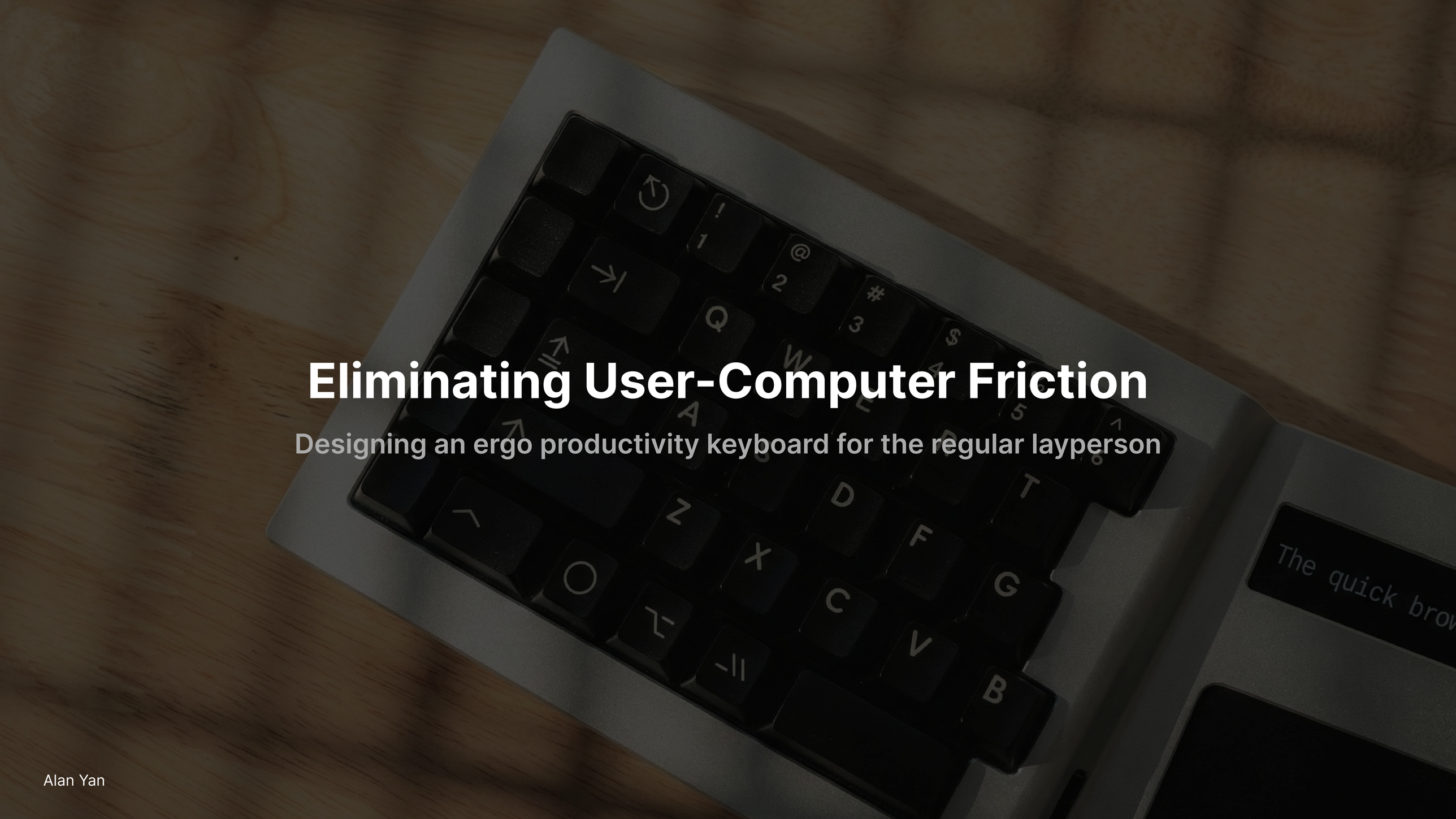
