

The Power(Point) Glove

Parsia ~~Hakimian~~ Hackerman

DEF CON 33 (8-10 Aug 2025)
Hardware Hacking and Soldering Skills Village

‘Diogenes’, painting by Jean-Léon Gérôme (1824-1904) released under CC 1.0 Universal by The Walters Art Museum

Friendship ended with Clicker

Now

PowerPoint

Glove

is my

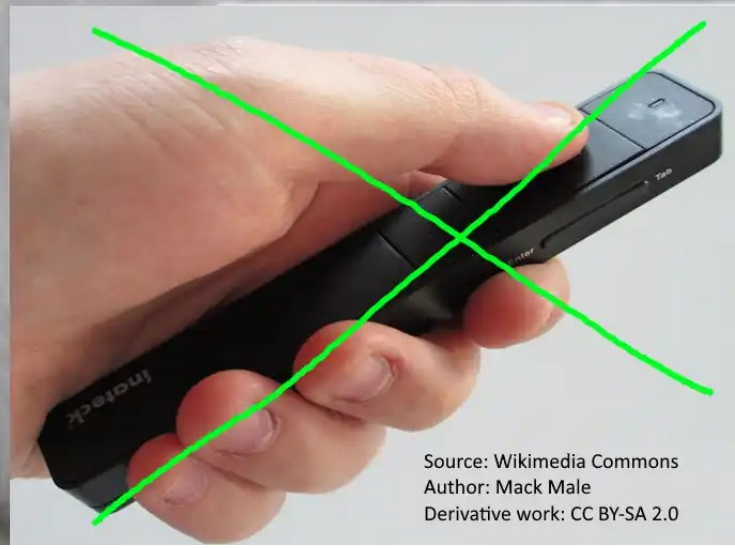
best friend



Source: Wikimedia Commons - public domain



Souce:
Wikimedia Commons - public domain



Source: Wikimedia Commons
Author: Mack Male
Derivative work: CC BY-SA 2.0

Agenda

- Intro
- Motivation
- Power Glove History
- How it Works
- Literature Review
- Development Boards
- ESP32 Development
- Controller Button Presses
- ESP32 as HID
- Demo

~~Humble Brag~~ about.md

- Security @ MSFT
- DEF CON 26/28/33
- No 1337 hacker name





Incoming Transmission from the Big Giant Head

- Independent “research”
- Not affiliated with:
  - My employer
  - Your employer
  - Any employer
  - Your uncle at Nintendo



Learning the Wrong Lessons from Haroon

1. Magic
   - “Any sufficiently advanced technology is indistinguishable from magic.”
     - Arthur C. Clarke
2. Charisma
   - Have rizz, will travel.

3. Pizzaz
   - Make it pop!



Barnaby Jack – Black Hat US 2010, photo by Dan Tentler (Viss)

History

- NES accessory
- 1989 @ $75~100
  - $200~250
- Not created by Nintendo.
- Production:
  - Pax (Japan)
  - Mattel (US)



What even is a Power Glove?



The Beauty and the Beast



Source: 'School of Athens' by Raffaello Sanzio (1483-1520)

