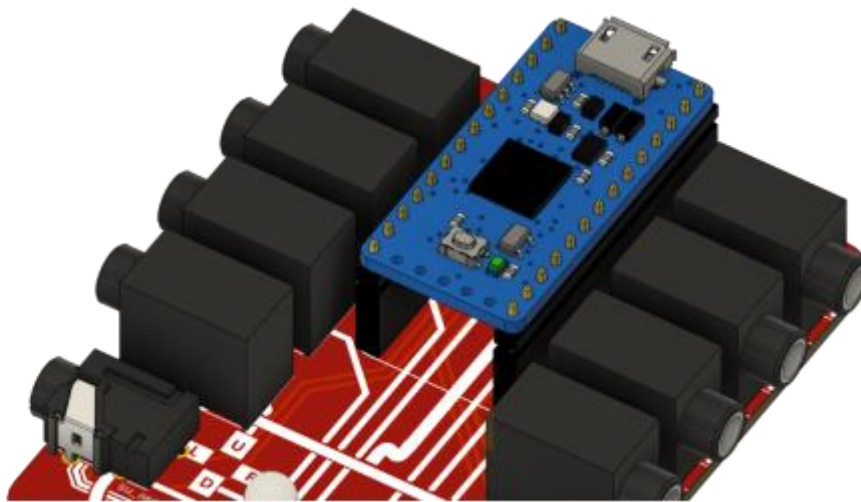
16-b

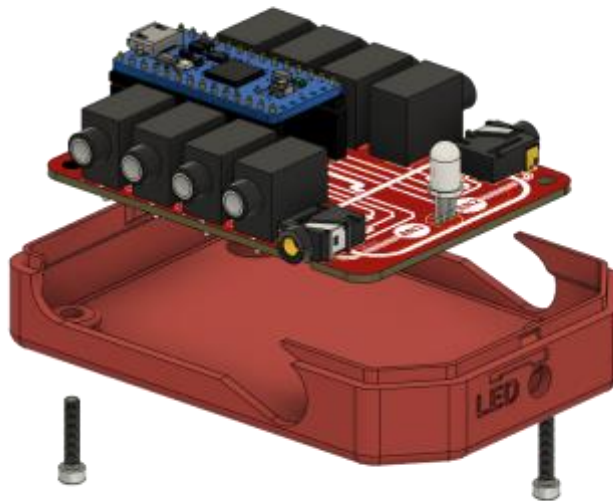**Step 16: Position and stack the soldered ItsyBitsy board over Enabled-Controller board**
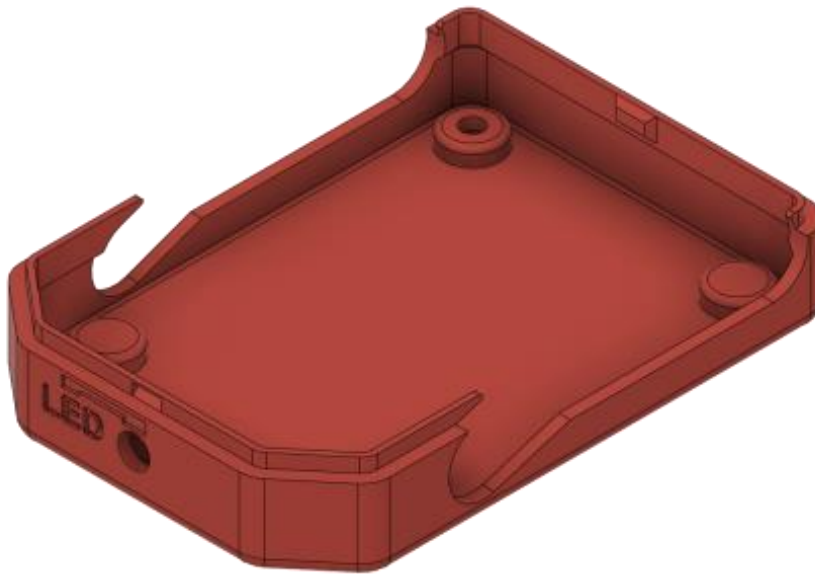
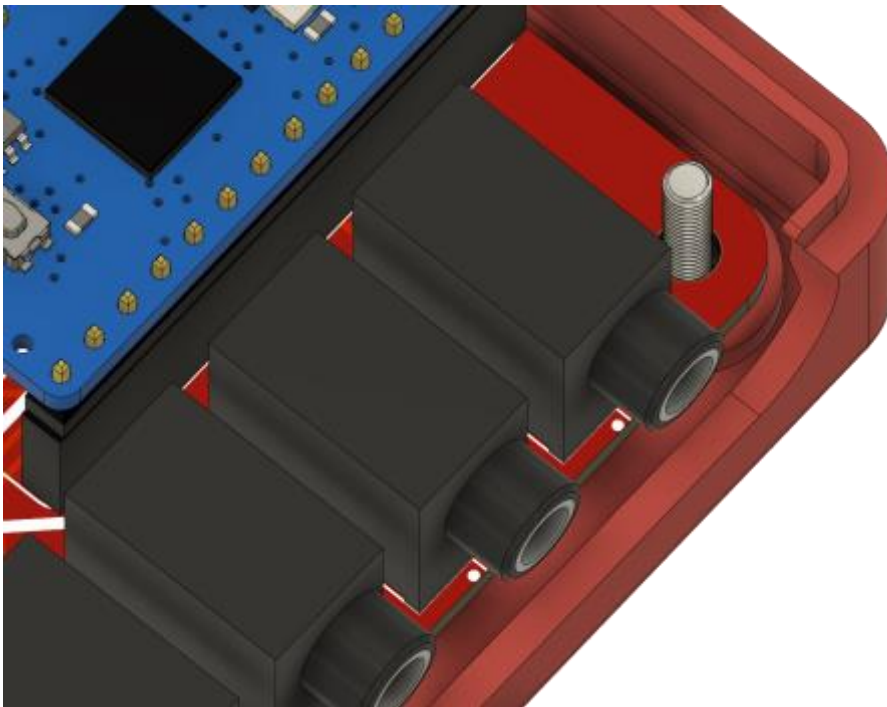**Step 17: Position the assembled Enabled-Controller board in bottom enclosure**
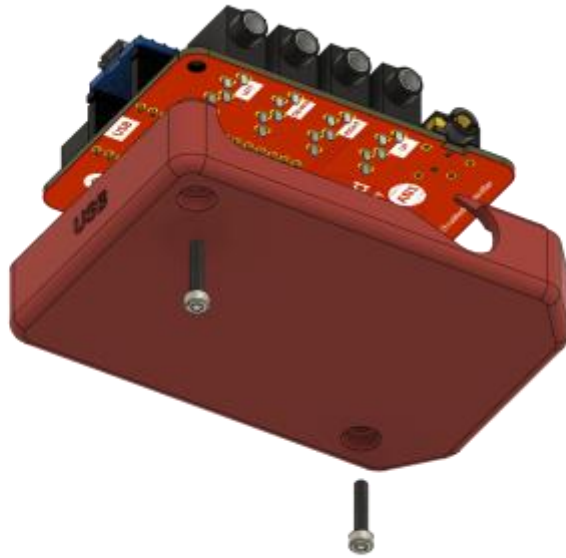
18-a

