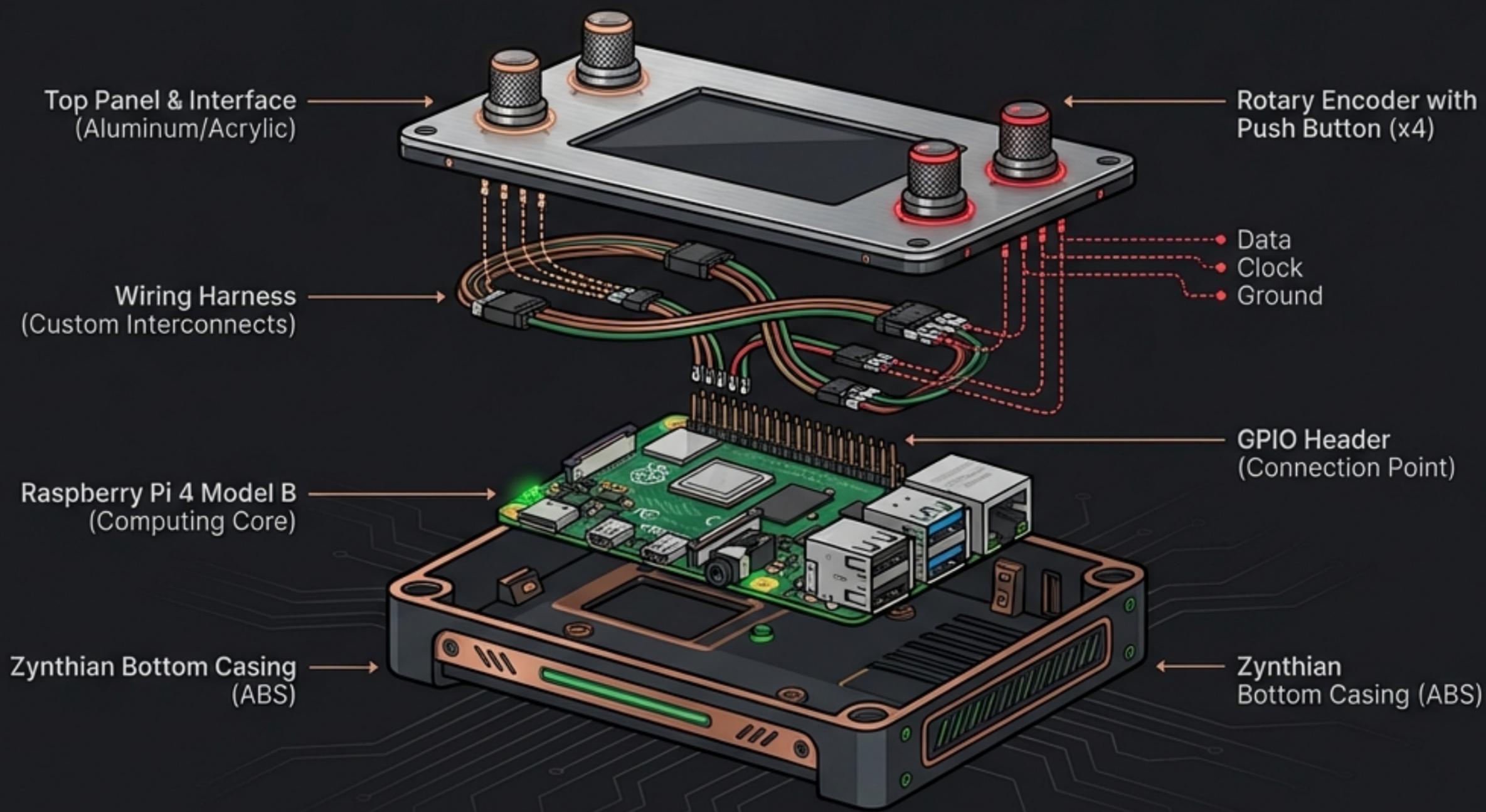


# CONTROL & INTERFACE

## Building the Zynthian Input System.



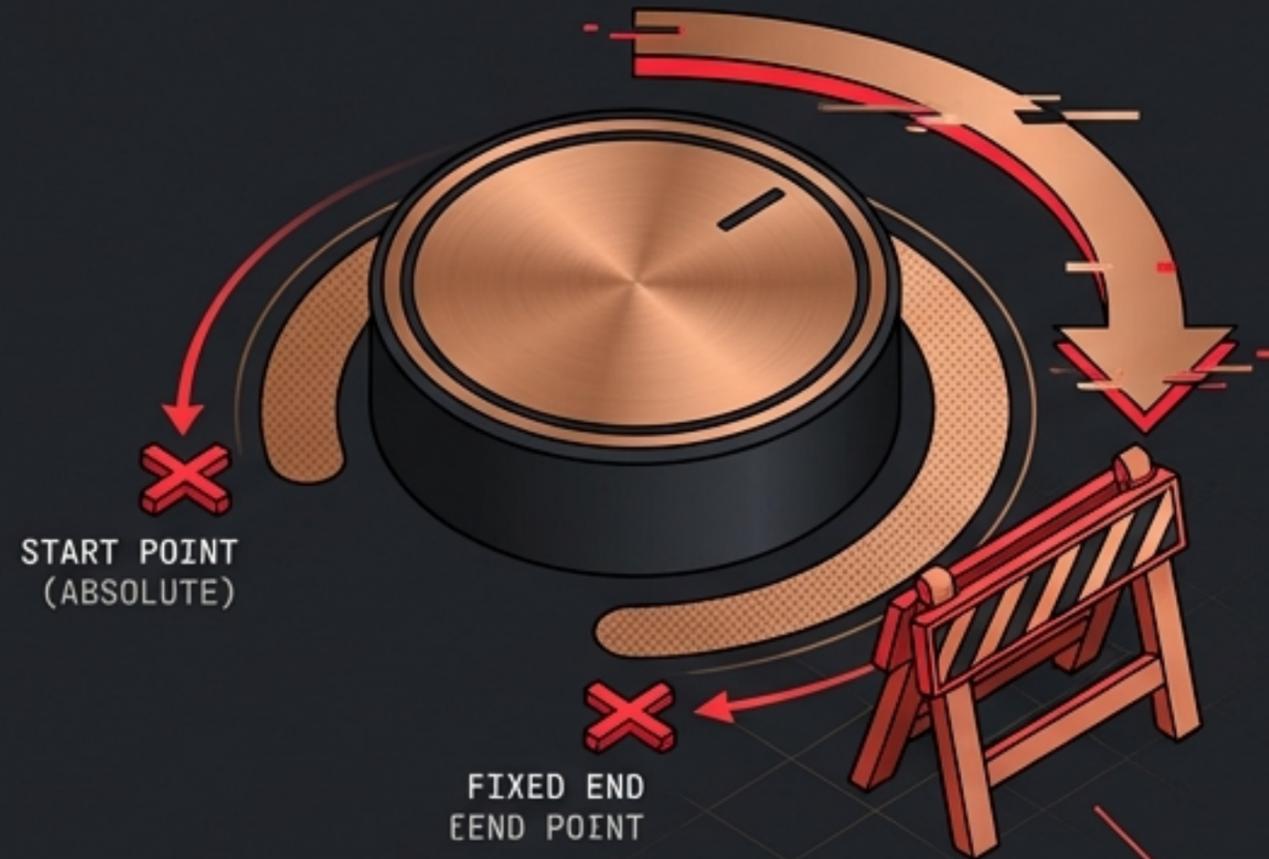
VOLTAGE	
USV	13.8V
CURRENT	
CURGIN	139. M0/s
DWE	180. M0/s
DWE	10320 M0/s
DATA	
USB 10	1000
CLOCK	1000
GROUND	1000
SERIAL	



From loose components to a responsive musical instrument.