The Wizard



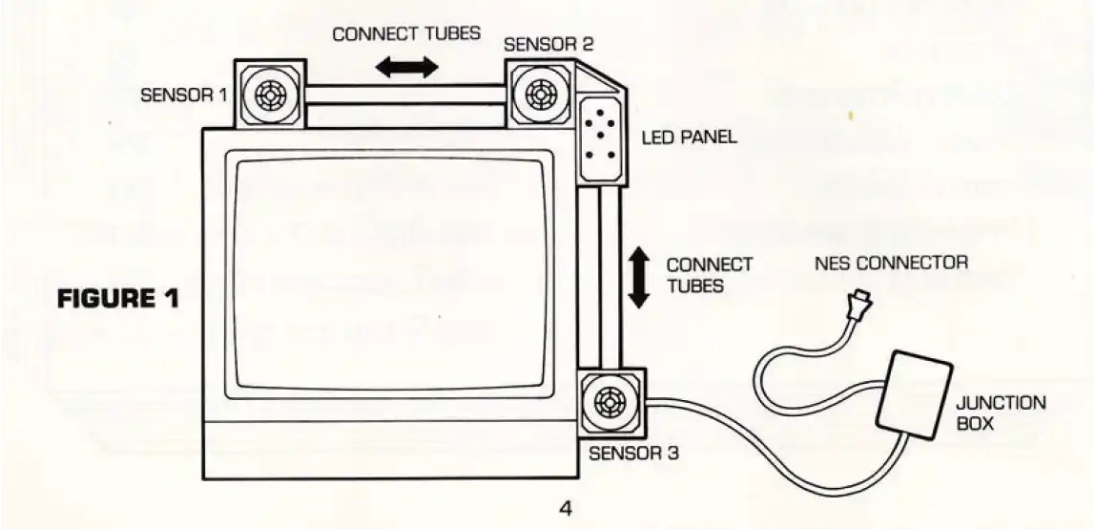
The Wizard



The Wizard



The Sensor Array



Source: Power Glove Manual – Page 4



The Junction Box

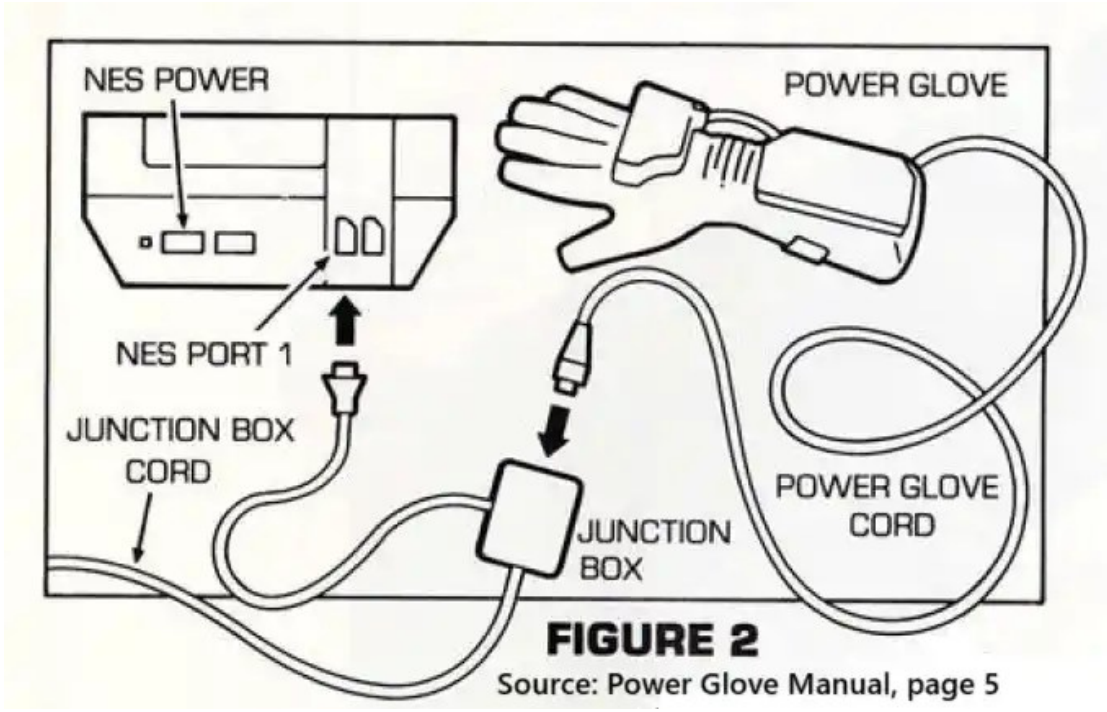
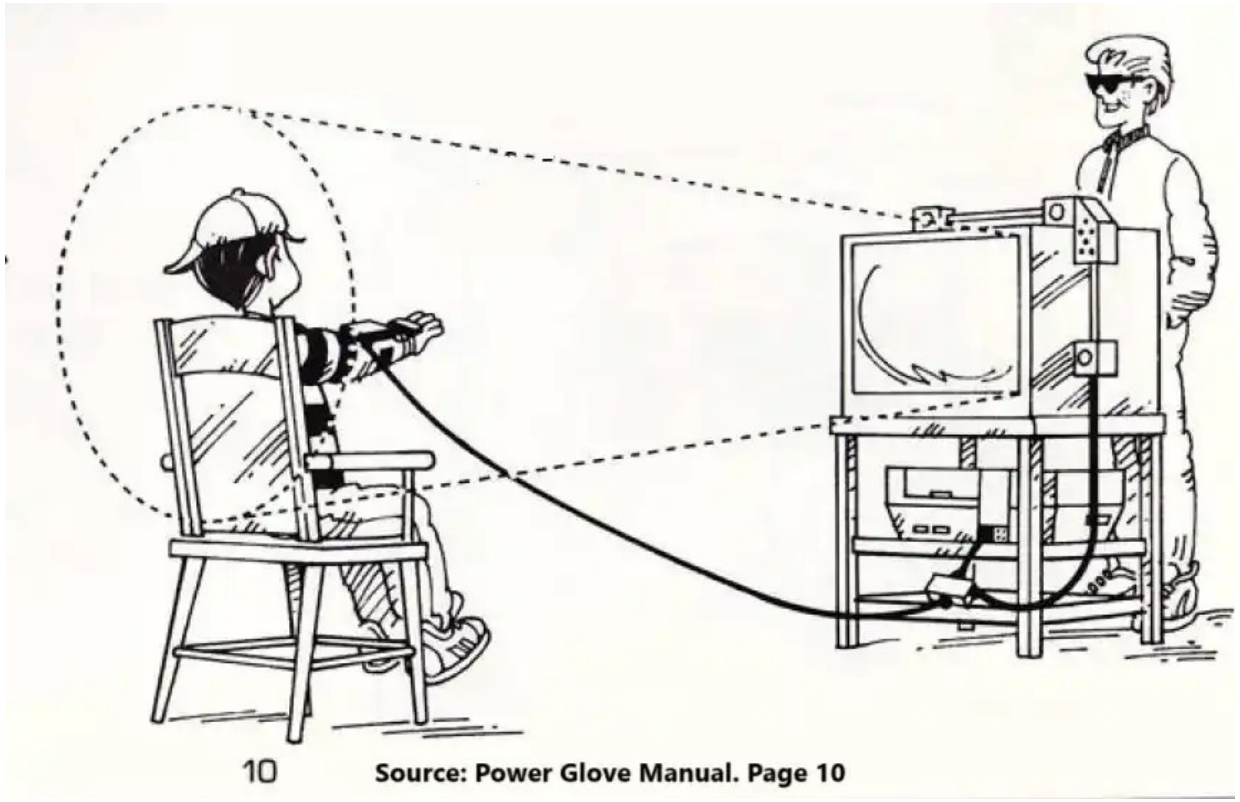


