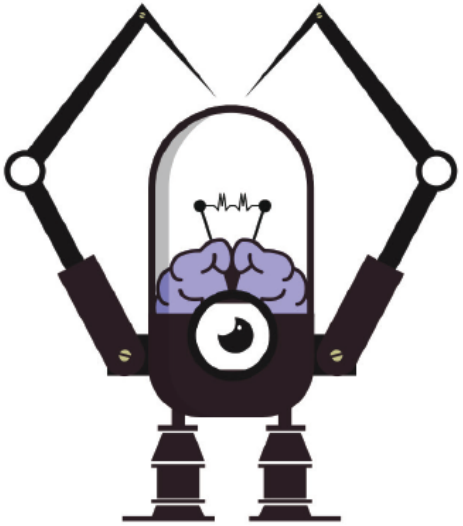
MIND MAKERS

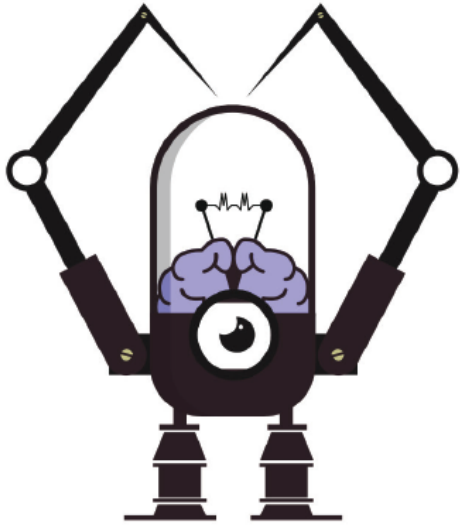
Making Mindful Matters, Matter

www.mindmakersproject.org



Javabots Workshop

Electronic Bow &
Social Impact Making



Our Vision & Mission

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

// Mind Makers

“Our mission is to inspire lifelong dreams, create lasting relationships, and strengthen women influence in STEM.”

//Javabots

The 1st Bow-Makers

The First Bow Workshop

(Play Bow Video)

Objectives

Today we will...

Learn...

- Electrical laws
- Circuits
- Soldering

Practice...

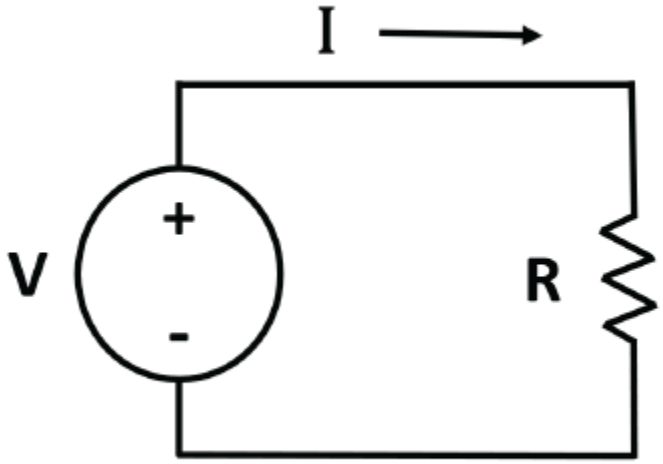
- Teamwork
- Value of teaching
- Paying it forward