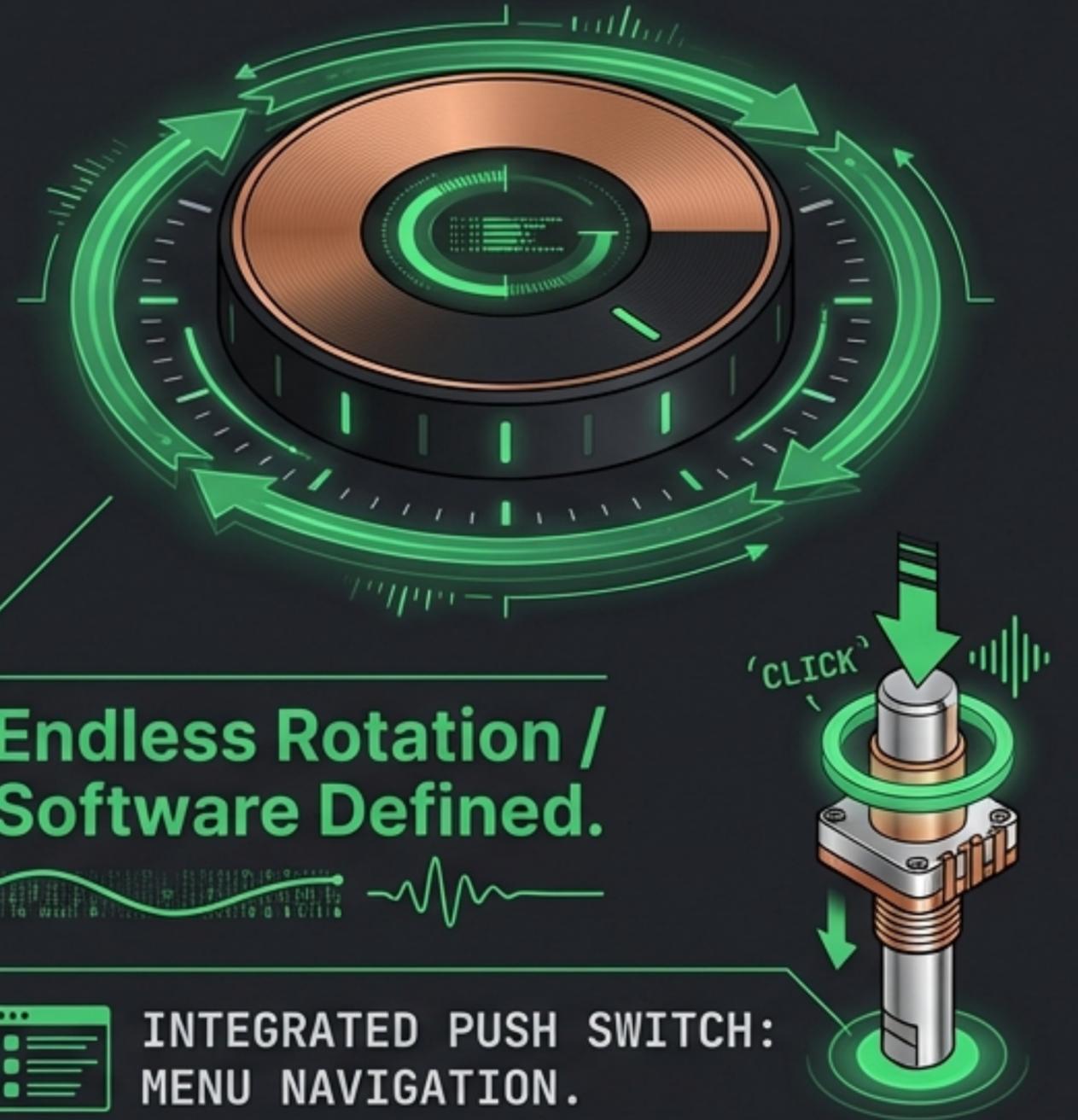
# THE ENCODER ADVANTAGE

## POTENTIOMETER (ABSOLUTE)



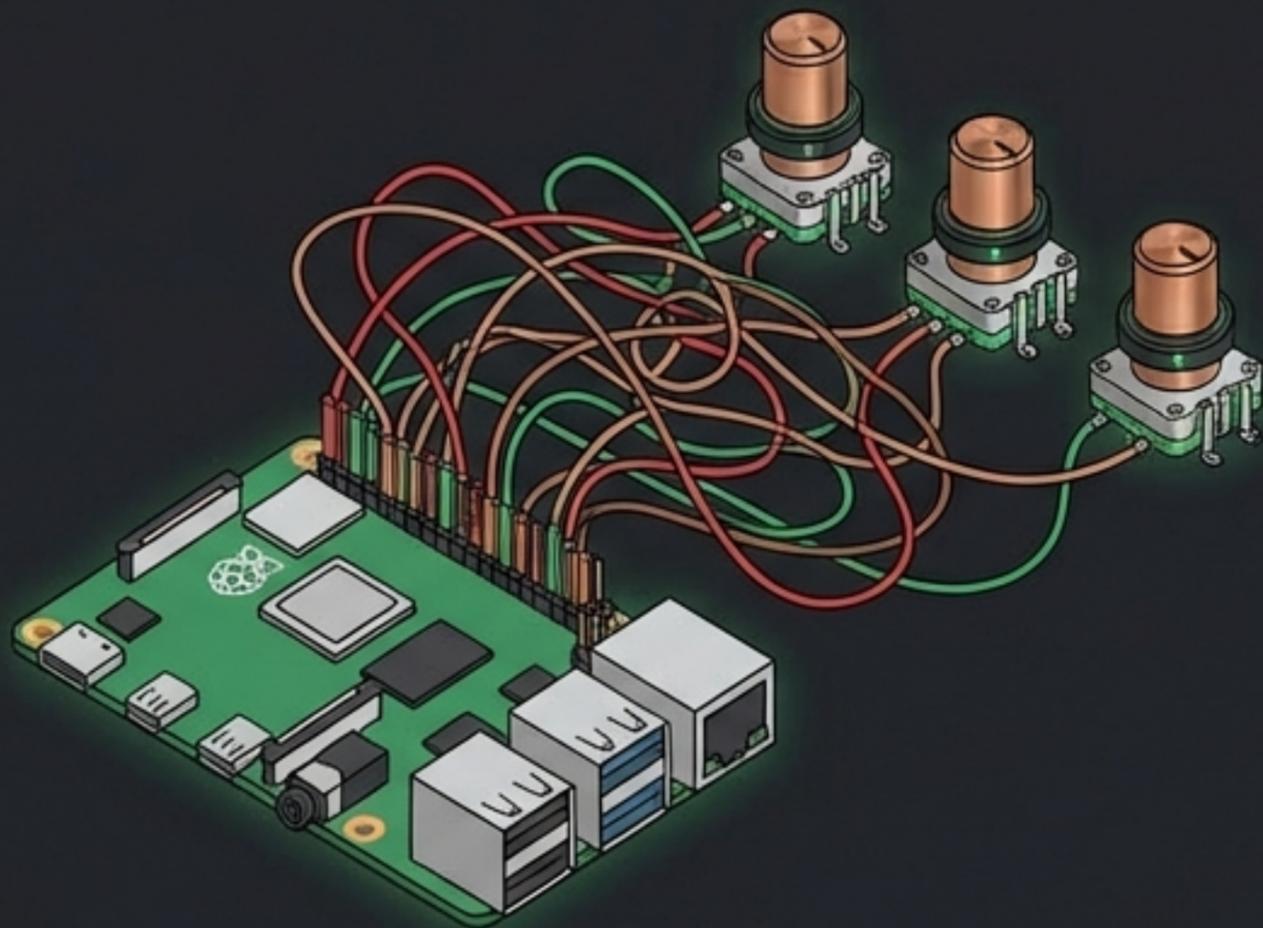
**Fixed Position / Jump Values.**

## ROTARY ENCODER (RELATIVE)



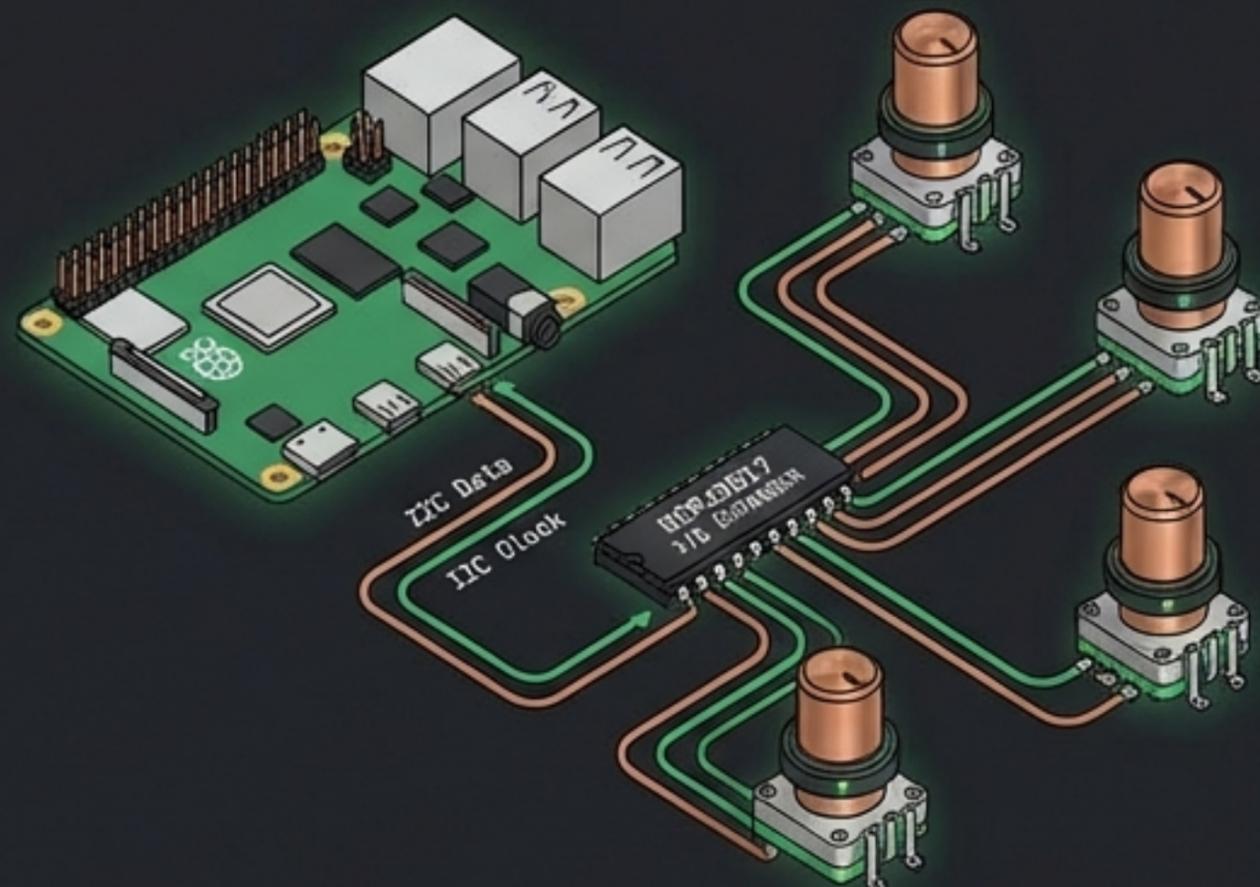
# CHOOSE YOUR ARCHITECTURE

## PATH A: DIRECT GPIO



- Simple hardware (no extra chips)