FIGURE 2

Source: Power Glove Manual, page 5



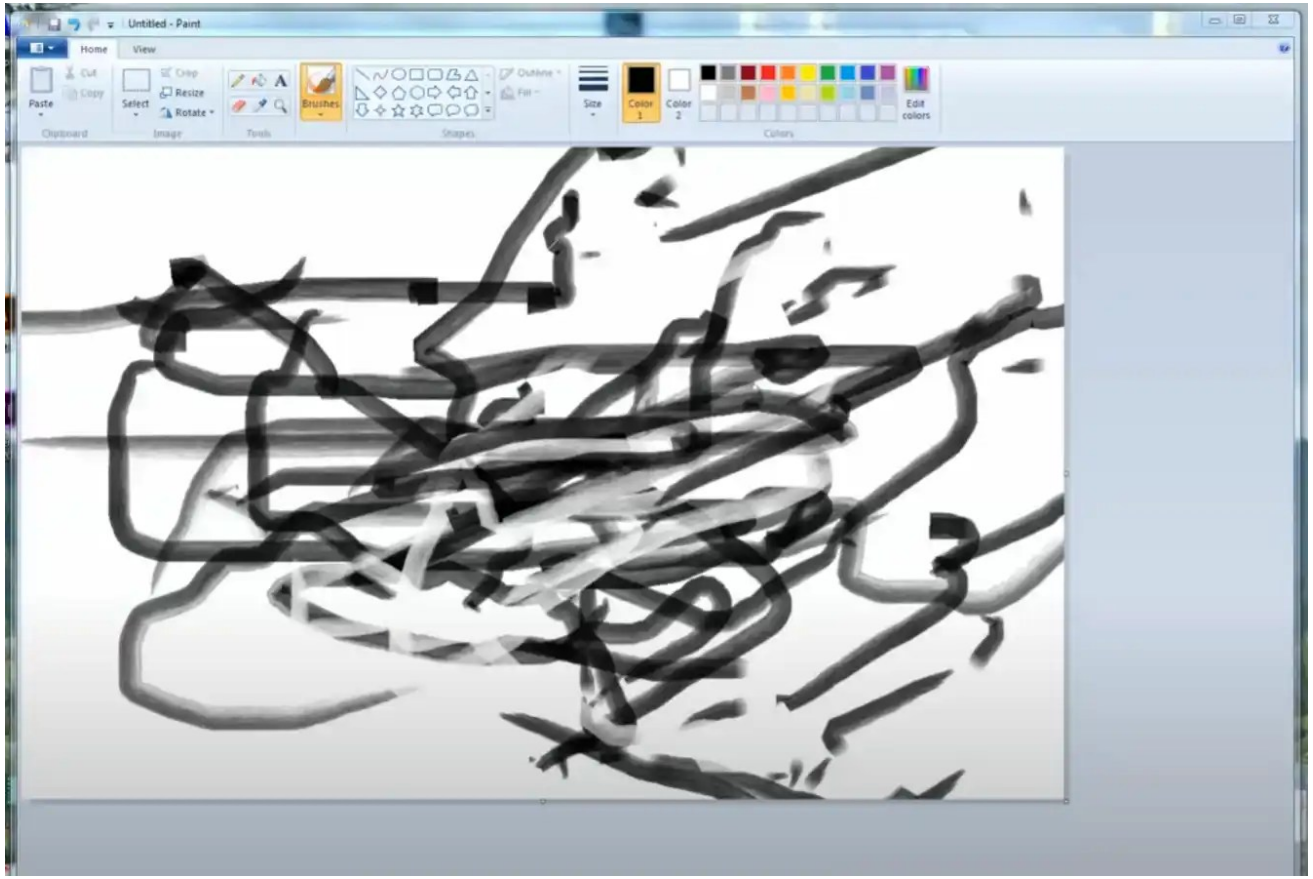
~~I am Batman~~ So it’s like a bat (without the echo)



10 Source: Power Glove Manual. Page 10



Literature Review #2 –

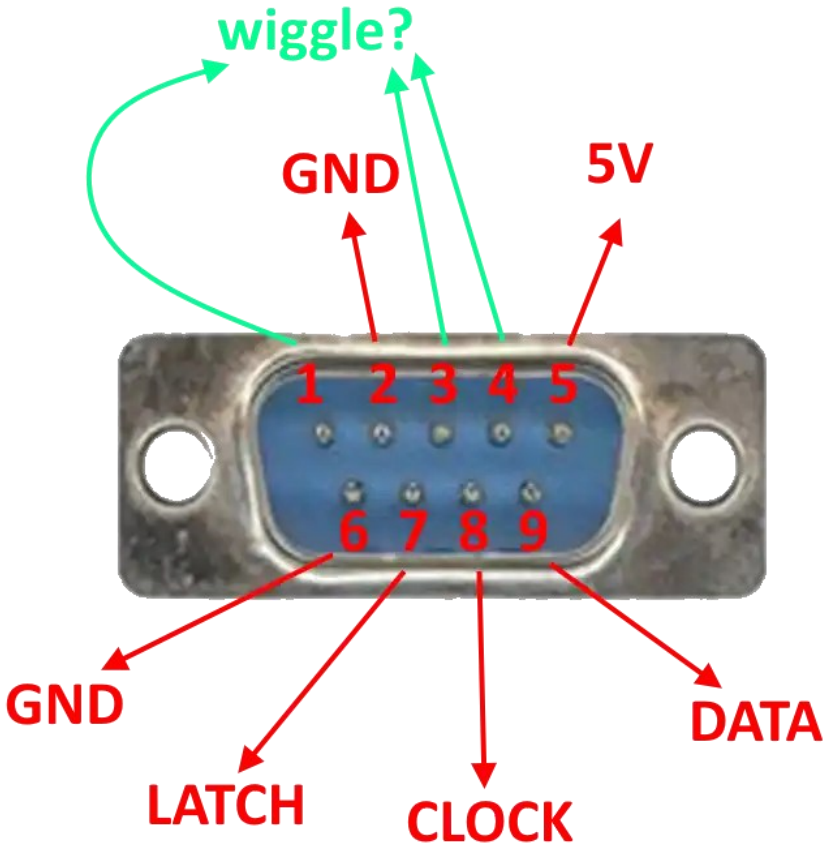




Ben Heck's Power Glove Teardown (2016)
https://www.youtube.com/watch?v=KAUp1c3_8wg

Dr. Benjamin Blundell (2018)
Blog: https://benjamin.computer/posts/2018-10-15-powerglove.html
Code: https://github.com/OniDaito/PowerGlove