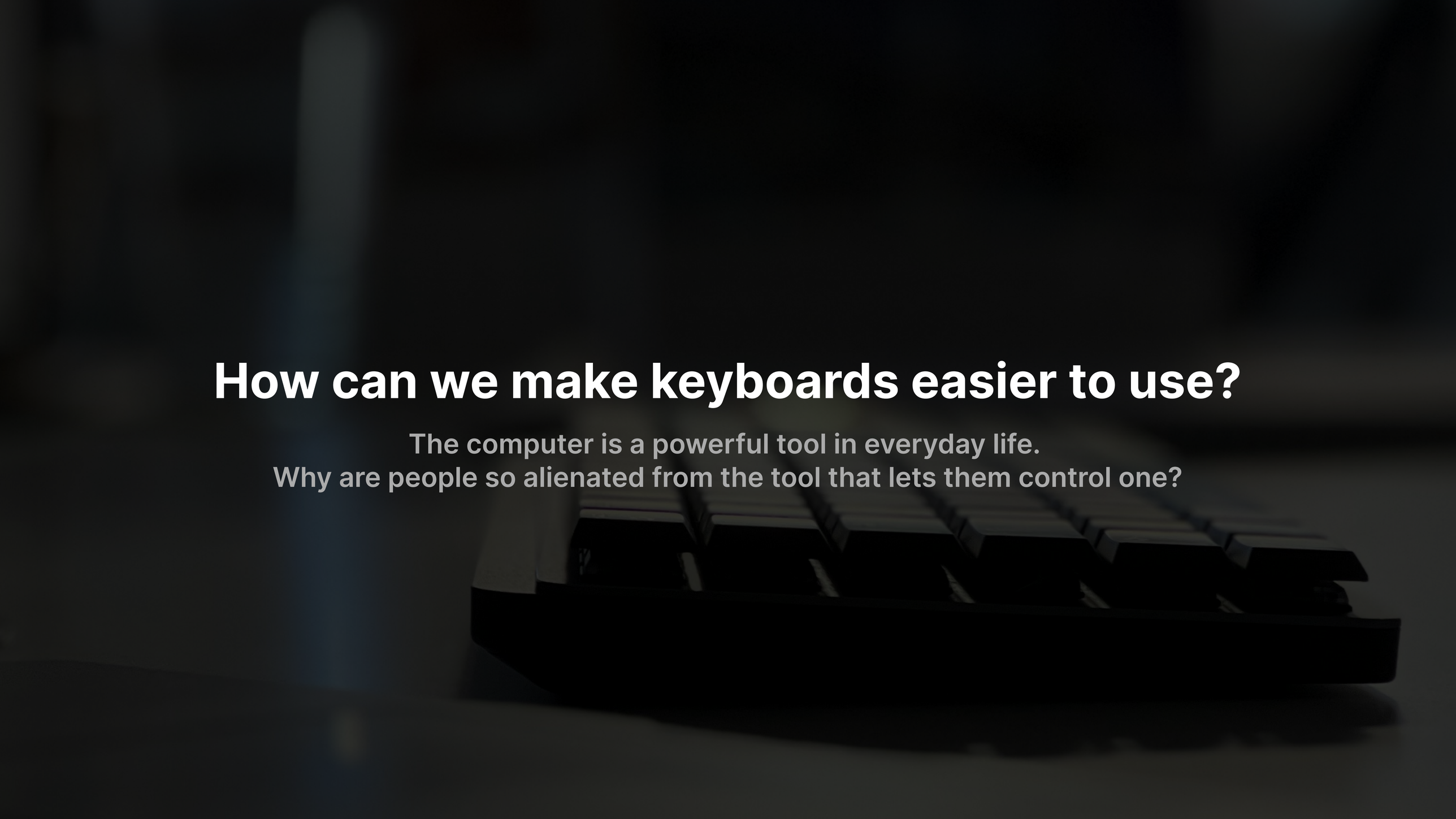


