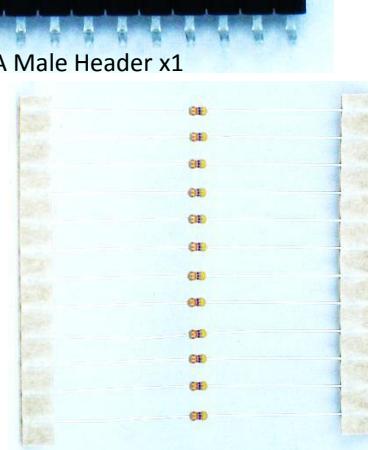
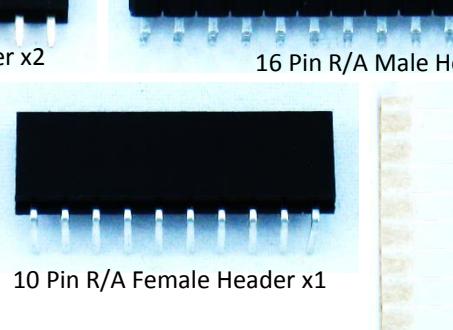
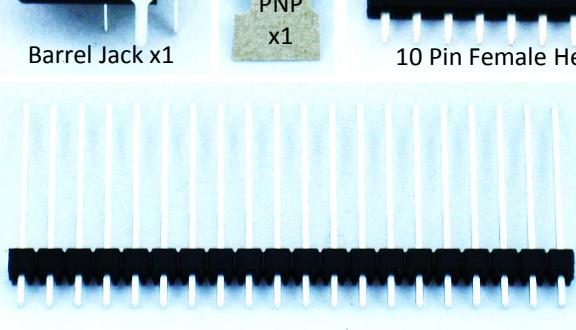
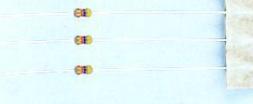
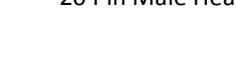
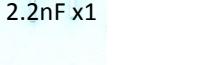
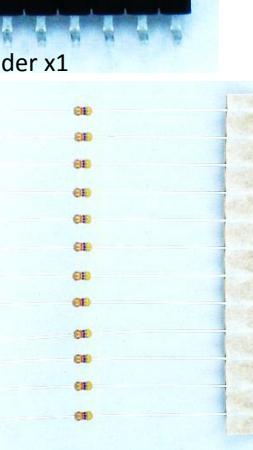
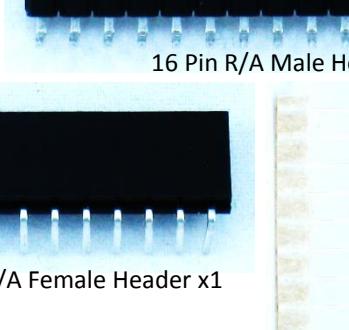
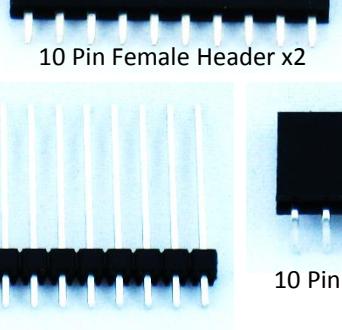
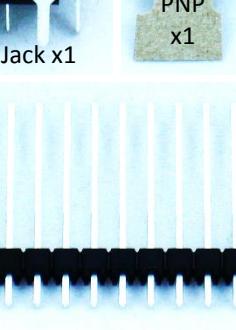
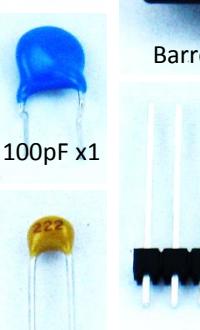
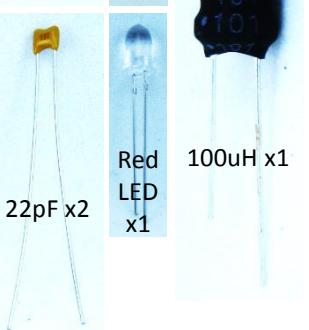
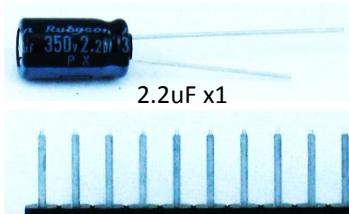
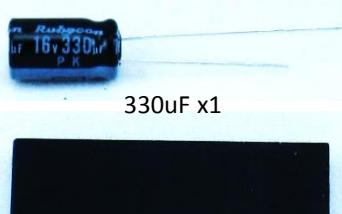
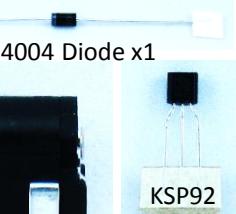
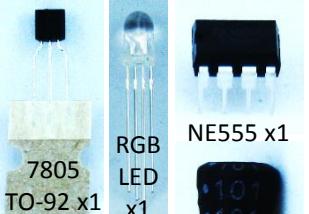
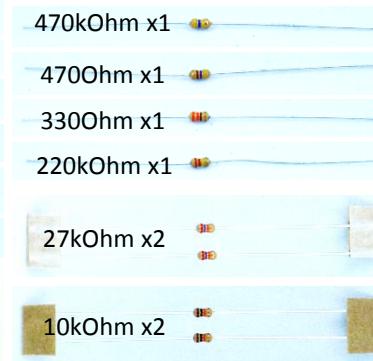
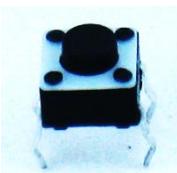
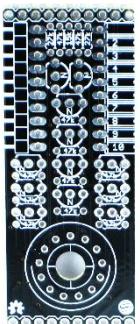
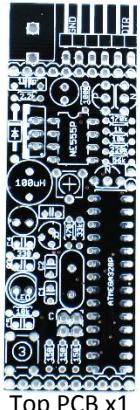


# Smart Nixie Tube



Assembly Guide

# Parts List



# Tools For Assembly



Solder Iron



Solder



Voltmeter



Heatsink (Optional)



