

# Stepped Frequency Pulser BOM

BHC 2021

# Stepped Frequency Modulation

- Features:
  - User defined sequences adds flexibility
    - csv loaded onto microcontroller flash (USB)
      - No C++ unless you want to...
  - Highly accurate frequency delivery
    - DDS
    - Externally triggered with switching times  $< 1$  ms.
  - Low Cost
    - \$60



**Trigger In**  
**3.3 V Max**

**Freq Out**  
**3.3 V**

# BOM

- Wio Terminal
  - <https://www.digikey.com/en/product-highlight/s/seeed/wio-terminal>
- DDS
  - AD9850
    - <https://www.amazon.com/HiLetgo-AD9850-Generator-0-40MHz-Equipment/dp/B01J7XPWNU>
- BNC Connectors
  - <https://www.amazon.com/Female-Bulkhead-Connector-20-Pack-Adapters/dp/B07DGV6482>
- Protoboard Platform
  - Mini breadboard
  - <https://www.amazon.com/LampVPath-12Packs-solderless-breadboard-Arduino/dp/B01KKE602W>
- Level Shifter
  - Github Repository: <https://github.com/bhclowers/Stepped-Pulser>
- 3D Printed Housing
  - Github Repository: <https://github.com/bhclowers/Stepped-Pulser>

