

L.A. COUNTY + IDEO

Deliverable 5.1.4
In-process Hardware Prototypes

VOTING PRINCIPLES

Relevant for Hardware Prototype 5.1.4

3

*The voting system must be **flexible**.*

- The BMD should be suitable for deployment in a variety of venues, including both precinct polling places and larger vote centers.
- The BMD should use modular subassemblies that can be replaced or upgraded without large system changes.

9

*The voting system should be easy and reliable for election workers to **use, set-up, breakdown, and explain**.*

- BMD set-up and breakdown should be fast, reliable and feasible for the crew that will perform the tasks.
- The BMD should make pollworkers confident so that they may readily guide voters or explain the system to them.

10

*The voting system must be **portable**.*

- The BMD should be small and light enough to be transported from EOC to the polling place and back.
- The BMD should be light enough for pollworkers to set it up.
- The BMD should be compact for efficient storage.
- Hand grips, handles, straps and wheels should be incorporated to assist in maneuvering the packed BMD.

11

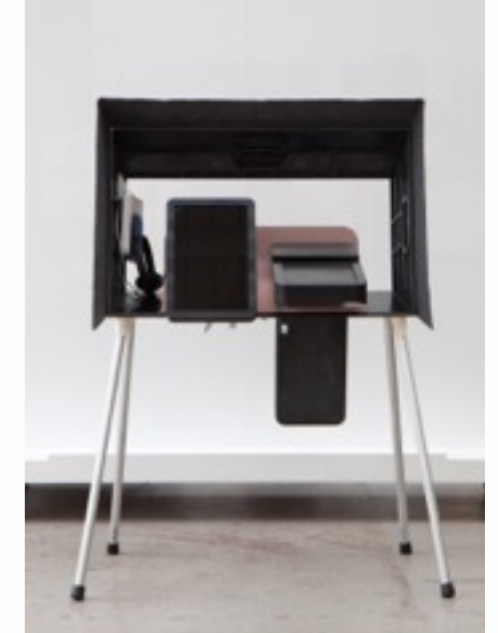
*The voting system must include features for **safe and secure storage**.*

- Appropriate locks and security seals should protect the BMD and ballots through all the various states of custody.

GOALS

Goals for Hardware Prototype 5.1.4 in User Evaluation Session

1. Identify a preference for one of two candidate approaches to **BMD set-up**: (1) a more all-in-one stored unit that is larger and heavier to transport but has fewer separate pieces to assemble versus (2) a more separable design that breaks into multiple smaller pieces for convenient transport at the expense of set-up complexity. Two prototypes were fabricated to test the tension between conflicting requirements: ease of transport in a passenger car versus simplicity of set-up.
2. Understand the desired **access to critical components at EOC**, such as the ethernet and power jacks, the display and the paper path. Clarify when and how these points are to be accessed.
3. Gain insight into **what motivates pollworkers**, and into what design attributes make them **confident in managing and explaining the system**.
4. Observe the varied **storage, transport and polling environments** in which the BMD will need to be **robust** and functional.
5. Collect **stories and advice** from operational experts: EOC staff, pollworkers, and trainers.



Prototype	5.1.3	5.1.4
Paper Path	Sidecar approach, with two variations	Single variation of the sidecar approach
Tactile Controller	Hangs on the privacy shroud	Two variations: one hangs on privacy shield and the other is held to the “crossbar” with velcro
Privacy Shroud	Tall vertical left, back, and right side walls	Two variations: one with short vertical fabric walls on the sides and back, the other with larger felt panels on the sides and top
Packed Configuration	Not yet designed	Two variations: one with an all-in-one package and the other split into three smaller/lighter pieces for transport
Set-up Method	Not yet designed	Two variations: a simpler method (with larger/heavier package) and a more complex method (with more, smaller packages)
Appearance	Privacy shroud and stand not yet designed	Two variations: light an minimal partition on a “sawhorse” and a more substantial iconic “speaker” form