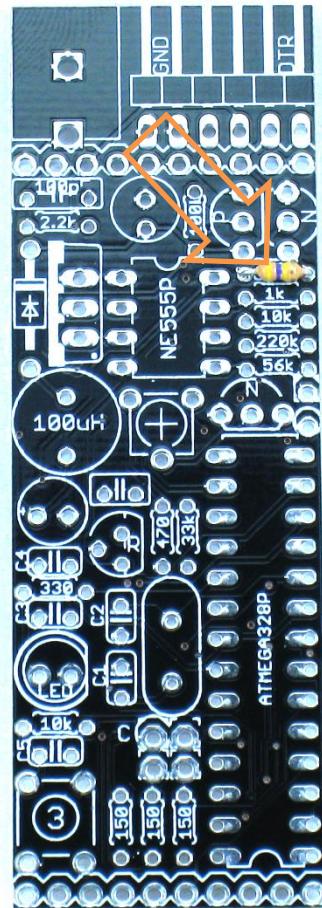
Wire Cutter



Drill with 13/64" or 5mm bit

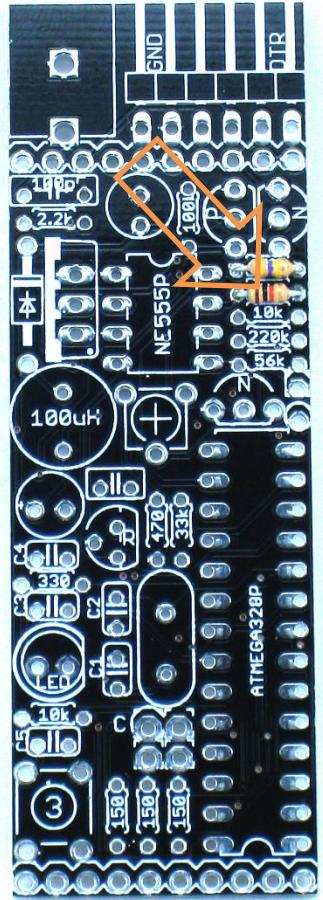
# Step 1

Solder 470kOhm Resistor



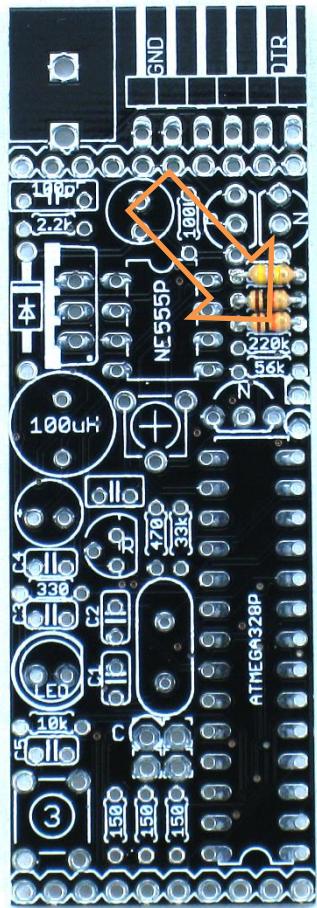
# Step 2

Solder 1kOhm Resistor



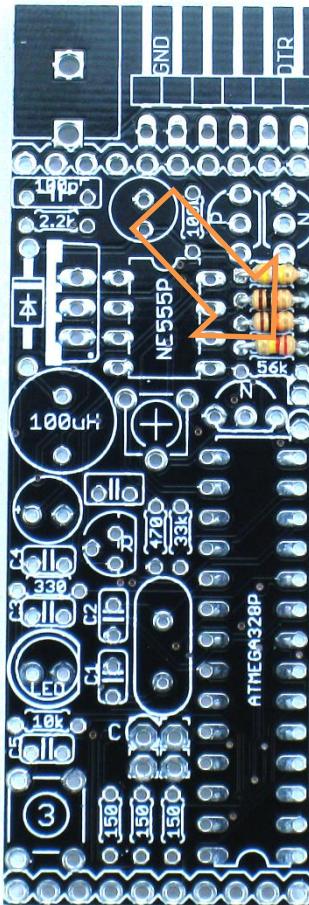
# Step 3

Solder 10kOhm Resistor



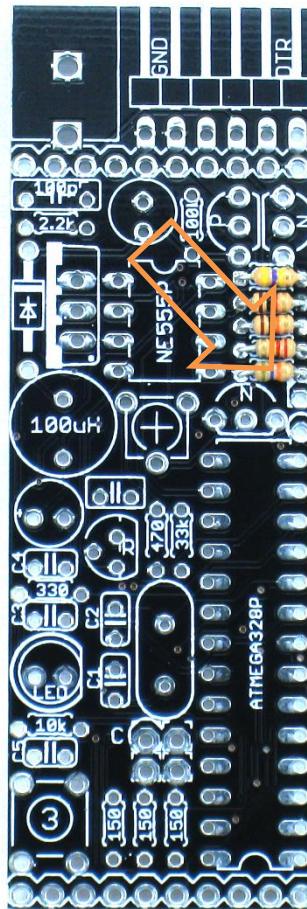
# Step 4

Solder 220kOhm Resistor



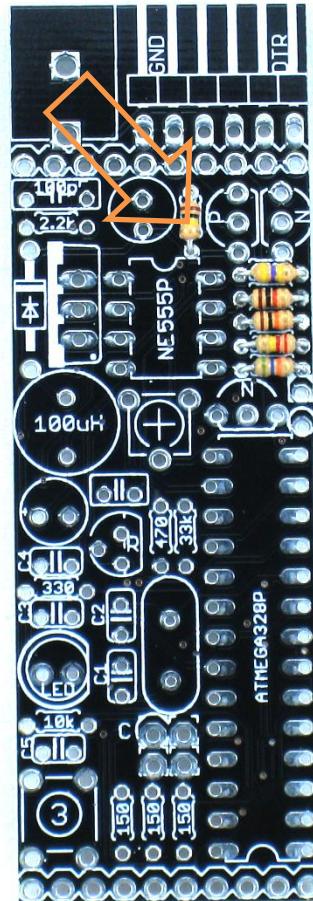
# Step 5

Solder 56kOhm Resistor



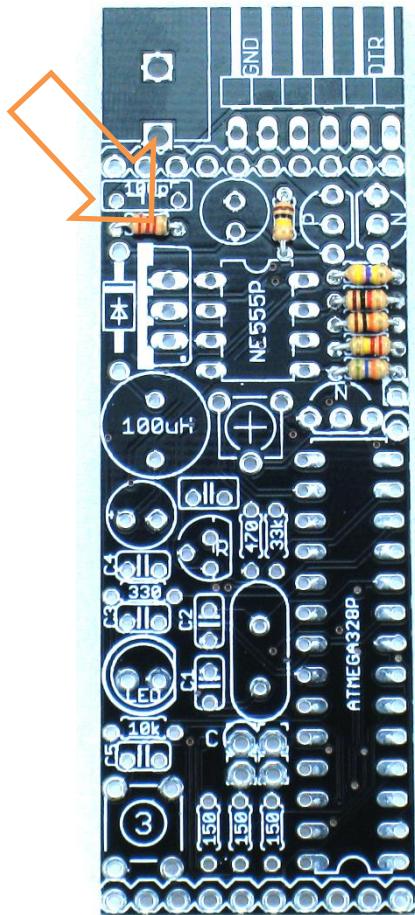
# Step 6

Solder 100kOhm Resistor



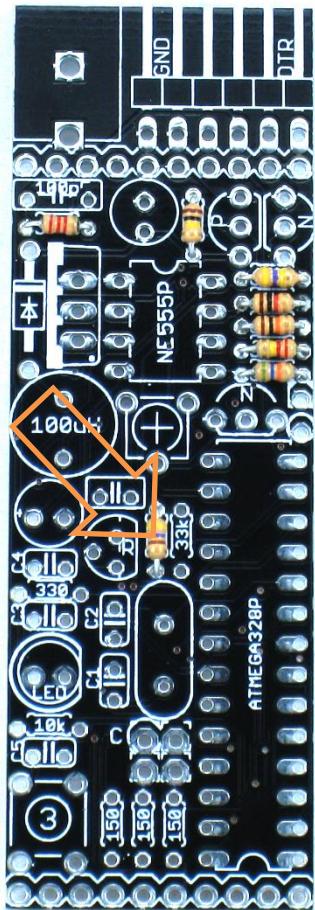
