

# L.A. COUNTY + IDEO

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*Deliverable 5.1.3*  
*In-process Hardware Prototypes*

# VOTING PRINCIPLES

## *Relevant for Hardware Prototype 5.1.3*

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*The voting system must instill **public trust** by having the ability to produce a physical and tangible record of a voter's ballot to verify the ballot was marked as intended before it is cast and to ensure audibility of the system.*

- The role of the paper ballot should be understood by the voter.

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*The voting system must offer a **variety of options** to cast a vote to ensure that a single/fixed method of voting does not prove to be a barrier and source of disenfranchisement for any group of voters.*

- Voters with visual impairments should have an option to vote on the BMD in a way that doesn't require the touchscreen.

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*The voting system must guarantee a **private and independent** voting experience for all voters, including voters with a full range of types of disabilities and voters with limited English proficiency.*

- Voters who arrive at a BMD should be able to discover and use the audio interface privately and independently.
- Voters should be able to cast and verify their ballots privately and independently.

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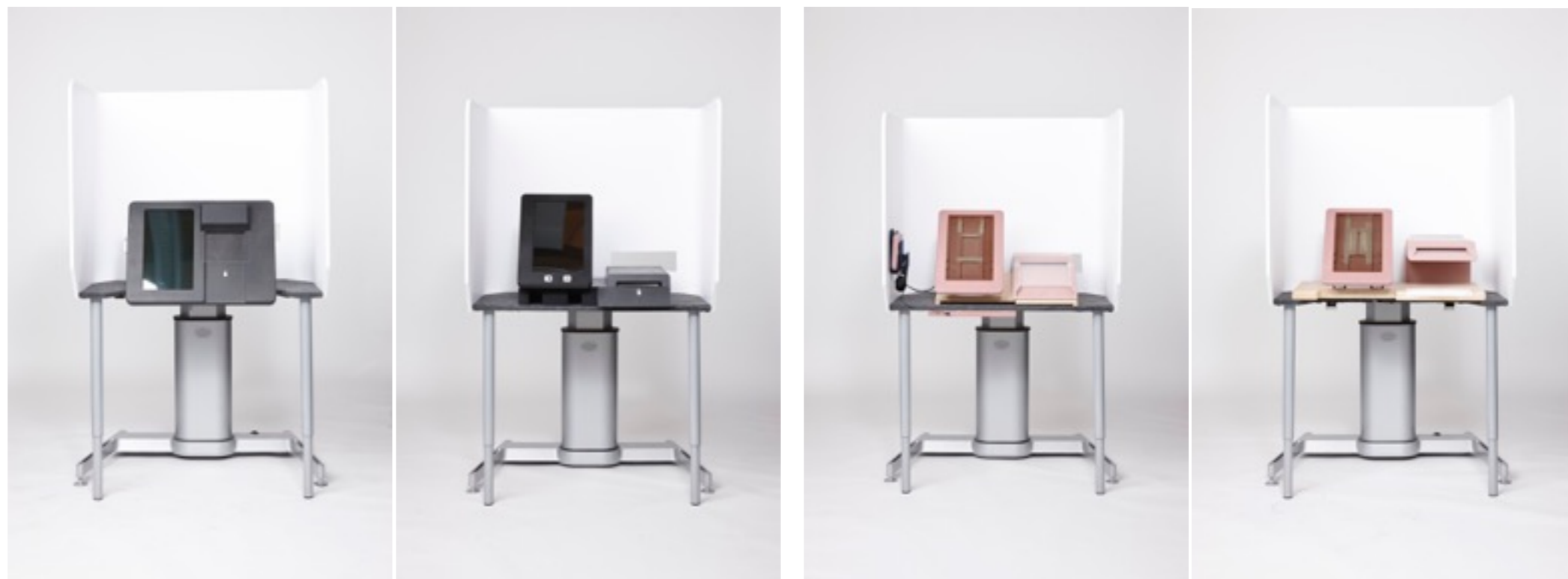
*The voting system must be **easy** for all voters to use, in particular, for voters with a full range of types of disabilities and voters with limited English proficiency.*

- The audio UI and the interaction with the hardware inputs and outputs, should be easy to use.
- The paper path for inserting, verifying and casting the ballot should be intuitive to use and easily accessible to voters.

# GOALS

## *Goals for Hardware Prototype 5.1.3 in User Evaluation Session*

1. Identify a preference for one of two candidate forms of the **paper handling portion of the BMD**, based upon which form is most easily discovered, understood, and used by voters with vision impairments.
2. Understand the desired **storage positions for the headphones and keypad** provided with the BMD.
3. Solicit guidance on **keypad button functions, layout, size, shape, and feel**.
4. Observe how the preliminary designs of BMD features not created for the audio experience--things like the **privacy screen, touch screen, and legs**--aid or interfere with the desired audio voting experience.



