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Supplementary information

Inducing different severities of traumatic brain injury in Drosophila using a piezoelectric actuator

In the format provided by the authors and unedited

Supplementary Video 1
Severe compression in the low-throughput and high-throughput devices.

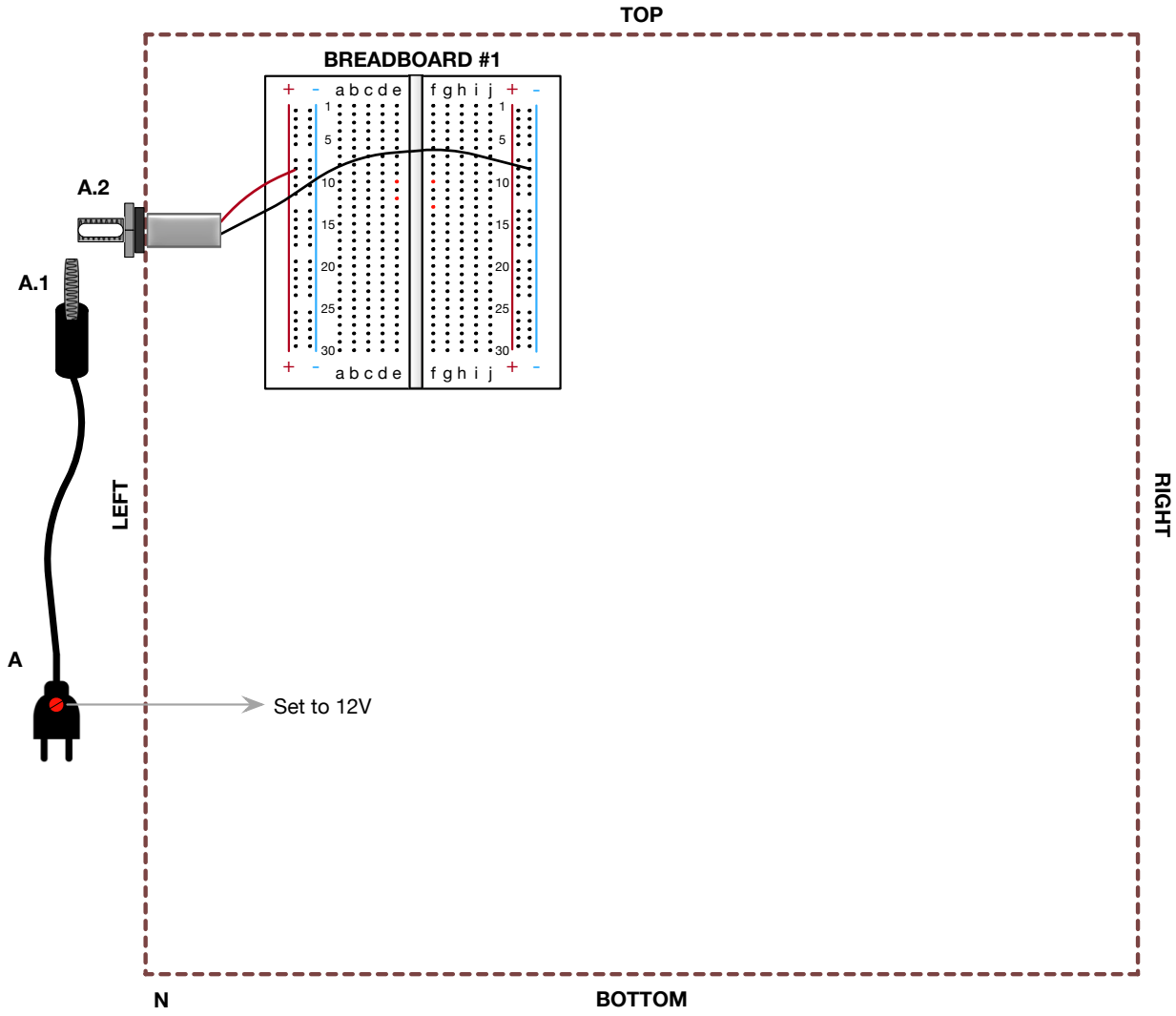
Supplementary Video 2
Calibration and compression measurements in the low-throughput device: The measurements of % head compression, the gap between the collar surface and piezoelectric (purple), height of uncompressed fly head (green), height of fly head at the point of maximum compression (blue), and the gap between the head and the piezoelectric (red) corresponding in location to the schematic in **Fig 5b**.