# Step 7

Solder 2.2kOhm Resistor



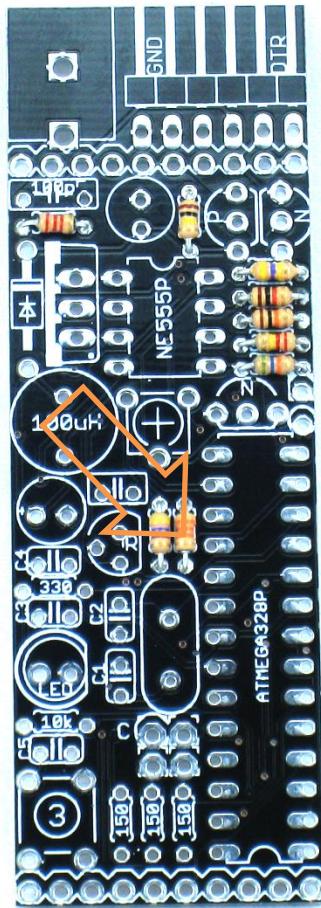
# Step 8

Solder 470Ohm Resistor



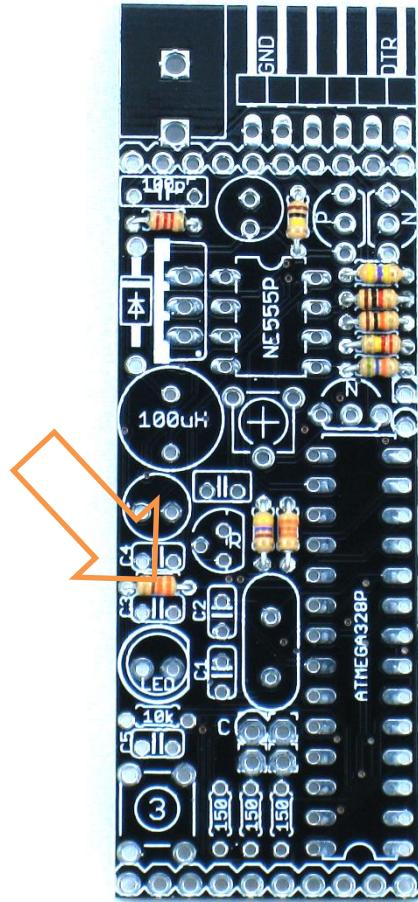
# Step 9

Solder 33kOhm Resistor



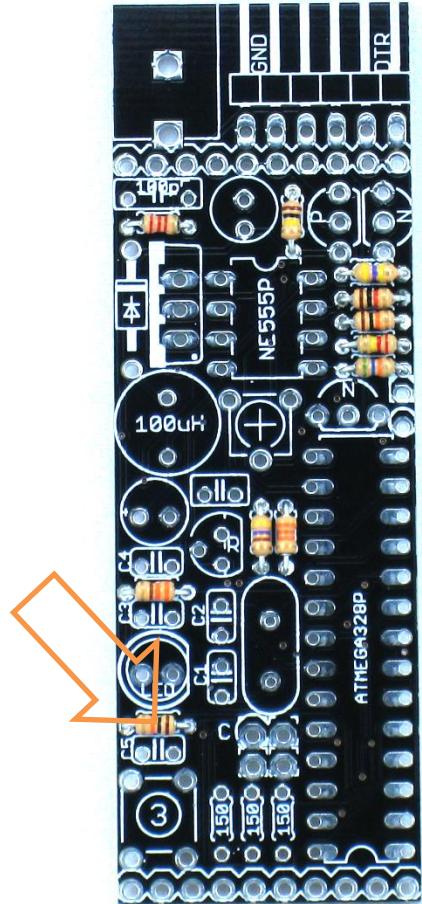
# Step 10

Solder 330Ohm Resistor



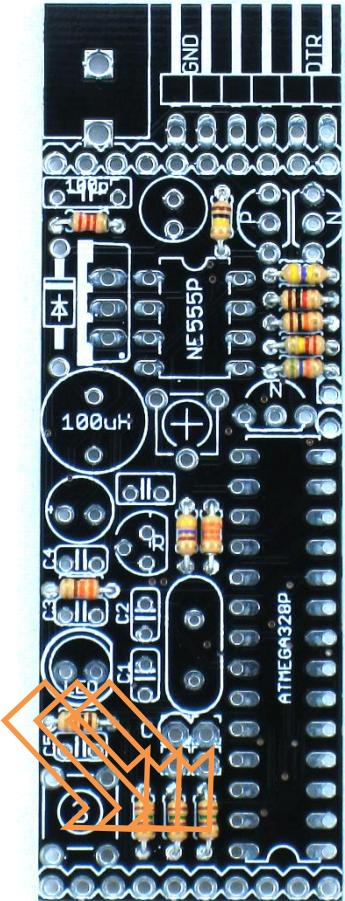
# Step 11

Solder 10kOhm Resistor



# Step 12

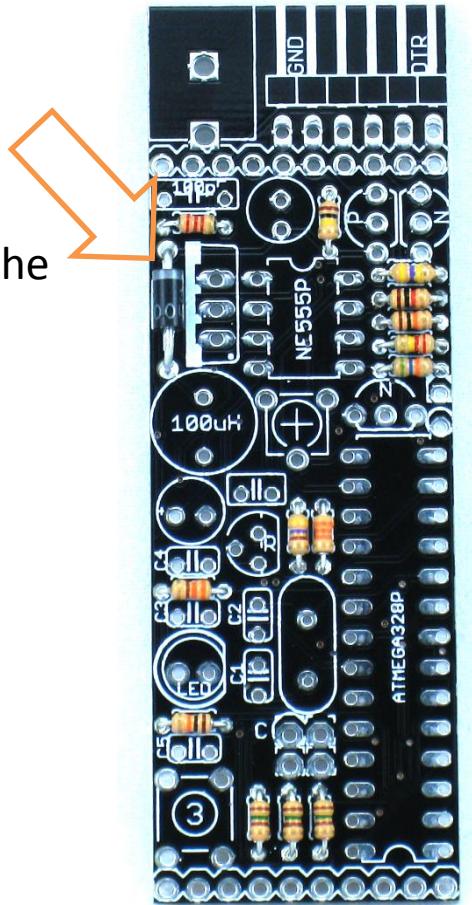
Solder 150Ohm Resistors



# Step 13

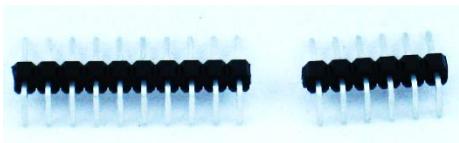
Solder UF4004 Diode

Make sure the polarity matches the image to the right, with the band pointing towards the 2.2kOhm resistor