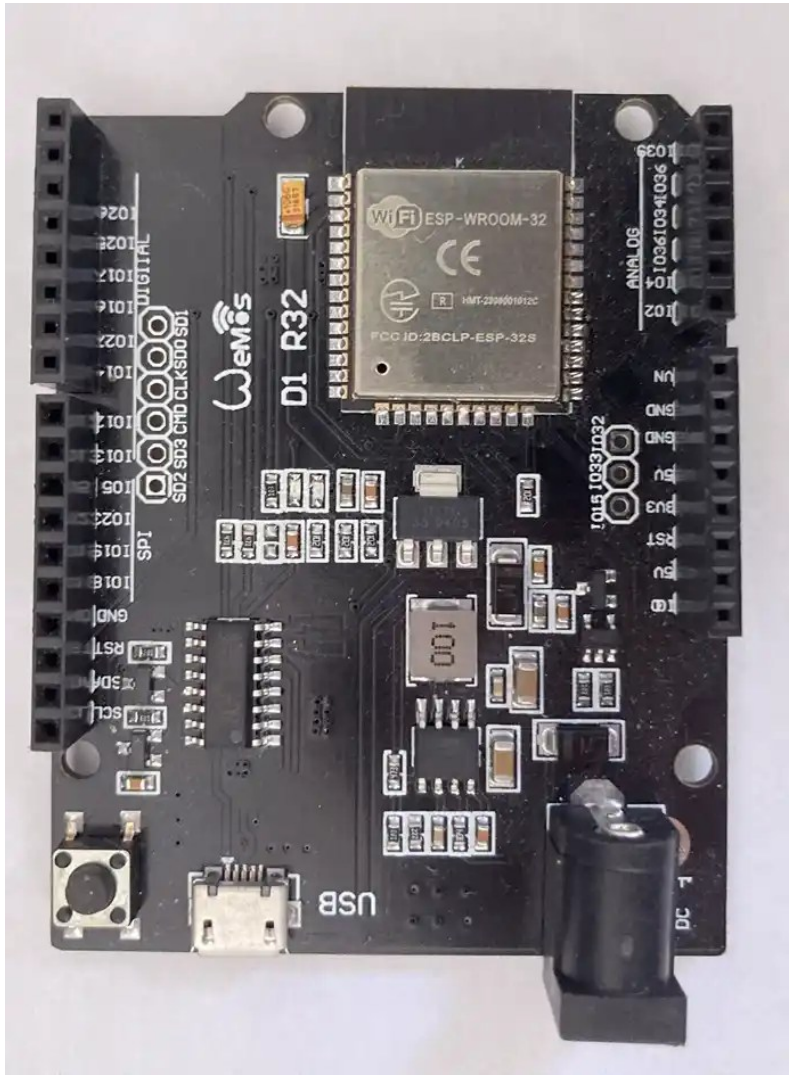
DB9/DE9 Diagram

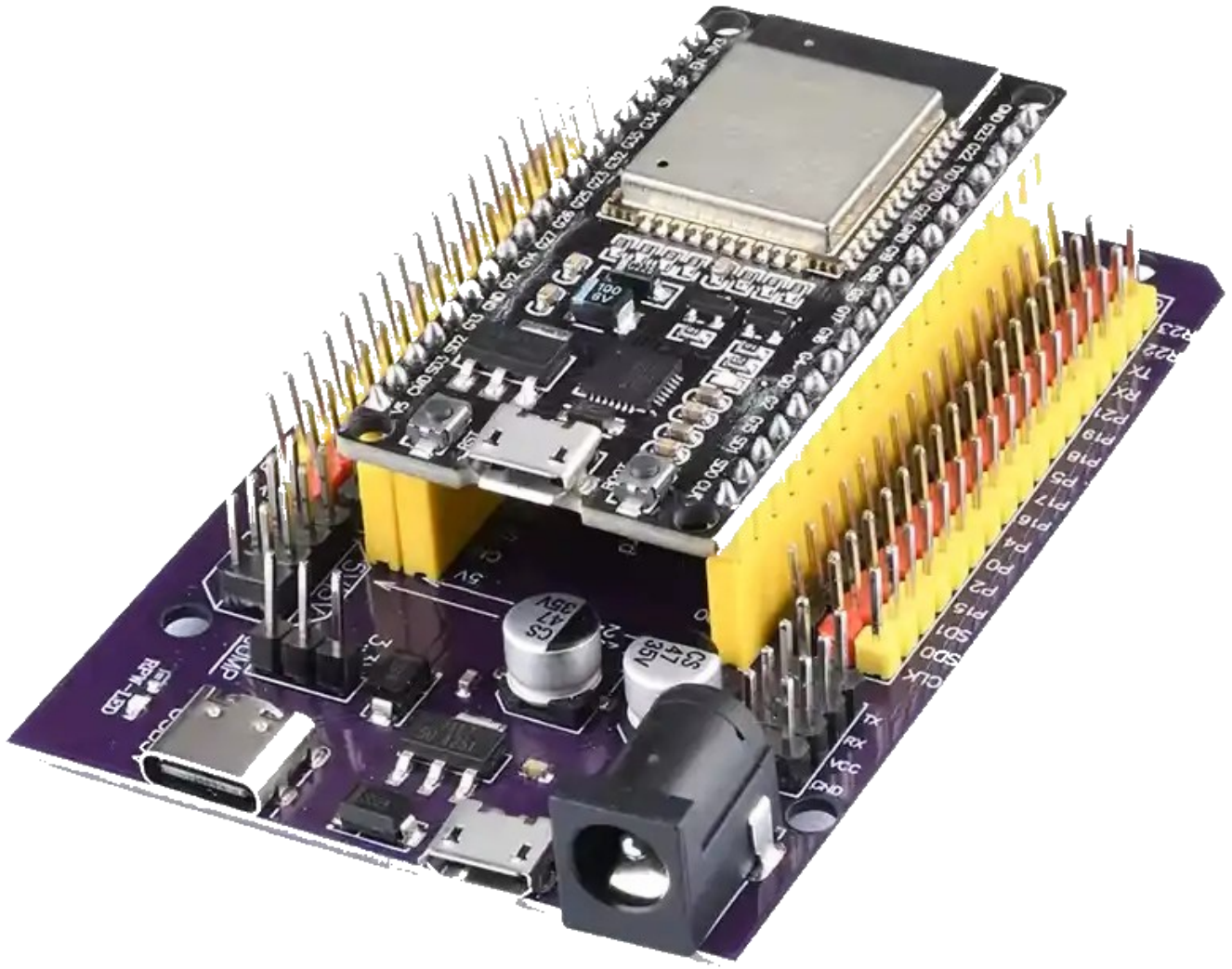




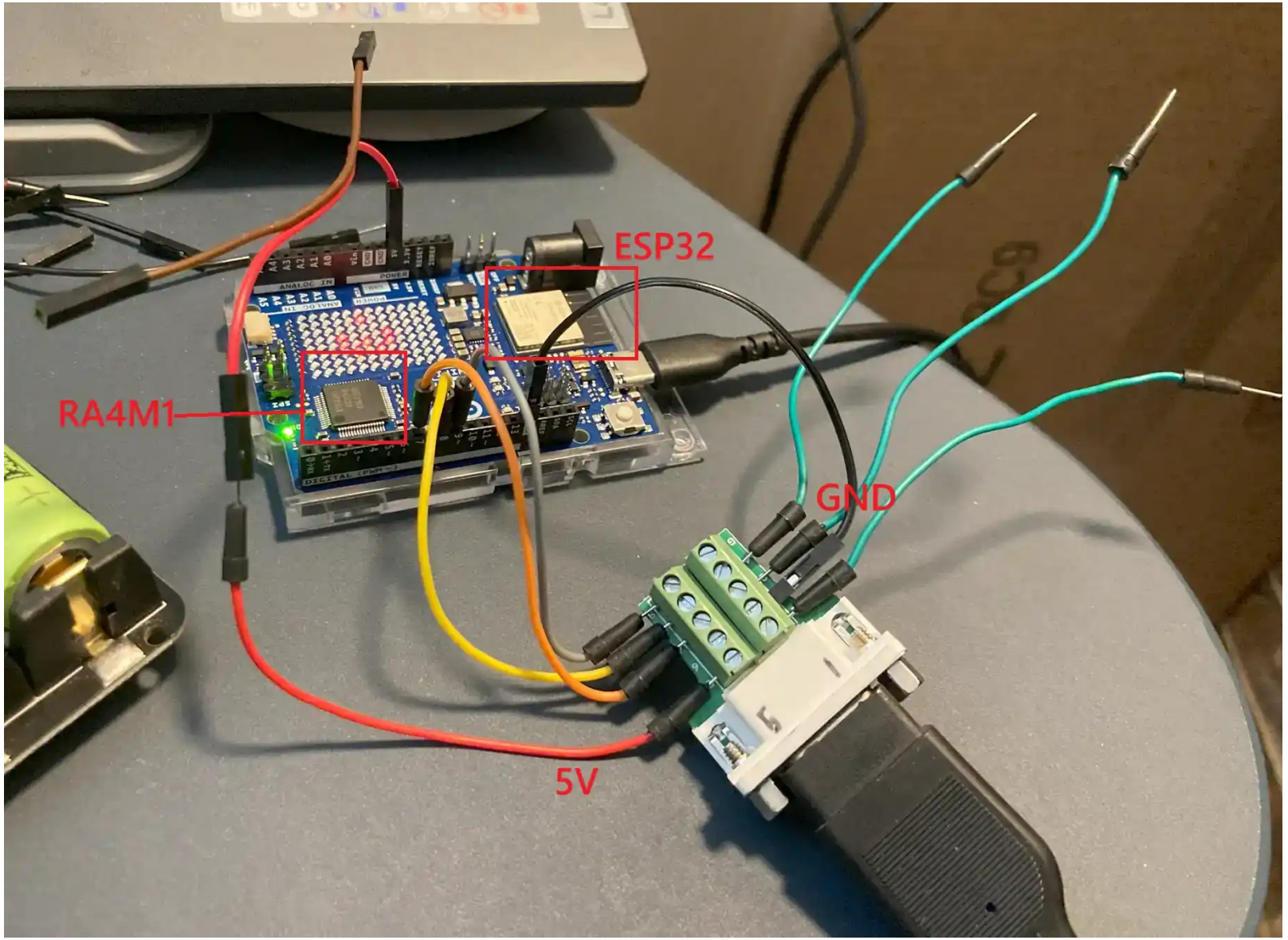
https://www.retrousb.com/product/nes-retroport/24