Pre-Engineering = Theory

Circuits & Ohm's Law

$$V = I \; x \; R$$

voltage = current x resistance



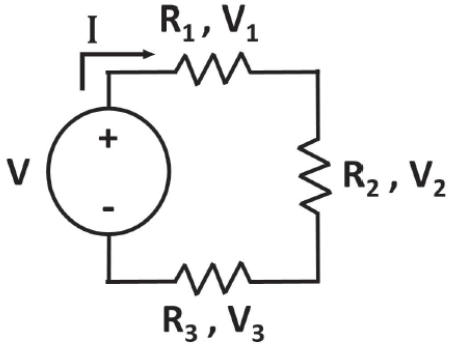
volts = amps x ohms

$$V = A \; x \; \Omega$$

Kirchhoff's Laws

Voltage (Loop) Law

$$V = V_1 + V_2 + V_3$$

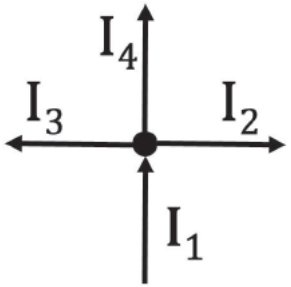


Ohm's Law

$$V = I \; x \; R$$

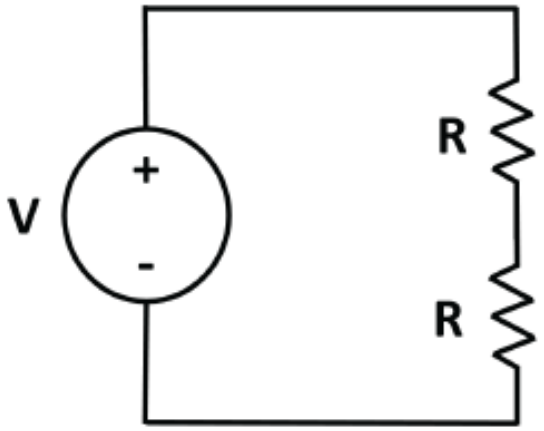
Current Law

$$I_1 = I_2 + I_3 + I_4$$

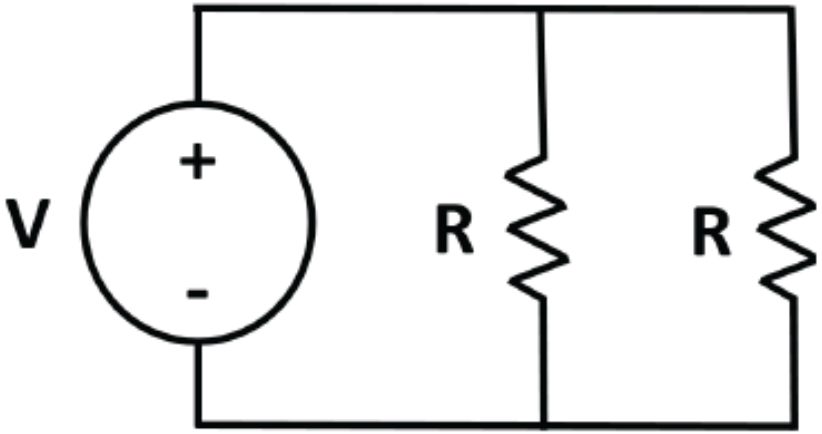