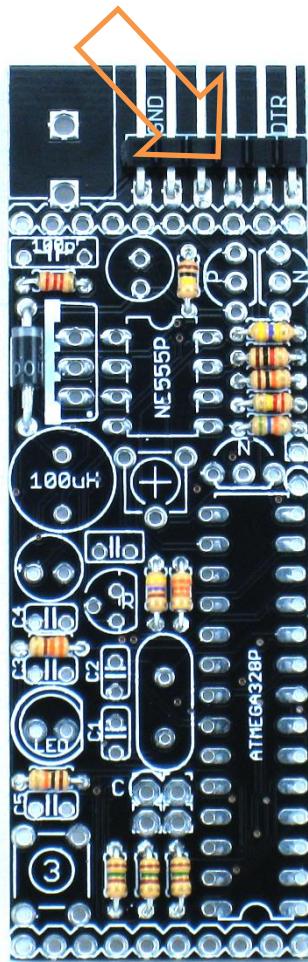
# Step 14

Cut the 16 Pin R/A Male Header into a 10 Pin section and a 6 Pin section



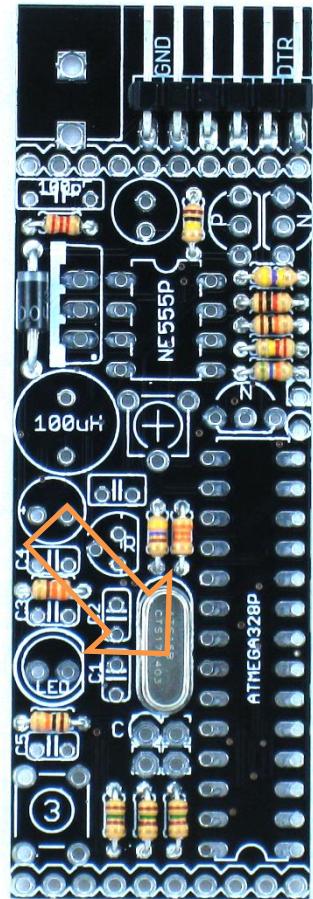
Set aside 10 pin section

Solder 6 pin section



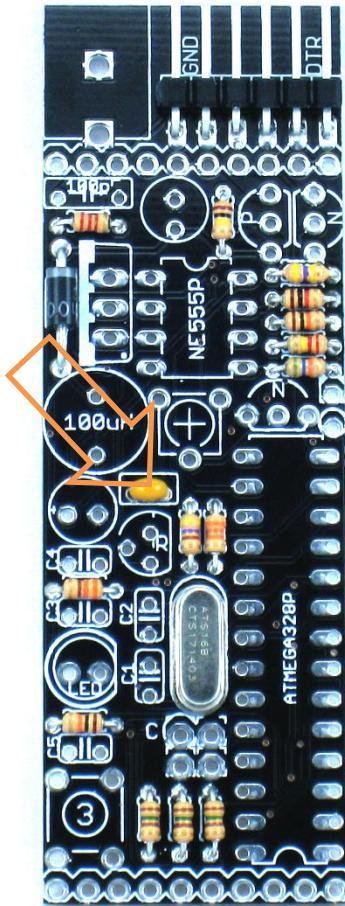
# Step 15

Solder 16MHz Crystal



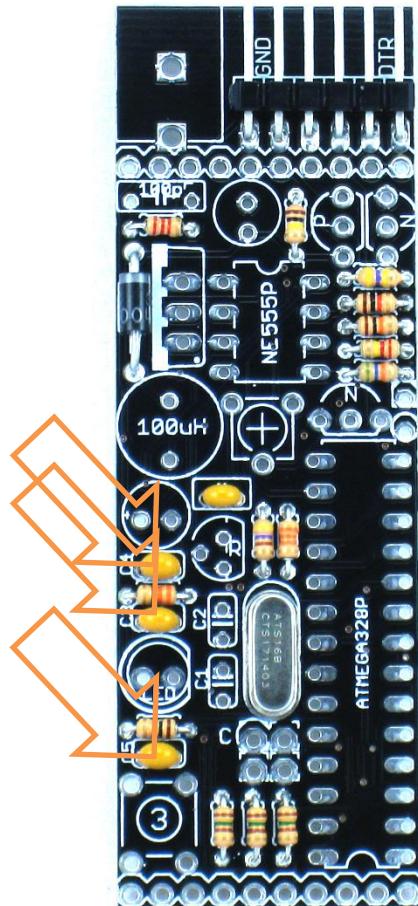
# Step 16

Solder 2.2nF Capacitor



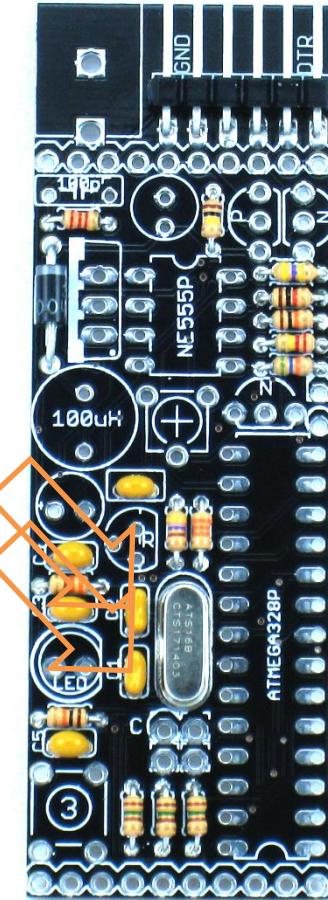
# Step 17

Solder 0.1uF capacitors



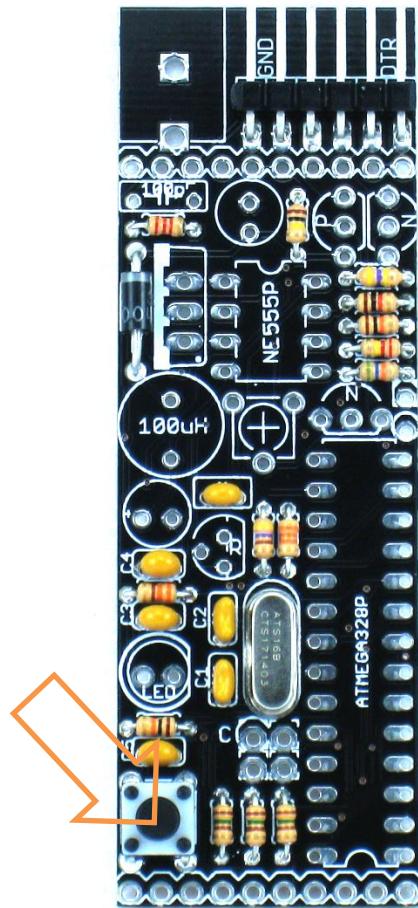
# Step 18

Solder 22pF Capacitors



# Step 19

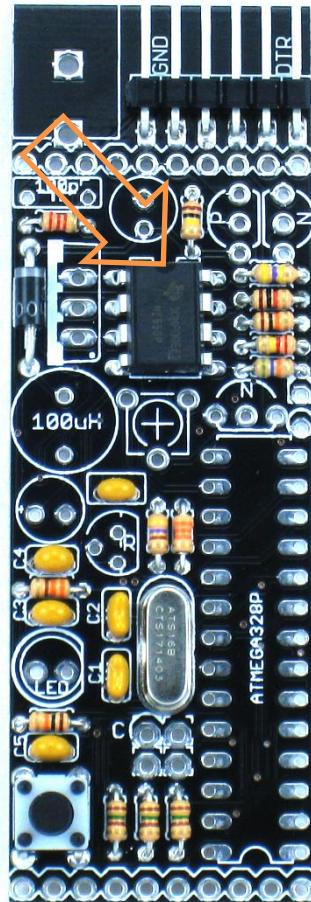
Solder Pushbutton



# Step 20

Solder NE555 Timer

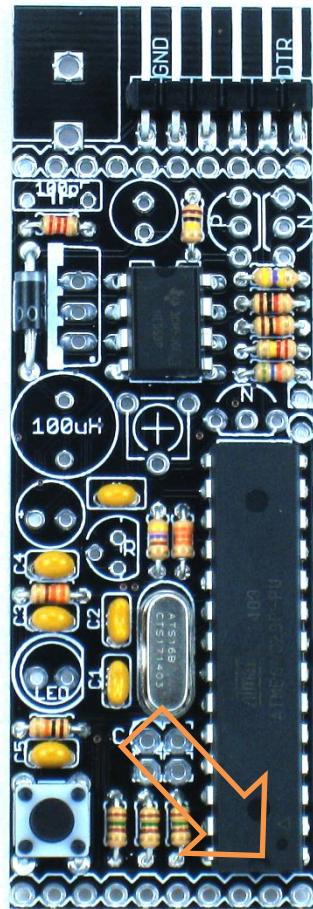
Make sure the half circle indicator on the top of the NE555 matches the image to the right



# Step 21

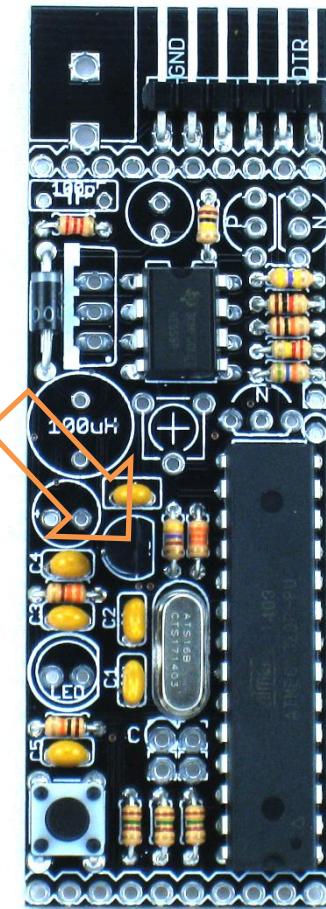
Solder ATMEGA328p

Make sure the half circle indicator on the top of the ATMEGA328p matches the image to the right



