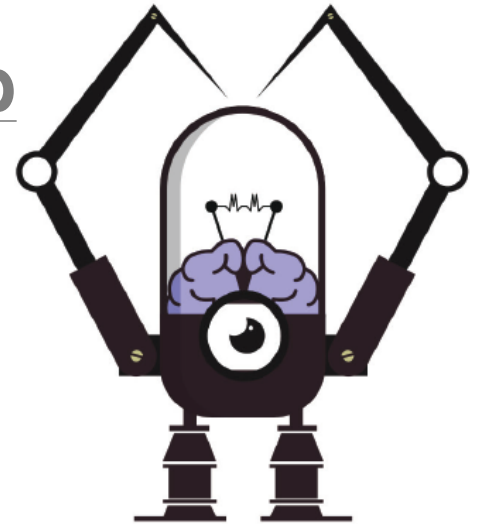
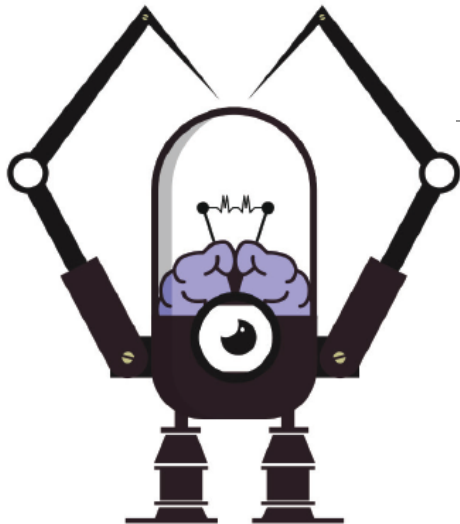




Making Mindful Matters, Matter
www.mindmakersproject.org

RF Bow/Tie Workshop

Electronic Bow &
Social Impact Making



Our Vision & Mission

“Mind Makers’ mission is to encourage STEM diversity and empower and inspire children and underserved adults through education, outreach and service.”

“Our vision is to build a diverse technology proficient community that values knowledge sharing, redefines possibility and inspires a new generation of engineering enthusiasts.”

The 1st Bow-Makers



Objectives

Today we will...

Learn...

- Electrical laws
- Circuits
- Soldering

Practice...