Series & Parallel Circuits

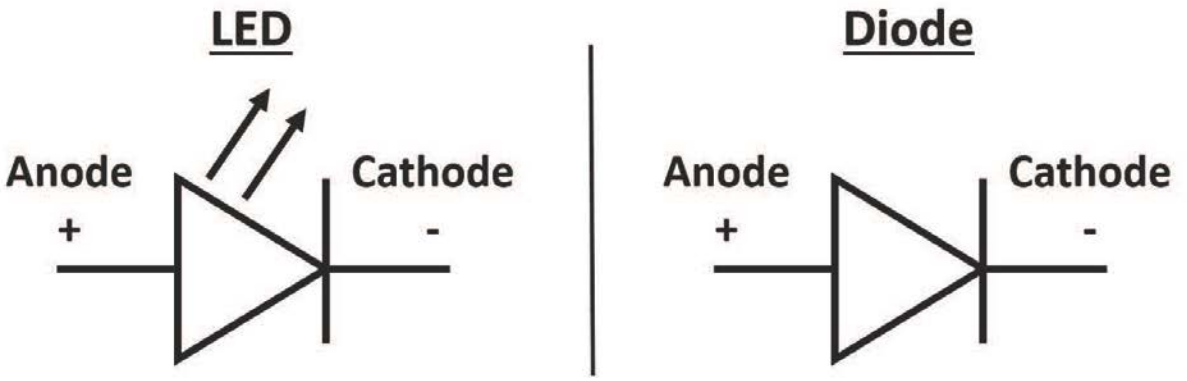
Series

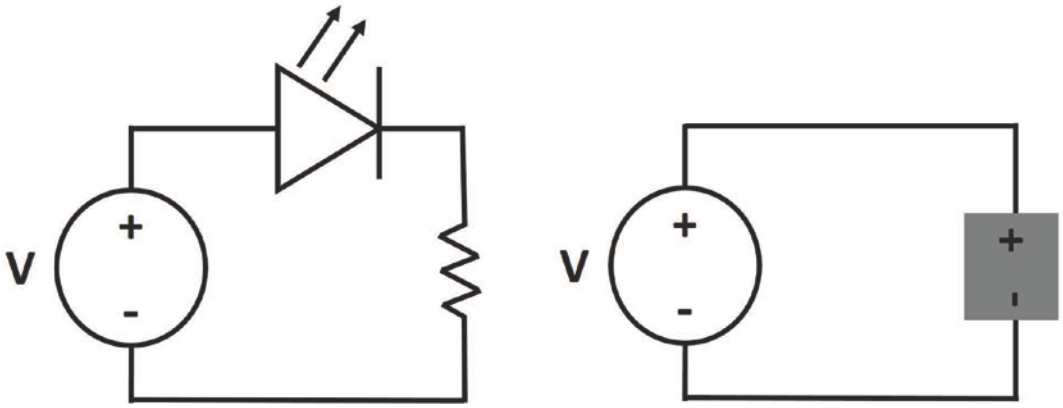


Parallel

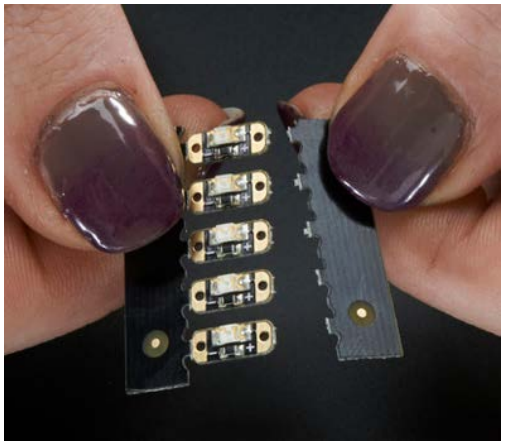


Diodes & LEDs





LED Sequins, Adafruit



LED Sequins

LED Sequin, Adafruit

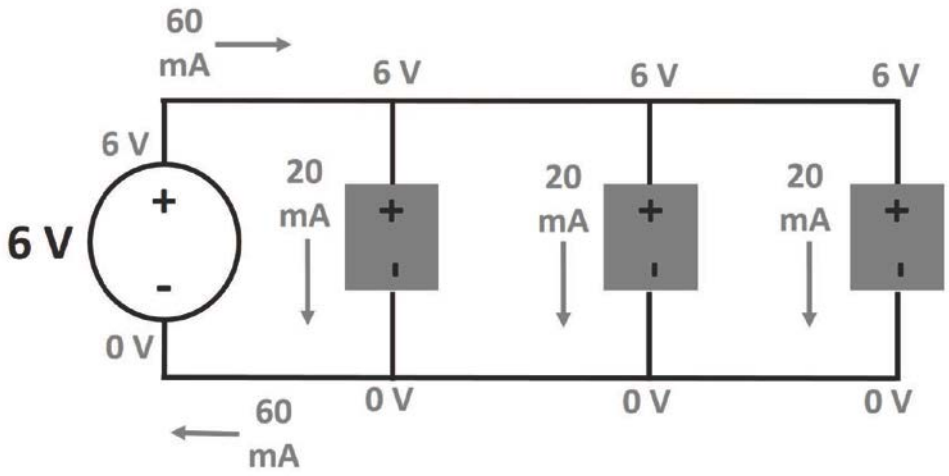
Sequin Specs

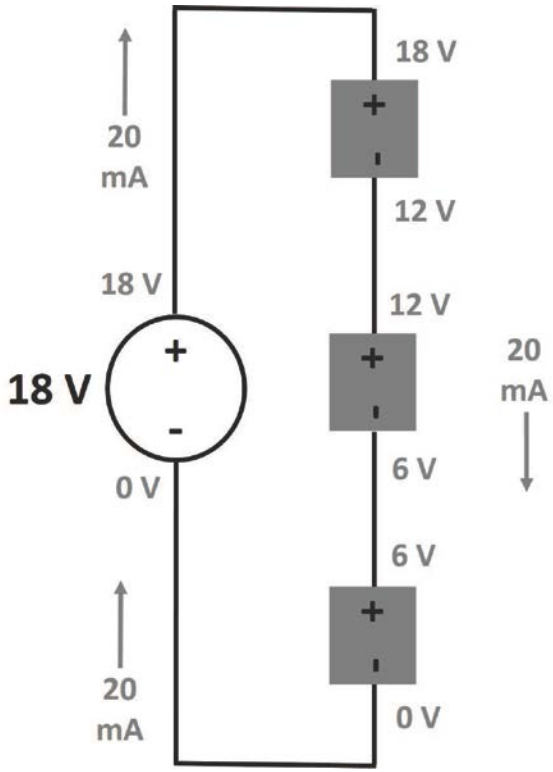
3-6 V
5-25mA

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)