Supplementary Video 3
Collar loading and unloading protocol: A step-by-step guide on using a pair of blunt forceps to load the fly into the collar and move it along the groove with the forceps or a paintbrush.

Supplementary Video 4
dTBI procedure: A step-by-step guide on positioning the collar under the piezoelectric and performing the injury.

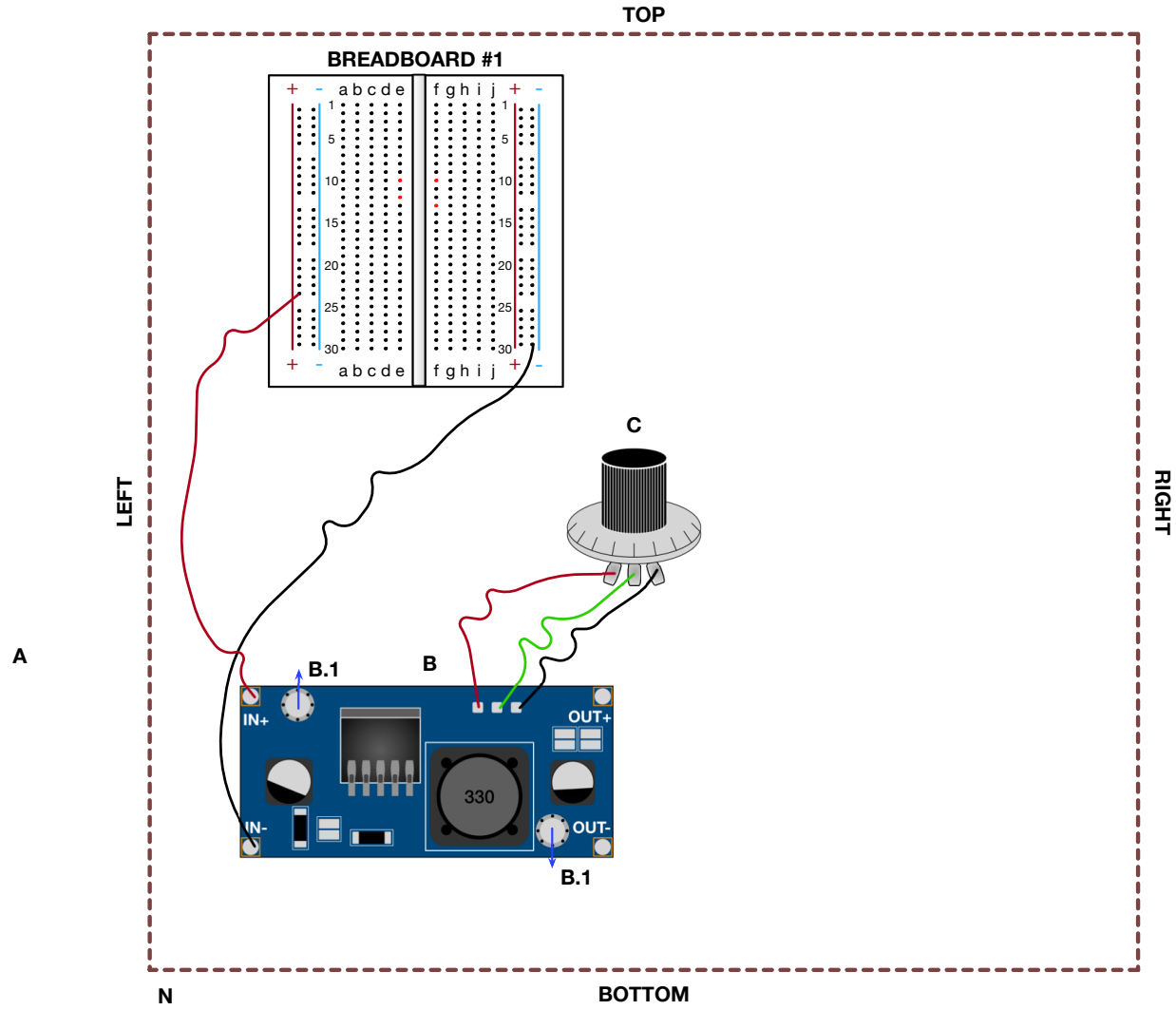
Supplementary Software 1
Arduino code to operate dTBI machine.