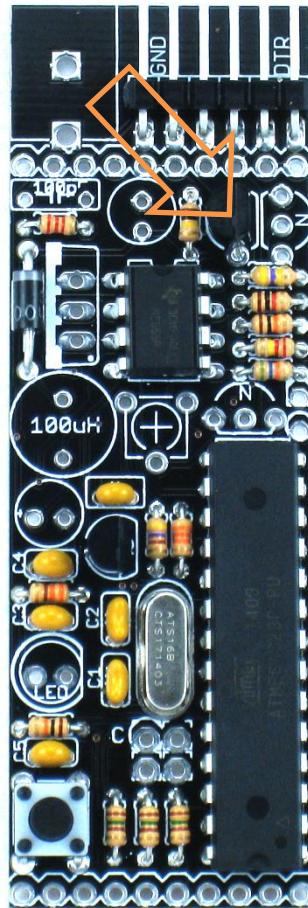
# Step 22

Solder 7805 Regulator



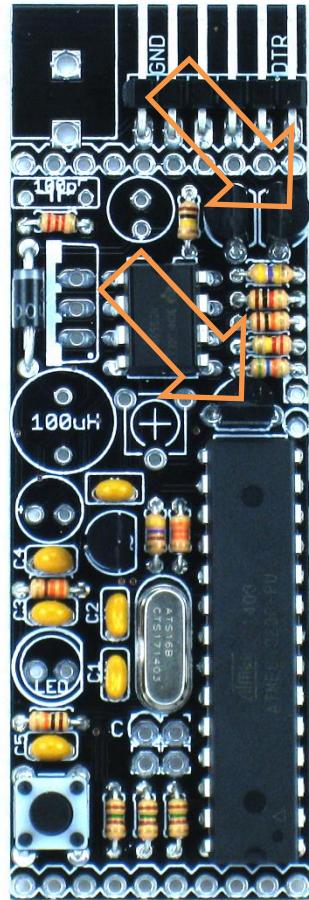
# Step 23

Solder KSP92 PNP  
Transistor



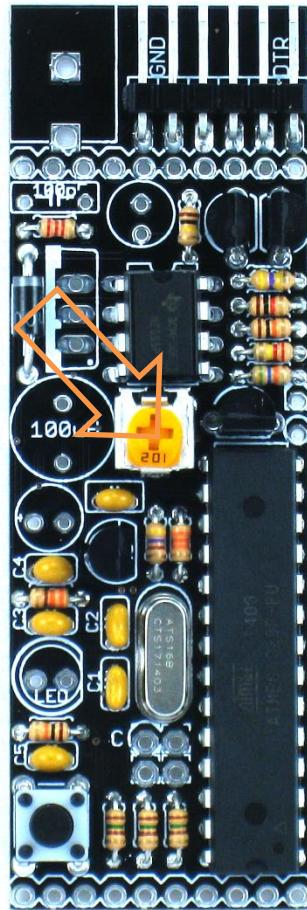
# Step 24

Solder KSP42 NPN  
Transistors



# Step 25

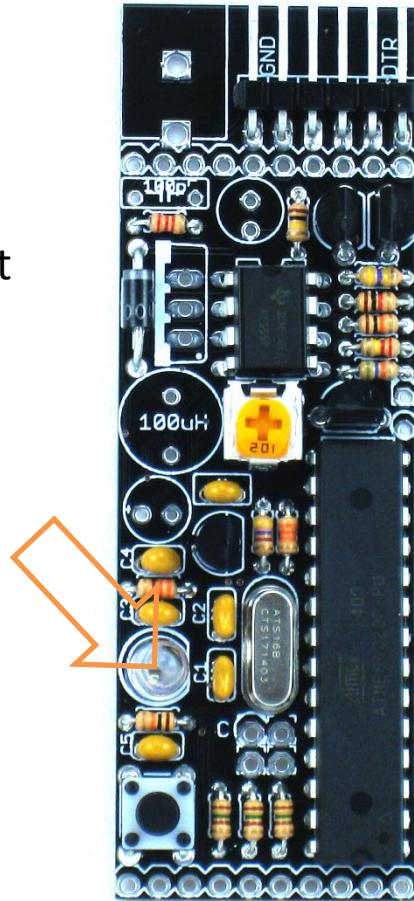
Solder 1kOhm Trimmer  
Potentiometer



# Step 26

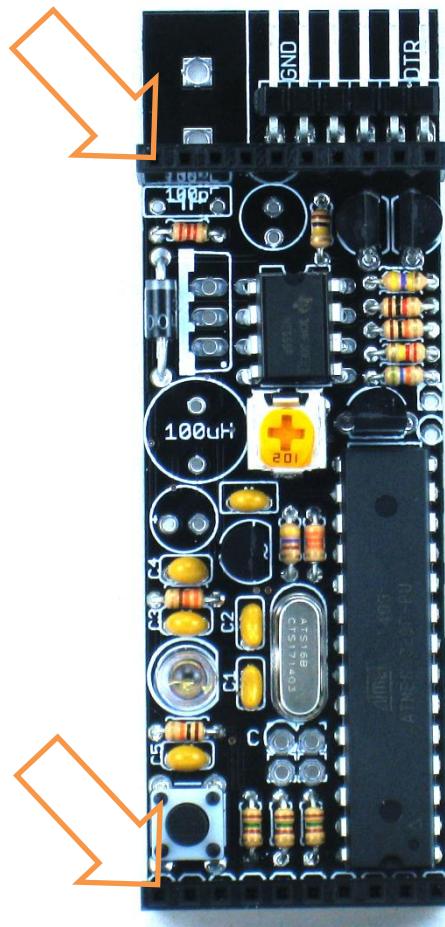
Solder Red LED

The long lead of the LED goes into the hole closest to the edge of the PCB.



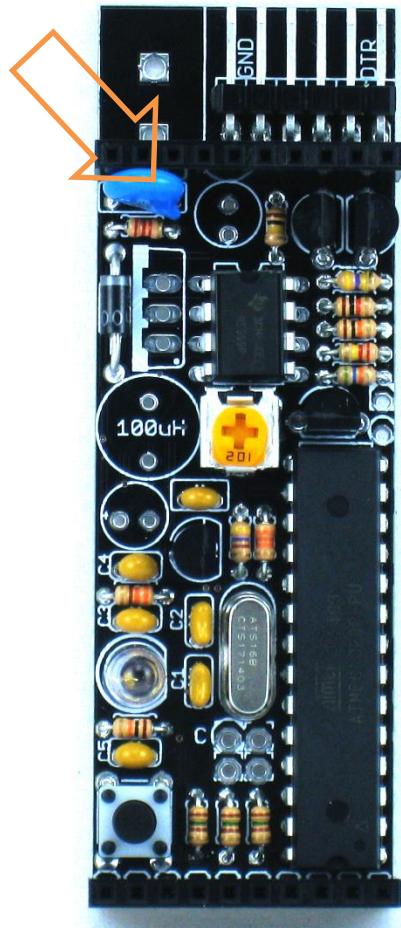
# Step 27

Solder 10 Pin Female Headers



# Step 28

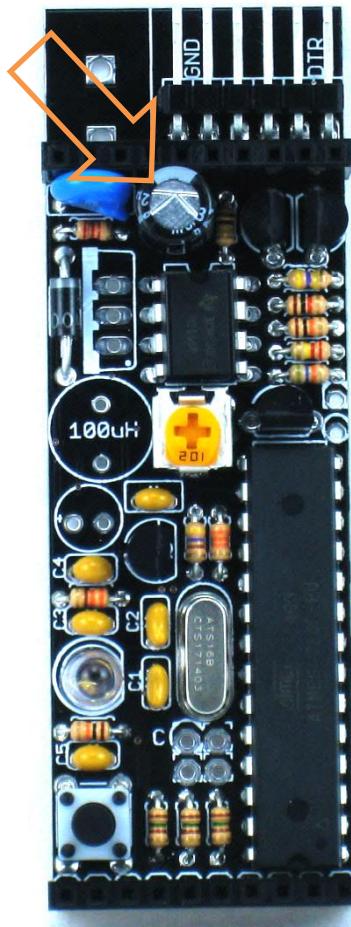
Solder 100pF Capacitor



# Step 29

Solder 2.2uF Capacitor

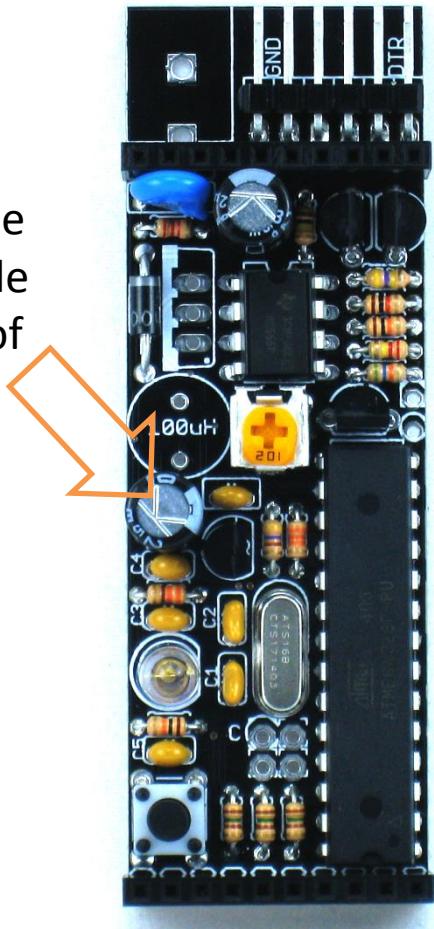
The negative band on the capacitor goes in the hole closest to the 10 Pin Female Header



# Step 30

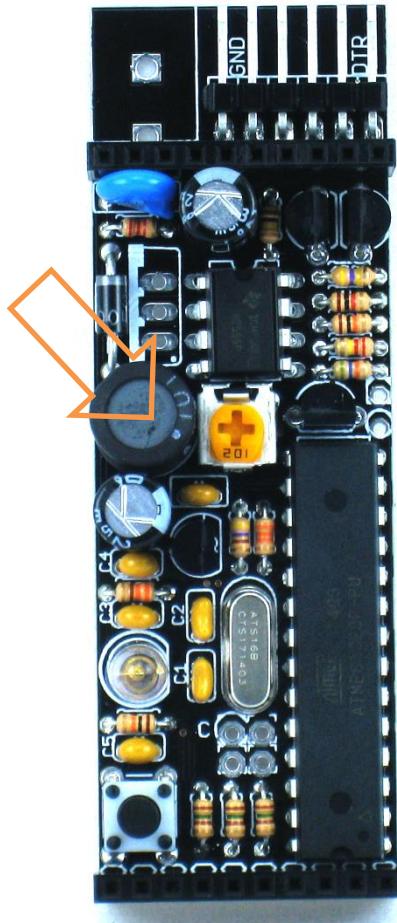
Solder 330uF Capacitor

The negative band on the capacitor goes in the hole furthest from the edge of the PCB



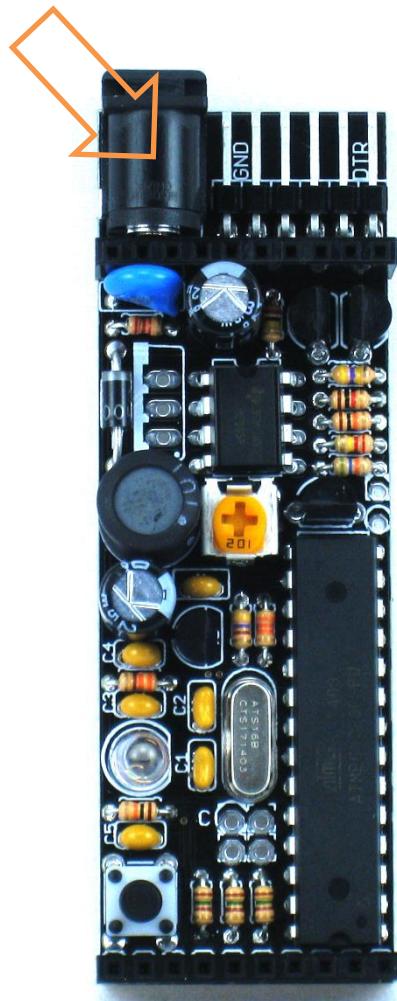
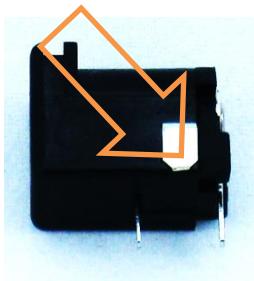
# Step 31