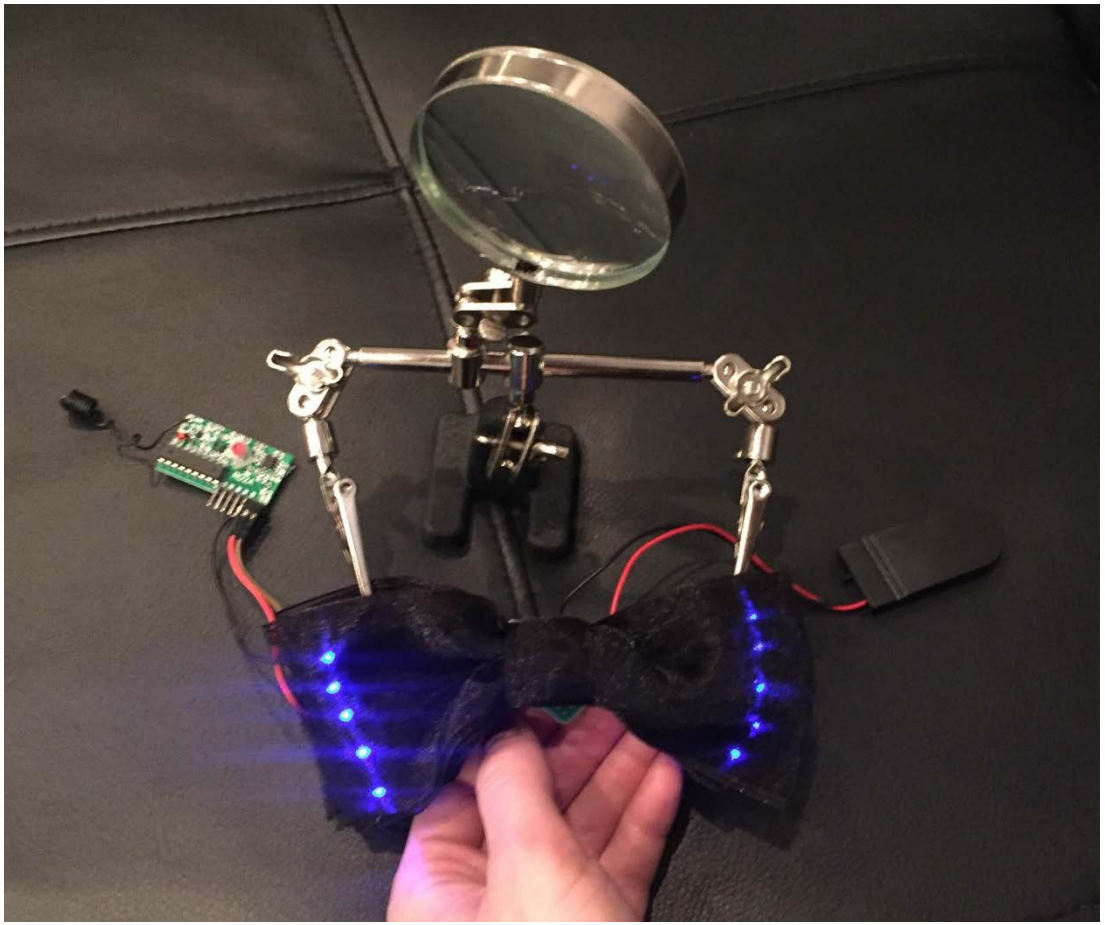


RF Communication

- 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

Image from Wikipedia

Engineering – Applied Theory



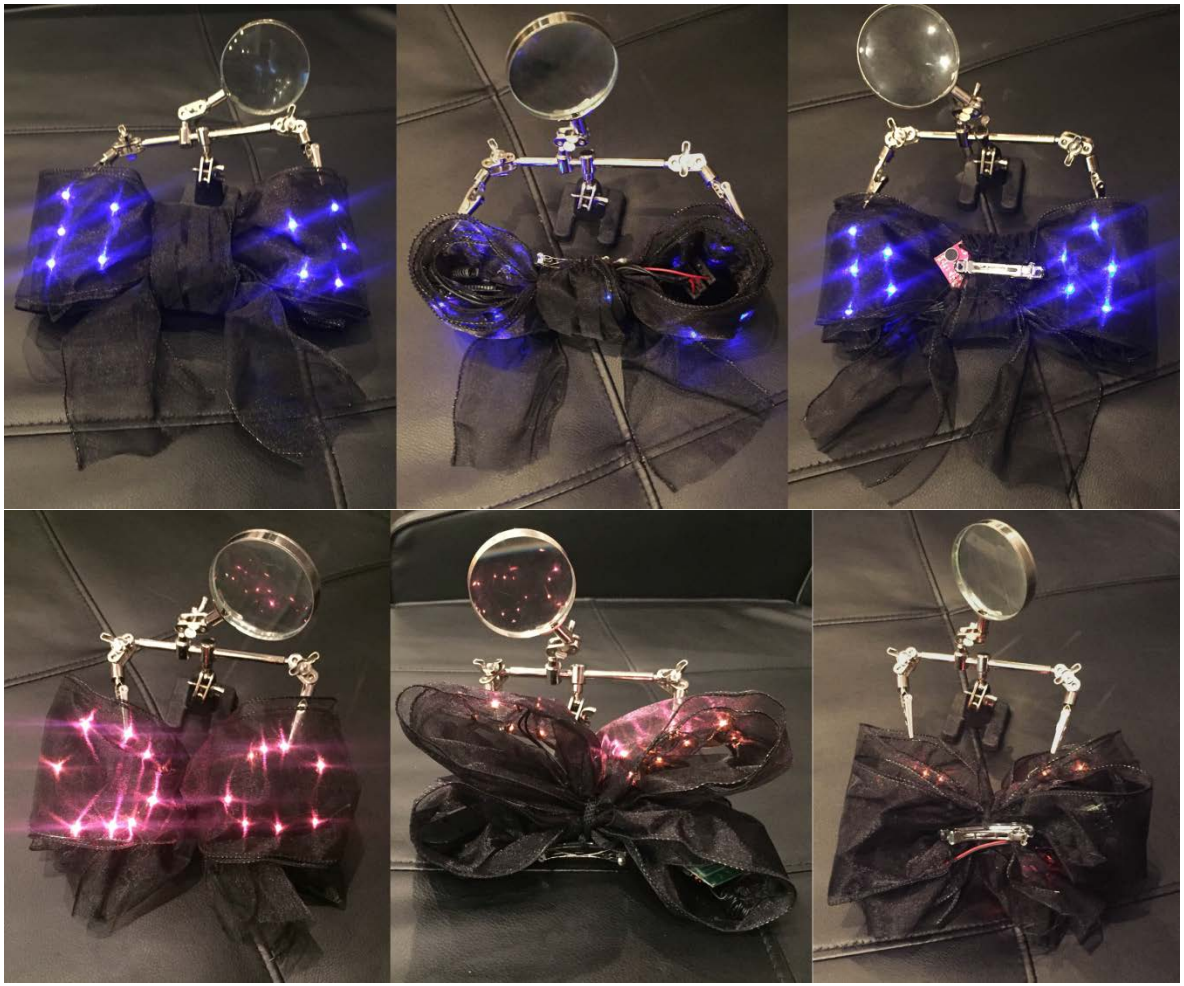
Your Materials

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