ESP32

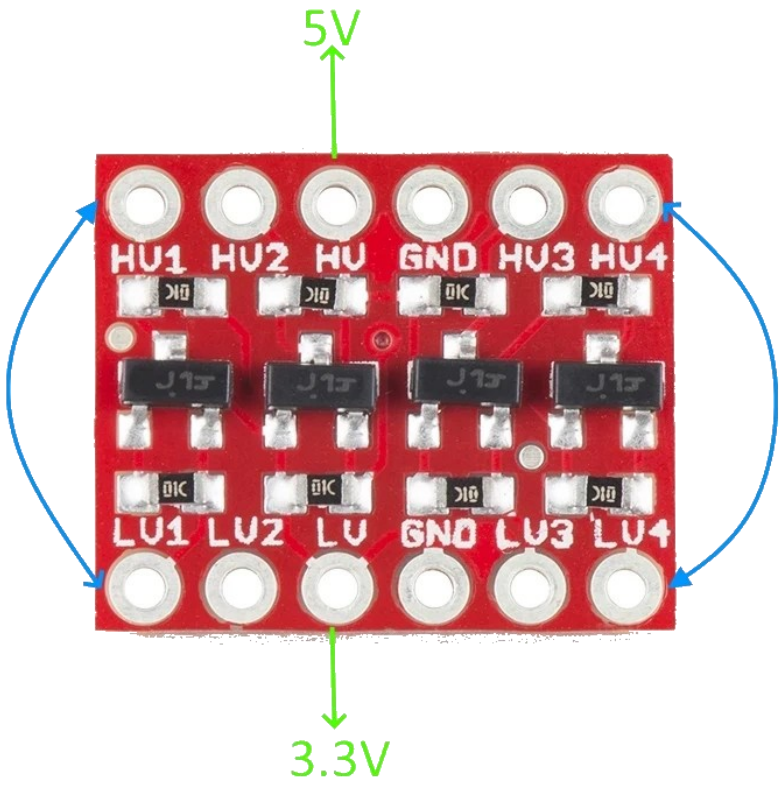

WiFi ESP-WROOM-32
FCC ID:2BCLP-ESP-32S
D1 R32
WeMos
ANALOG
SPI
USB
DC

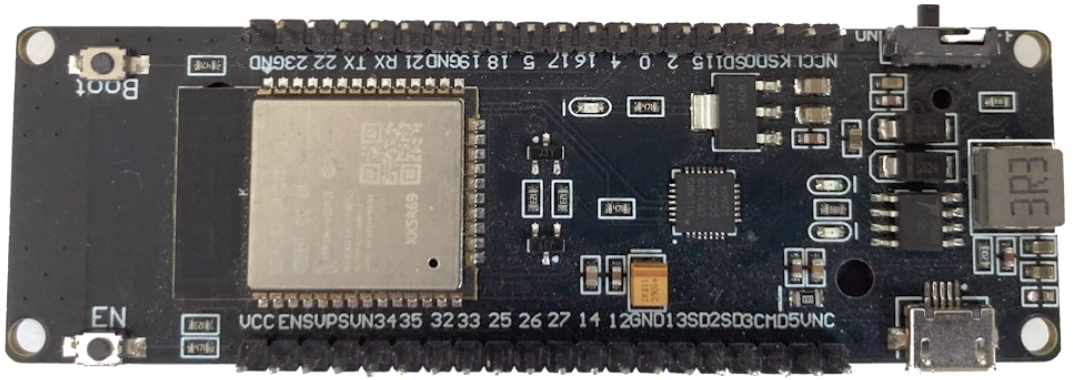


He was a 5V boy!