Prototype	5.1.2	5.1.3
Paper Path	Monolith or Sidecar alternatives	Sidecar approach, with two variations
Tactile Controller	Not included	One functional electromechanical controller and several non-functional alternatives
Display Adjustment	Friction hinge or counterbalance with lock	Friction hinge
Ballot	6" wide, rectangular	8" wide, variations on corner cut detail
Headphones	Not prototyped	Included

# CHANGES FROM PROTOTYPE 5.1.2



“Glass” Prototype



“Cobra” Prototype

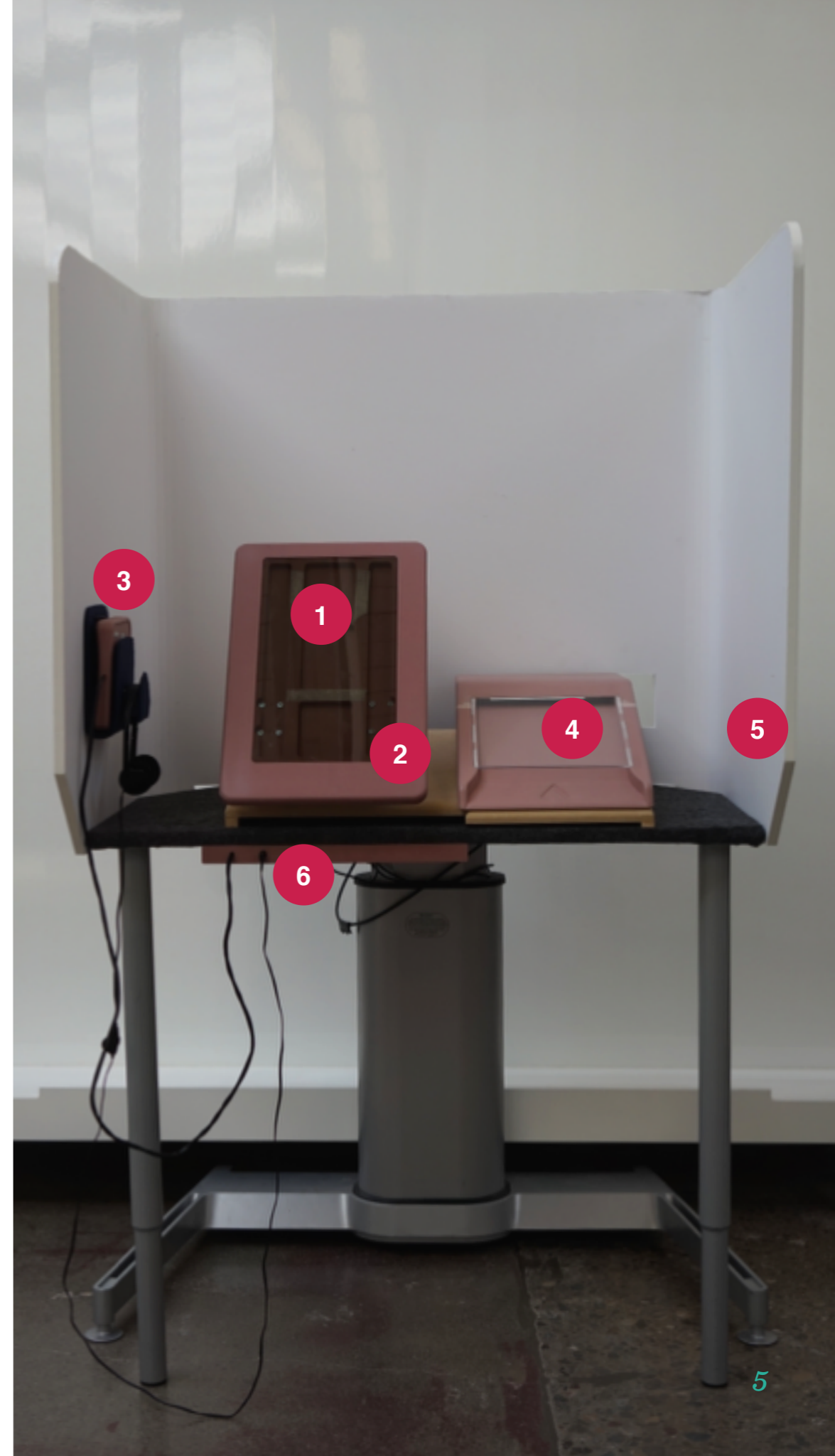
# BMD PROTOTYPES

## *Overview of Prototypes*

# “GLASS” PROTOTYPE

## *Overview of features*

- 1 15.6” display mockup
- 2 60 in-lb friction hinges on display
- 3 Holster containing a functioning user-input keypad and pair of headphones
- 4 25 degree ballot insert slot with cover window for ballot review
- 5 Privacy Screen
- 6 3.5mm headphone jack and keypad cable connection below the display