Solder 100uH Inductor



# Step 32

Clip the side contact on the barrel jack as it is not needed



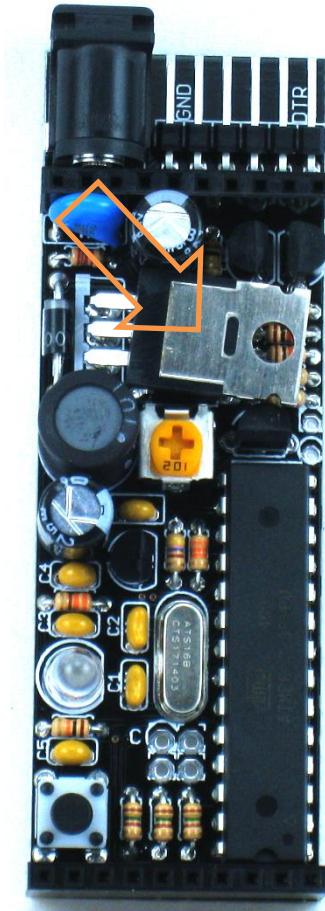
Solder the barrel jack

# Step 33

Insert the IRF740 MOSFET  
and bend at a 90 degree  
angle over the NE555  
timer

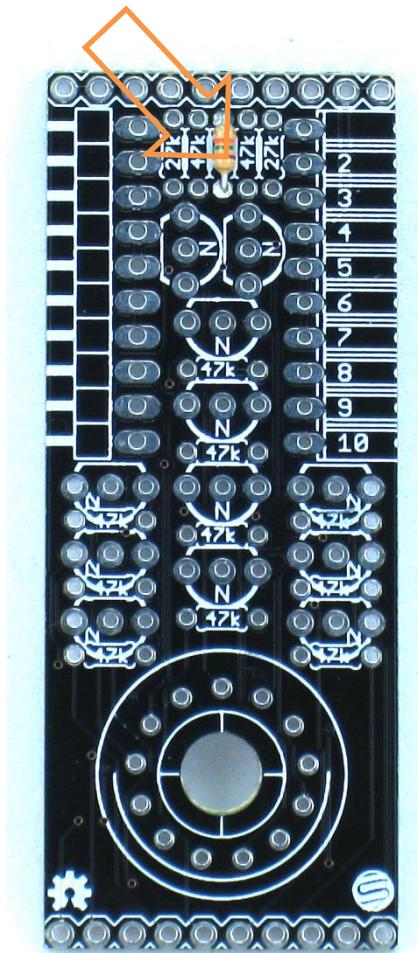
Hint: It's easiest to bend it  
before soldering the  
MOSFET

Solder the IRF740 MOSFET



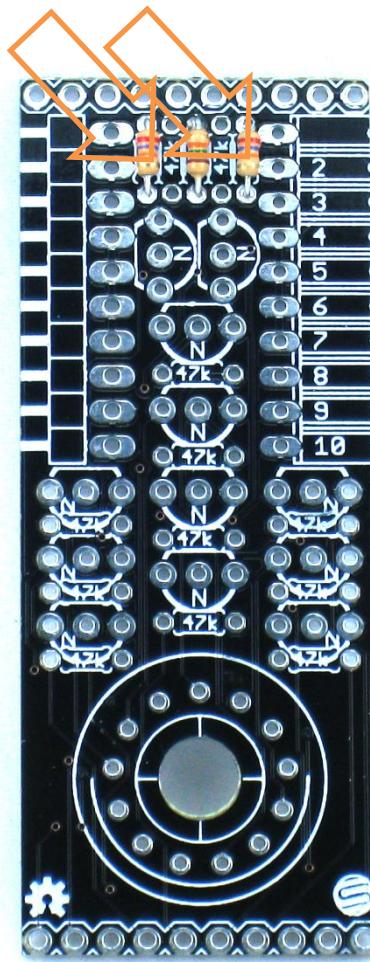
# Step 34

Solder 15kOhm Resistor



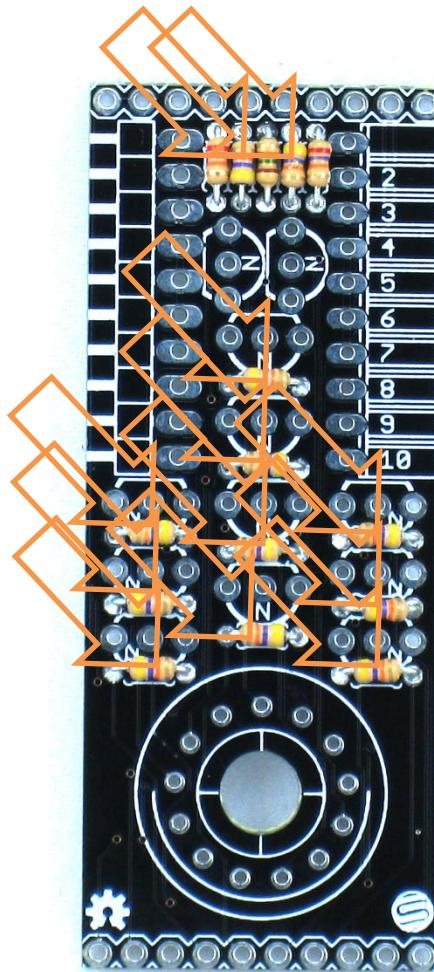
# Step 35

Solder 27kOhm Resistors



# Step 36

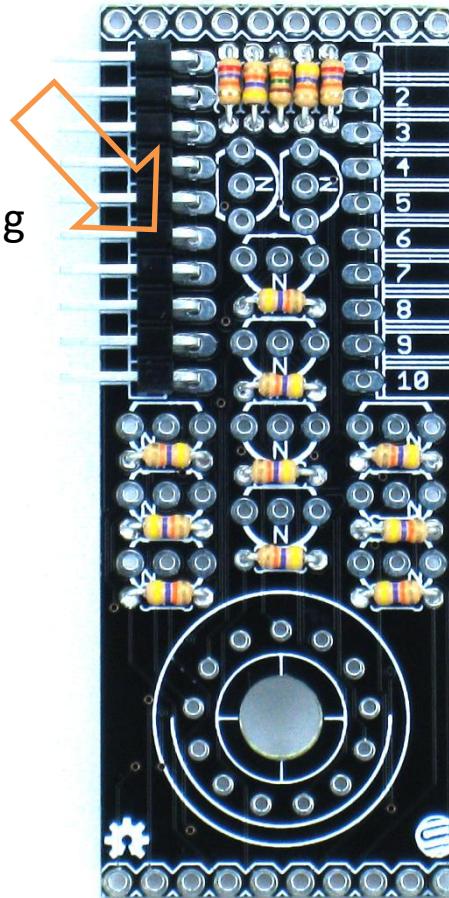
Solder 47kOhm Resistors



# Step 37

OPTIONAL: Solder 10 Pin  
R/A Male Header

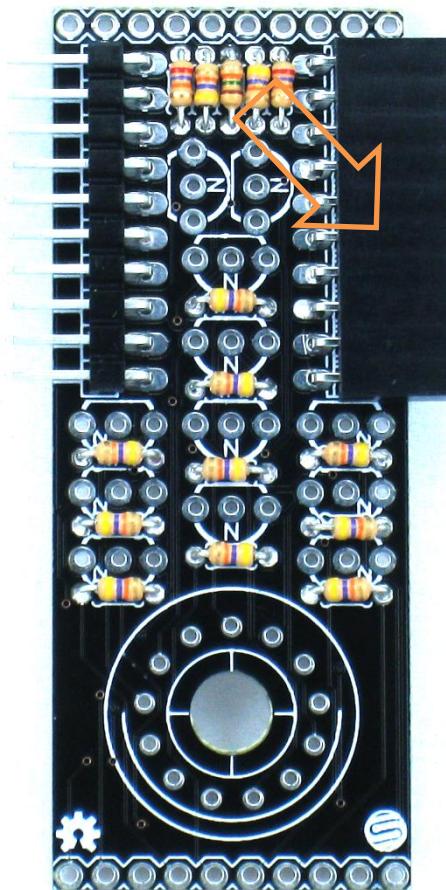
This header is for chaining  
multiple Smart Nixie  
Tubes together



