

# EMDR Hardware

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# Parts

## 1) Arduino MKR 1000

- a) This chip was chosen for its output pins, which could output 5V.
- b) This chip was also chosen for the onboard PWM which helps with controlling the pulsars
- c) The Tx/Rx pins of this chip are essential to receiving the data from the TTL

## 2) TTL

- a) The TTL is the main driving force of this project as this is what enables us to read the data from the USB port serially.
- b) This also allows the Arduino MKR 1000 to be powered from the USB

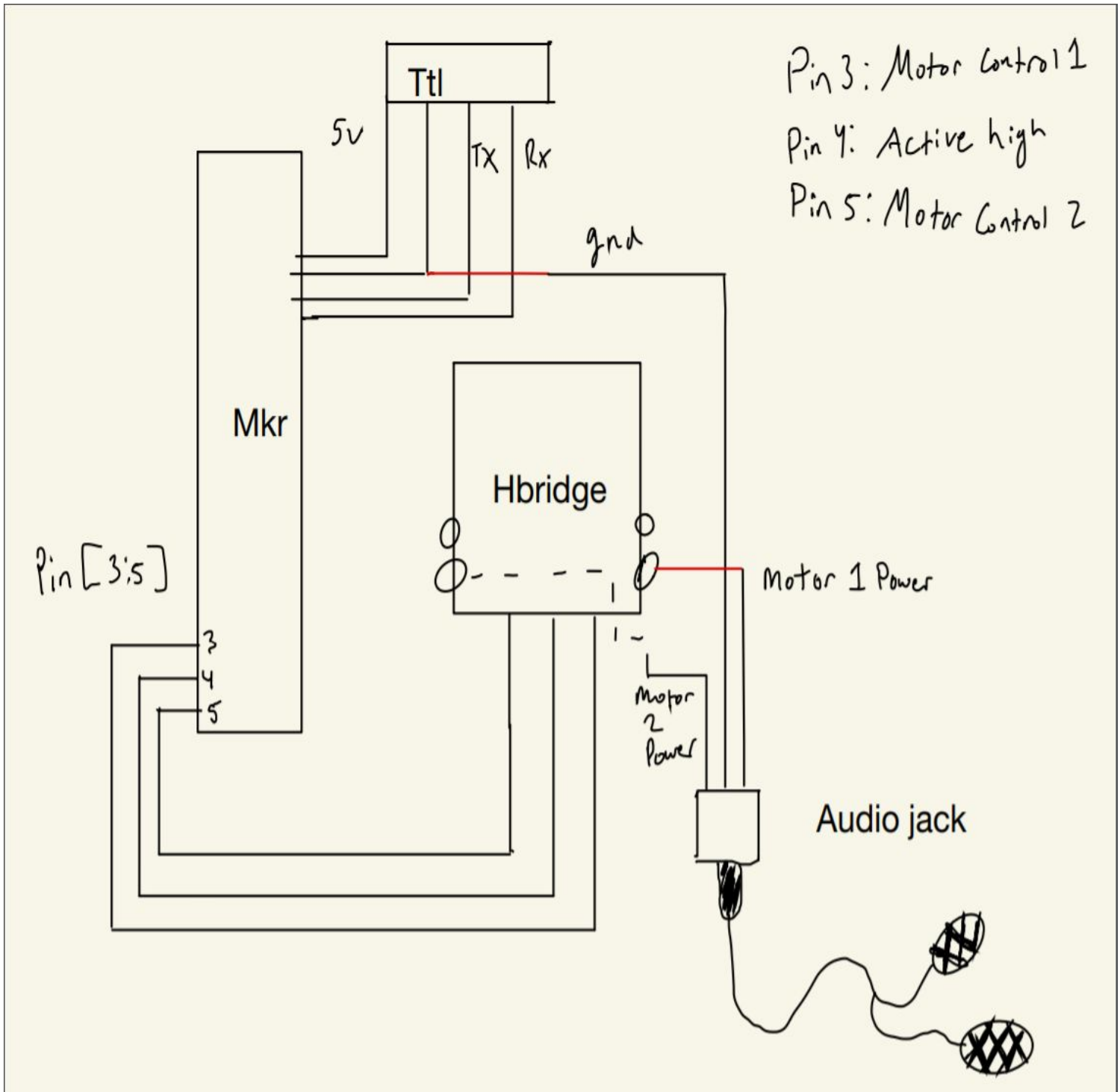
## 3) H-Bridge

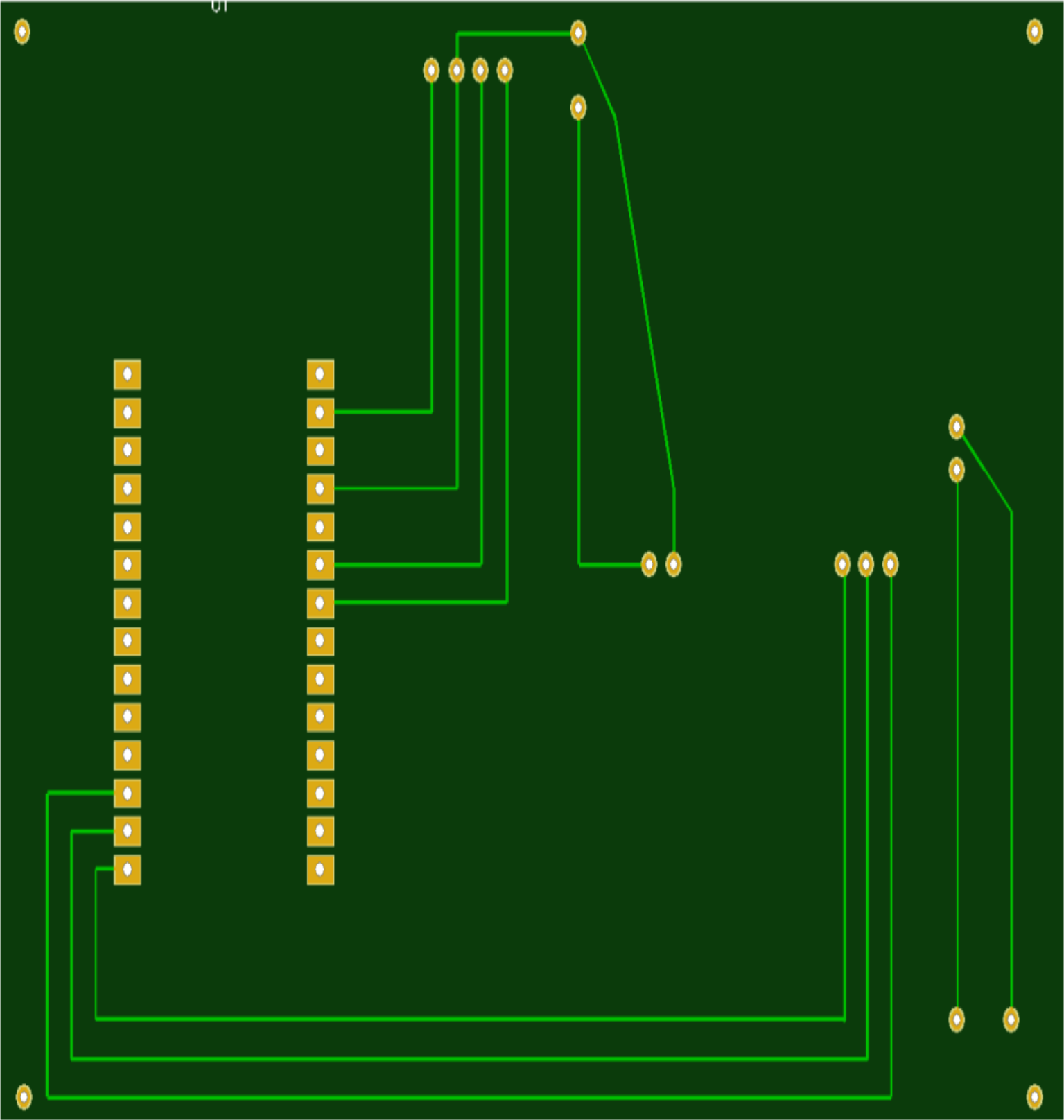
- a) The H-Bridge is a device that was designed to run multiple motors, in this one 2, at the same time. These motors can be enabled and disabled at will individually. For this, we have taken the concept of running multiple motors at the same time and have applied that to the pulsars. In this case, we switch the pulsars on and off.

## 4) Battery Pack

- a) We used a battery pack inside the design to allow the patients the ability to turn off the device completely, as otherwise, even after unplugging the device from the USB port, the H-Bridge would still be running as it uses the separate power source.

## Schematic





# Design Flow

For the explanation of this design, for simplicity, I will explain this based on the data flow from the USB Port.