Finding Keypad



Inserting Ballot



Audio Voting

# “GLASS” PROTOTYPE

## *Major Interactions*

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Keypad and headphones are stowed in a pocket hanging from the privacy shield

# “GLASS” PROTOTYPE

*Holstered Keypad*

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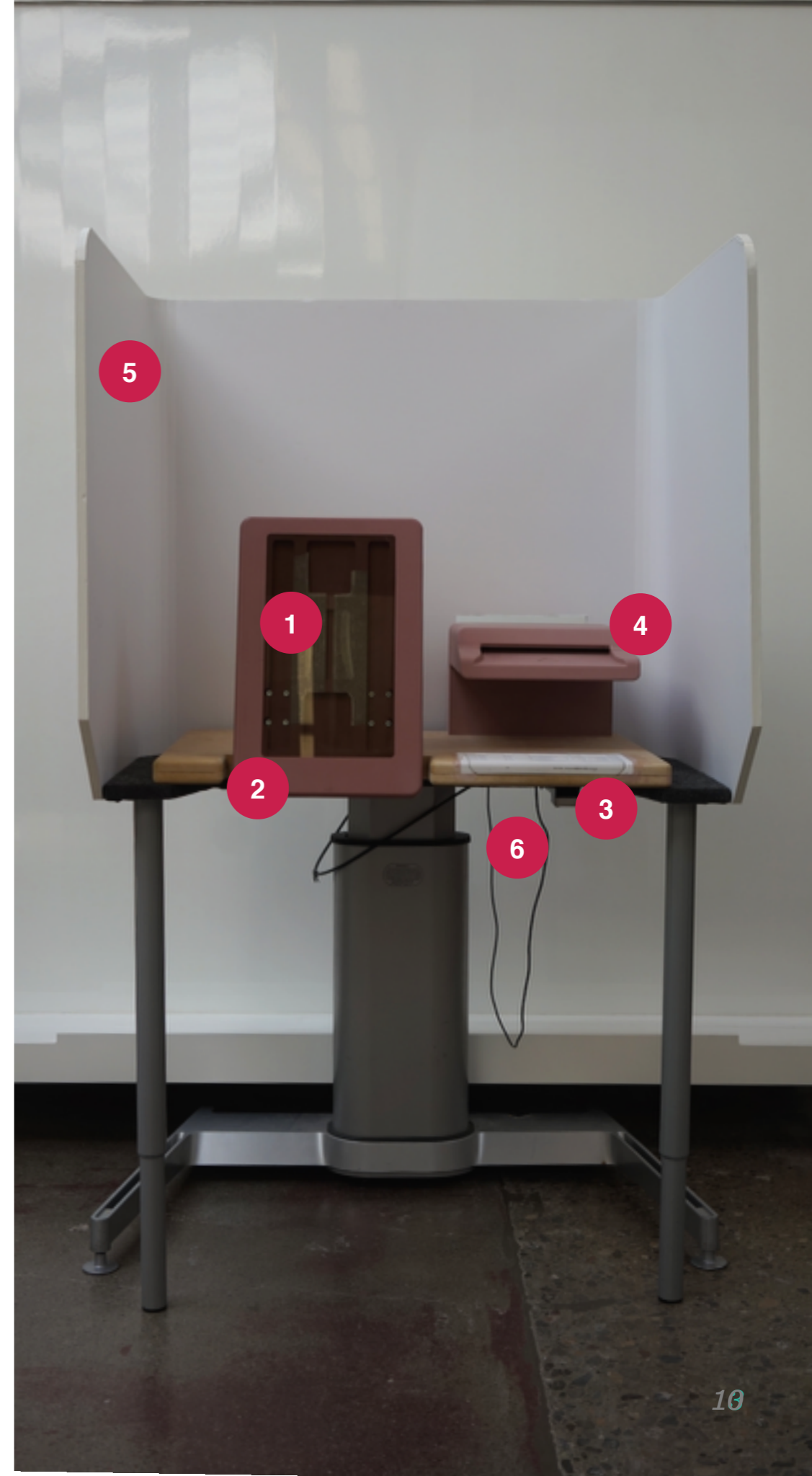
*Deliverable 3.1.3*

*In-process BMD Prototypes (Audio UI)*

# “COBRA” PROTOTYPE

## *Overview of features*

- 1 15.6” display mockup
- 2 60 in-lb friction hinges on display
- 3 Removable keypad is inset into the table surface
- 4 Independent raised ballot slot above the keypad
- 5 Privacy Screen
- 6 Keypad cable stows away through the table surface