CHANGES FROM PROTOTYPE 5.1.3



“Sawhorse” Prototype



“Speaker” Prototype

BMD PROTOTYPES

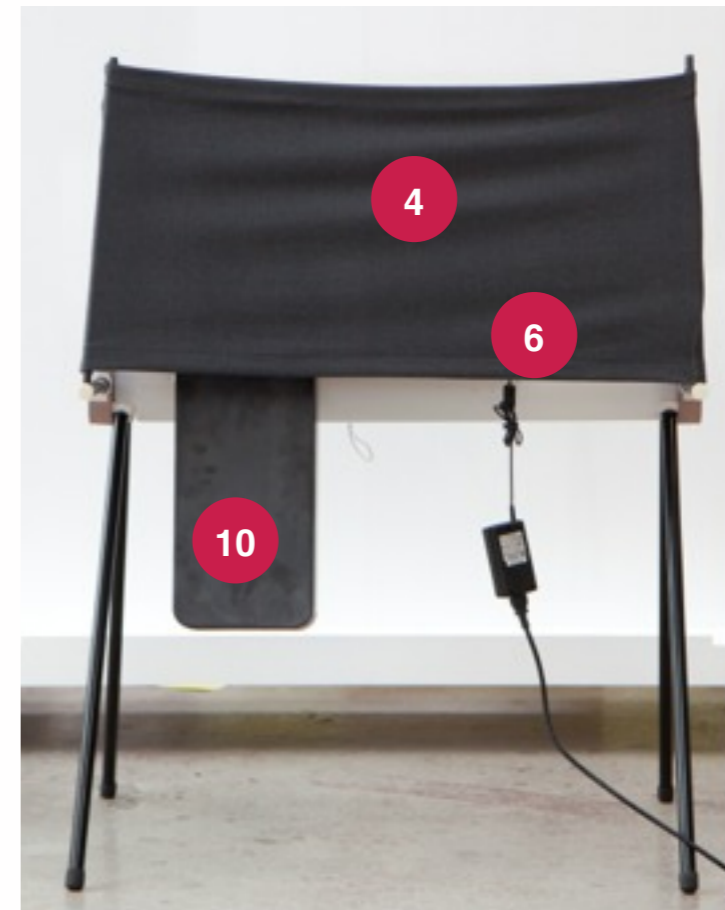
Overview of Prototypes

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“SAWHORSE” PROTOTYPE

Overview of features

- 1 15.6” hinged display mockup
- 2 Keypad controller and headphones hang on crossbar
- 3 Ballot insertion slot with runway to guide paper in
- 4 Privacy Screen
- 5 User-facing I/O jacks
- 6 Power and ethernet jacks
- 7 Legs
- 8 Crossbar (stores legs, end bars and privacy screen when not in use)
- 9 End bars (protect unit if toppled)
- 10 Integrated ballot box