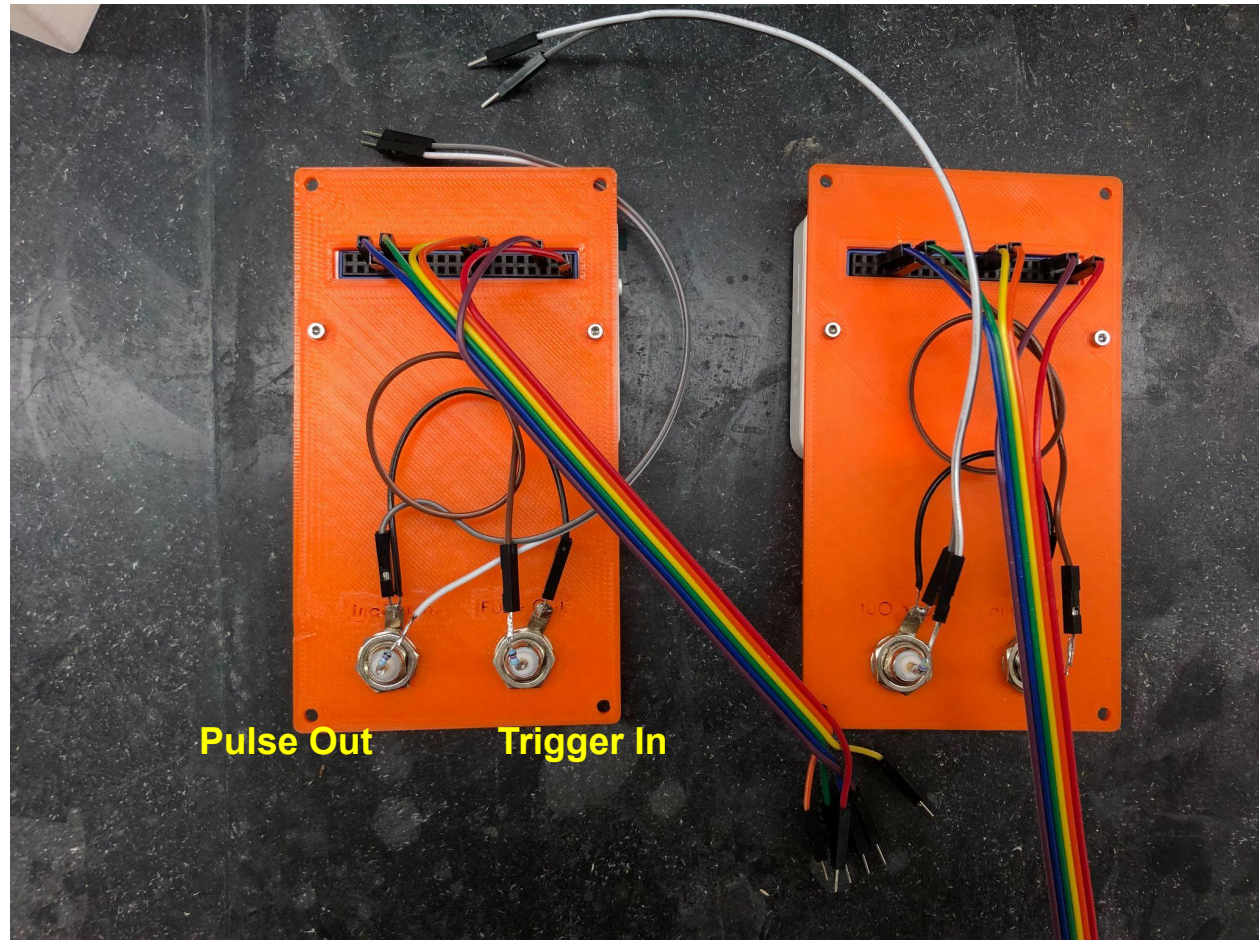
## Connection Diagram

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1																				
2				T																