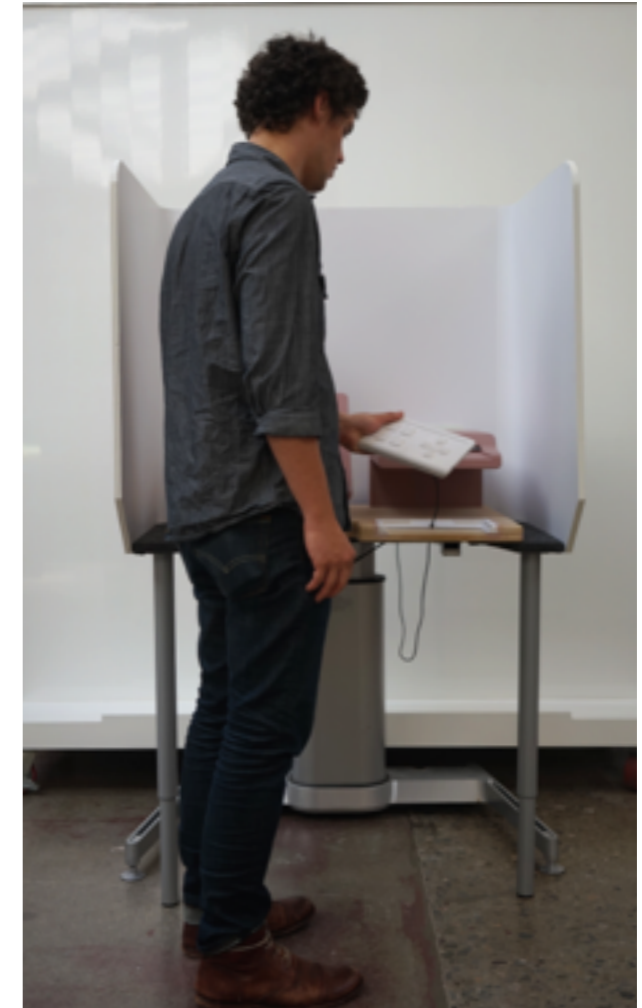




Finding Keypad



Inserting Ballot



Audio Voting

# “COBRA” PROTOTYPE

## *Major Interactions*

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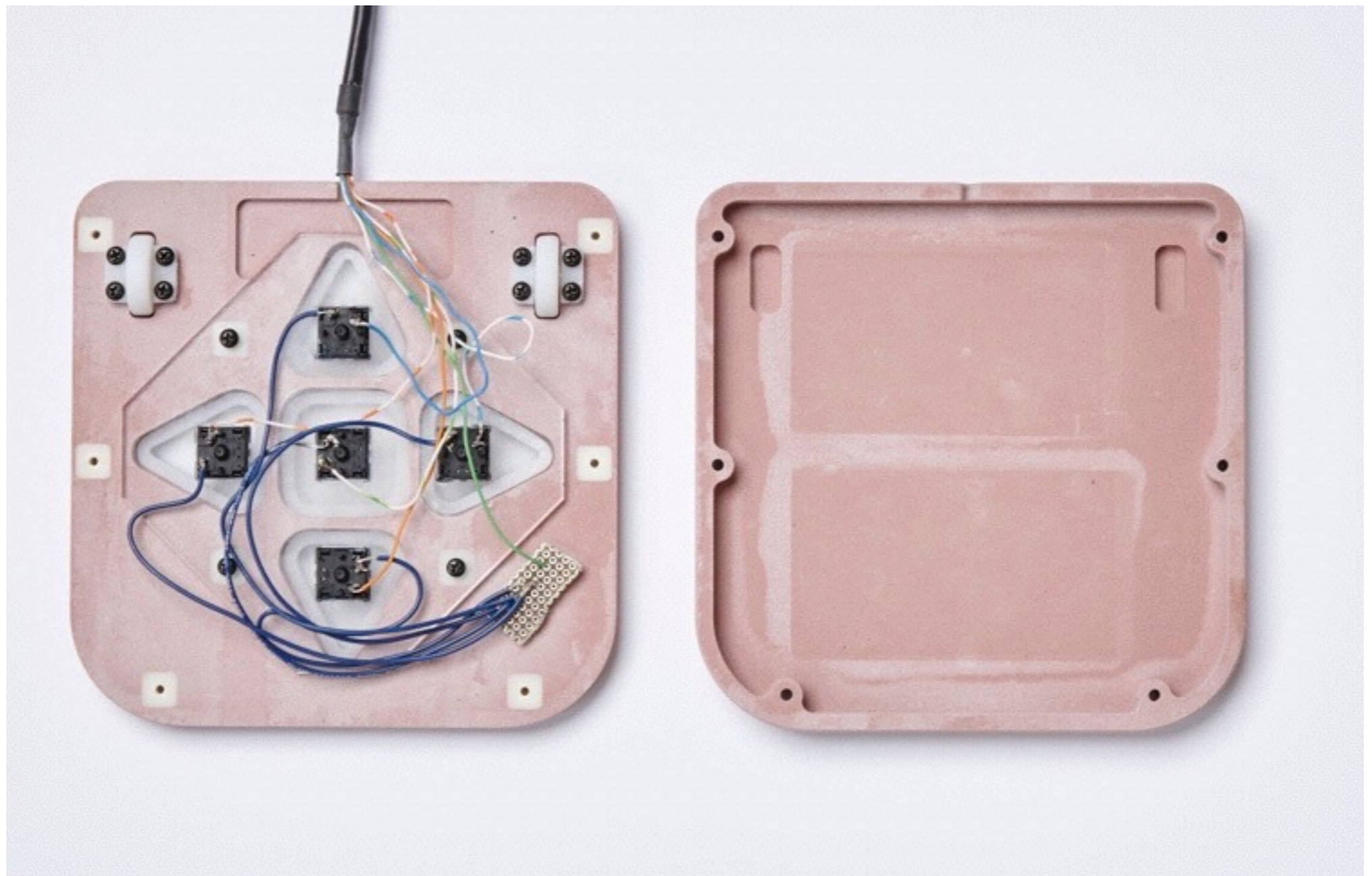