- Teamwork
- Value of teaching
- Paying it forward

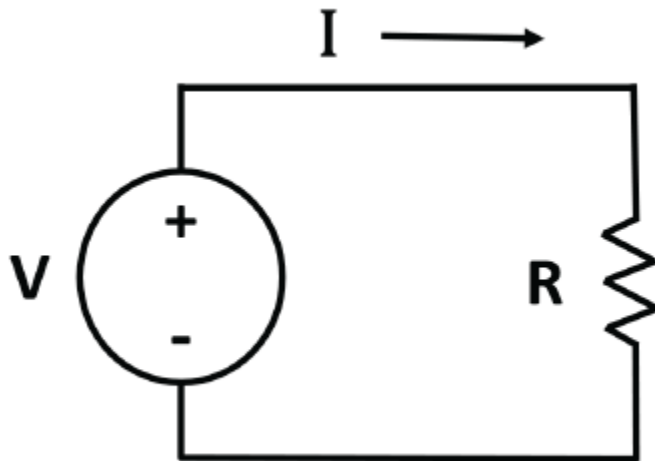


Pre-Engineering = Theory

Circuits & Ohm's Law

$$V = I \times R$$

voltage = current x resistance



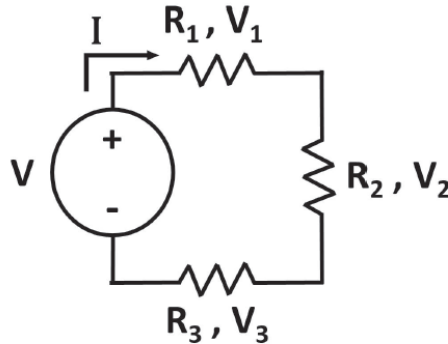
volts = amps x ohms

$$V = A \times \Omega$$

Kirchhoff's Laws

Voltage (Loop) Law

$$V = V_1 + V_2 + V_3$$

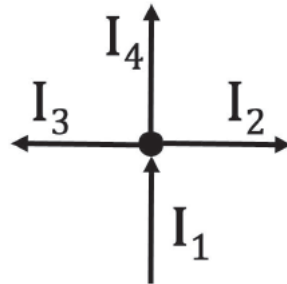


Ohm's Law

$$V = I \times R$$

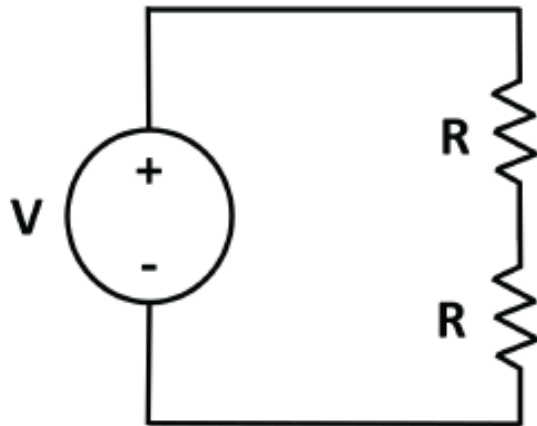
Current Law

$$I_1 = I_2 + I_3 + I_4$$

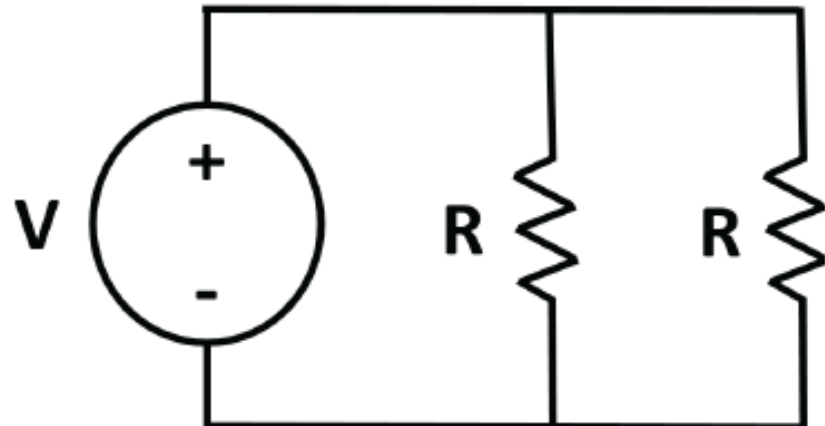


Series & Parallel Circuits

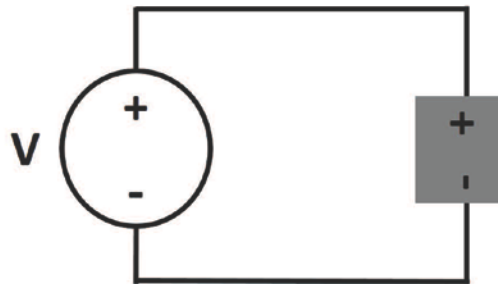
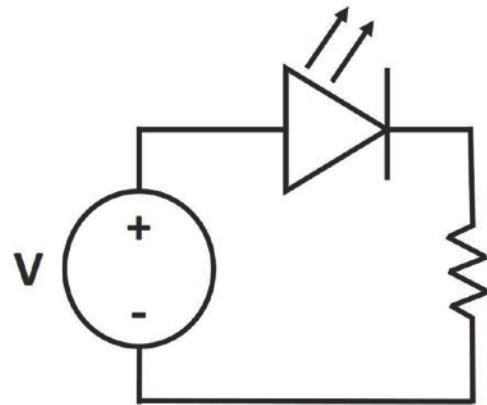
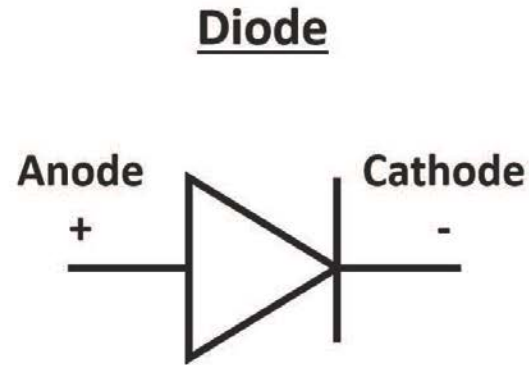
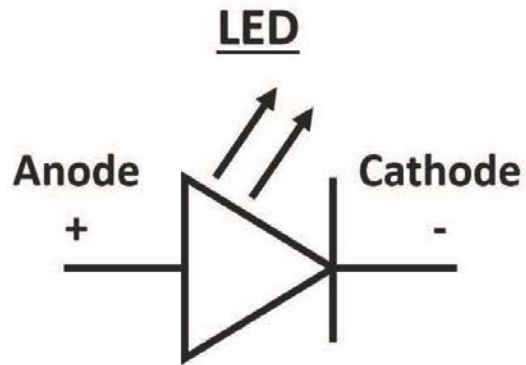
Series