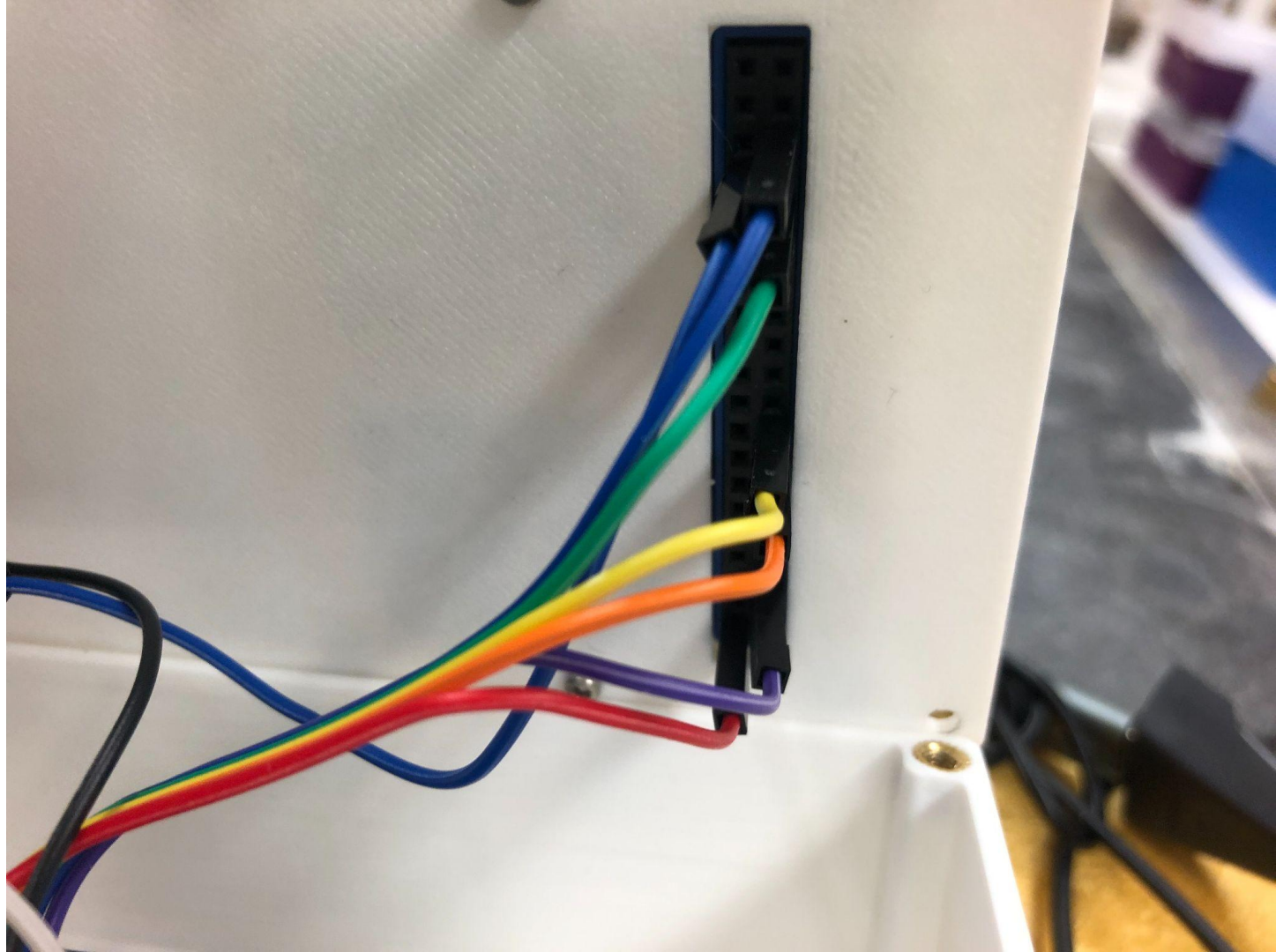
# Assembly Photos

Each Input/Output has  
a 50 Ohm Resistor.