https://store.arduino.cc/products/uno-r4-wifi







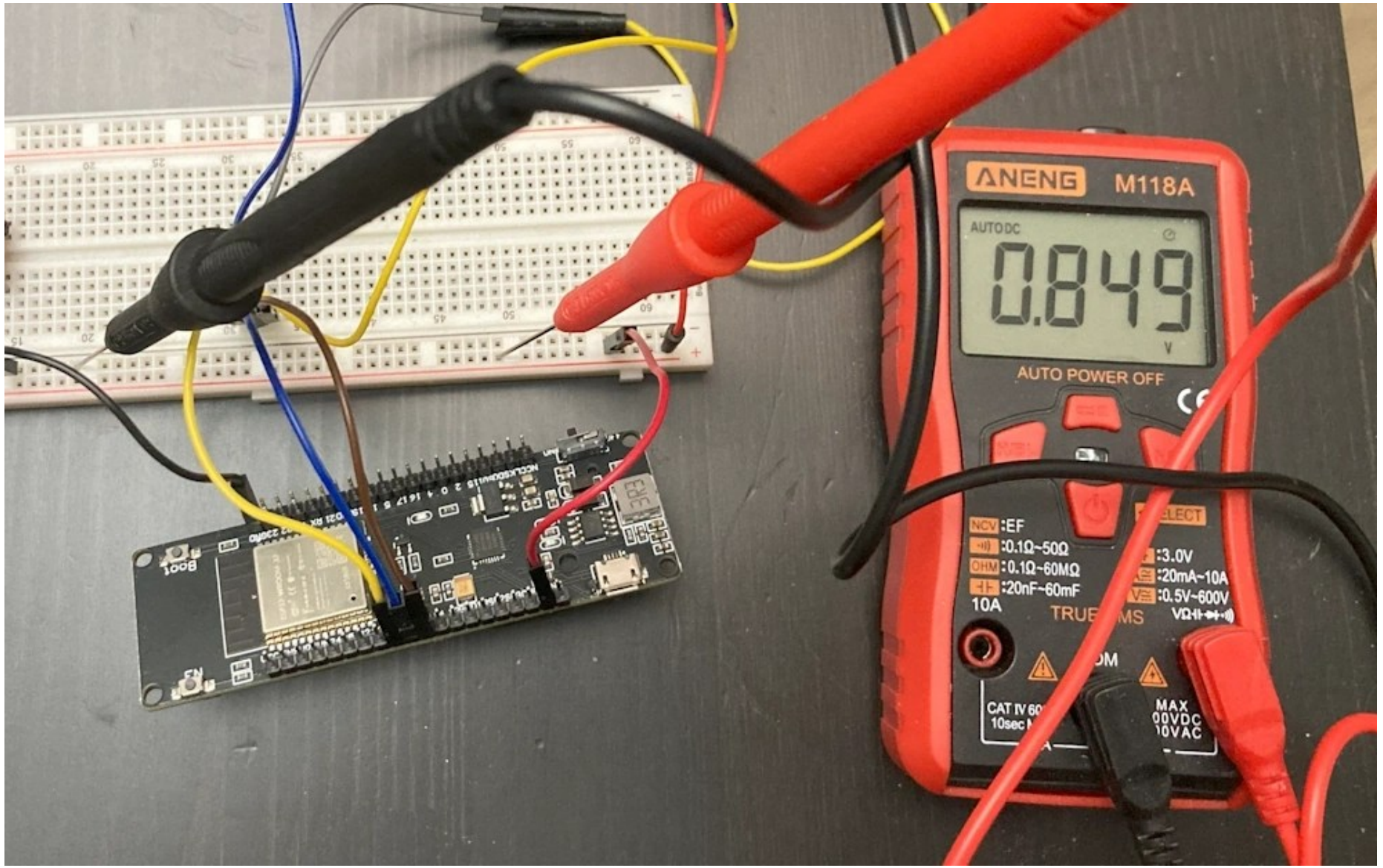
Level shifter: https://www.sparkfun.com/sparkfun-logic-level-converter-bi-directional.html
ESP32:
https://www.taydaelectronics.com/wifi-and-bluetooth-battery-esp-wroom-32-with-18650-battery-socket.html