- High pin consumption
- Risk of conflict with Audio HATs

## PATH B: MCP23017 EXPANDER



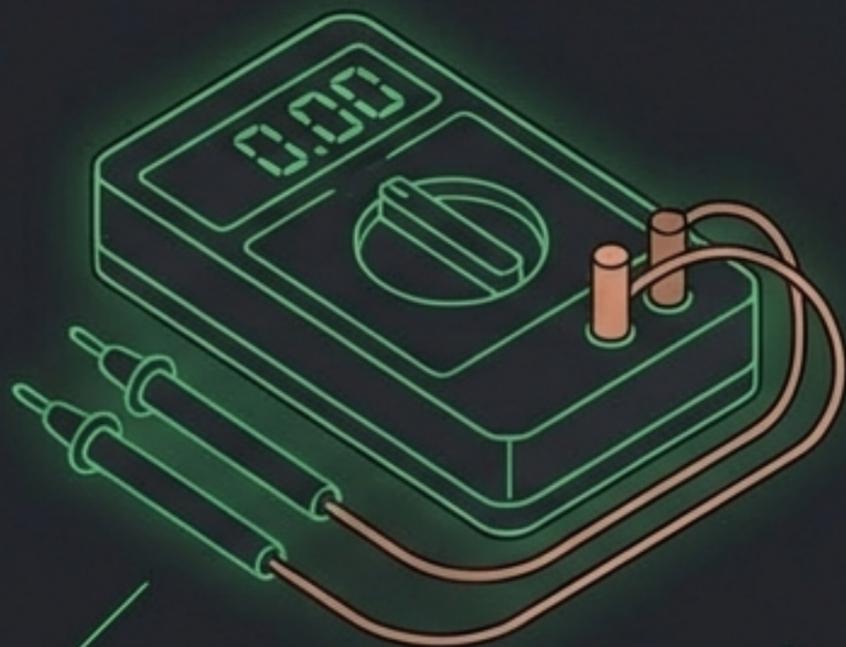
- Uses I2C Bus (2 pins)
- Expandable & Clean
- Handles Interrupts
- Recommended for Pro Builds

# THE MAKER'S TOOLKIT



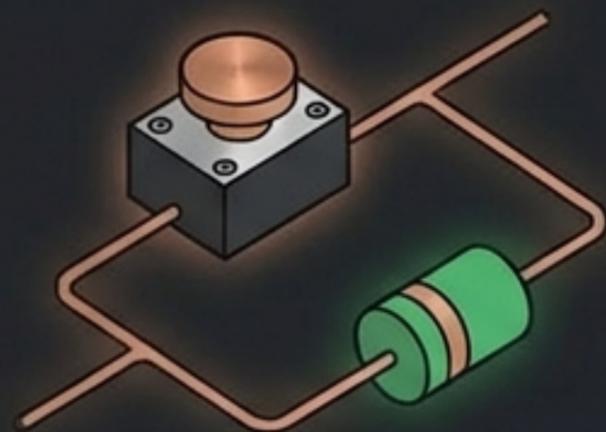
## Connection Hygiene

Use Flux for lead-free solder. Cold joints fail silently.



## The Truth Teller

Check Continuity (Beep Test) before powering on. Verify no shorts.



## Hardware Debouncing

100nF caps for switches, 10nF for encoders. Saves CPU cycles.

# ROUTE A: DIRECT GPIO WIRING

**DANGER:** 3.3V Logic Only.  
Never connect encoders to 5V.

Direct wiring requires careful GPIO in GPIO header.