Eliminating User-Computer Friction

Designing an ergo productivity keyboard for the regular layperson

Alan Yan



How can we make keyboards easier to use?

The computer is a powerful tool in everyday life.
Why are people so alienated from the tool that lets them control one?

Problem

Context

Technological competence is shifting drastically for all generations. Highschool teachers are reporting more students with inadequate typing skill, not less. A majority of older adults also lack computer interface literacy.

Much of the older generation have stubbornly established a fluency of ‘good enough’. Saying things like “it takes too much effort to learn”.

Establishing Standards

What is considered an acceptable level of computer interface literacy?

A user reaches a degree of speed and familiarity once they are capable of touch typing — using all of their fingers without looking at the keyboard

Touch typing at the minimum requires the memorization of the user’s current keyboard layout. Productivity or leisurely browsing on the computer is easily disrupted due to lack of familiarity with the keyboard.

Looking at Trends

Key drivers

What generations are the most capable in typing?

Generation	Primary Equipment	Typing Training
Boomer	Typewriter/ Computer much later	Secretaries or data input. Still not universal. Generation is **not well trained** on computers relative to its later counterparts.
Gen X	Typewriter/ Computer	General touch typing training enters schools due to college emphasis and emergence of **early computer terminal systems**.
Millennial	Typewriter (very short)/ Computer/ Smart Phone/ Tablet	General touch typing training, however often gamified and **not generally effective**. Rapid growth of computers and instant messaging makes typing important.
Gen Z +	Computer/ Smart Phone/ Tablet	Keyed input losing important vs tablets and smart phones. **Typing training devolved** to computer interaction without true guidance. Keyboard use is more prevalent in the gaming community.

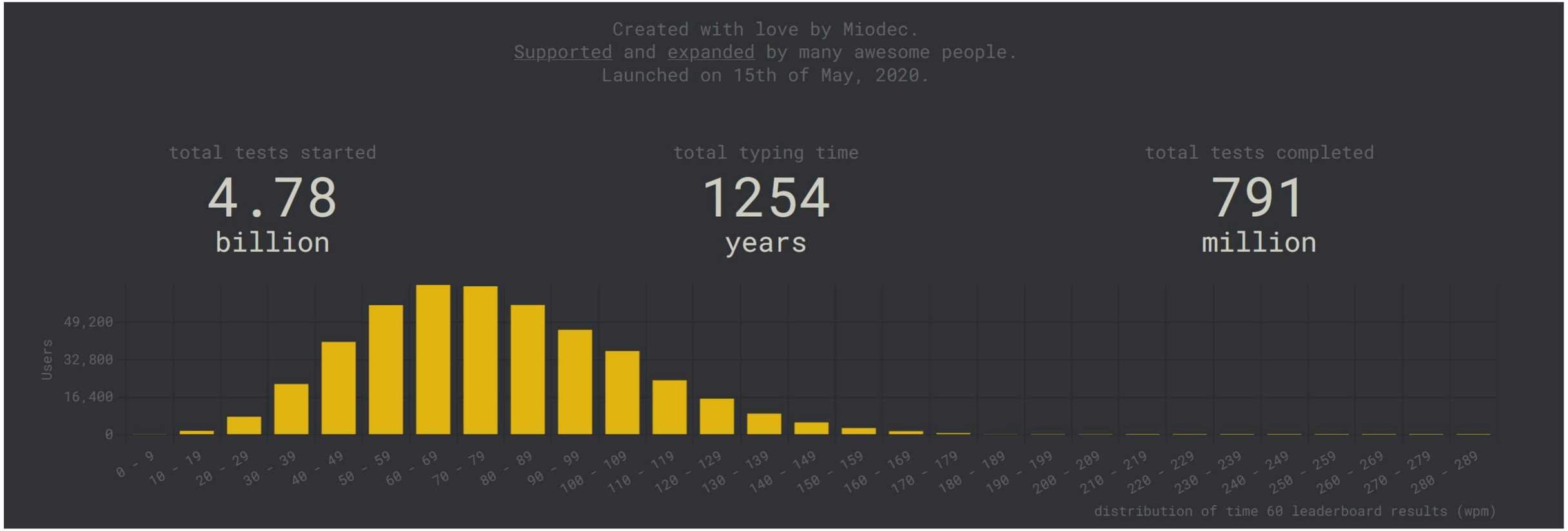
While younger generations on average are more capable of typing, the computer interfacing skill was never fully fleshed out or passed down in any generation. Keyboard fluency isn’t typically determined through practice anymore, rather it is often through brute force and forced exposure to build habits — whether they be good or bad ones.