The Procedure

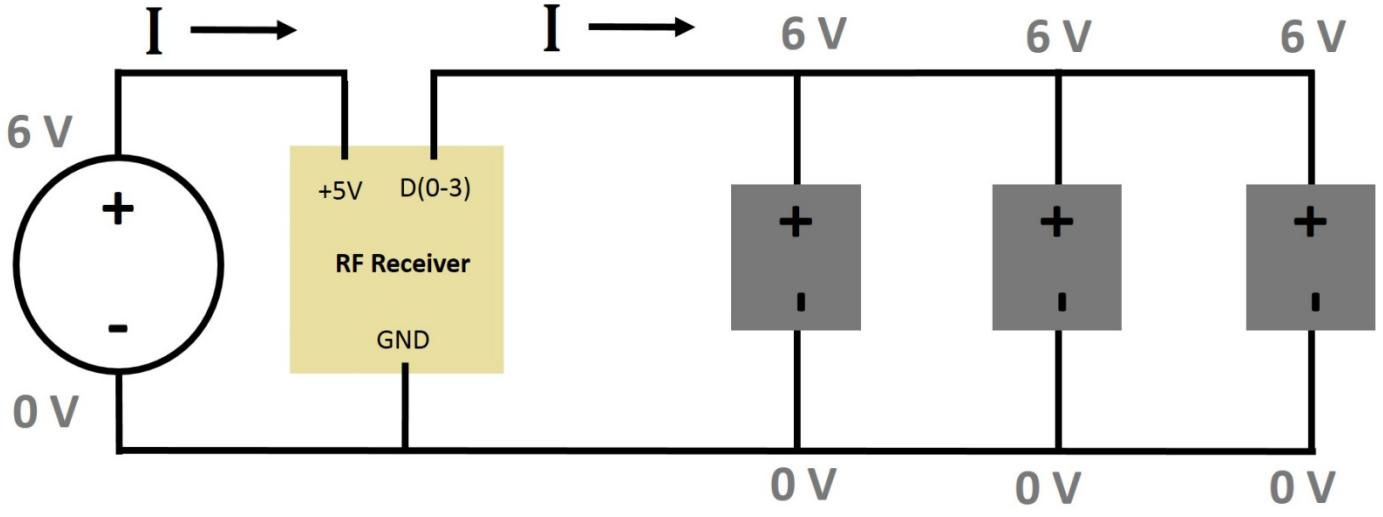
1. Plan component placement (& sew bow)
2. Layout & Attach LEDs
3. Solder LEDs into Circuit
4. Test & Debug LED Circuit
5. Build Power Breakout Board
6. Connect RF Module
7. Test RF Control
8. Mount Components to Bow