# Step 38

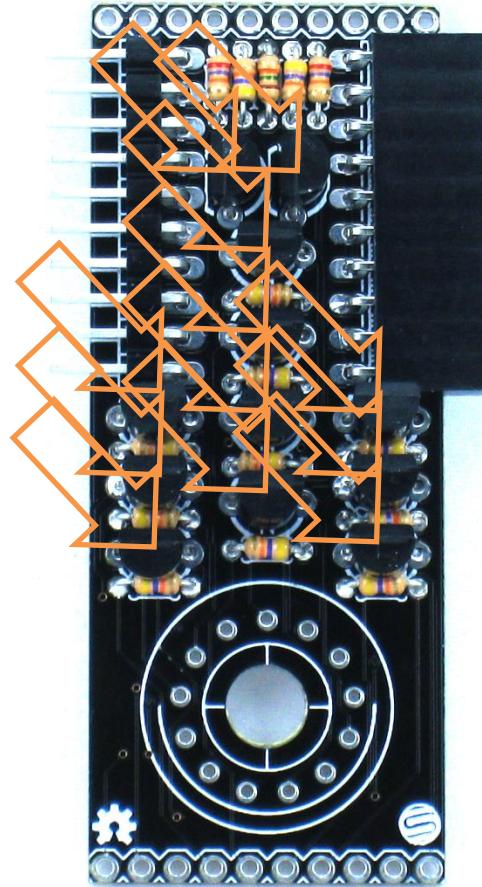
OPTIONAL: Solder 10 Pin  
R/A Female Header

This header is for chaining  
multiple Smart Nixie  
Tubes together



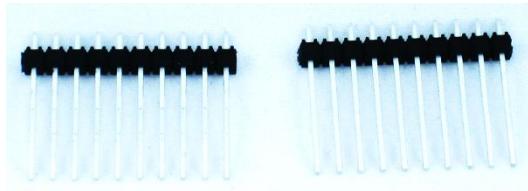
# Step 39

Solder KSP42 NPN  
Transistors



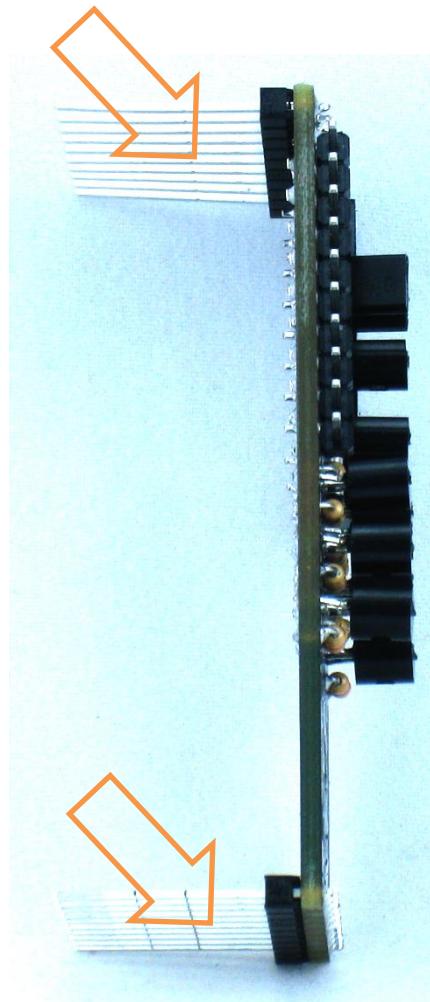
# Step 40

Cut the 20 Pin Male Header in two sections of 10 Pins each



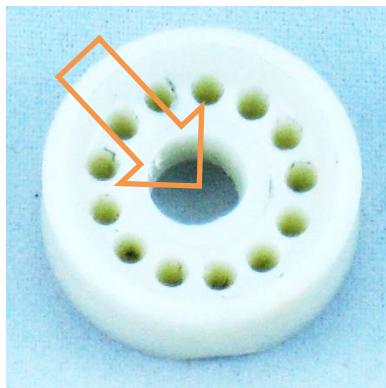
Hint: It's easiest to insert these into the female headers of the bottom PCB before soldering

Solder the Male Headers

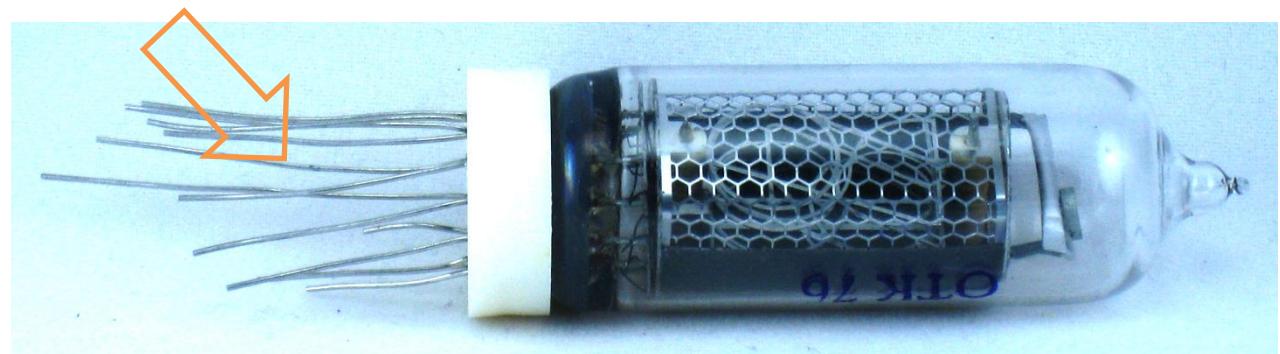


# Step 41

Remove the spacer from the IN-14 Nixie Tube and drill a hole in the middle



Cut each lead of the Nixie Tube a different length and put the spacer back on the Nixie Tube.



Use about a  
13/64" or 5mm  
drill bit

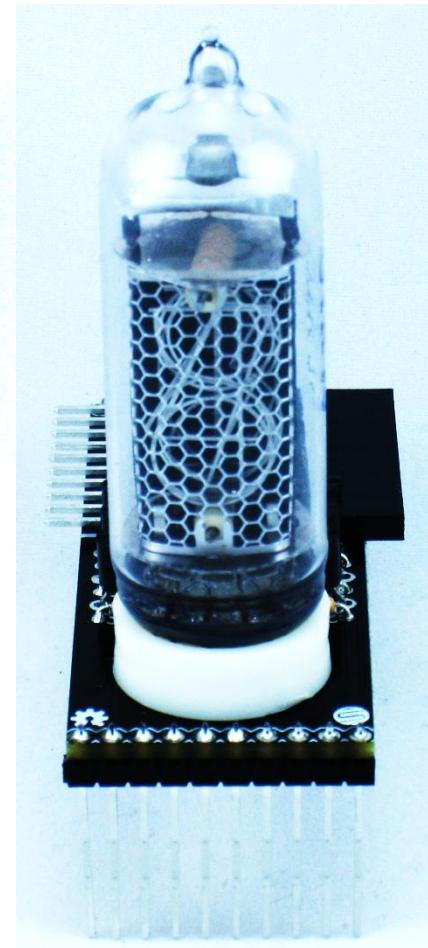
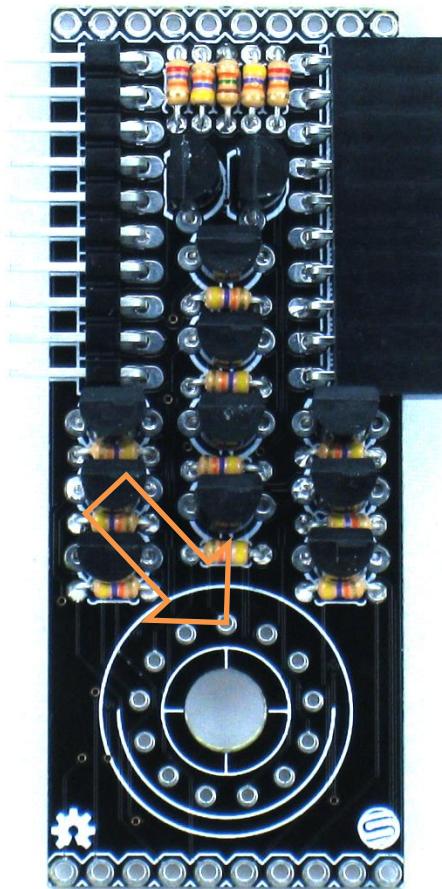
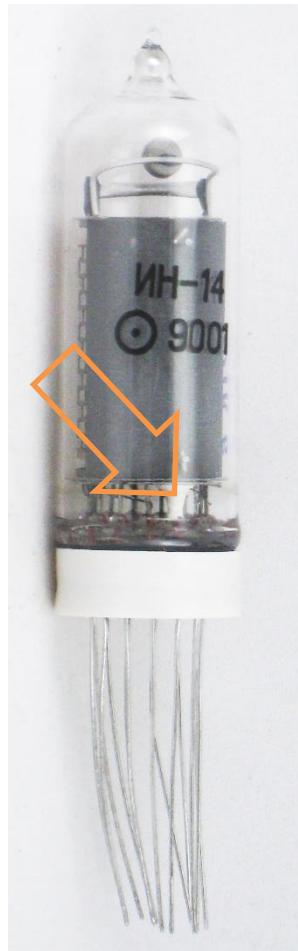
# Step 42