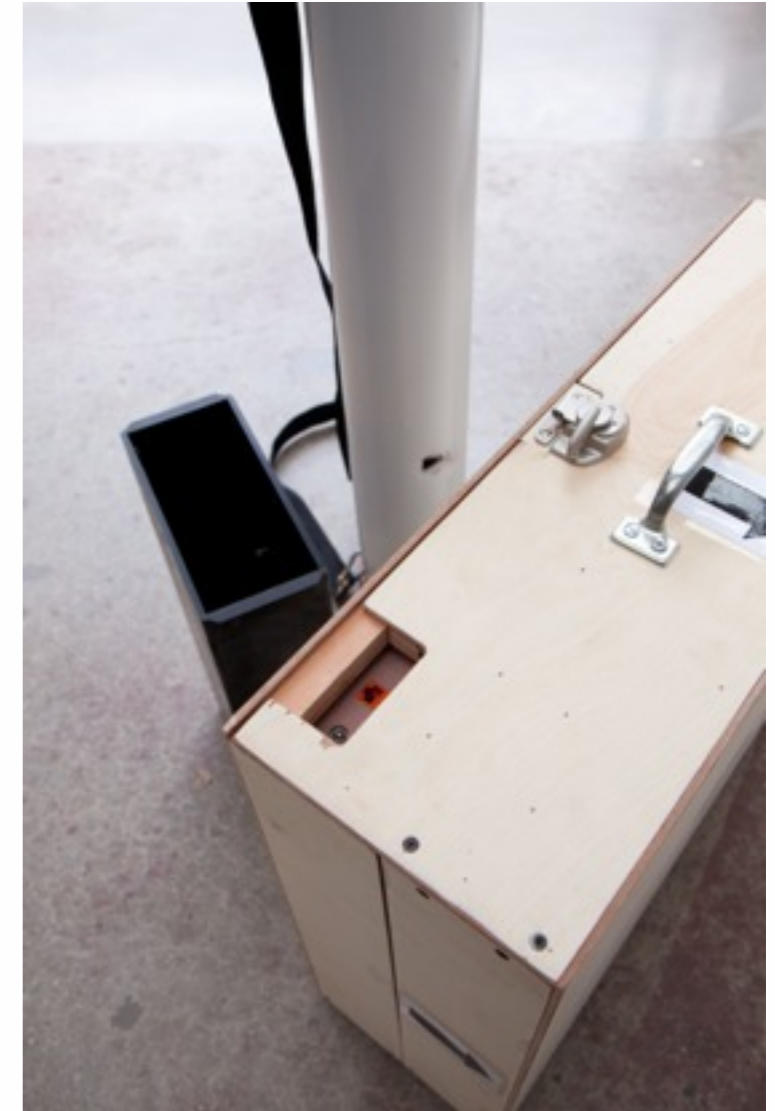




BMD packs into three pieces: crossbar tube (legs, end bars, and privacy screen inside), ballot box, and suitcase.



Suitcase contains main electronics unit, headphones, keypad, and power supply.