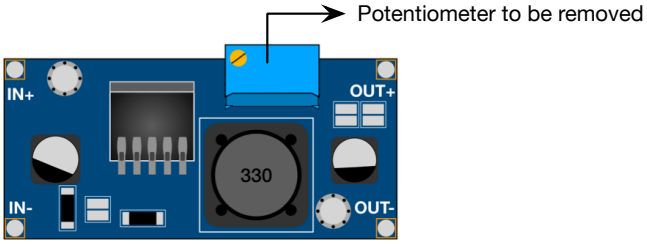
SUPPLEMENTARY FIGURES
Supplementary Fig 1



dTBI device wiring diagram for Steps 2-5: The component labelling corresponds to the Materials section and **Fig 3**, the wiring and wire colour correspond to the Device Construction section. A) Power supply, A.1) Male DC power supply plug, A.2) panel mount with female jack N) Enclosure

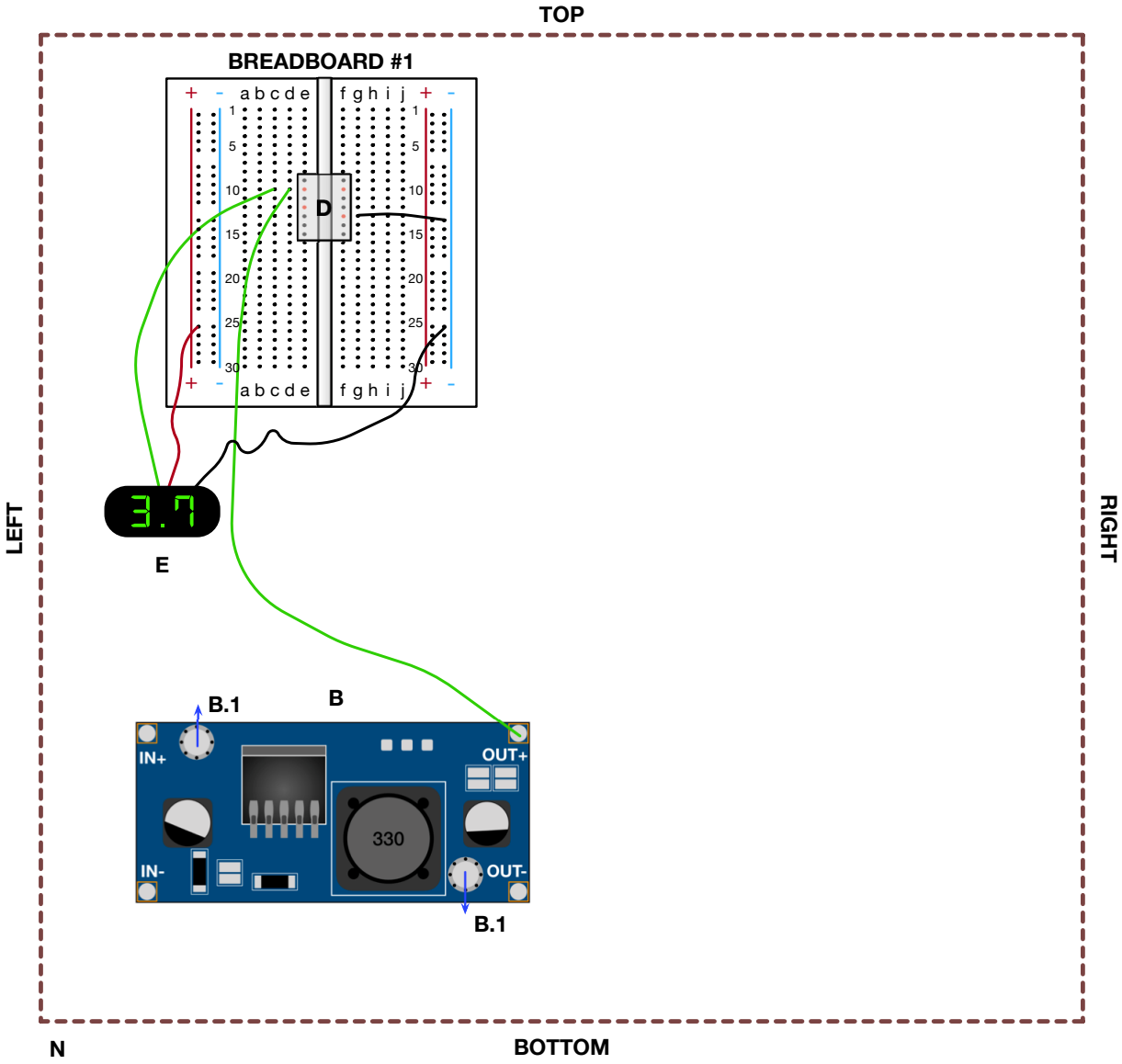
Supplementary Fig 2

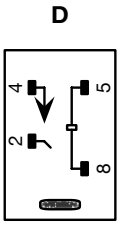




dTBI device wiring diagram for Steps 7-10: The component labelling corresponds to the Materials section and **Fig 3**, the wiring and wire colour correspond to the Device Construction section. B) Buck converter, B.1) mounting holes for the standoff. C) Potentiometer N) Enclosure. Schematic of the buck converter (below) indicates the blue potentiometer to be removed in Step 7.