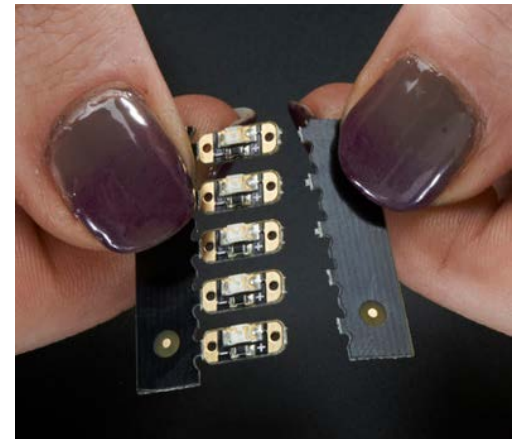
Parallel



Diodes & LEDs



LED Sequins, Adafruit



LED Sequins



LED Sequin, Adafruit

Sequin Specs

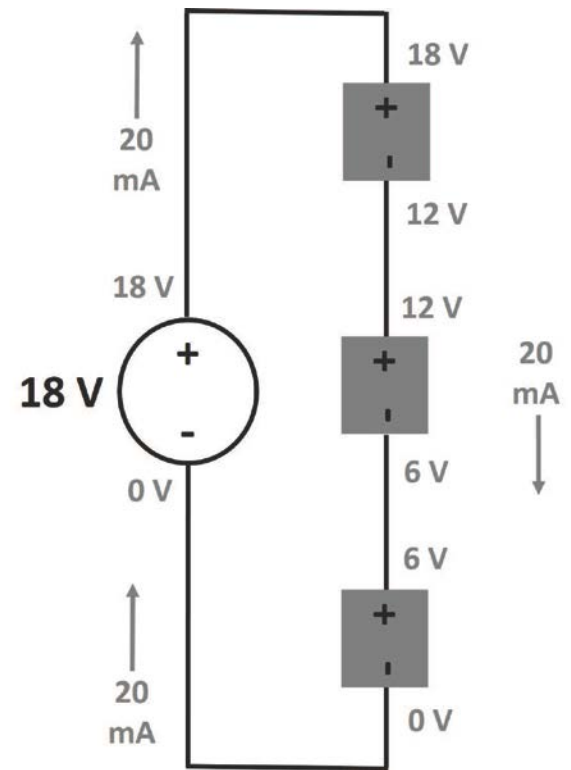
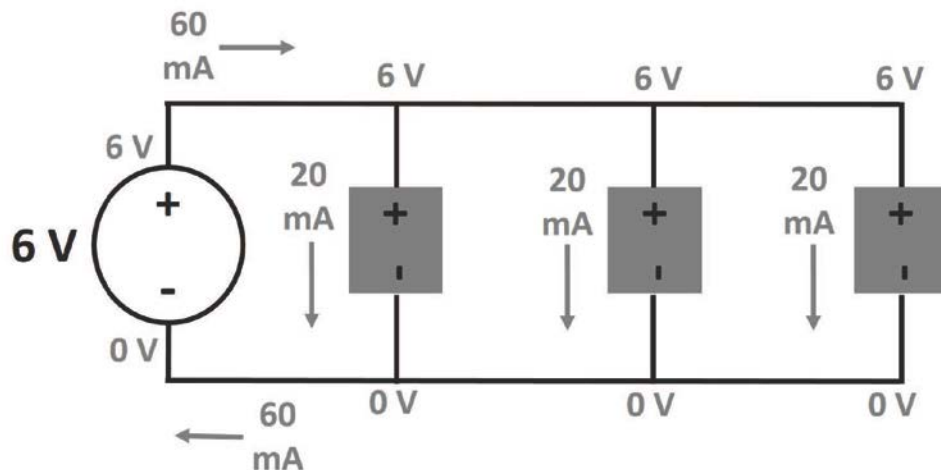
Assume each needs:

3-6 V

5-25mA

Sequins in Series & Parallel

- Both circuits use equal power per LED
 - Same voltage, same current
- Low voltage, high current (overall)
- High voltage, low current (overall)