- 1) The TTL extracts the data from the USB Port and formats it into the pins labeled 5V, Rx, Tx and GND.
- 2) These pins are connected directly into the Arduino MKR 1000 in their respective pins (5V -> Vcc, GND->GND, Tx->Rx, Rx->Tx).
  - a) PLEASE NOTE, do not put Tx -> Tx and Rx-> Rx
- 3) The data sent into the Arduino MKR 1000 is read and computed, then the appropriate data is sent out of the pins 3, 4, and 5.
  - a) Please note that pin 4 is always active HIGH
- 4) The H-Bridge reads these 3 pins and sends the proper signals out through the motor power pins.
- 5) These power signals are sent into the audio jack pins and are accompanied by the ground connection from the TTL, which enables the Pulsars to operate.

## Links to the Parts Bought

- 1) Arduino MKR 1000  
<https://store.arduino.cc/usa/arduino-mkr1000>
- 2) H-Bridge  
[https://www.amazon.com/Qunqi-2Packs-Controller-Stepper-Arduino/dp/B01M29YK5U/ref=sr\\_1\\_13?dchild=1&keywords=h-bridge&qid=1588028375&sr=8-13](https://www.amazon.com/Qunqi-2Packs-Controller-Stepper-Arduino/dp/B01M29YK5U/ref=sr_1_13?dchild=1&keywords=h-bridge&qid=1588028375&sr=8-13)
- 3) TTI  
[https://www.amazon.com/IZOKEE-CP2102-Converter-Adapter-Downloader/dp/B07D6LLX19/ref=sr\\_1\\_17?dchild=1&keywords=ttl&qid=1588028428&sr=8-17](https://www.amazon.com/IZOKEE-CP2102-Converter-Adapter-Downloader/dp/B07D6LLX19/ref=sr_1_17?dchild=1&keywords=ttl&qid=1588028428&sr=8-17)
- 4) PCB
  - a) App used to create the PCB  
<https://easyeda.com/>