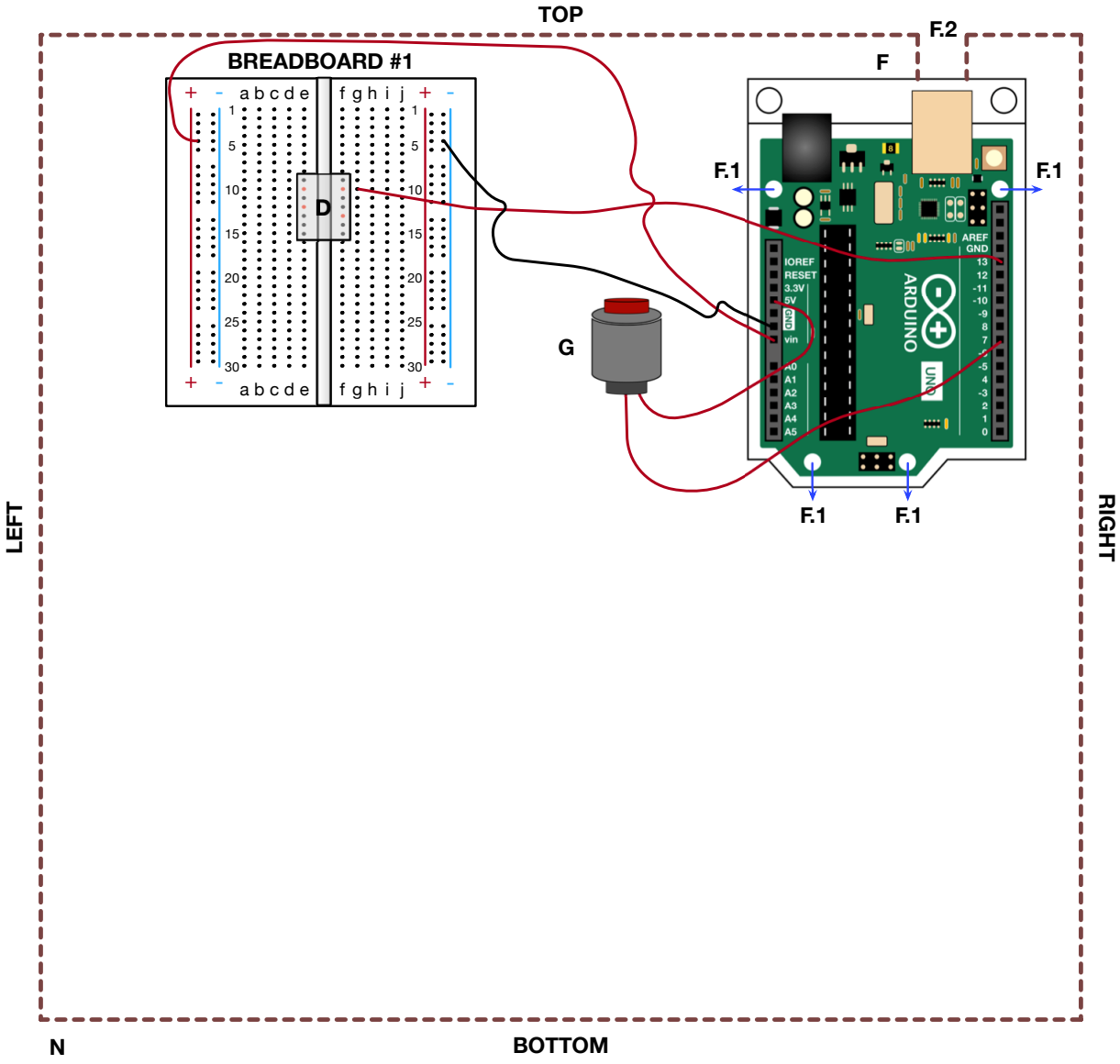
Supplementary Fig 3

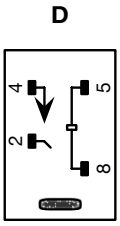




dTBI device wiring diagram for Steps 11-12: The component labelling corresponds to the Materials section and **Fig 3**, the wiring and wire colour correspond to the Device Construction section. B) Buck converter, B.1) mounting holes for the standoff. D) SPST relay (larger version at the bottom with terminals numbered, and smaller version on Breadboard #1 with the terminal positions labelled in orange). E) Digital display N) Enclosure