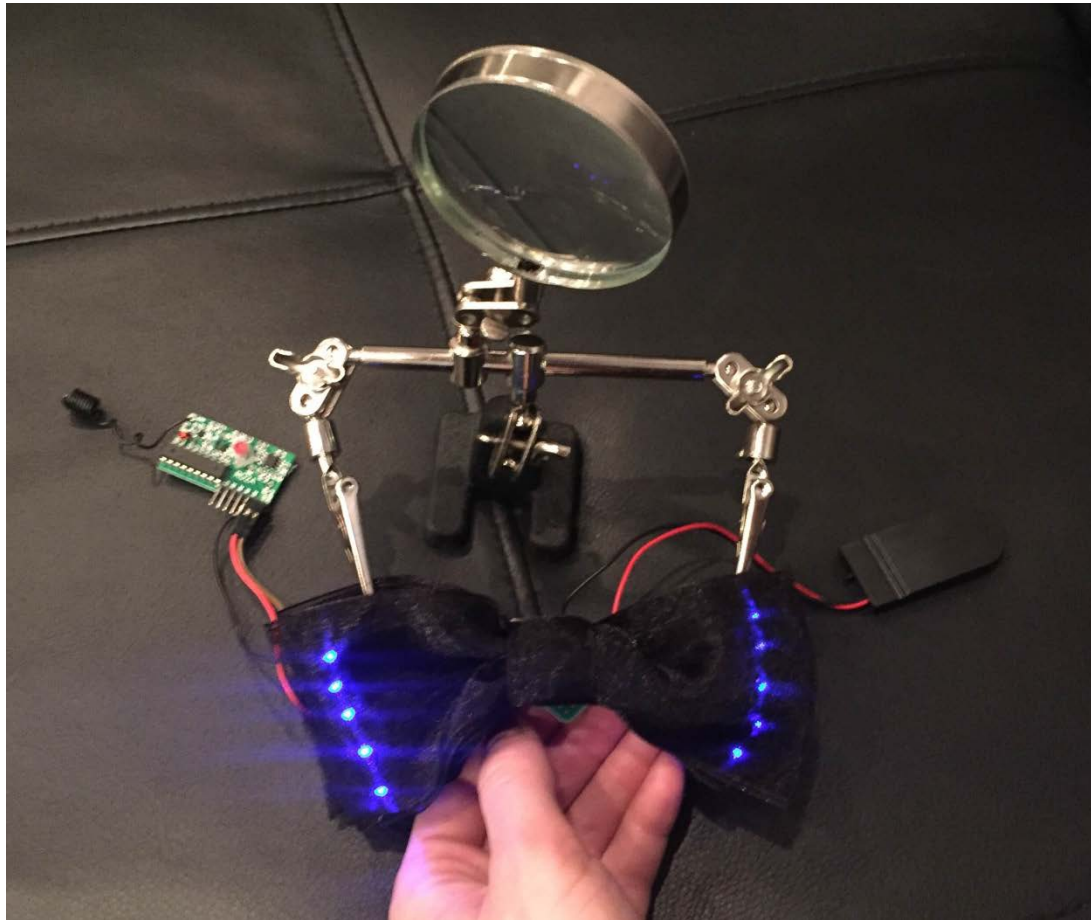
RF Communication

- Crystal vibrates at frequency dependent on atomic structure
- Voltage changes distort shape, generate electric field
- Signal measured & matched to “tune in”
- Wave can be modified to encode information
- Inbound wave induces current in conductor (antenna)