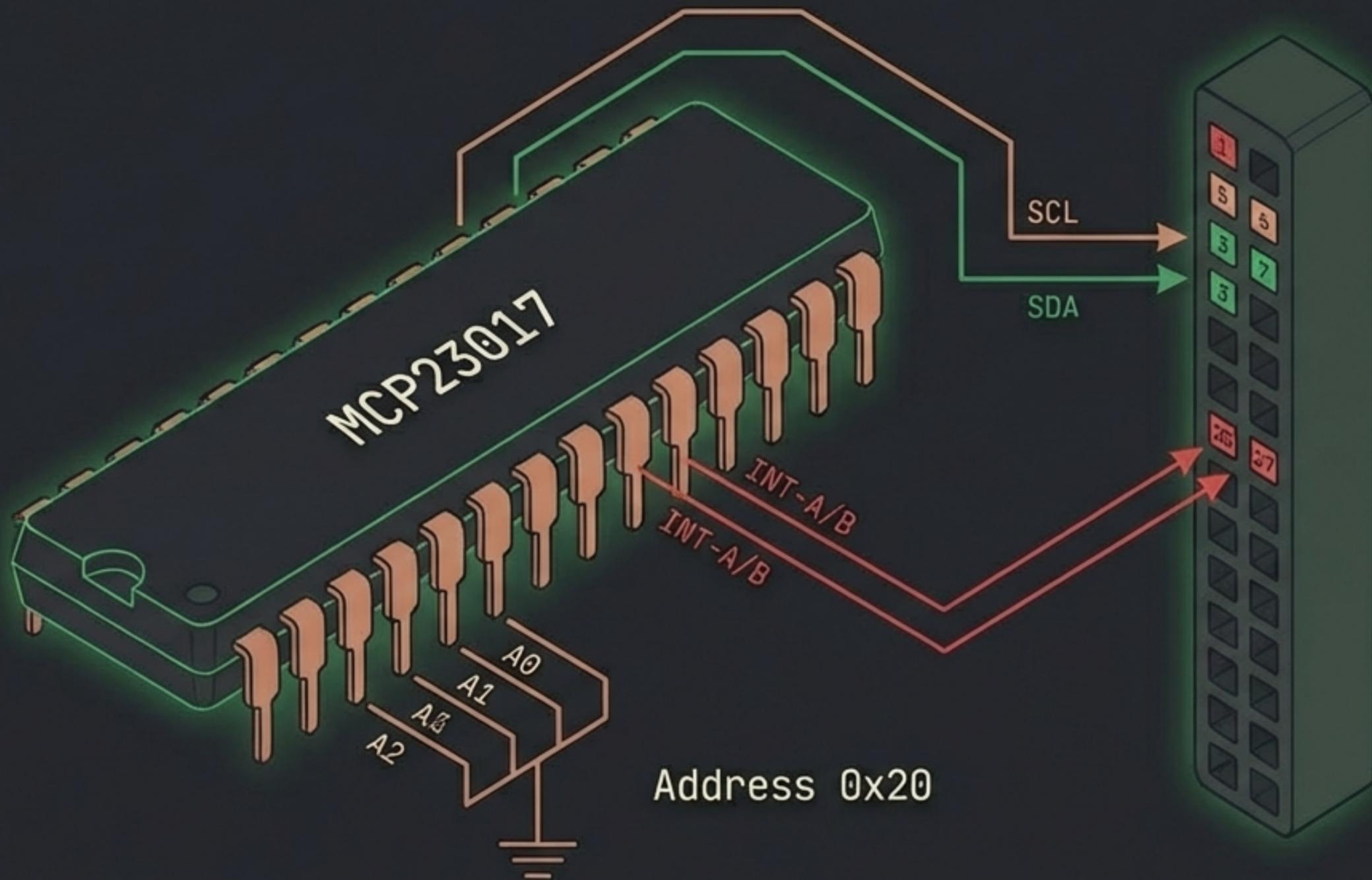
Direct wiring requires careful pin selection to avoid system conflicts.