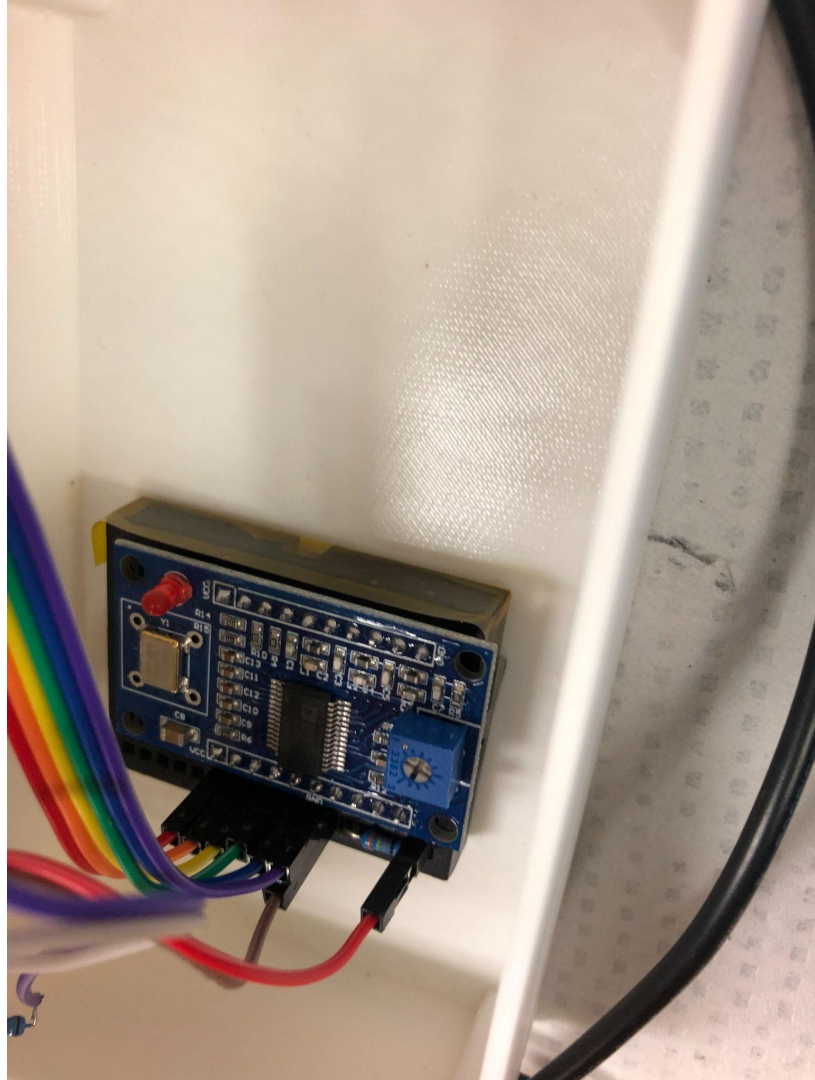


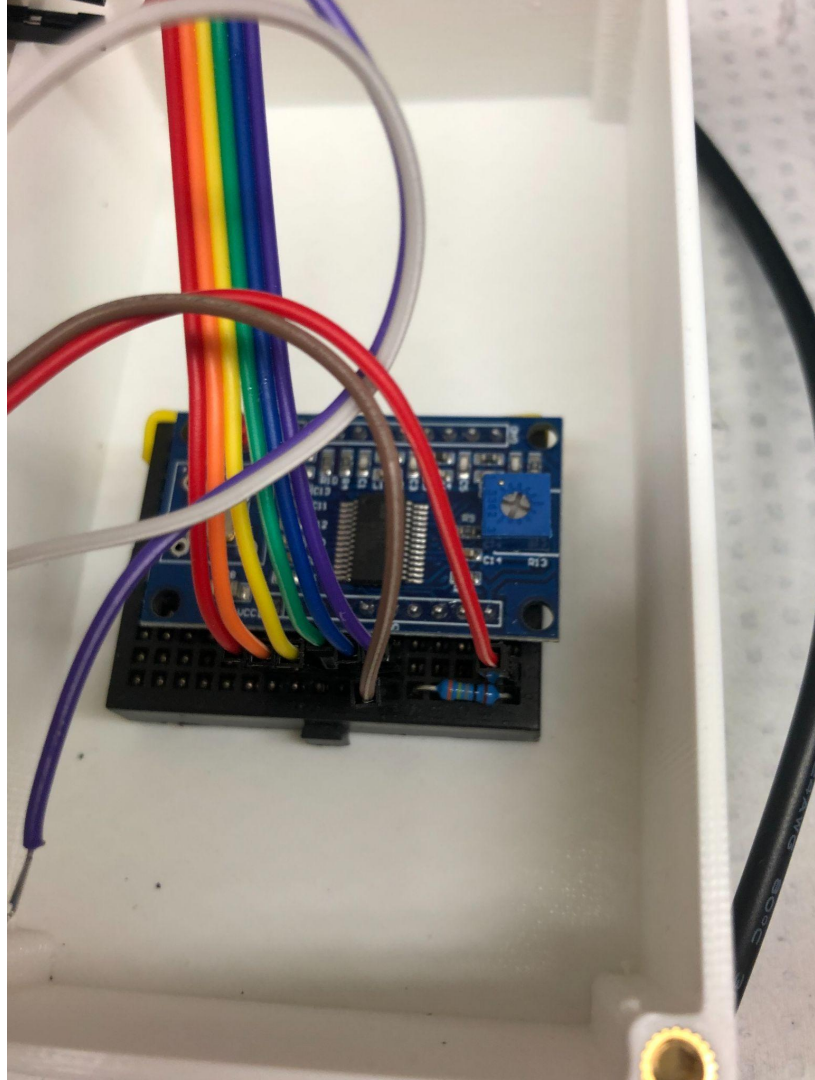






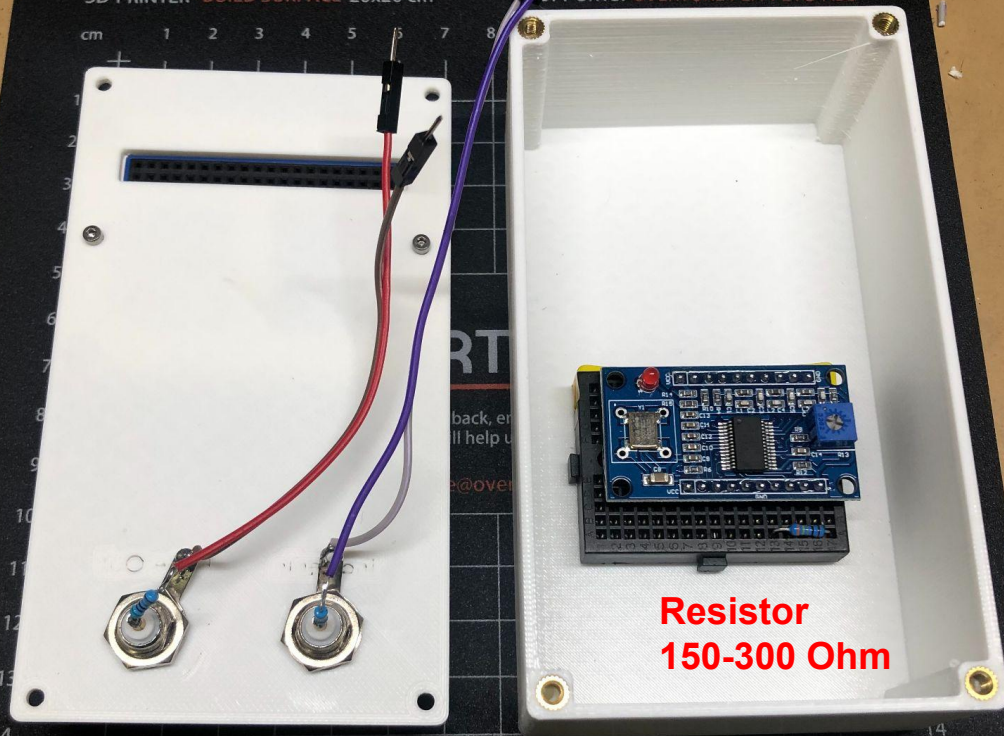






3D PRINTER BUILD SURFACE 20x20 cm

SUPPORTS: OVERTURE PLA-PETG-ABS



**Resistor  
150-300 Ohm**

HOT SURFACE

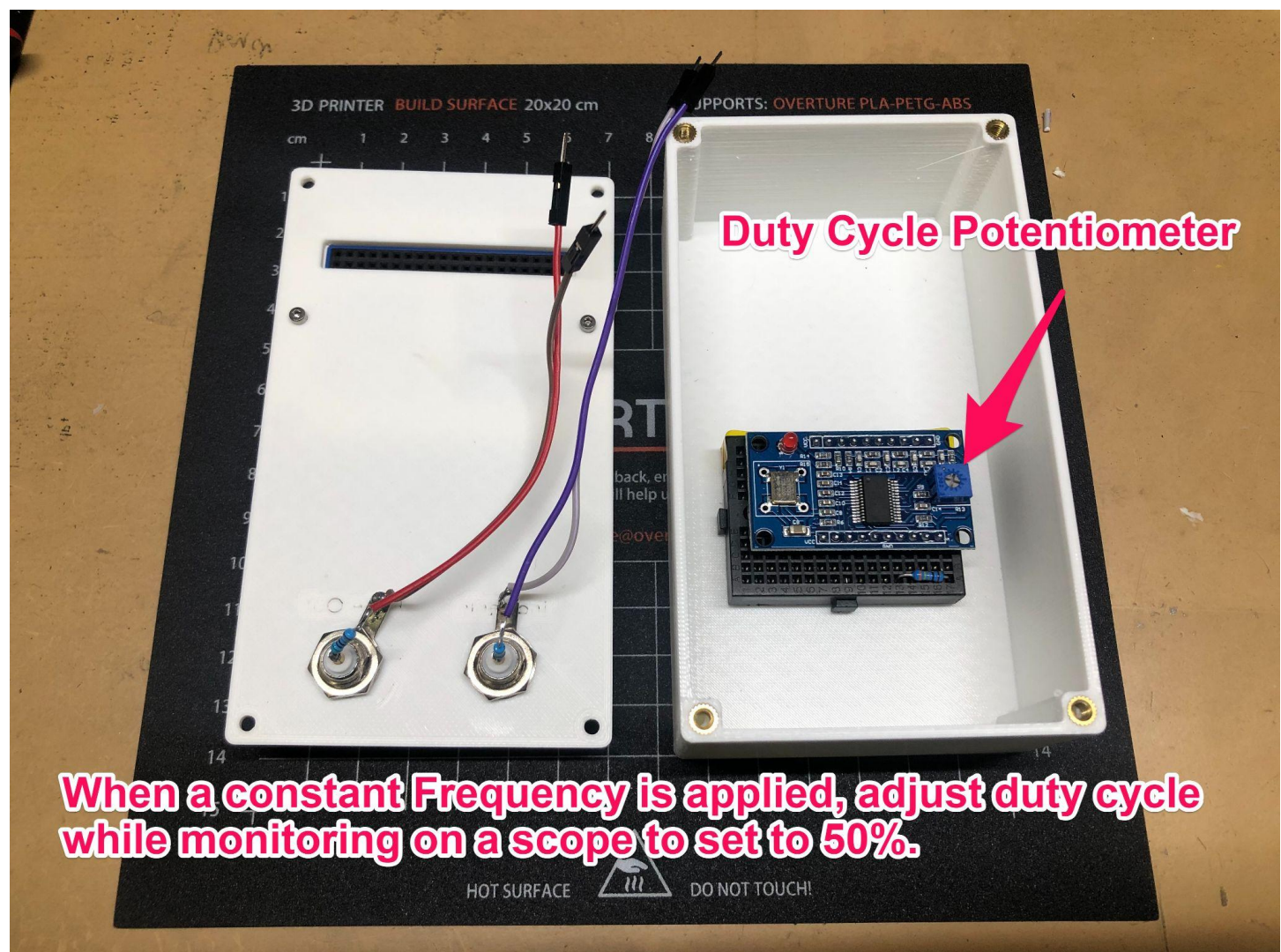


DO NOT TOUCH!



Depending upon the state of the DDS chip from the vendor it is possible that no signal will be observed on the output until the duty cycle pot is adjusted correctly. To verify, using a scope probe you can evaluate the output signal on the last 4 pins on the bottom right for an output signal.

