01 ELECTRODE INPUTS — USE J1 OR J2, NOT BOTH

Signal	J1 · 3.5 mm jack	J2 · 3 pins (silkscreen)	Purpose
IN+	Tip	pin 1 · "+" (square pad)	Positive measuring electrode
IN−	Ring	pin 2 · "−"	Negative measuring electrode
REF	Sleeve	pin 3 · "REF"	Reference / driven right leg: cancels mains hum

The amplifier measures IN+ minus IN−; swapping them only flips the signal. REF is actively driven to VCC/2 (current limited to about 13 µA by 390 kΩ). Cable colours differ: follow the plug position (Tip / Ring / Sleeve), or check with a multimeter in continuity mode.

02 OUTPUT HEADER J3

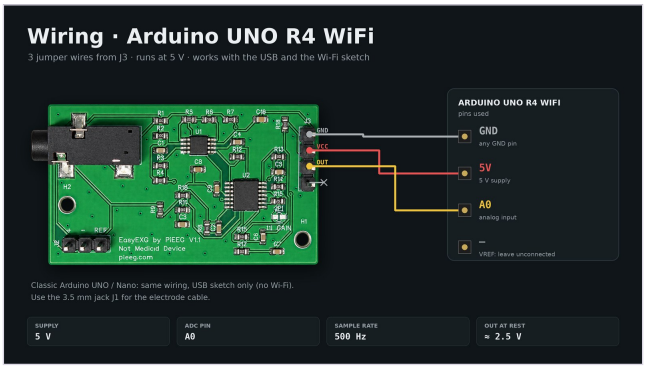
Pin	Name	Connect to	Notes
1	GND	MCU GND	Square pad
2	VCC	MCU 5 V or 3.3 V	Same voltage as the MCU ADC range. Max 5.5 V
3	OUT	MCU analog input (A0)	Rests at VCC/2, swings with the biosignal
4	VREF	Not needed	VCC/2 reference, optional: for a differential ADC or hardware offset removal

03 WIRING TO YOUR MICROCONTROLLER

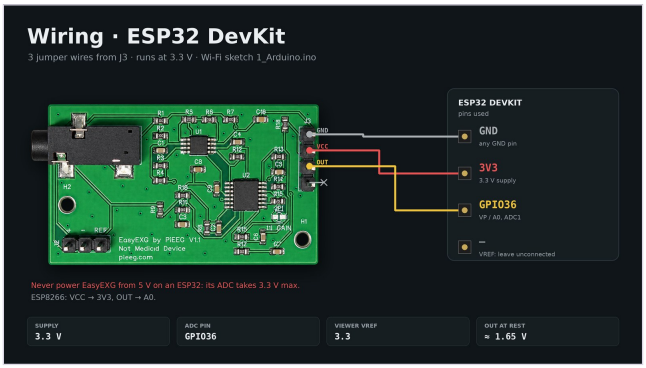
MCU	VCC from	OUT to	GND	Software
Arduino UNO R4 WiFi	5V	A0	GND	USB or Wi-Fi sketch
Arduino UNO / Nano / Mega	5V	A0	GND	USB sketch
ESP32	3V3	GPIO36 (VP, A0)	GND	Wi-Fi sketch
ESP8266	3V3	A0	GND	Wi-Fi sketch
Raspberry Pi Pico	3V3(OUT), pin 36	GP26 / ADC0, pin 31	pin 38	USB sketch (Arduino-Pico core)
STM32 (Arduino core)	3V3	PA0 or any ADC pin	GND	USB sketch, change PIN

3.3 V BOARDS

OUT swings between 0 V and VCC. On an ESP32, ESP8266 or Pico, power EasyEXG from 3.3 V so the analog pin never sees more than 3.3 V, and set VREF = 3.3 in the Python viewer so µV values are correct.

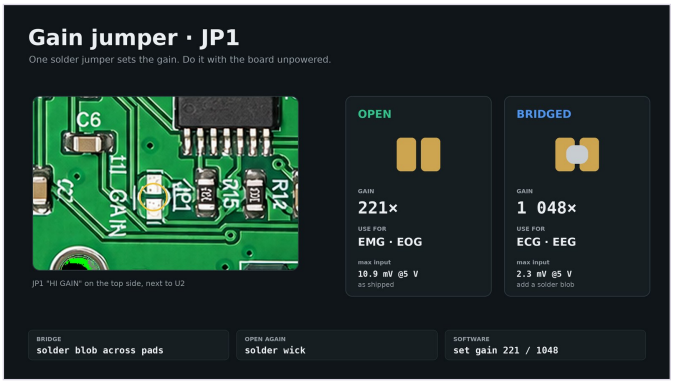


Arduino UNO R4 WiFi: 5V, A0, GND



ESP32 DevKit: 3V3, GPIO36, GND

04 GAIN JUMPER JP1



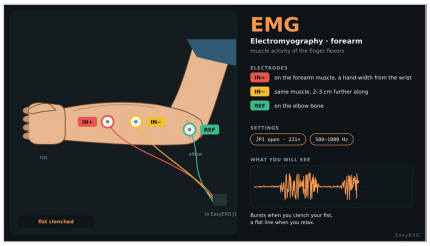
JP1	Gain	Use
Open (as shipped)	221×	EMG, EOG
Bridged	1 048×	ECG, EEG

- **To bridge:** board unpowered, heat both pads and add a small solder blob that joins them.
- **To open:** remove the solder with solder wick.
- **Software:** the Gain setting must match JP1, otherwise µV values are 4.7× off.