**FORBIDDEN / RESERVED.**

**SAFE ZONES.**

**SAFE ZONES.**

# ROUTE B: MCP23017 INTEGRATION



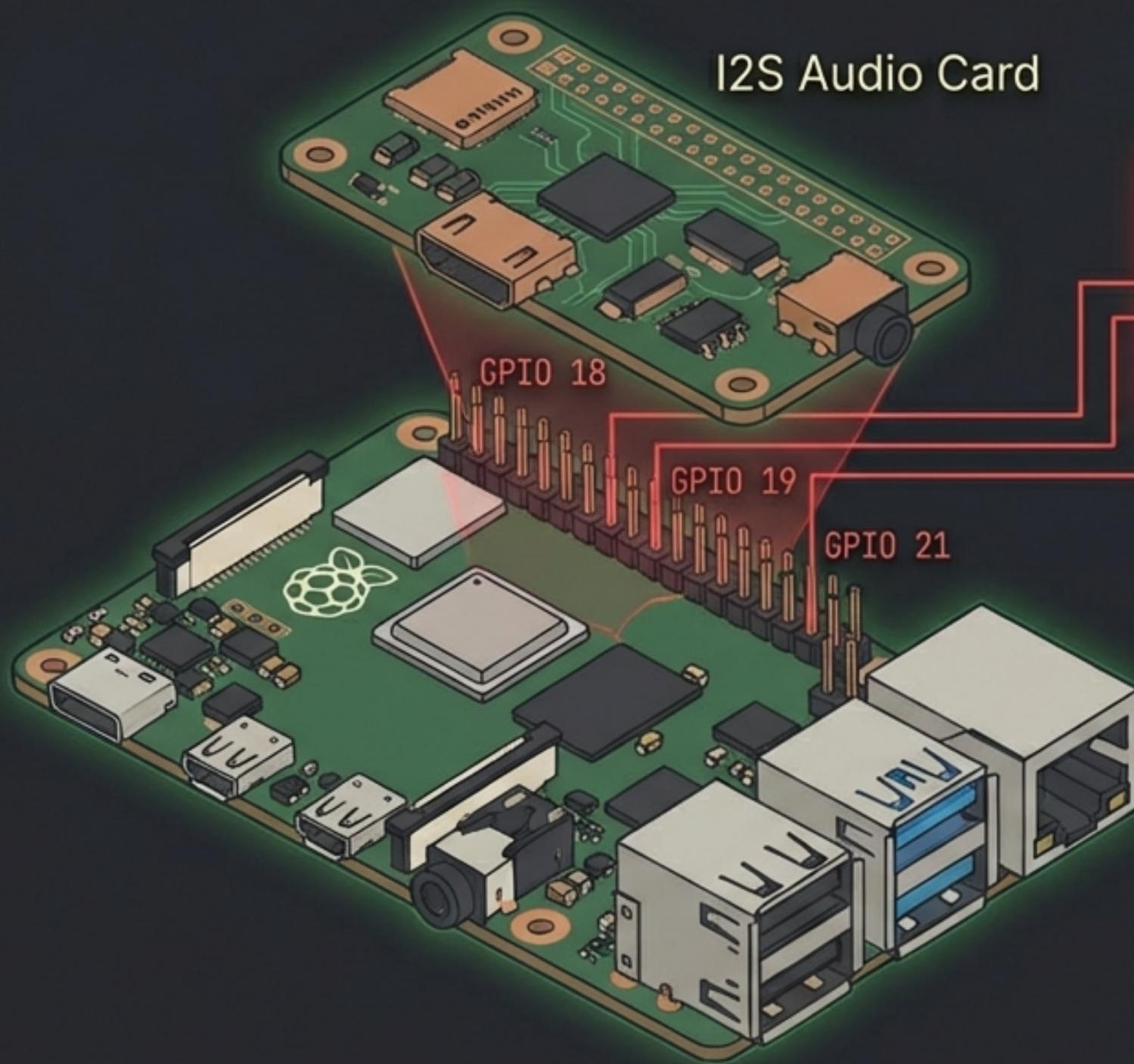
The MCP chip acts as a bridge, translating 16 inputs into a single I2C data stream.

# THE PIN NUMBERING ROSETTA STONE

	PHYSICAL PIN (Board)	WIRINGPI (Legacy)	BCM (Broadcom)
1	Pin 3	8	GPIO 2
2	Pin 5	9	GPIO 3
3	Pin 40	29	GPIO 21

Zynthian  
WebConf  
speaks BCM.  
Ignore physical  
pin numbers  
when configuring  
software.

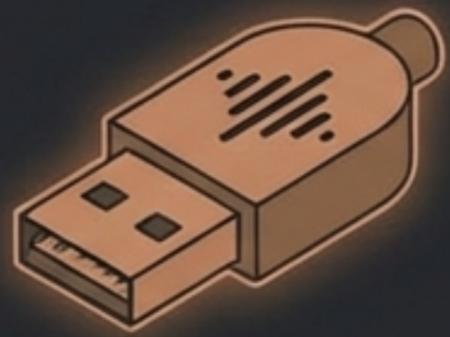
# SYSTEM CONTEXT: AUDIO & CONFLICTS



BLOCKED by I2S Audio. Do not use for Encoders.

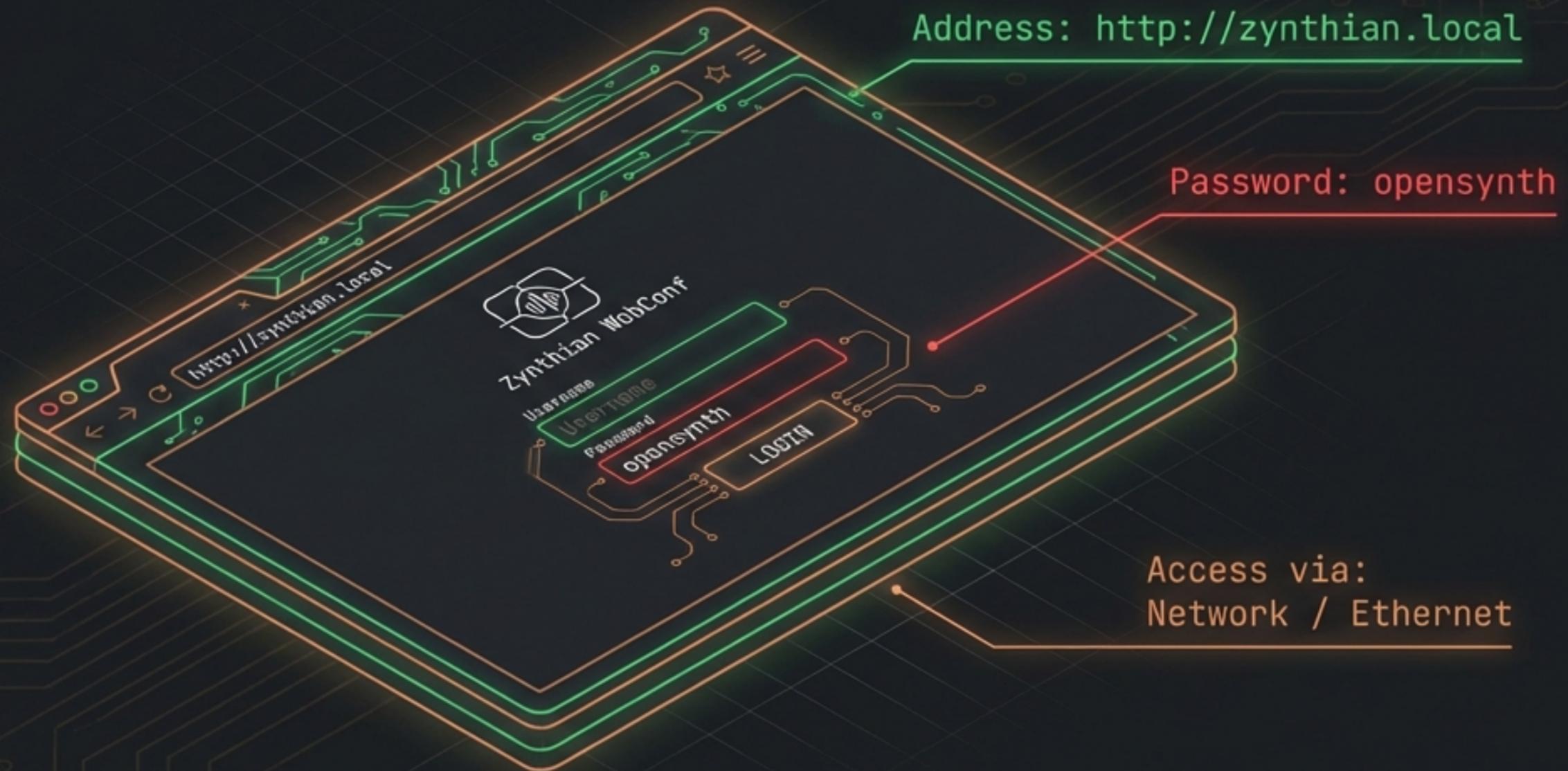
Frees up all GPIO pins for maximum control flexibility.