1. Plan Placement & Sew



2. Layout & Attach LEDs

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



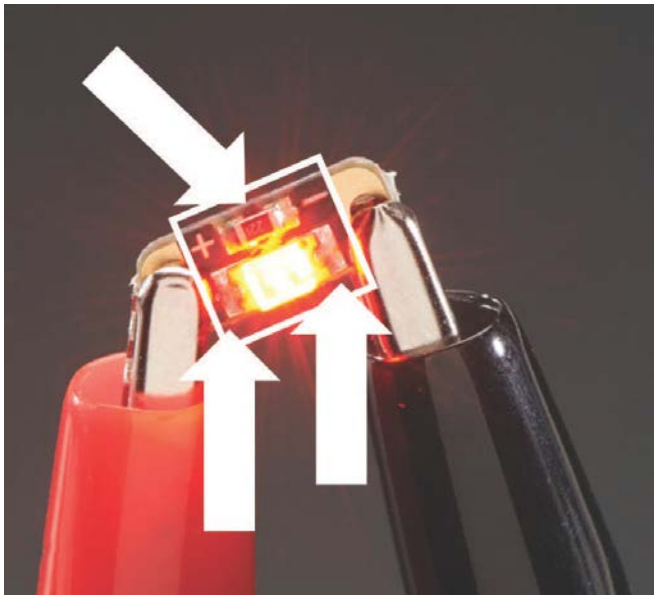
3. Solder LEDs Into Circuit

Soldered Jumper Wire

+ to + **- to -**

Leave two wire leads from the Sequin nearest to power or RF board

One lead +, one lead -



LED Sequin, Adafruit

4. Test & Debug Circuit

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

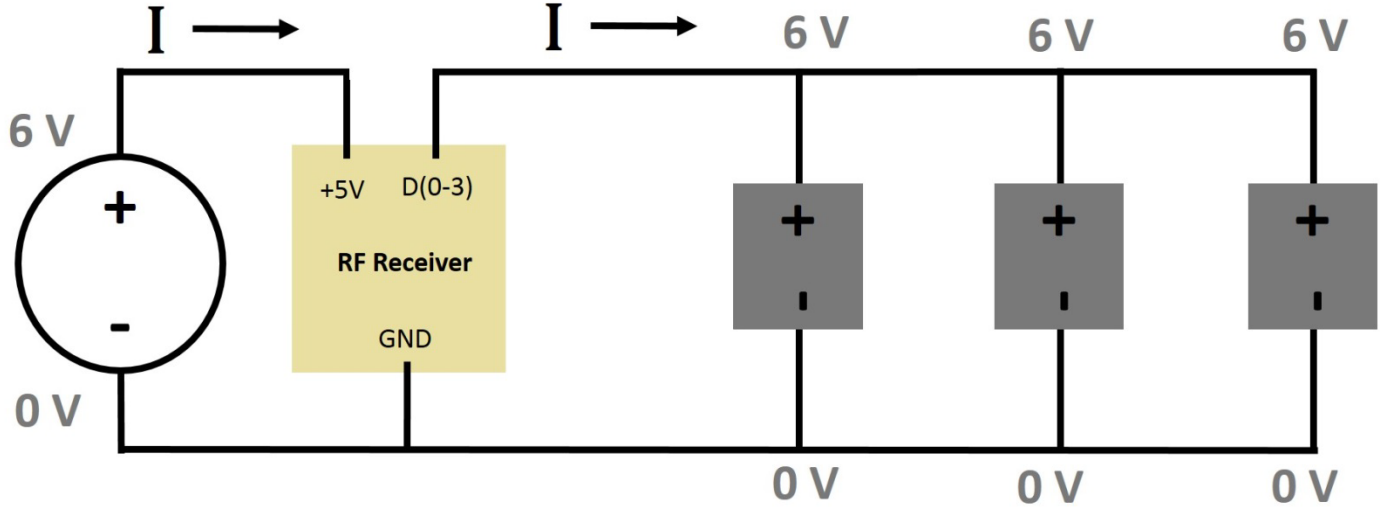
Debug...