18650

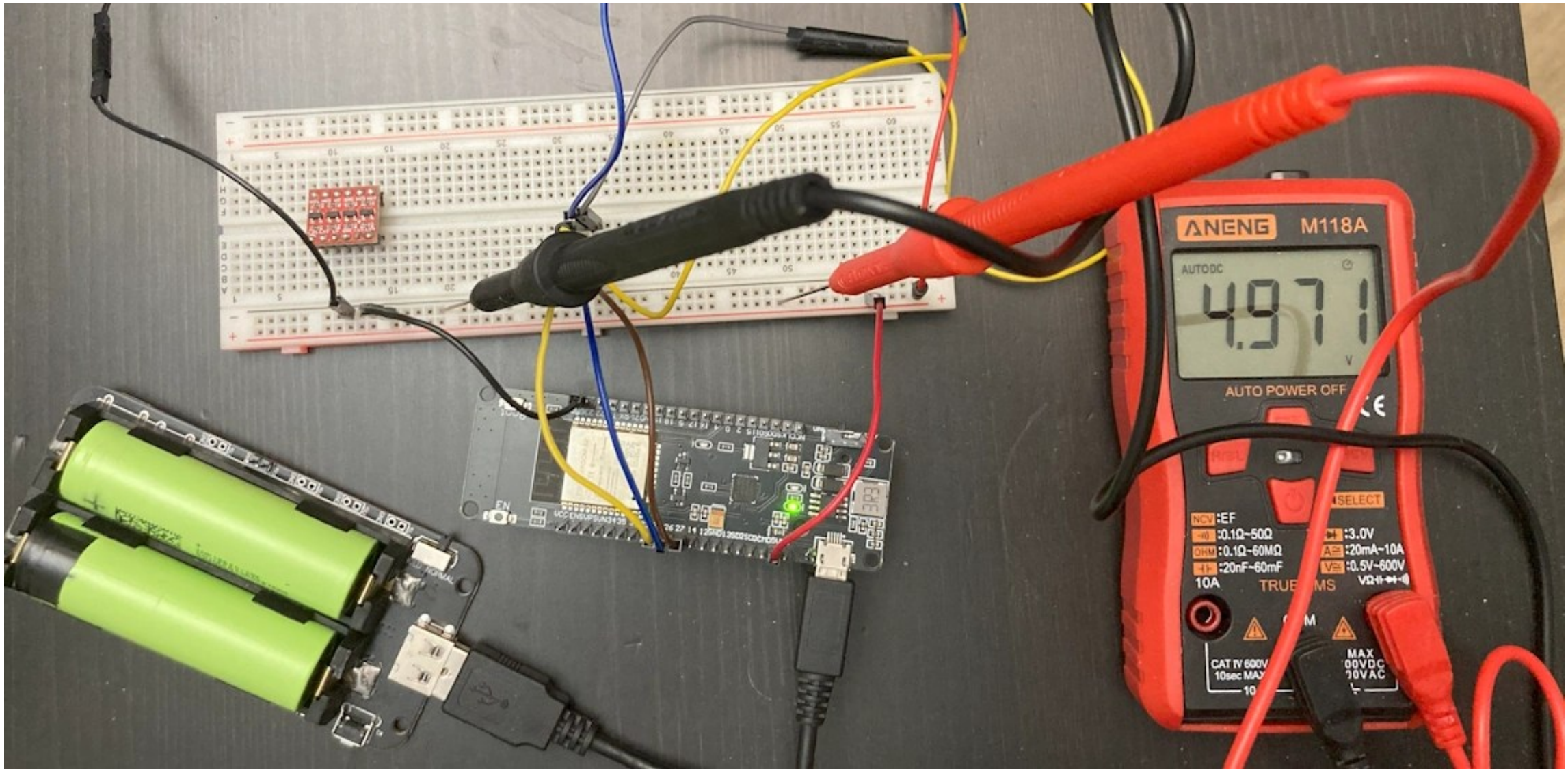


- Over discharge --> battery dies!
- Over charge --> bad!
- TP4056

Festival of Failures!



5V 5V Whatcha Gonna Do?

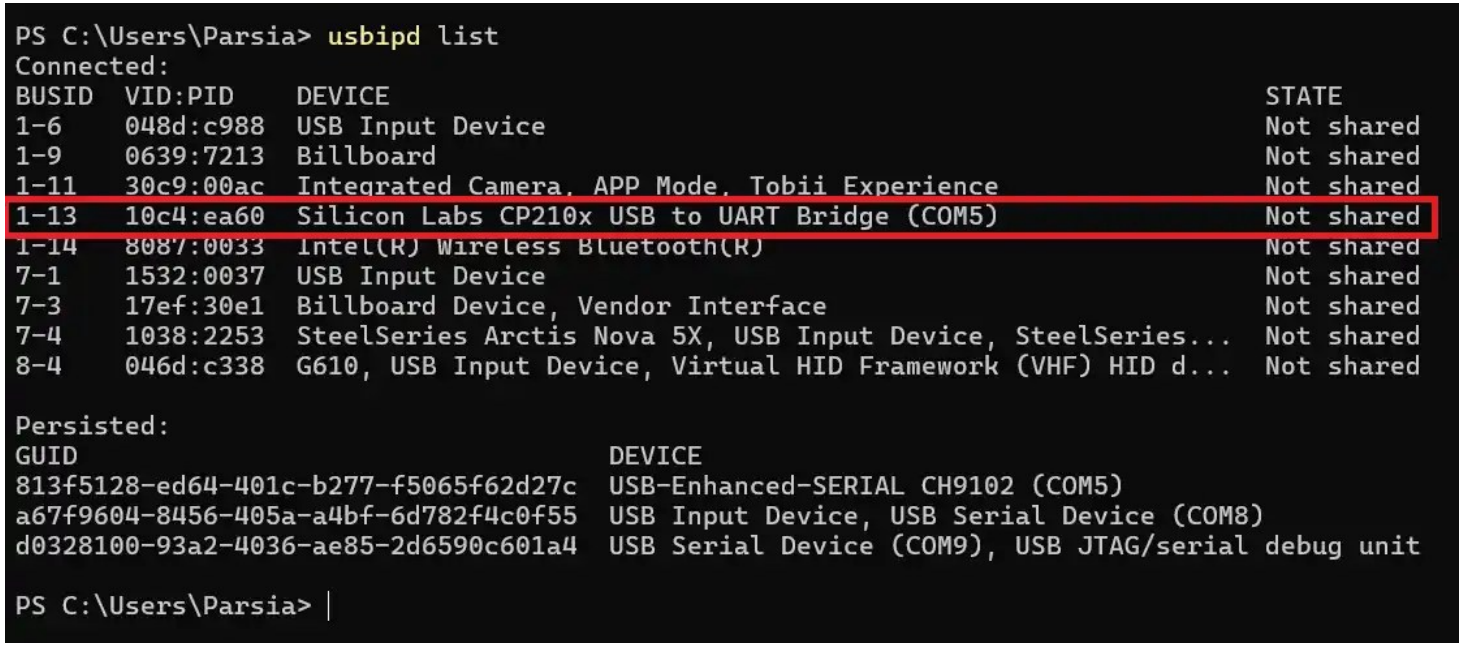


Development Environment

- Arduino IDE
  - Better on Windows (for me)
  - Has ESP32 support
  - Didn’t put the board in download mode – hold boot
- ESP-IDF
  - Better on WSL (for me)
  - No hands downloading
- Unlicensed code samples from Espressif are a life saver (some Apache V2).
  - https://github.com/espressif/esp-idf/blob/master/examples/

Setup in WSL

- On Windows:
  - winget install usbipd
  - usbipd list
  - usbipd --bind --b 1-13 (admin cmd)
  - usbipd attach --wsl --busid 1-13
    - After restart
- In WSL:
  - sudo modprobe vhci_hcd



Read NES Controller

```
uint8_t readController() {
  uint8_t tempData = 255;  // Preload a variable with all 1s. This means nothing is pressed.

  digitalWrite(LATCH, LOW);
  digitalWrite(CLOCK, LOW);
  delayMicroseconds(12);

  digitalWrite(LATCH, HIGH); // Pulse the LATCH
  delayMicroseconds(12);

  // After latching, we can read the first bit (A_BUTTON).
  if (digitalRead(DATA) == LOW) bitClear(tempData, 0);

  digitalWrite(LATCH, LOW);
  delayMicroseconds(6);
  // We have to read 7 more bits. So PULSE the clock and read the bits.
  for (int i = 1; i < 8; i ++) {
    digitalWrite(CLOCK, HIGH);
    delayMicroseconds(6);
    if (digitalRead(DATA) == LOW) {
      bitClear(tempData, i);
    }
    digitalWrite(CLOCK, LOW);
    delayMicroseconds(6);
  }
  return tempData;
}
```