Frees up all GPIO pins for maximum control flexibility.



USB Audio

# ENTERING THE DIGITAL WORKSHOP



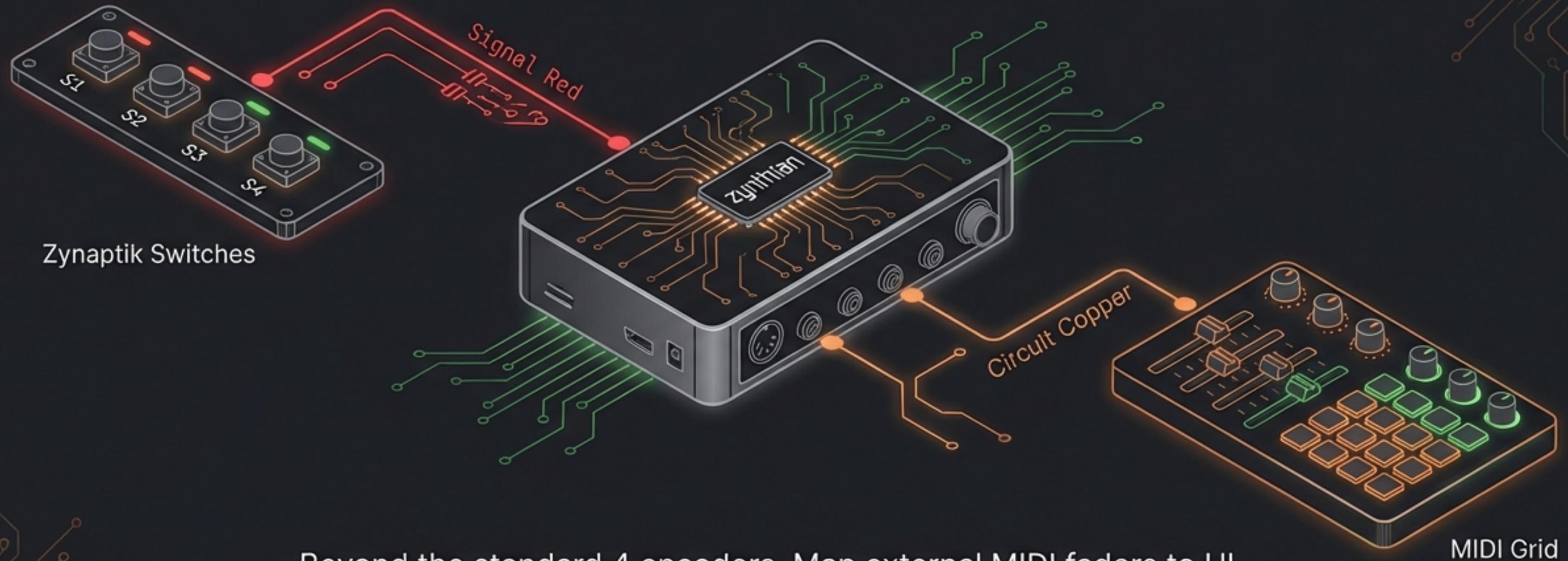
The soldering is done. Now we tell the brain what the body looks like.

# MAPPING THE HARDWARE



**PRO TIP:** Use 'Dummies' setting for any unused encoder slots to prevent software errors.

# ADVANCED CONTROL



Beyond the standard 4 encoders. Map external MIDI faders to UI parameters or use Zynaptik for custom function switches.