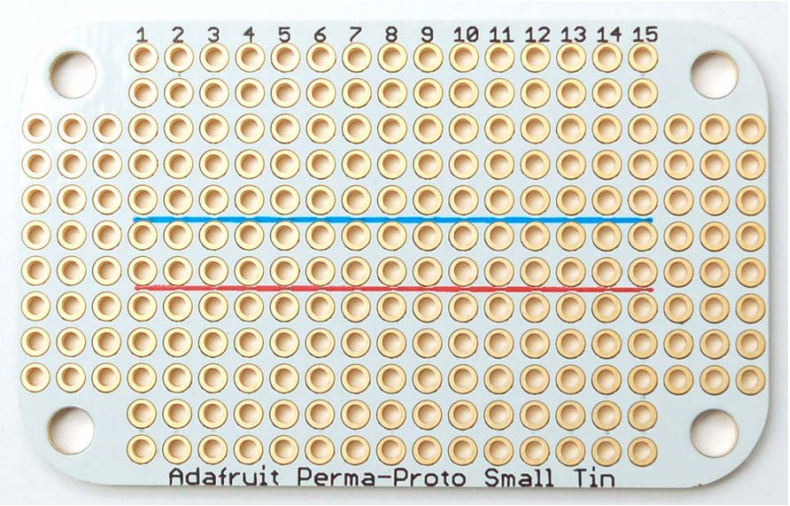
Your BFF, The Multimeter

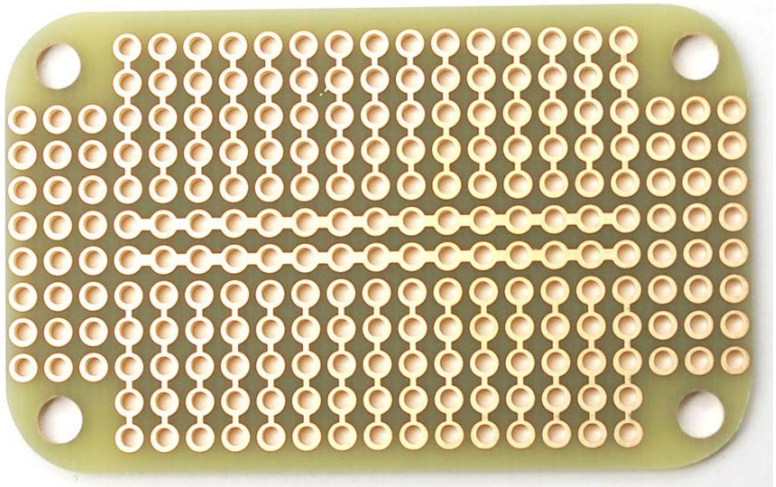
- Continuity measurement

- Battery voltage

5. Build Power Breakout Board







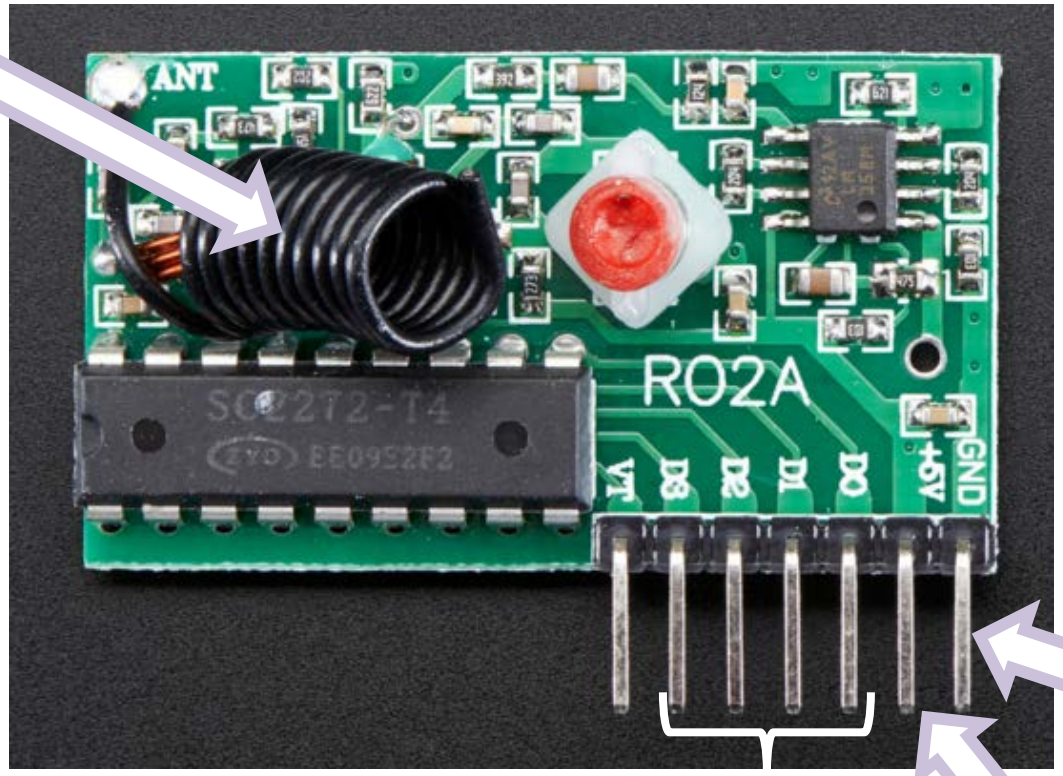
6. Connect RF Receiver

Antenna

Apply power

Board compares inbound RF signals

Activates voltage pins 0-3



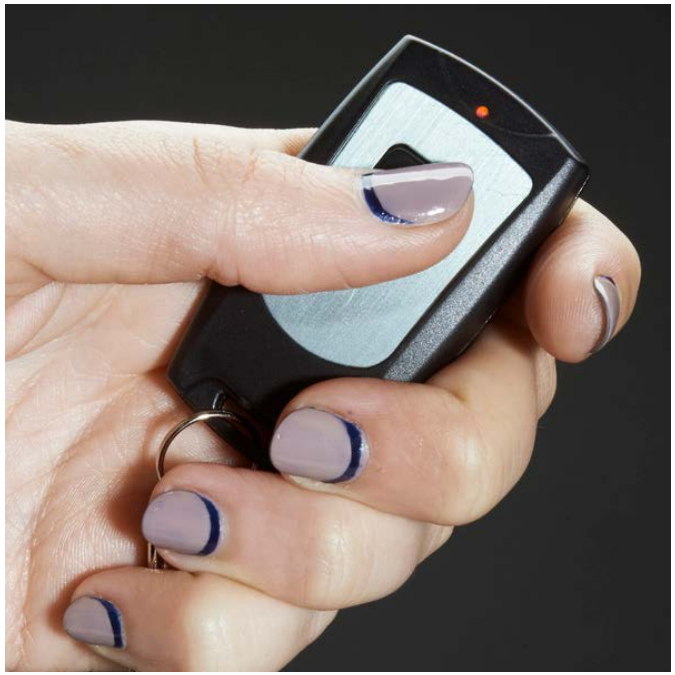
RF Receiver, Adafruit

Ground

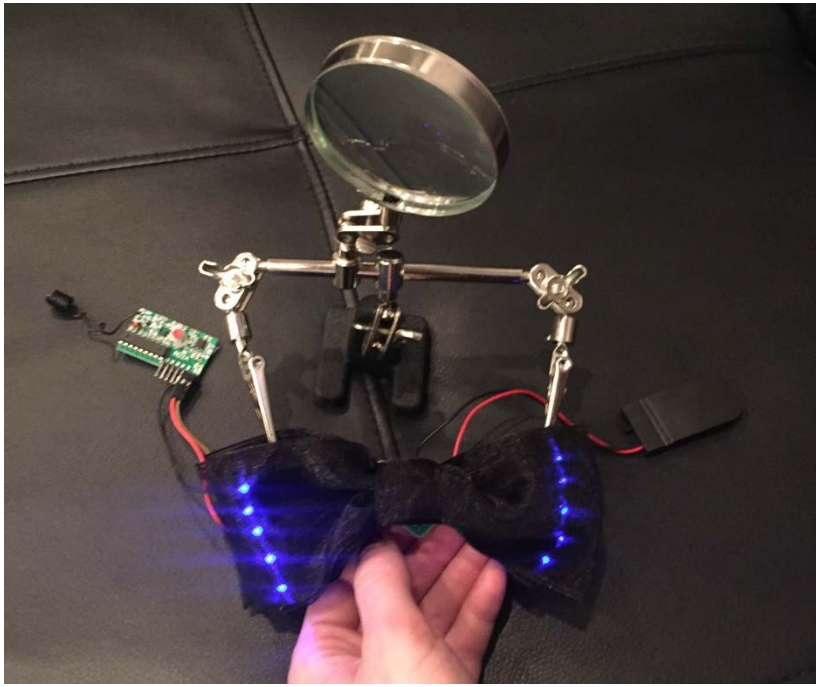
Digital Output (On/Off Voltage)