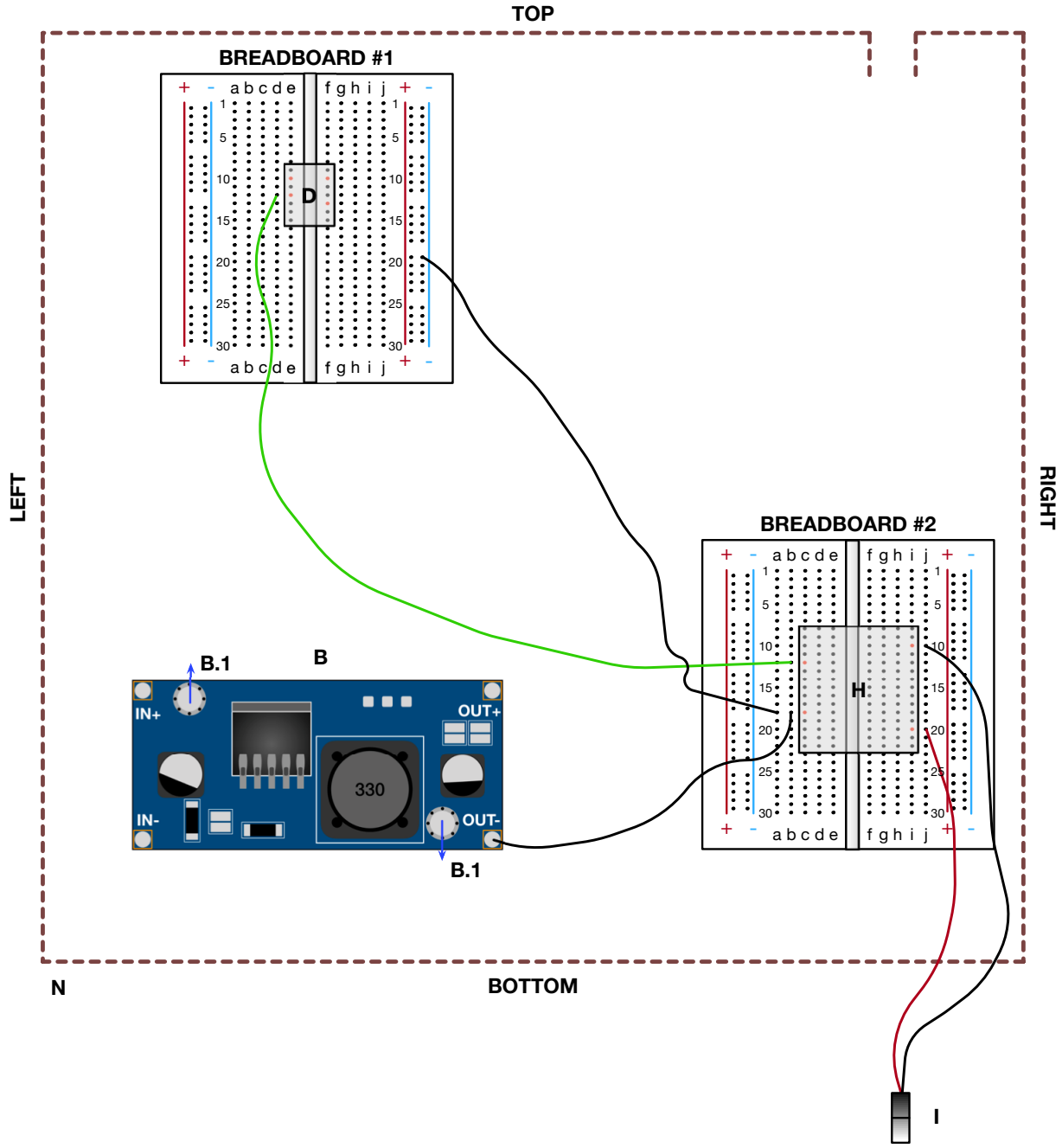
Supplementary Fig 4

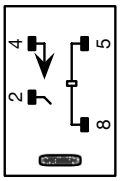


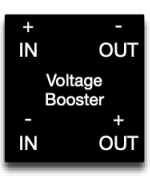


dTBI device wiring diagram for Steps 13-16: The component labelling corresponds to the Materials section and **Fig 3**, the wiring and wire colour correspond to the Device Construction section. D) SPST relay (larger version at the bottom with terminals numbered, and smaller version on Breadboard #1 with the terminal positions labelled in orange). F) Arduino, F.1) mounting holes for the standoff, F.2) 14x14mm square cutout in enclosure for Arduino USB G) Pushbutton N) Enclosure