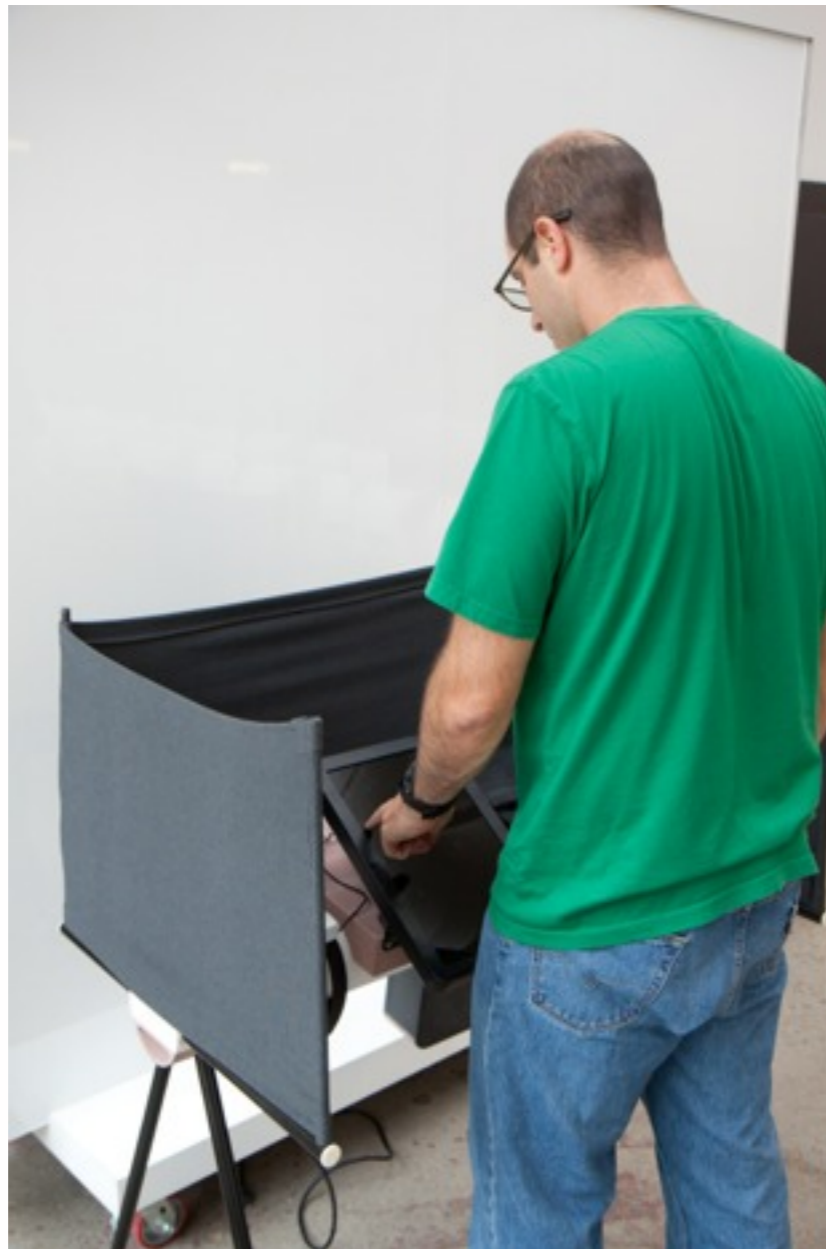


Power and ethernet ports are accessible through a cutout in the suitcase

“SAWHORSE” PROTOTYPE

Storage and Transport

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“SAWHORSE” PROTOTYPE

Views with Voter

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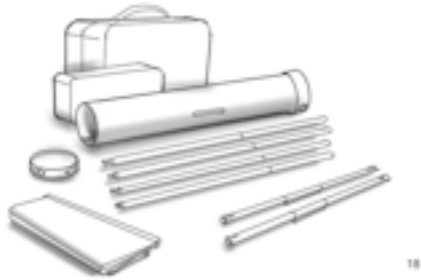


“SAWHORSE” PROTOTYPE

Preliminary Rendering

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B
1. Remove one end cap from the tube and take out the four long legs, two short cross bars and black privacy shield.



18

B
2. Attach the four legs onto the tube by screwing them into the four threaded holes.



19

B
3. Stand the unit up so the long white slot in the center of the tube faces you. This is the front, where the voter will stand.



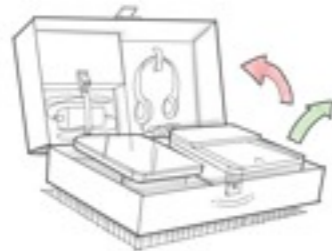
20

B
4. From the front of the unit, slide the two cross bars into the holes at the ends of the tube, white tab facing down and red end first, until they stop.



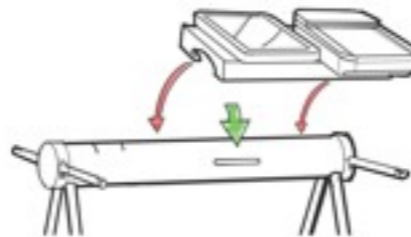
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B
5. Unlatch and open the case containing the electronic unit.



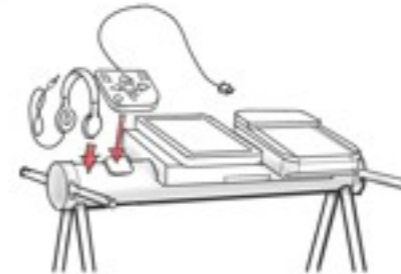
22

B
6. Remove the electronic unit and place it onto the tube by inserting the two tabs at the back of the electronic unit into the two holes in the back of the tube.
7. Tilt the electronic unit down until it snaps into place.



23

B
8. Remove the white control pad from the case and attach it to the Micro mount on the left side of the tube.
9. Remove the headphones from the case and hang them on the tube next to the control pad.



24

B
10. Plug the control pad and headphones into the front of the electronic device.



25

B
11. Remove the ballot box from the case and slide it into the slot on the back of the electronic unit.
12. Secure with a zip tie through the holes in the ballot box and the electronic unit.



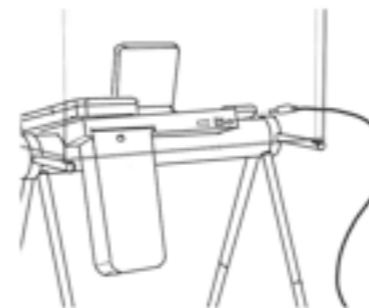
26

B
13. Attach the privacy shield by inserting the four posts into the four holes on the top of the crossbars.



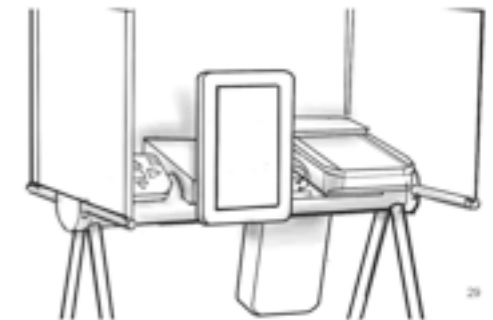
27

B
14. Plug the power cord into the back of the electronic unit, then into the power supply.
15. Turn the unit on.