18-b

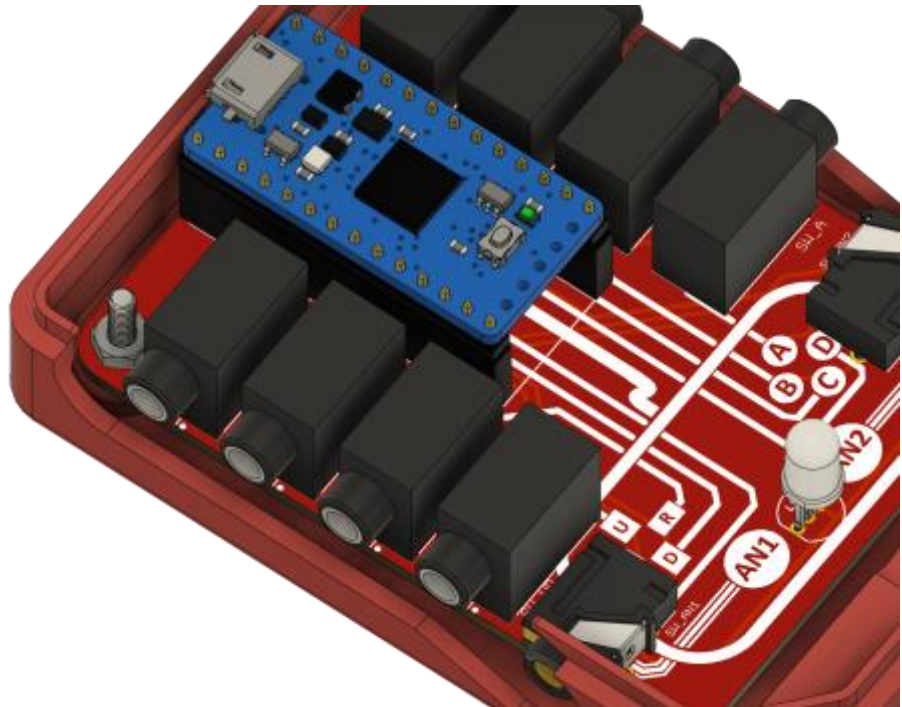**Step 18: Position the 6-32 screws under the bottom enclosure x 2**