Image from Wikipedia

Engineering – Applied Theory



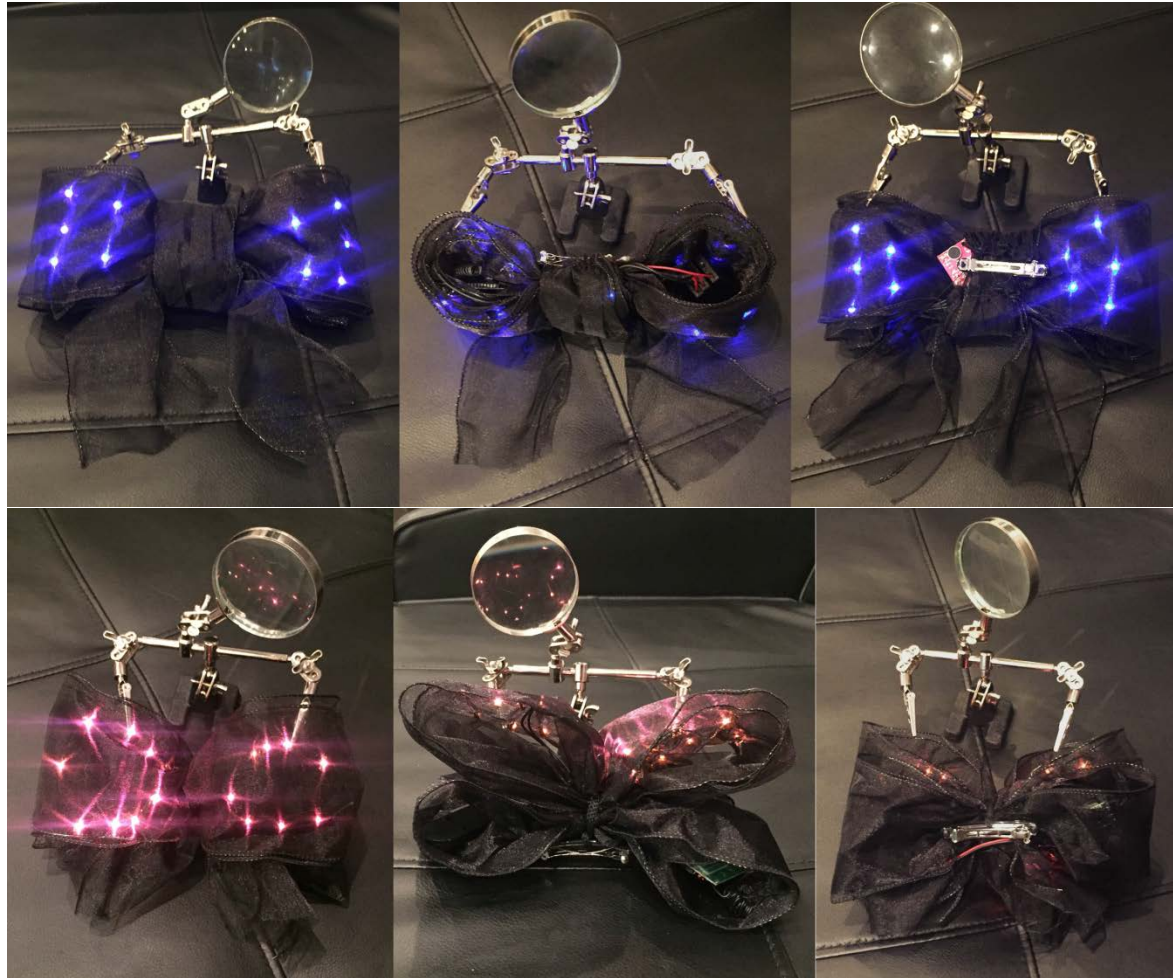
Your Materials

<input type="checkbox"/> Soldering iron	#
<input type="checkbox"/> Solder (rosin core)	#
<input type="checkbox"/> Copper sponge	# \$
<input type="checkbox"/> RF Toggle Receiver	@
<input type="checkbox"/> RF 2-button Remote	#
<input type="checkbox"/> LED Sequins (5-10)	@ \$
<input type="checkbox"/> Battery pack with power switch	@
<input type="checkbox"/> Rechargeable batteries - 3-6 Volts	@
<input type="checkbox"/> Black fabric bow or ribbon	@
<input type="checkbox"/> Black thread	#
<input type="checkbox"/> Thin sewing needle	@
<input type="checkbox"/> Black insulated 16-20 AWG wire	#
<input type="checkbox"/> Small soldered breadboard (PCB)	@
<input type="checkbox"/> Wire strippers	#
<input type="checkbox"/> Helping hands	# \$
<input type="checkbox"/> Needle nose pliers	#
<input type="checkbox"/> Wire cutters/nippers	#
<input type="checkbox"/> Conductive thread	# \$
<input type="checkbox"/> Small, printed circuit board (PCB)	@
<input type="checkbox"/> Headband, barrette, pins or other fasteners	@
<input type="checkbox"/> Multimeter	#
<input type="checkbox"/> Hot glue and glue sticks	#

The Procedure

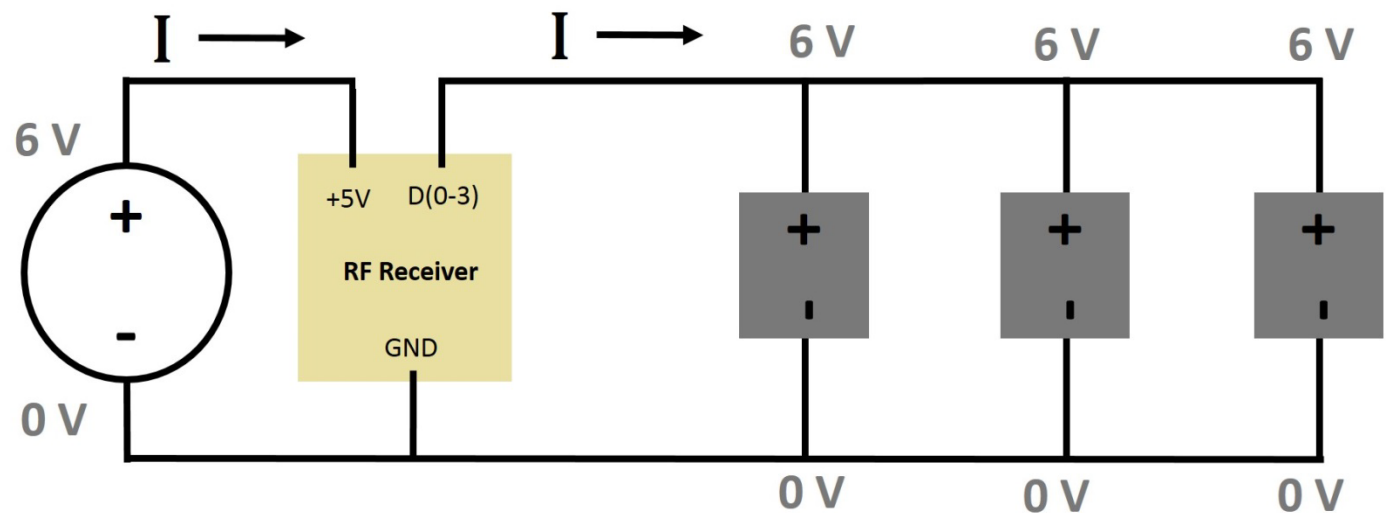
1. Plan component placement (& sew bow)
2. Layout & Attach LEDs
3. Solder LEDs into Circuit
4. Test & Debug LED Circuit
5. Build Power Breakout Board
6. Connect RF Module
7. Test RF Control
8. Mount Components to Bow

1. Plan Placement & Sew



2. Layout & Attach LEDs

- Mount LEDs with thread
 - Enough to hold w/o covering pad
- Line up +/-
 - Parallel circuit



3. Solder LEDs Into Circuit

Leave two wire leads from the Sequin nearest to power or RF board
One lead +, one lead -



Soldered Jumper Wire
+ to + - to -



LED Sequin, Adafruit

4. Test & Debug Circuit

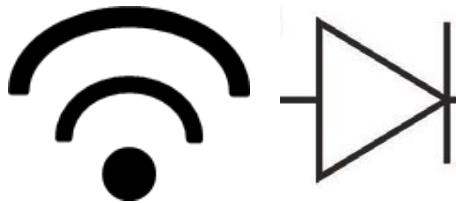


- Connect battery to LED circuit using leads
- If circuit doesn't light...