Bluetooth Mouse

```
uint8_t buttons = 0;
char dx = 0;
char dy = 0;

// Up
if (!(incomingData & BUTTON_UP)) dy = -1;
// Down
if (!(incomingData & BUTTON_DOWN)) dy = 1;
if (!(incomingData & BUTTON_LEFT)) dx = -1;
// Right
if (!(incomingData & BUTTON_RIGHT)) dx = 1;

// A was pressed. Left-click, set the first bit to 1.
if (!(incomingData & BUTTON_A)) buttons = 1;

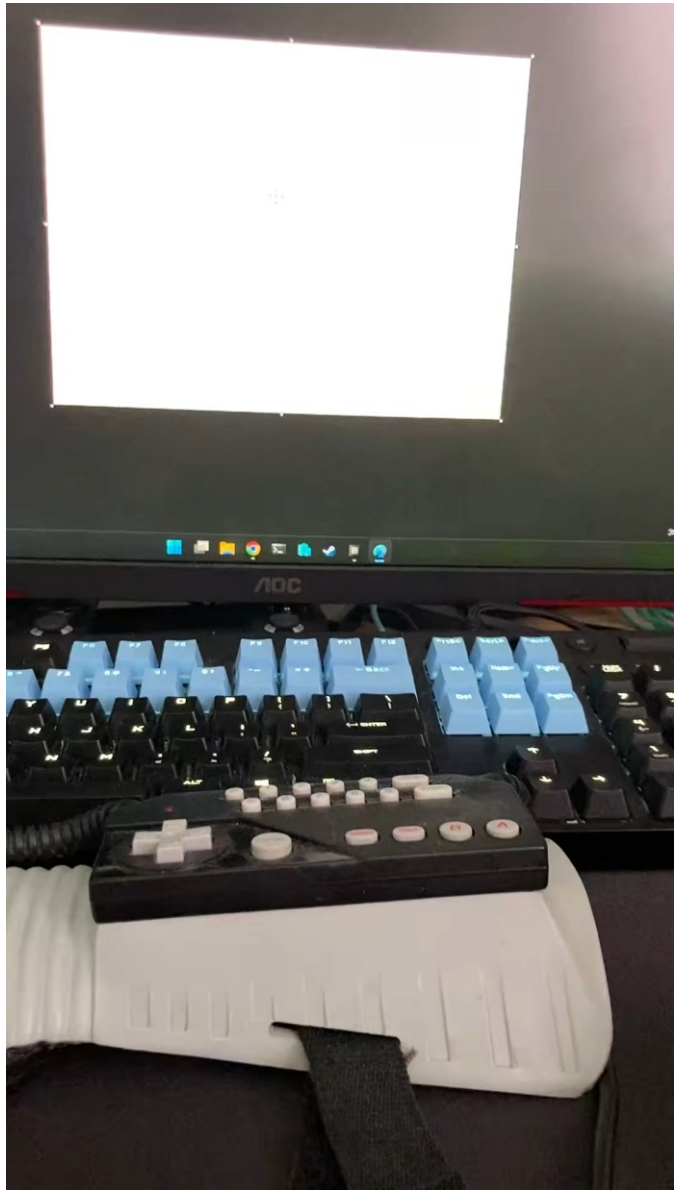
// B was pressed. Right-click, set the 2nd bit to 1.
if (!(incomingData & BUTTON_B)) buttons = 2;

// Optional: Do stuff with `Start` and `Select`.
// if (!(incomingData & BUTTON_SELECT)) actionC(); // Select
    // if (!(incomingData & BUTTON_START)) actionD(); // Start

// 4th item is wheel which is zero here.
send_mouse(buttons, dx*STEP, dy*STEP, 0);
```

- esp-idf/esp_hid_device example

World’s Clunkiest Etch A Sketch



Keyboard Report #1

```
// Check if lower or upper case
if(ch >= 'a' && ch <= 'z')
{
    buffer[0] = 0;
    // convert ch to HID letter, starting at a = 4
    buffer[2] = (uint8_t)(4 + (ch - 'a'));
}
else if(ch >= 'A' && ch <= 'Z')
{
    // Add left shift
    buffer[0] = USB_HID_MODIFIER_LEFT_SHIFT;
    // convert ch to lower case
    ch = ch - ('A'-'a');
    // convert ch to HID letter, starting at a = 4
    buffer[2] = (uint8_t)(4 + (ch - 'a'));
}
```

Library used: https://github.com/T-vK/ESP32-BLE-Keyboard

Bluetooth Keyboard Mappings

```
ButtonMapping arrowMappings[] = {
  {BUTTON_RIGHT, KEY_RIGHT_ARROW},
  {BUTTON_LEFT,  KEY_LEFT_ARROW},
  {BUTTON_UP,    KEY_UP_ARROW},
  {BUTTON_DOWN,  KEY_DOWN_ARROW},
};

MediaButtonMapping mediaMappings[] = {
  // KEY_MEDIA_WWW_SEARCH
  {BUTTON_A, {0, 8}},
  // KEY_MEDIA_LOCAL_MACHINE_BROWSER
  // My computer on Windows
  {BUTTON_B, {0, 1}},
  // KEY_MEDIA_CALCULATOR
  {BUTTON_SELECT, {0, 2}},
  // KEY_MEDIA_WWW_BOOKMARKS
  // Doesn't work on Windows :(
  {BUTTON_START, {0, 4}},
};
```

Demo?


POWER GLOVE
I am
the demo
OK, fine!
Source: 'School of Athens' by Raffaello Sanzio (1483-1520)

I Better See Some Weird Presentation Props Next Year

- Code: https://github.com/parsiya/PowerPointGlove
- Slides: https://github.com/parsiya/presentations
- Suggestions/feedback/jokes (after Aug 15th please):
  - https://parsiya.net
  - https://twitter.com/CryptoGangsta
  - “parsiya” in pretty much every place.