Looking at Online Data

Surveying the typing landscape

The average computer user's WPM (words per minute) is 36, while those who are capable of touch typing is 58. For those that are typing enthusiasts, average WPM is about 70 over a sixty second period.

[See graph below from MonkeyType.com. Date taken - 12/16/2025]



User Journey Surveys

Conducting in person research

I wanted to get a clear picture of how the average person uses their keyboard.

In order to get a better understanding of their pain points and workflows, I supplemented my online research and data with performing in-person interviews and surveys. With the data, I learnt existing user behaviors for typical keyboard usage and computer interaction. Findings daily routines with computers and notable habits when using computers for work or for leisure.



Occupation: Academic Researcher
Age: 23
Cannot touch type
Avg WPM: 50 (Bluetooth Keyboard), 40 (Laptop Keyboard)

"Never bothered learning better typing because her current proficiency is good enough to get by."

"Has to go out of her way to practice."



Occupation: PHD Nuclear Eng. Student
Age: 23
Can touch type
Avg WPM: 80 (Laptop), 60 (Bluetooth Keyboard), 50 (Lab Keyboard)

"Excels in typing extremely comfortably with her laptop keyboard due to familiarity."

"Would enjoy a travel keyboard (65%) to improve consistency to carry around."



Occupation: Purdue Honors College Recruitment Specialist
Age: 23
Cannot touch type
Avg WPM: 55 (Work Desk Keyboard), 45 (Work Laptop), 45 (Personal Laptop),

"Must recenter herself on any keyboard when looking away."

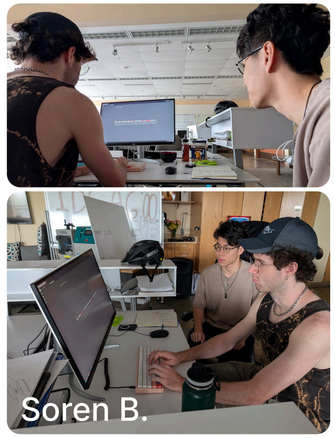
"Typing emails is easier because she doesn't need to reference other words, just looking up and down from the screen and her keyboard."



Occupation: Dewey Electronics Systems Test Engineer
Age: 25
Can touch type
Avg WPM: 102, (Alpha Stag, Uni Row Stag, 40%), 65 (Standard), 40 (Ortho, 40%)

"Loves trying alternative 40% keyboard typing layouts."

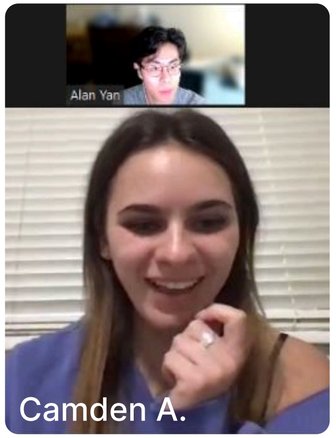
"Learning new layouts is always hard at first, but the concentrated practice pays off."



Occupation: BFA Purdue Industrial Design Student, Senior
Age: 22
Cannot touch type
Avg WPM: 50 (Standard 60%)

"Big bottleneck is not being able to think about what to type when typing since it takes active thinking to type."

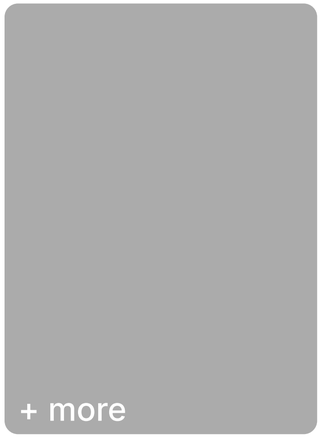
"Only really CADs and the occasional Google search. Never needed to improve further."