Debug...

Your BFF, The Multimeter

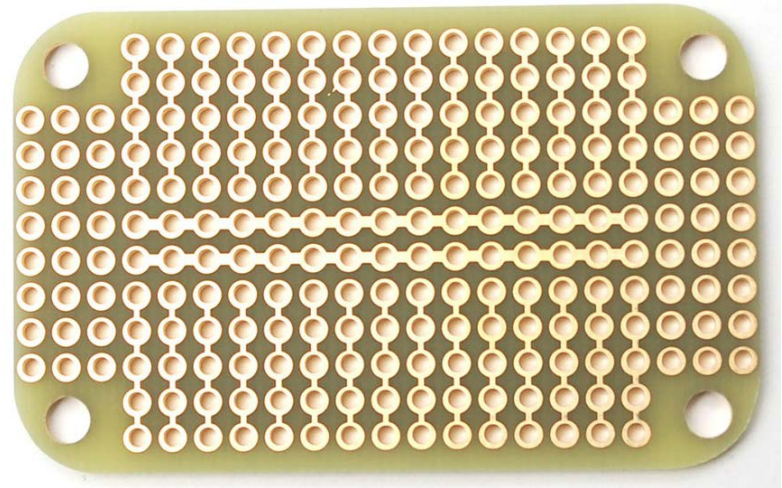
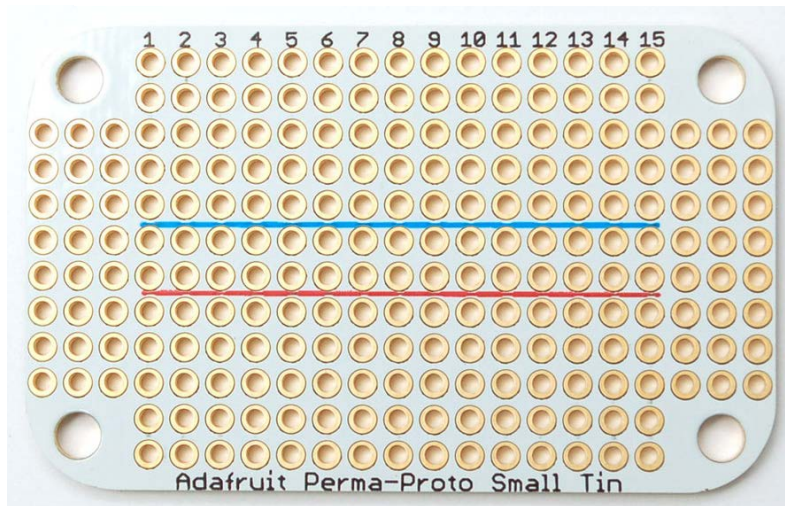
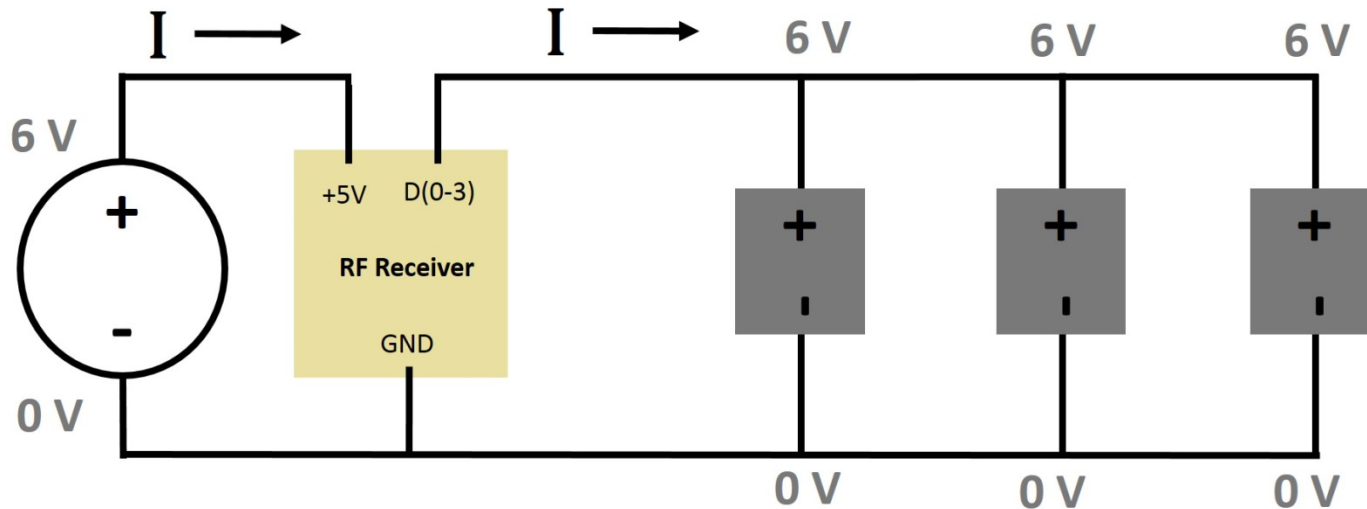
- Continuity measurement