Keypad is exposed when stowed on the tabletop, and is removable.

# “COBRA” PROTOTYPE

*Exposed Keypad*

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# FUNCTIONAL KEYPAD



- Research Goals:**
- (1) Verify the usability of the 5-key cursor cross in a functioning audio user interface.
  - (2) Compare the usability of a narrow keypad vs. a wide keypad on the lap while seated.
  - (3) Identify the preferred size for cursor-cross buttons for vision-impaired voters.
  - (4) Explore the number, style, and location of inputs beyond the main cursor cross.

# KEYPAD VARIATIONS

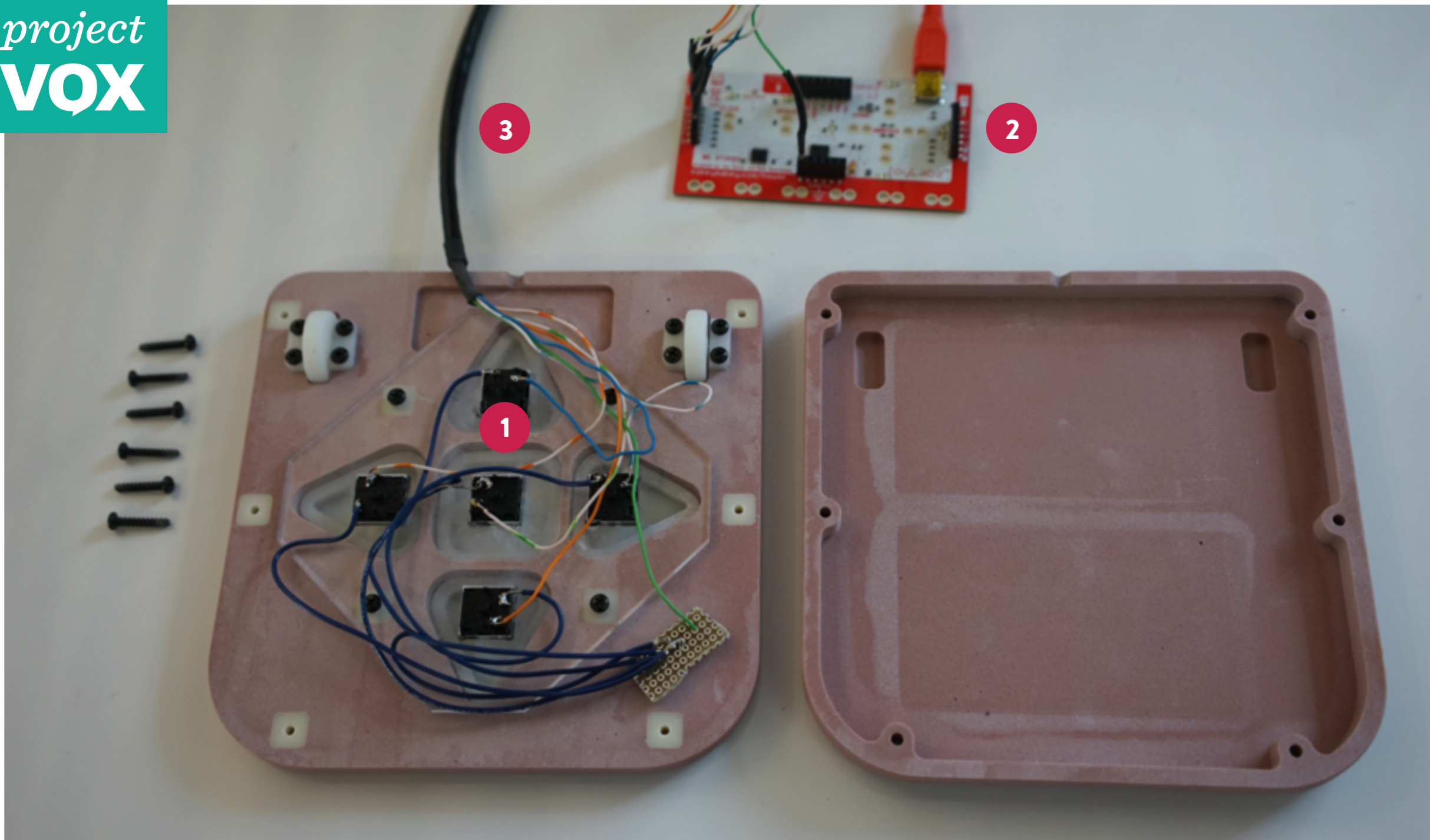


**1** Large Cursor Cross Buttons

**2** Volume and Speed Wheels

# KEYPAD PROTOTYPE 1

*Key Layout*