Solder the IN-14 Nixie Tube

The pin with the white insulation on it is the anode (also has an arrow pointing towards it on bottom of glass tube)

The anode goes into the pad furthest from the front edge of the PCB

Hint: Before soldering, make sure Nixie Tube is perfectly aligned towards the front of the PCB



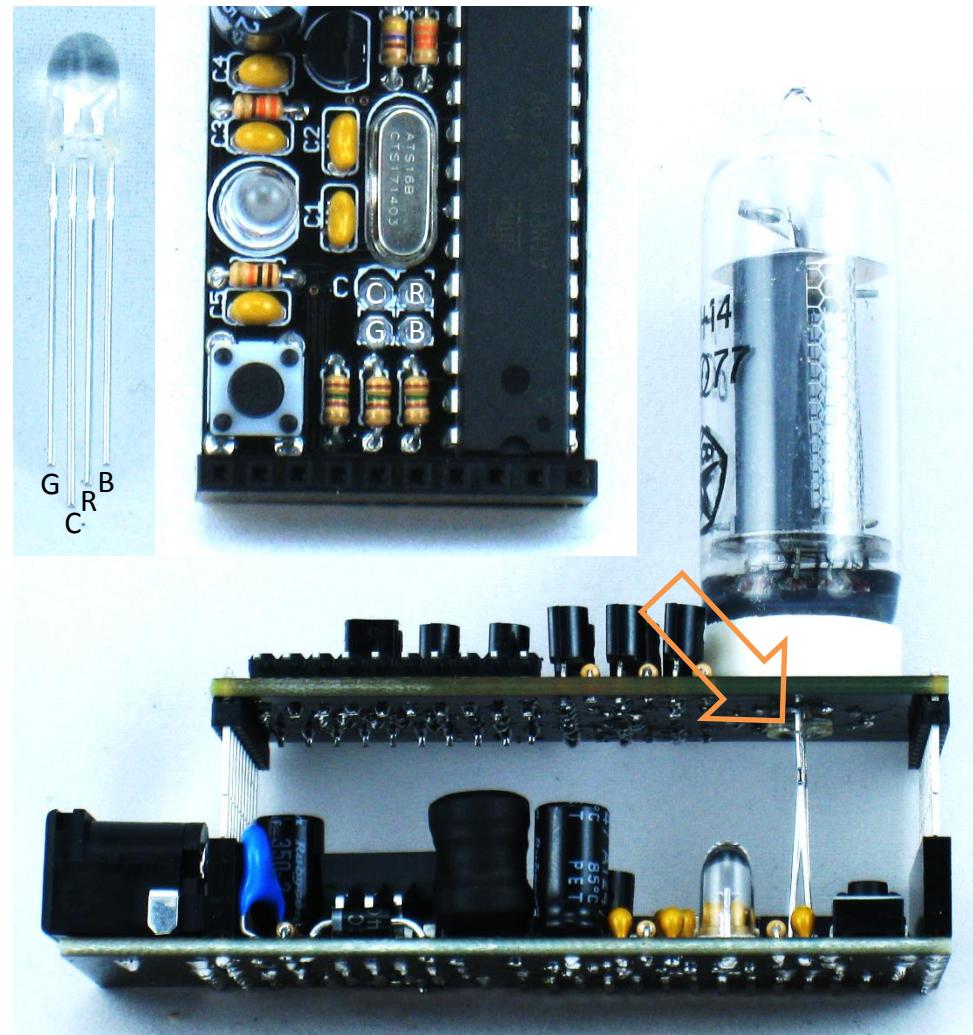
# Step 43

Insert the RGB LED into the bottom PCB

The longest lead of the LED goes into the hole marked C. The other middle lead of the RGB LED goes immediately right of the hole marked C

Connect the top PCB and push the RGB LED as far into the hole as it will go

Solder the RGB LED



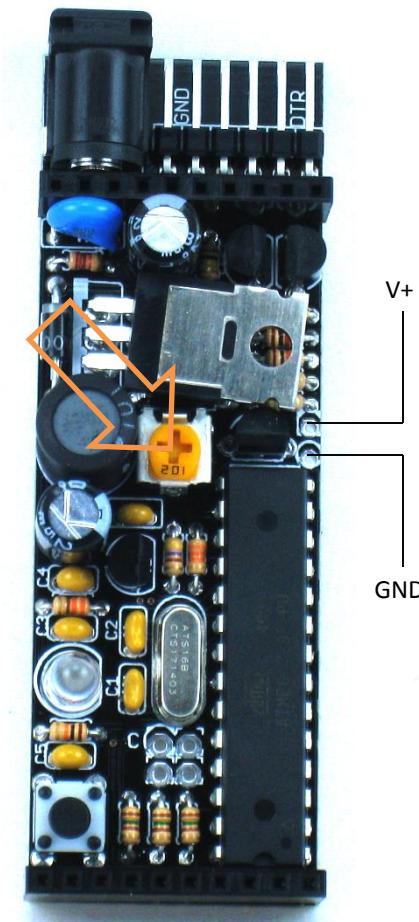
# Step 44

Connect a 9 – 12VDC power supply to the barrel jack

Connect a voltmeter to the two test pads shown in the photo on the right

Adjust the potentiometer until the voltmeter reads 170VDC

**Caution:** Take care not to touch the components while the board is being powered



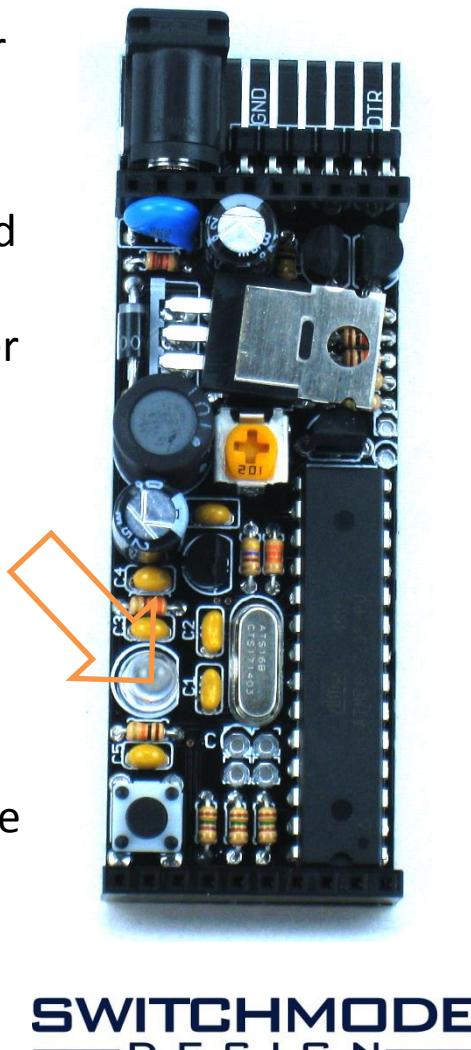
# Step 45

Connect the FTDI adapter to the six pin header

Open the Arduino IDE and select the correct COM port that the FTDI adapter instantiated as

As a test, download the Blink sketch under File > Examples > Basics > Blink

The Red LED should blink when the program is done downloading



Once the Blink sketch has been verified to work properly, download the example firmware found at [switchmodedesign.com](http://switchmodedesign.com)

# Congratulations!

You've successfully  
assembled the Smart Nixie  
Tube!

Please refer to the User  
Guide for instructions on  
how to send commands to  
the Smart Nixie Tube

Example software can be  
downloaded at  
[switchmodedesign.com](http://switchmodedesign.com)