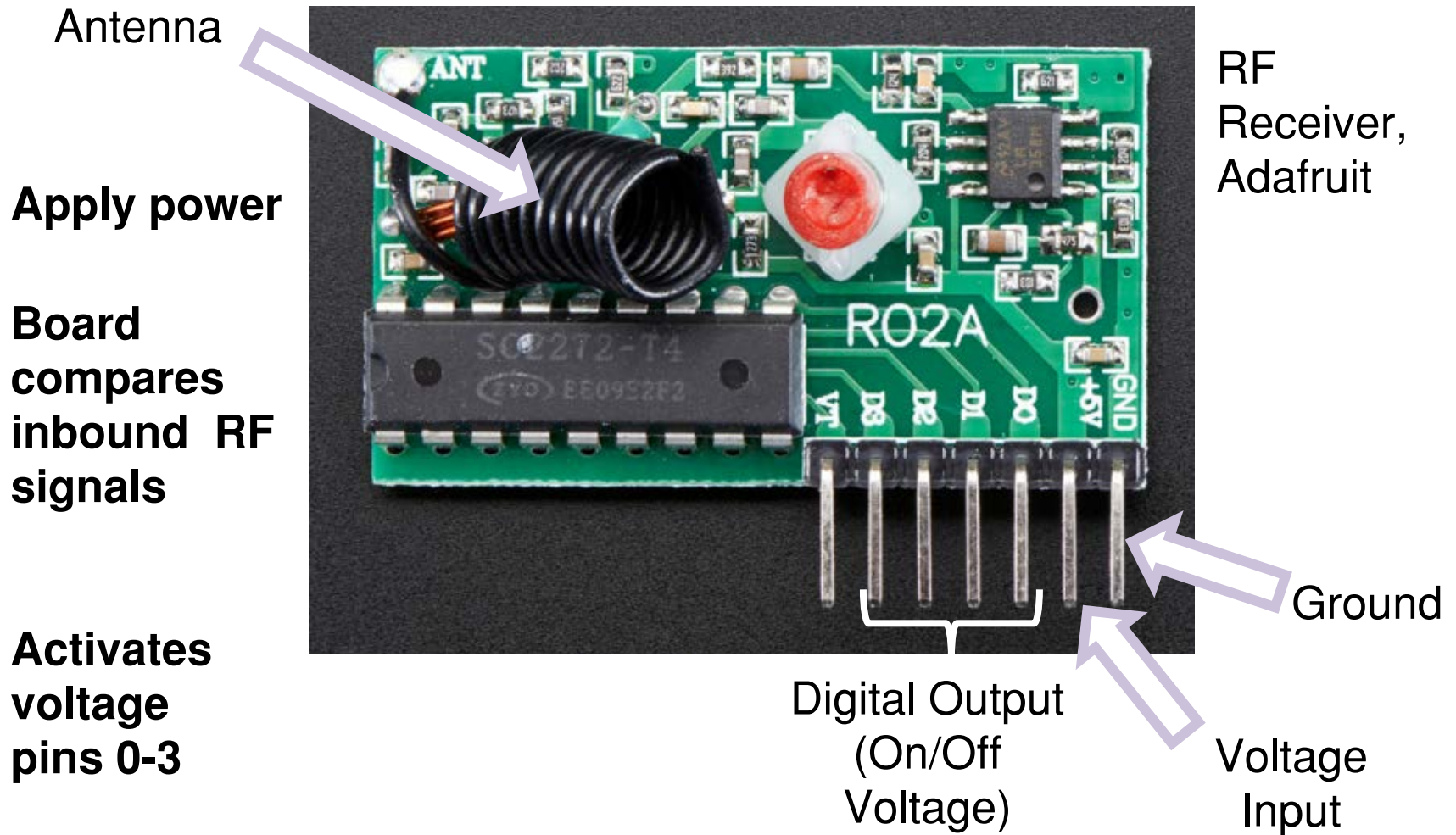
- Battery voltage



5. Build Power Breakout Board



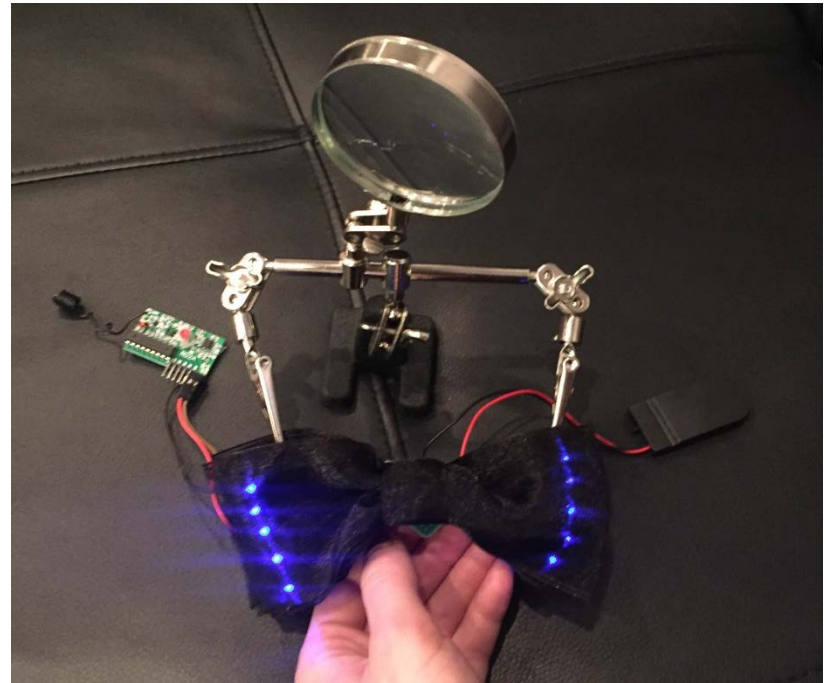
6. Connect RF Receiver



7. Test RF Control

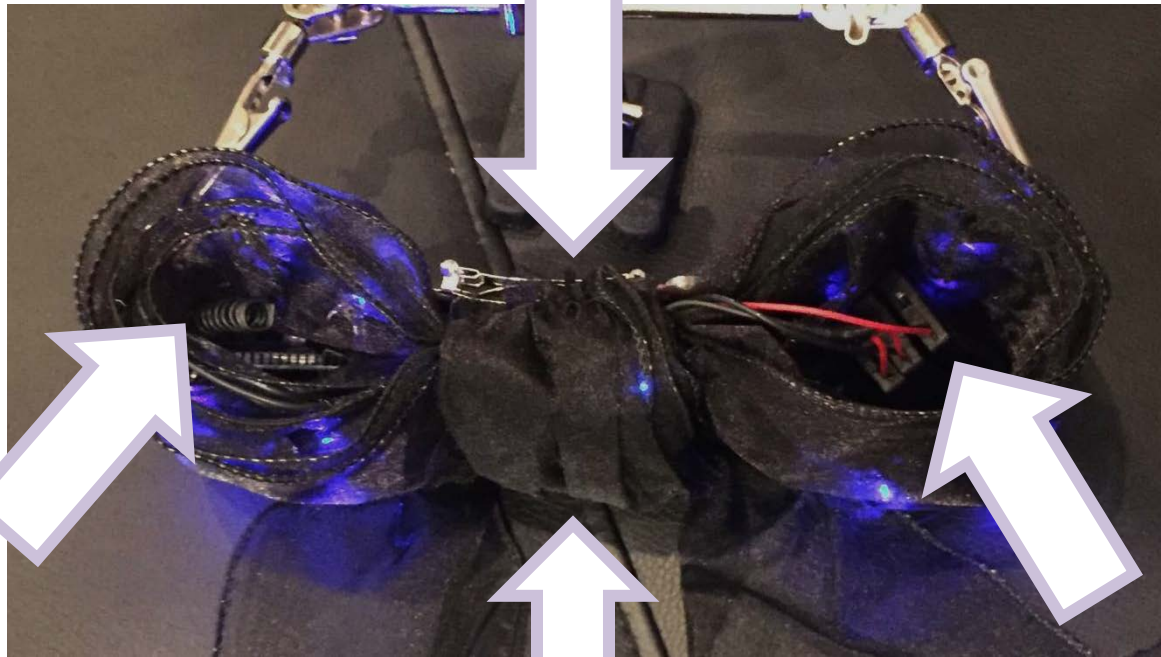


RF Transmitter, Adafruit



8. Mount Components to Bow

Ribbon laced through clip backing &