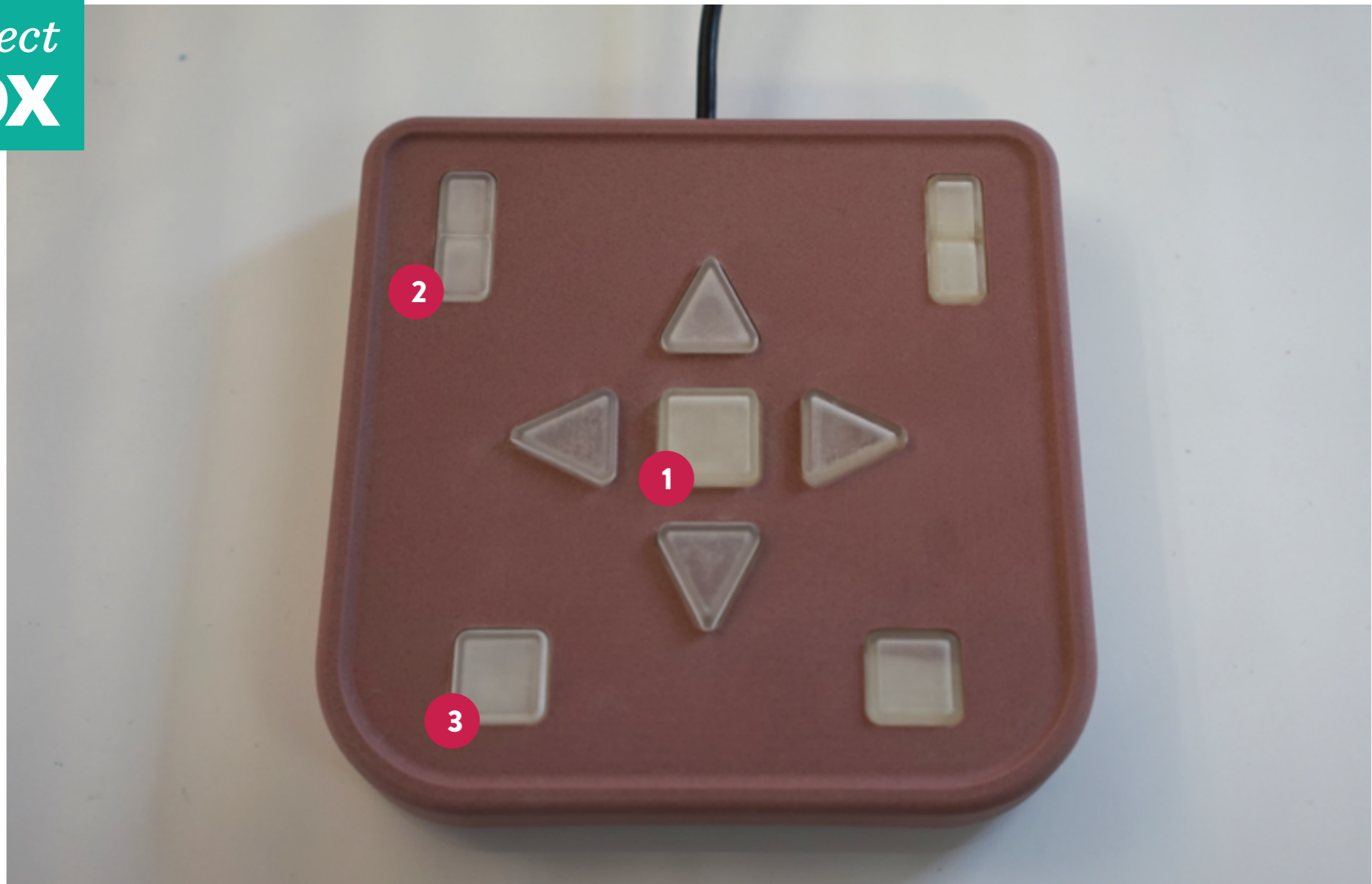


- 1 Mechanical Keyboard Switches    2 Makey Makey device    3 Keypad Cable

# KEYPAD PROTOTYPE 1

## *Internal Circuitry*

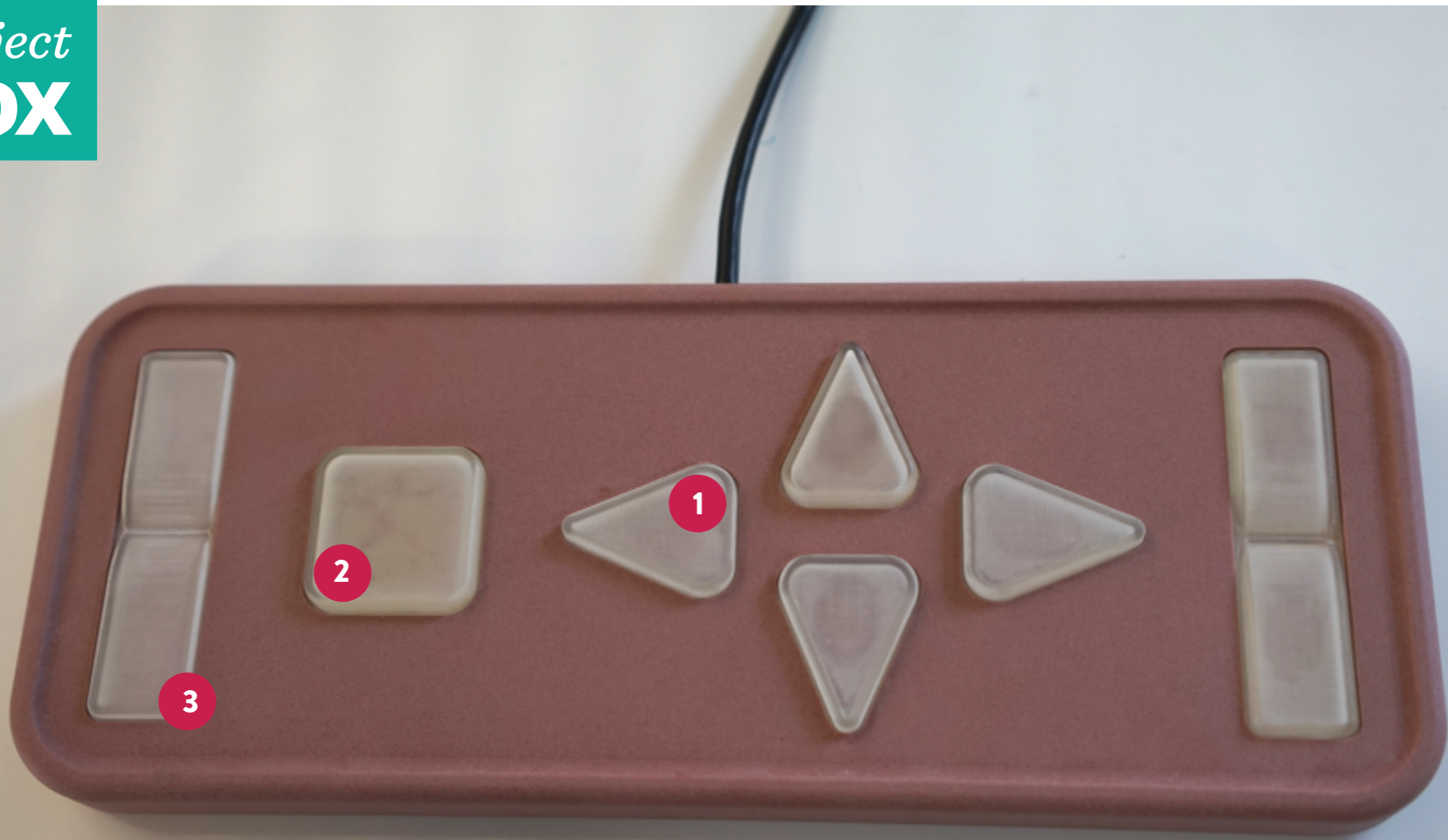




- 1** Small Cursor Cross Keys    **2** Volume and Speed Keys    **3** Extra Function Keys