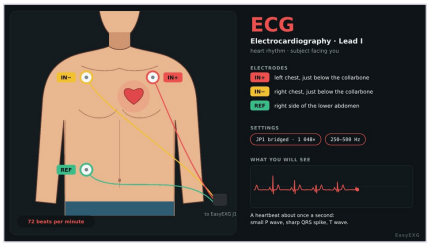
05 ELECTRODE PLACEMENT

Signal	JP1	IN+ (Tip)	IN− (Ring)	REF (Sleeve)	Rate
EMG forearm	Open	Forearm muscle, a hand-width from the wrist	Same muscle, 2–3 cm further along	Elbow	500–1000 Hz
ECG Lead I	Bridged	Left chest, below the collarbone	Right chest, below the collarbone	Right lower abdomen	250–500 Hz
EOG horizontal	Open	Outer corner of the right eye	Outer corner of the left eye	Centre of the forehead	100–250 Hz
EOG vertical	Open	Just above one eyebrow	Just below the same eye	Forehead, to the side	100–250 Hz
EEG Fp1	Bridged	Forehead above the left eye	Left earlobe	Centre of the forehead	250 Hz

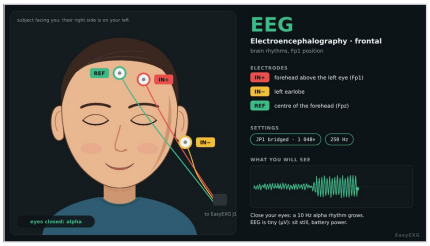
"Right" and "left" mean the person's own right and left. Electrode colours in the pictures: IN+ red · IN− yellow · REF green.



EMG: forearm

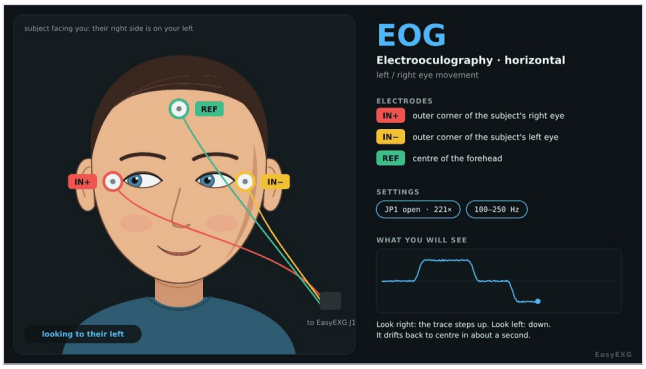


ECG: chest, Lead I

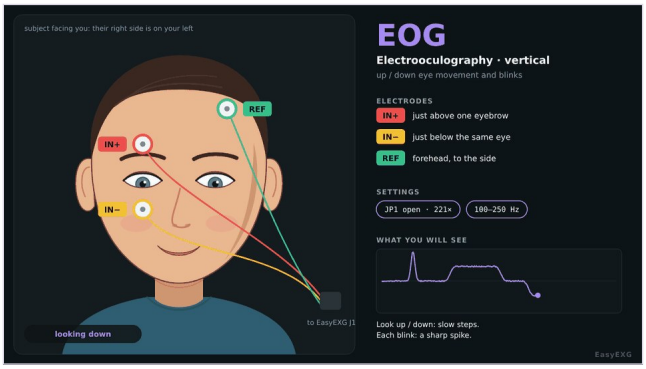


EEG: Fp1 and earlobe

06 EYE MOVEMENT (EOG)



Horizontal EOG: steps for look left / right



Vertical EOG: steps for up / down, spikes for blinks

07 BEFORE YOU START

- **Clean the skin:** alcohol wipe or soap and water, then let it dry. Oil and dead skin are the main cause of noise.
- **Snap first:** snap the electrodes onto the cable, then stick them on. Pressing a stuck electrode moves it.
- **Set JP1:** open for EMG / EOG, bridged for ECG / EEG.
- **Battery only:** then plug the cable into J1.
- **Wait 10–20 s:** the 0.16 Hz high-pass needs a few seconds to settle after the electrodes go on.

08 ELECTRODE TIPS

Do	Don't
Use fresh gel electrodes on clean, dry skin	Reuse dried-out electrodes
Push the plug fully into J1	Let the cable hang and pull on the electrodes
Keep the cable short and away from power strips	Record next to a charger or a running motor
Put REF on a bony, neutral spot	Put REF on a muscle you are measuring

09 WHAT YOU NEED (NOT INCLUDED)

- **Microcontroller:** Arduino UNO R4 WiFi, ESP32 or ESP8266 for Wi-Fi; any UNO, Nano or Pico for USB.
- **Electrode cable:** 3-lead snap cable with a 3.5 mm TRS plug (Tip IN+, Ring IN−, Sleeve REF).
- **Electrodes:** disposable Ag/AgCl snap electrodes, 3 per session.
- **Wires and power:** 3 Dupont jumper wires; a 5 V power bank or a laptop on battery.
- **Soldering iron:** only to bridge JP1 for ECG / EEG.