**When a constant Frequency is applied, adjust duty cycle while monitoring on a scope to set to 50%.**





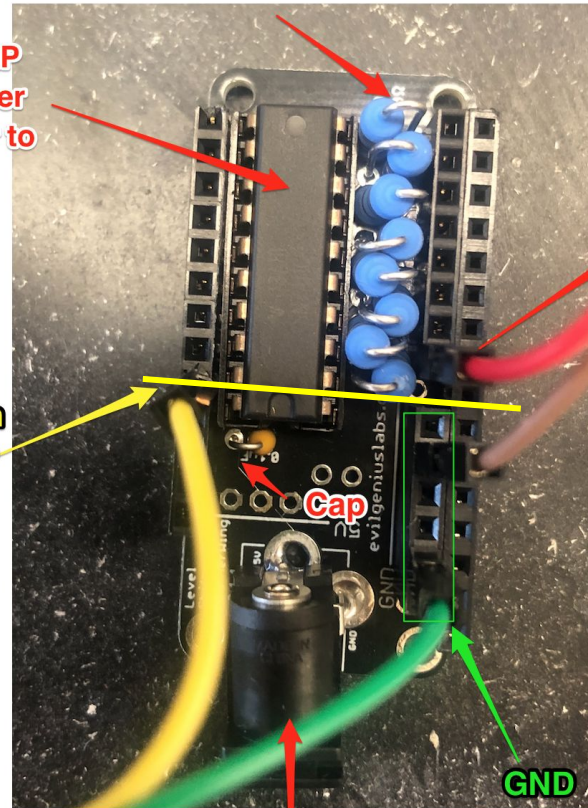


# Level Shifter Wiring

- Notice that the input of the TTL buffer is not horizontally aligned with the output. The offset is due to the board layout.
- MOUNT TTL buffer in socket so you can replace it if it blows.

TTL Buffer  
Mount in DIP  
socket rather  
than solder to  
the board

Pulse In  
3.3 V or  
your  
choice  
of logic  
level



180 Ohm\*

5V Out

\* 180 Ohm was  
chosen for our  
use as we  
needed to drive  
multiple LEDs  
for a fiber optic.  
Adjust for your  
application.  
Look at TTL  
buffer data  
sheet.

DC Barrel Jack  
5V

# Pulser File Format

- CSV
- Two columns
  - First column is the frequency
  - Second column is currently not used by the code but will be in a future iteration.
    - Set all values in this column to 127
  - Don't change it.

Example:

320,127

350,127

380,127

1000,127

3000,127