Supplementary Fig 5

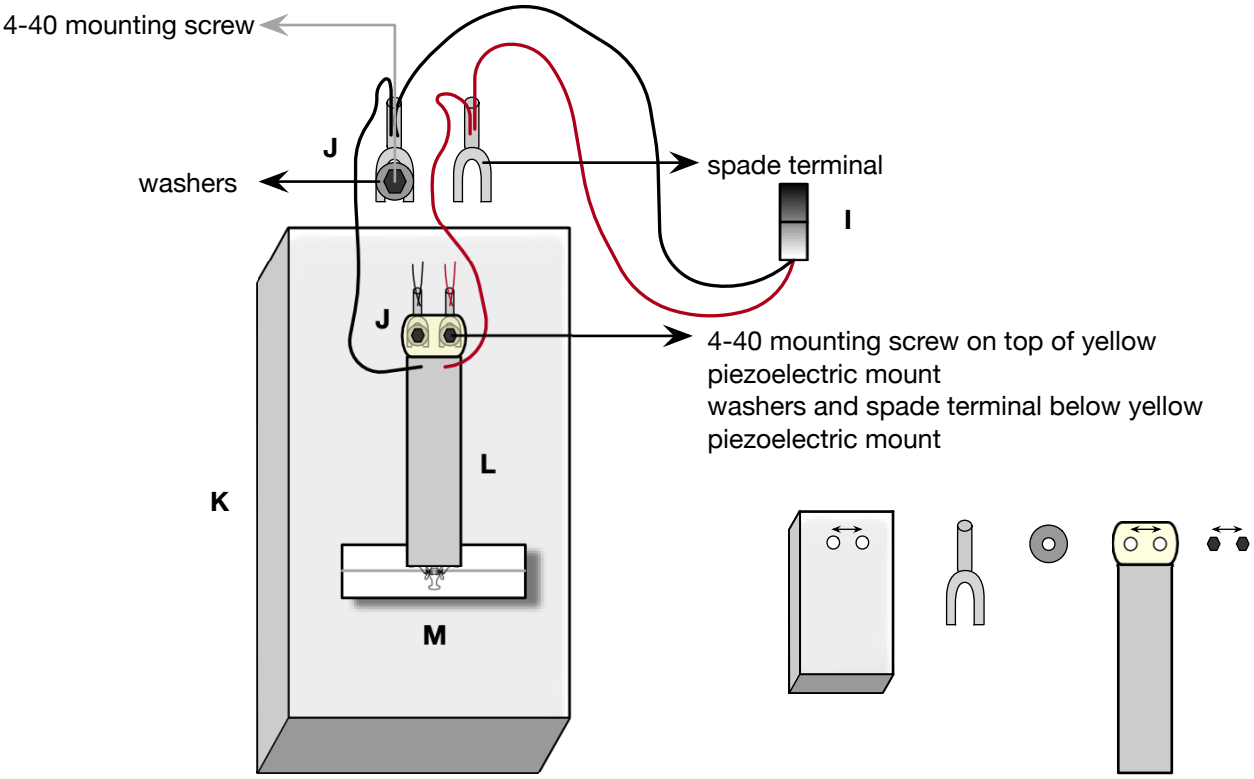






dTBI device wiring diagram for Steps 17-18: The component labelling corresponds to the Materials section and **Fig 3**, the wiring and wire colour correspond to the Device Construction section. B) Buck converter, B.1) mounting holes for the standoff. D) SPST relay (larger version at the bottom with terminals numbered, and smaller version on Breadboard #1 with the terminal positions labelled in orange). H) Proportional voltage booster (larger version at the bottom with terminals labelled, and smaller version on Breadboard #2 with the terminal positions labelled in orange). I) Electrical terminal connector N) Enclosure

Supplementary Fig 6



dTBI device wiring diagram for Steps 25-28: The component labelling corresponds to the Materials section and **Fig 3**, the wiring and wire colour correspond to the Device Construction section. I) Electrical terminal connector J) Spade terminal with washers (circle) and 4-40 mounting screw (hexagon). Larger version showing connections from electrical terminal connector and piezoelectric, and smaller version showing the positioning of the screws on top of the piezoelectric, with the washers and spade terminal underneath the piezoelectric. (Right) Components layering order (bottom to top): drilled and tapped holes in the polycarbonate base, spade terminal, washers, piezoelectric, 4-40 mounting screw. Line indicating gap between the holes in the polycarbonate sheet corresponding to gap between the holes provided on the yellow piezoelectric mount. K) Polycarbonate base L) Piezoelectric actuator M) Heisenberg collar with fly