28

B
16. Run the set-up procedure on the screen.



29

“SAWHORSE” PROTOTYPE

Draft Set-Up Instructions

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“SPEAKER” PROTOTYPE

Overview of features

- 1 15.6” hinged display mockup
- 2 Keypad controller and headphones hang in holster from privacy screen
- 3 Ballot insertion slot with runway to guide paper in
- 4 Privacy Screen
- 5 User-facing I/O jacks
- 6 Power and ethernet jacks
- 7 Folding legs
- 8 Structural “bucket” holds core electronics (different positions for voting and storage) and positions privacy screen
- 9 Integrated ballot box





All components of the BMD pack into a single container. The main electronics unit comes out of the bucket and is placed back in a different orientation.



There is only one package to transport per BMD, but it is bigger and heavier than the components that make up the Sawhorse concept.

“SPEAKER” PROTOTYPE

Storage and Transport

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“SPEAKER” PROTOTYPE

Views with Voter

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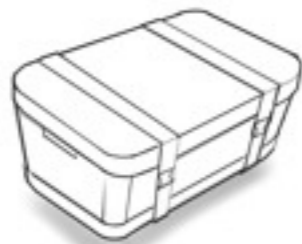


“SPEAKER” PROTOTYPE

Preliminary Rendering

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A



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A

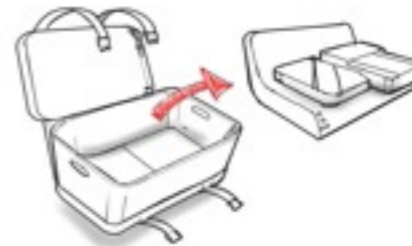
1. Unbuckle the two straps and open the lid of the case.



4

A

2. Remove the electronic unit from the case and set it aside.



5

A

3. Remove the back plastic shell from the case, lifting it by the two handles, and place the side with the smaller opening on the floor.



6

A

4. Swing the shell's four legs out, then push them into the sockets to lock them in place.



7

A

5. Stand the shell up and place it where you want the voting station to be. The side of the shell with the larger opening is the front, where the voter will stand.

6. Place the electronic unit onto the shell by hooking the lip at the back of the unit over the back of the shell, and centering it.



8

A

7. Remove the ballot box from the case and hook the black tab onto the rectangular opening in the back of the shell. The ballot box will be able swing back and forth.



9

A

8. With the key, unlock the ballot box lock (horizontal position), then swing the ballot box up as far as it can go and lock it (vertical position) into place.

9. Give the key to your inspector.



10

A

10. Remove the headphones and control pad caddy from the case and attach it to the Velcro pad on the left side of the shell.



11

A

11. Remove the grey privacy shield from the case and unfold it, looking for the blue dot in the center on one side.

12. Drape the privacy shield over the top and sides of the shell, with the blue dot facing down. Magnets in the privacy shield and the shell will find each other and hold the privacy shield in place.



12

A

13. Plug the power cord into the back of the electronic device, then into the power supply.

14. Turn the unit on.



13

A

15. Run the set-up procedure on the screen.



14

“SPEAKER” PROTOTYPE

Draft Set-Up Instructions

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NEXT STEPS

- High level conclusions from the research sessions with EOC staff, pollworkers and trainers are communicated in separate research report documents.
- Based on the unanimous feedback during the sessions, proceed with a design that is more “all in one” like the Speaker concept rather than multi-part like the Sawhorse concept, even if doing so makes the stored and transported unit larger and heavier than might be possible with more separate pieces.
- Where possible, pursue opportunities to make the stored BMD lighter for the benefit of pollworkers who will be setting up the device. However, do not constrain the design to pack multiple units into the trunk of a passenger car as the BMD is unlikely to be delivered by inspectors in the future.
- In the next iteration of a Speaker-like unit, ensure that the power and ethernet ports as well as the display and paper path are readily accessed on the (future) racks at EOC.
- Implement a method of communicating status while on the racks at EOC (e.g. loading, on, off, error) using, perhaps, a series of multi-color LEDs.
- Add handles, wheels and carry straps to make the units easier to transport.
- Make units stack and nest well when they are packed in a case.
- Consider the palletization strategy.