sewn in place to rest of bow



RF
Module
inside
loop sewn
shut @
bottom

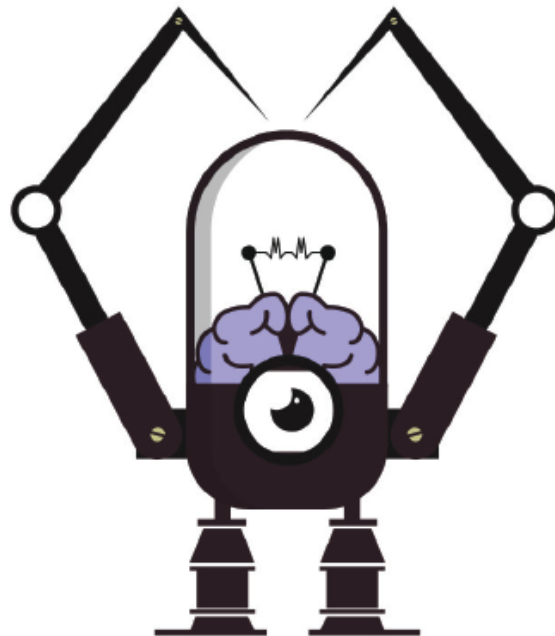
Battery
pack
inside
loop sewn
shut @
bottom

Layer of ribbon wrapped around,
covering & isolating power breakout

Light Up the Room!



Step 1: Let's Start With Sewing!



Target Circuit

* Use pin D2 for
single button

remote!