19-a

19-b

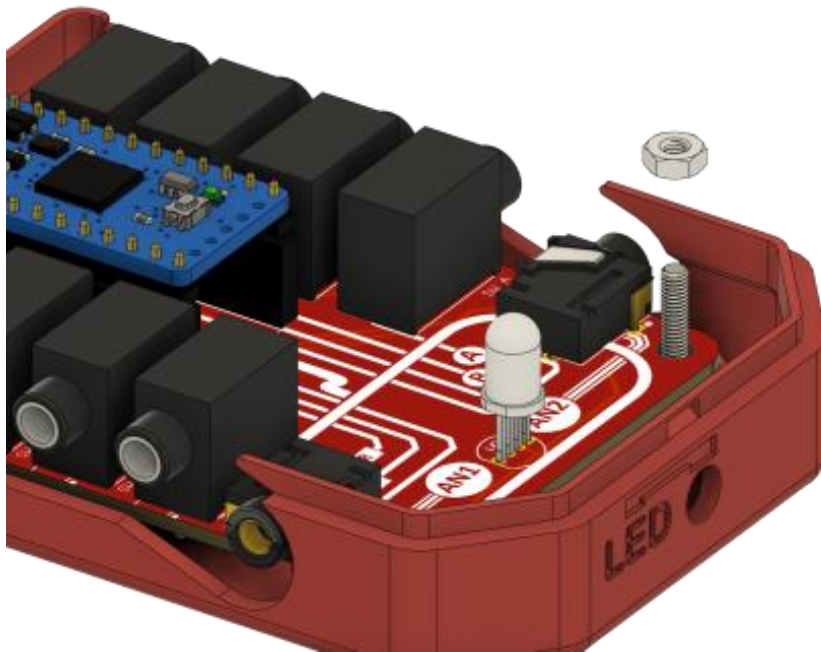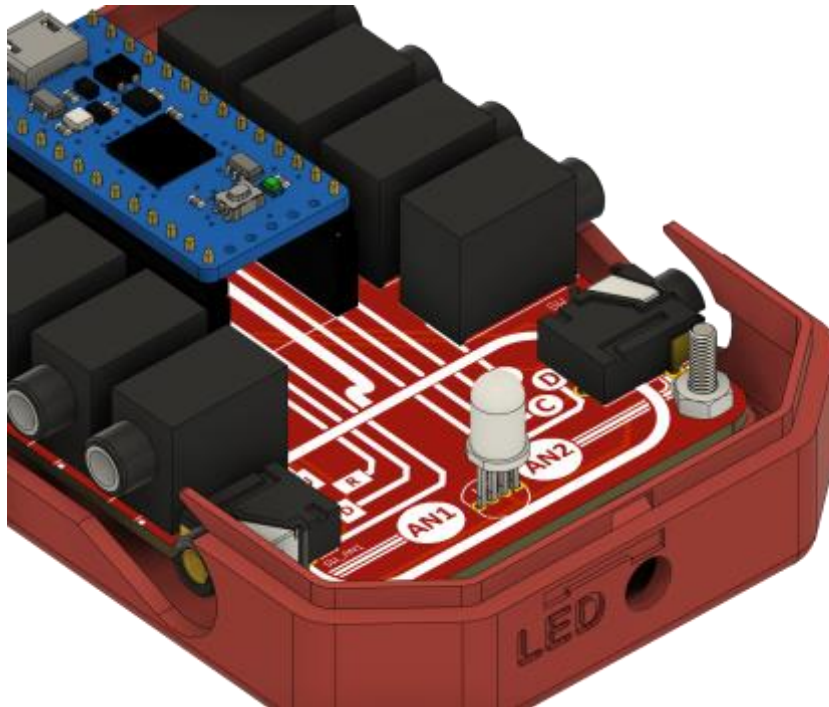**Step 19: Insert the 6-32 screws and push them until they pass Enabled-Controller drill holes   x 2**