# KEYPAD PROTOTYPE 2

## *Key Layout*



**1** Cursor Keys   **2** Select Button   **3** Volume and Speed Keys

# KEYPAD PROTOTYPE 3

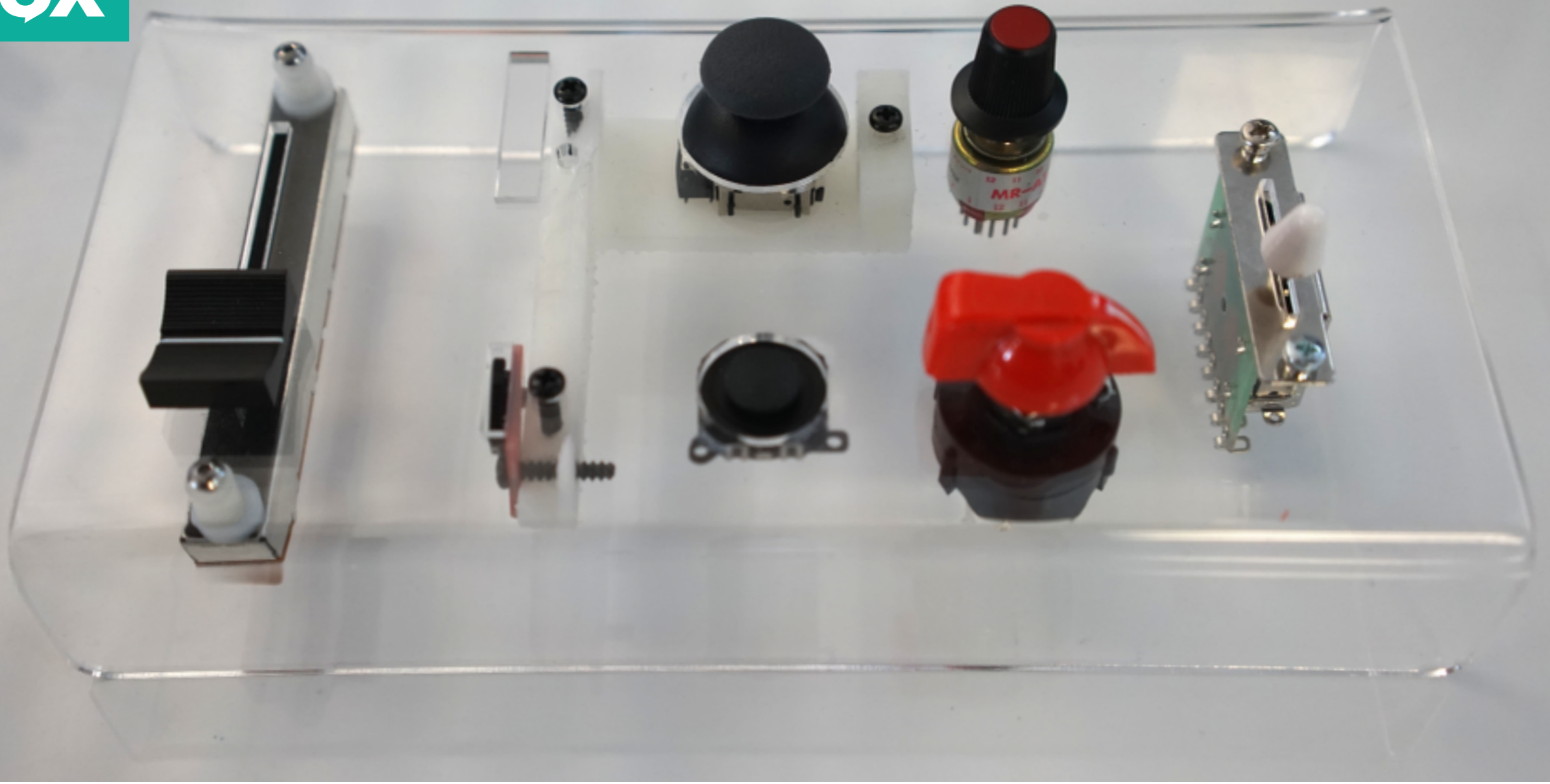
*Key Layout*



**4 buttons, each with a different switch mechanism and spring assist**

**Research Goal: Identify preferred button tactile response including button force, throw, and click ratio**

# **BUTTON PROTOTYPE**



A variety of potential input devices including a joystick, slide potentiometer, 5-way switch, rotary switch, and thumb slide

Research Goal: Identify preferred selection switches for visual impaired voters

# INPUT PROTOTYPE

# NEXT STEPS

- High level conclusions from the research session with voters with visual impairments are communicated in a separate research report document.
- The clear panel on the “glass” concept can feel like a touchscreen display to voters with vision impairments. The paper path design should progress without the clear panel.
- The tactile controller can be obscured by the holster. The design should progress to allow the controller to be more easily discovered, and to use descriptive language to better guide the user to the stored controller location.
- Headphone and tactile controller cables may drape in a position where a seeing eye dog could become entangled. The design should progress to manage the cables such that they do not present a hazard.
- While voters with vision impairments explore the BMD physical design, discovering the features with their hands, it is useful to provide a temporary resting place for the paper ballot (such as the flat spot on top of the “cobra” design). The design should progress with such an affordance in mind.