Voltage Input

7. Test RF Control



RF Transmitter, Adafruit



8. Mount Components to Bow

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

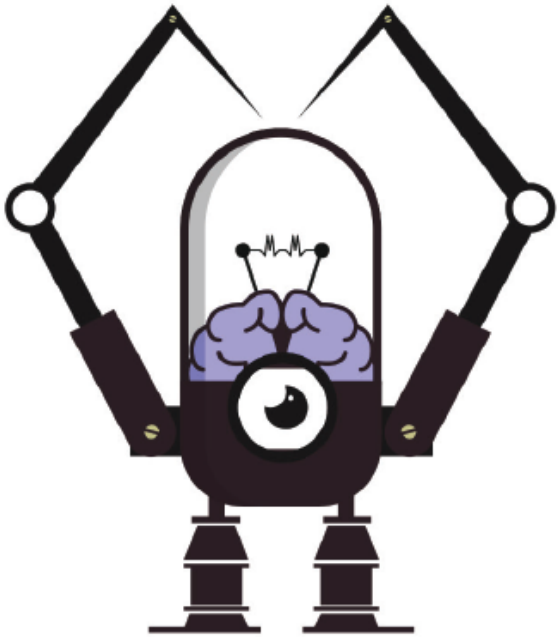
RF Module inside loop sewn shut @ bottom

Battery pack inside loop sewn shut @ bottom

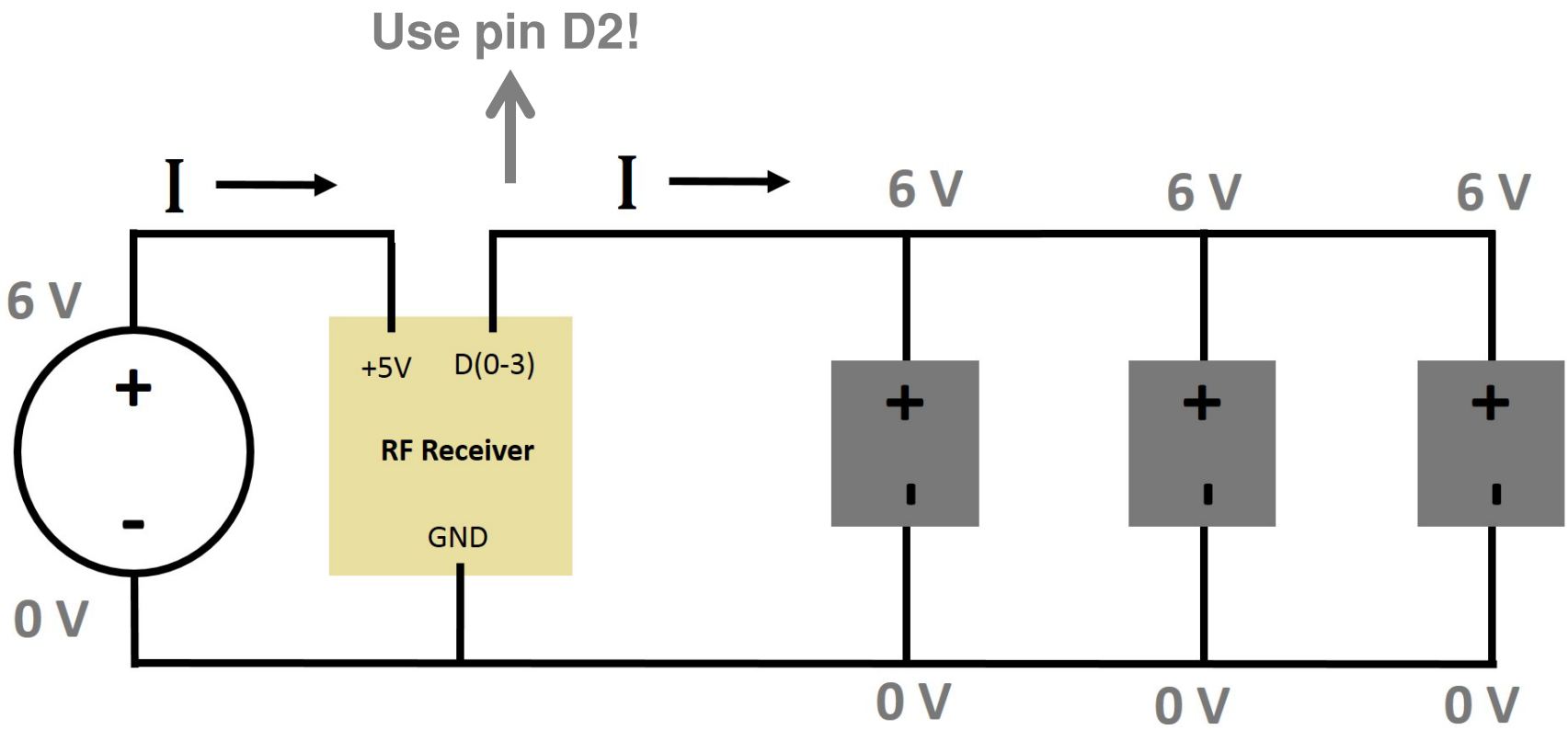
Layer of ribbon wrapped around,
covering & isolating power breakout

Light Up the Room!

Let’s Start With Sewing!



Target Circuit



Add'l Slides

Power

$watts = volts\ x\ amps$

$watts = I^2\ x\ R$

Ohm's Law

$V = I\ x\ R$