# TROUBLESHOOTING: HARDWARE LAYER

```
> i2cdetect -y 1
    0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
10:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
20:  --  --  --  20  --  --  --  --  --  --  --  --  --  --  --  --
30:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
40:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
50:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
60:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --
70:  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --  --

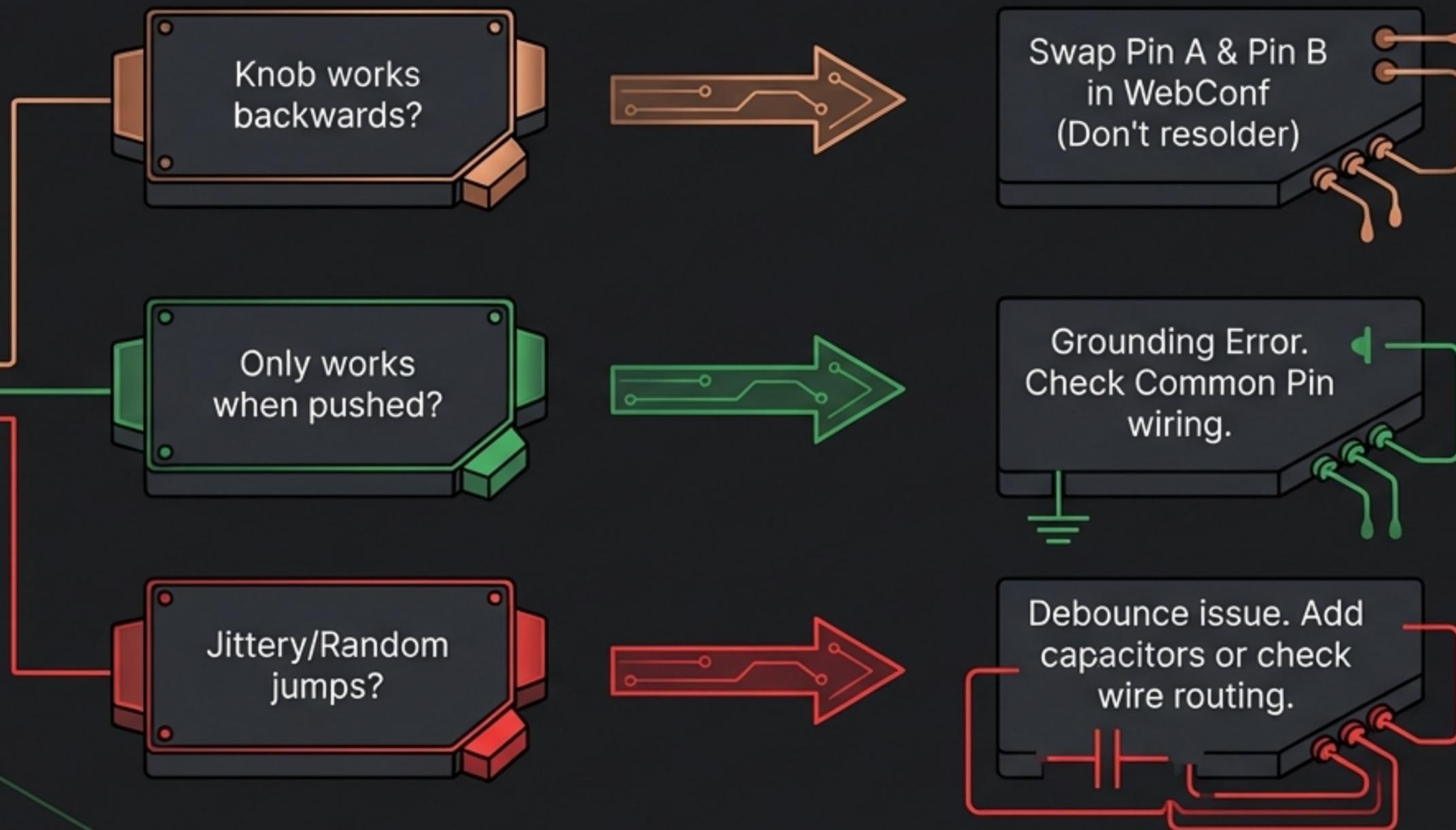
> gpio readall
-----Pi 4-----
| BCM | wPi | Name      | Mode | V | Physical | V | Mode | Name      | wPi | BCM |
|-----|-----|-----|-----|---|-----|---|-----|-----|-----|-----|
|  2  |  8  | 3.3v SDA.1 | ALTO  | 1 |    3     | 4 |      | 5v 5v     |    8 |    2 |
|  3  |  9  | 3.3v SCL.1 | ALTO  | 1 |    5     | 6 |      | 0v 0v     |    9 |    3 |
|  4  |  7  | GPIO. 7   | IN    | 1 |    7     | 8 | 1 ALTO | TxD    |   15 |   14 |
|     |     | 0v       |      | 1 |    9     |10 | 1 ALTO | RxD    |   16 |   15 |
| 17  |  0  | GPIO. 0   | IN    | 0 |   11     |12 | 0 IN   | GPIO. 1 |    1 |   18 |
| 27  |  2  | GPIO. 2   | IN    | 0 |   13     |14 | 0 IN   | 0v     |    4 |   23 |
| 22  |  3  | GPIO. 3   | IN    | 0 |   15     |16 | 0 IN   | GPIO. 4 |    4 |   23 |
|     |     | 3.3v     |      | 0 |   17     |18 | 0 IN   | GPIO. 5 |    5 |   24 |
| 10  | 12  | MOSI     | ALTO  | 0 |   19     |20 | 0 IN   | 0v     |    6 |   25 |
|  9  | 13  | MISO     | ALTO  | 0 |   21     |22 | 0 IN   | GPIO. 6 |    6 |   25 |
| 11  | 14  | SCLK     | ALTO  | 0 |   23     |24 | 1 OUT  | CE0    |   10 |    8 |
|     |     | 0v       |      | 1 |   25     |26 | 1 OUT  | CE1    |   11 |    7 |
```

MCP23017 Detected.

**SYMPTOM: DEAD INPUTS**

Fix: Check power to chip and SDA/SCL continuity.

# TROUBLESHOOTING: LOGIC LAYER



# THE BUILDER'S GOLDEN RULES



# READY TO PLAY



Component -> Architecture ->  
Wiring -> Config -> Music.

Join the conversation at [discourse.zynthian.org](https://discourse.zynthian.org)