# Build 1 - Body cord tester

Everything for ONE pocket tester. Building several? Multiply every quantity. ★ = local stores rarely stock this, plan to order it.

## Parts

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|---|---|---|---|
| ☐ | 6 | **4 mm banana jacks, panel mount**<br>the plain spring-leaf kind, NOT the sheathed safety type; any colours |
| ☐ | 1 | **TP4056 lithium charger board, USB-C, protected** ★<br>the little red board; protected = it has OUT+ and OUT- pads too |
| ☐ | 1 | **18650 battery, 2000 mAh or more**<br>flat top or button top both fine |
| ☐ | 1 | **18650 battery holder with wire leads**<br>plastic open holder with two wires coming out |
| ☐ | 1 | **Green LED, 3 mm**<br>ordinary cheap green - the slightly yellowish kind, not super-bright |
| ☐ | 1 | **Red LED, 3 mm** |
| ☐ | 1 | **820 ohm resistor**<br>anything 680 ohm to 1 k works; 1/8 W or 1/4 W |
| ☐ | 1 | **1.2 k ohm resistor**<br>anything 1 k to 1.5 k works |
| ☐ | 1 | **100 nF ceramic capacitor**<br>may be labelled 0.1 uF or stamped 104 |
| ☐ | 1 | **M3 x 10 brass pan-head screw + M3 heat-set insert**<br>this becomes the alligator-clip post |
| ☐ | 4 | **M2 x 6 screws + M2 heat-set inserts**<br>for the printed lid |
| ☐ | 1 roll | **Hookup wire, 26 AWG stranded**<br>two colours minimum; red + black ideal |

> **No switch needed.** The tester works by how you plug in: both ends plugged in = continuity test, only one end plugged in = shorts test. If a kit you buy includes slide switches, you simply will not use one.

> **Also needed, but not from a store:** the printed shell (body, lid, and the jack-spacing test coupon you print first to check your jacks really fit).

# Build 2 - Three-weapon scoring box

Everything for ONE box. ★ = order online, local stores almost never carry it.

## Parts

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| ☐ | **2** | **Black Pill STM32F401 board (WeAct F401CCU6) ★**<br>buy two, they are a few dollars each; this is the brain |
| ☐ | **1** | **ST-Link V2 programmer (clone) ★**<br>backup way to load firmware; USB alone usually works |
| ☐ | **7** | **4 mm banana jacks, panel mount**<br>6 fencer lines + 1 piste; real 3-pin fencing sockets also work |
| ☐ | **7** | **1 k ohm resistors, 1% metal film**<br>buy a strip of 10 or more so they all match each other |
| ☐ | **13** | **220 ohm resistors**<br>9 used, the rest spares |
| ☐ | **11** | **LEDs, 5 mm**<br>1 green, 1 red, 2 white, about 5 assorted for mode + fault, plus spares |
| ☐ | **1** | **Active piezo buzzer, 3.3 or 5 V**<br>active = it buzzes as soon as it gets power |
| ☐ | **1** | **NPN transistor, 2N2222 or PN2222 (TO-92)**<br>drives the buzzer so the chip pin does not have to |
| ☐ | **14** | **Small signal diodes, 1N4148**<br>static protection, two per fencing line - cheap insurance |
| ☐ | **2** | **Momentary pushbuttons, panel mount**<br>mode + reset; any small normally-open button |
| ☐ | **1** | **Perfboard / protoboard, 0.1 inch grid**<br>about 7 x 9 cm or larger |
| ☐ | **1** | **Heavy alligator clip lead**<br>clips the box to the metal piste |
| ☐ | **1 roll** | **Hookup wire, 22 AWG stranded** |
| ☐ | **1** | **USB power bank or 5 V wall supply**<br>powers the box; you may already own one |

> The seven 1 k resistors are the one place where matching matters - they set the sensing thresholds. Take them all from the same strip or bag.

> **Also needed, but not from a store:** an enclosure or project box, and a front panel to mount the lamps and jacks in.

# Optional add-ons and tools

Skip both optional sections on a first build if you want - neither changes how the box scores a touch.

## Optional - bright gym-visible lamps (scoring box)

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|---|---|---|
| ☐ | 4 | **Logic-level MOSFET, TO-220 (IRLB8721 or IRLZ44N)** ★<br>must say logic level; these drive the light strips |
| ☐ | 4 | **10 k ohm resistors**<br>gate pulldowns |
| ☐ | 1-2 m | **5 V LED strip**<br>white, plus red and green - cut into four lamp zones |
| ☐ | 1 | **5 V 2 A supply or power bank**<br>if the one powering the box cannot also feed the strips |

## Optional - hit simulator test rig

| | | |
|---|---|---|
| ☐ | 1 | **Arduino Nano (clone is fine)** ★<br>fires exact-millisecond fake touches to verify the timings |
| ☐ | 7 | **2.2 k ohm resistors** |
| ☐ | 1 | **8-channel USB logic analyzer (24 MHz clone)** ★<br>only needed to measure lockout to the microsecond |
| ☐ | 1 set | **Dupont jumper wires, male-male and male-female** |

## Tools - only if you do not already have them

| | | |
|---|---|---|
| ☐ | 1 | **Soldering iron + rosin-core solder**<br>any 30-60 W iron is plenty |
| ☐ | 1 | **Multimeter**<br>even a cheap one; you want resistance + continuity |
| ☐ | 1 | **Heat-shrink tubing, assorted**<br>or electrical tape in a pinch |
| ☐ | 1 | **Wire strippers** |

> **Counter translation cheats.** TP4056 means nothing to a clerk - ask for a lithium 18650 USB charging module. Resistor values are forgiving everywhere in the tester (they only set LED brightness), so a single assortment pack covers every value on all three pages. The Black Pill, ST-Link, Nano and logic analyzer are online-only at nearly every local store.