20-a

20-b

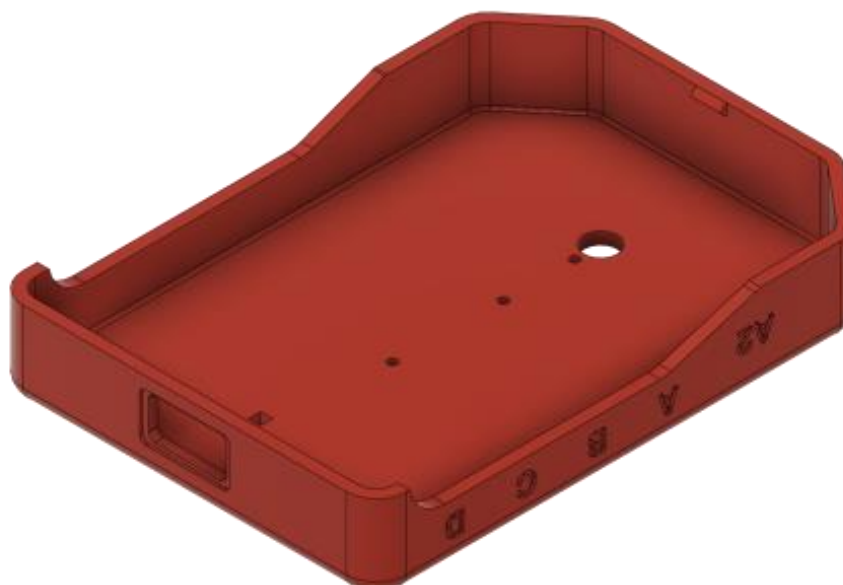Step 20: Insert the first 6-32 screw nut x 1

21-a

21-b

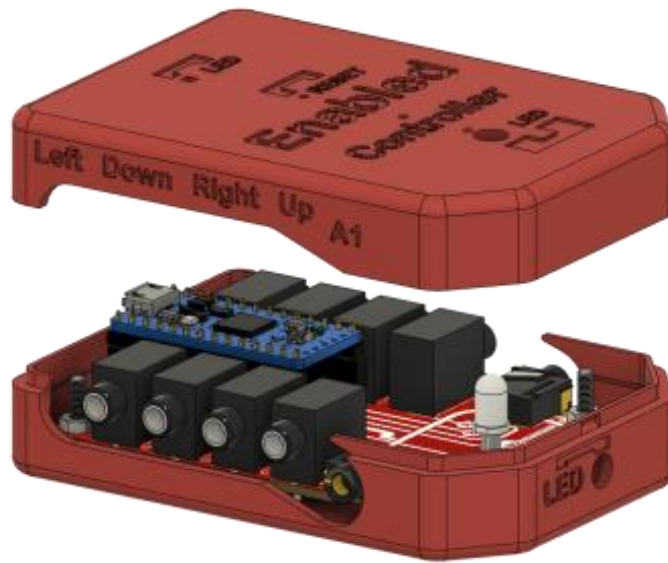**Step 21: Insert the second 6-32 screw nut x 1**

Step 22: Make sure the 6-32 screws hold the Enabled-Controller board by tightening the nuts

Step 23: Enabled-Controller top enclosure x 1

24-a

24-b

Step 24: Insert the top enclosure over the bottom enclosure and snap them together

25-a

25-b

Step 25: Connect a Micro USB-B cable through USB port

Step 26 – That's it! Your Enabled-Controller is fully assembled and ready to use.

ready to use.

Joystick Assembly

Enabled-Controller includes two 4 conductors input 3.5mm jacks reserved to connect up to two dual axis joysticks. The order of pins in joystick boards can vary depending on the brand but the following general configuration can be used to attach analog joystick. Enabled-Controller is designed to work with analog joystick which rated to work with 3.3V input voltage.
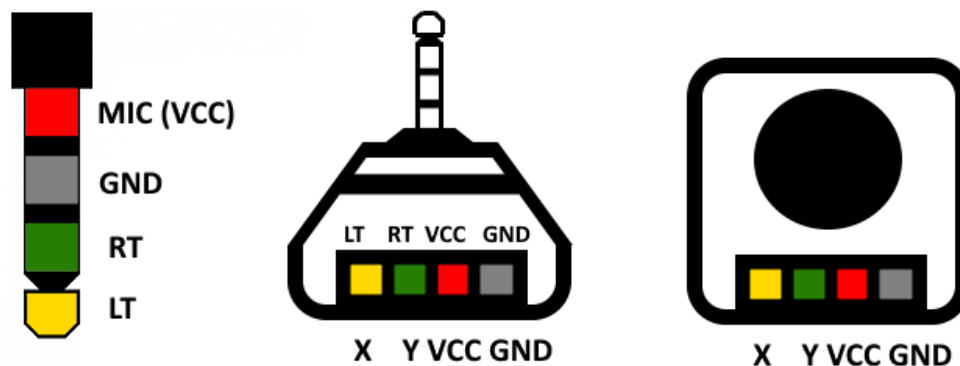

Figure 1: 4 Conductor plug (TRRS) pin mapping

The following table can summarize figure 1 as following:

PIN	FUNCTION
1 (Sleeve)	Microphone – VCC (3.3V)
2 (Ring 2)	GND
3 (Ring 1)	RT(Right Audio Channel)
4 (Tip)	LT(Left Audio Channel)

Table 1: 4 Conductor plug (TRRS) pin mapping