Occupation: Student Teachings - Teacher in training
Age: 21
Can touch type
Avg WPM: 65 (Laptop)

"Only uses laptops in her life, so she loves the trackpad and keyboard layout"

"Not many kids use touchscreen for typing, **a lot of kids would navigate with touchscreen instead of the trackpad.**"



Occupation: Young Professionals, Seasoned Industry Professionals, Students
Age: 19-63
Most cannot touch type

Typically those who type faster are:
1. Young
2. Play some/more computer games
3. In general enjoy spending more time on the PC

Survey Findings

Key pain points

Balancing user needs without sacrificing keyboard continuity

The user research has uncovered various areas of opportunity such as: a keyboard that is easy to use while still being fun and encouraging to type on, and minimizes unnecessary hand movements from using things like computer mice or unreachable keys. However, for the final design, it must not be overwhelmingly different to the general computer user.

Hand Placement

“I have to look down every time I start typing.”

“I often forget where my hands are when I type.”

“Looking at references makes me type super slow, since it’s another thing I need to look at.”

Convenient Practice

“I have to go out of my way to practice.”

“I don’t feel encouraged to type.”

“I can’t type and think at the same time. Only one or the other.”

Mouse Usage

“I hate moving my hands back and forth.”

“I love my laptop trackpad since it’s all I use for work”

“When I swap back to the keyboard after using the mouse, I always need to look back down.”

Setting up the Structure

Approaching the solution

Brainstorming

Value Proposition Canvas

Products & Services:
A productivity keyboard that is seamless to use and encourages practice while building habits.

Gain Creators:
Customers don't practice typing with intent or simply don't interact with computer keyboards enough to build habits to be more familiar in the typical day to day life.

This product fights the need to constantly look down at the keys to re-orient themselves and to continue typing.

Pain Relievers:
The more seamless integration of the keyboard into their life of removing the need to look down and up are training wheels to encourage more typing to build more familiarity and habits.

This applies to a travel keyboard or at a stationary desk.

Gains:
Familiarity with the keyboard promoting efficient and seamless computer interactions for work and leisure use (universal proficiency if using QWERTY).

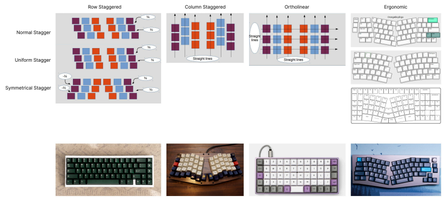
Jobs to be done:
Leisure computer use.

Productive computer use.

Day to day digital tasks on computer.

Pains:
Work flow on the computer, or browsing leisurely on the computer is easily disrupted due to lack of familiarity with the keyboard.

QMK Standard Keyboard Layouts



Common Latin Script Keymaps

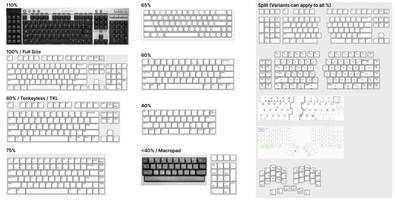
Based on Row Staggered - Applicable to all layouts



Case Manufacturing Styles



Keyboard Form Factors



Existing Market Solutions and Archetypes

Keyboards With Screens



HelloWorld 75 Keyboard
$500
E-Ink Screen
Limited display capabilities



Finalmouse Transparent Keyboard
$350
Transparent Keycaps with Screen
Too distracting of a display



Flux Transparent Keyboard
$450+ (modular parts)
Transparent keycaps with modular macropads on the top of the keyboard
Too distracting of a display, but much better execution than Finalmouse



Amazon BQAA Mechanical Keyboard
$390
Attached screen
Too large of a screen



Machenike KT84 - Kickstarter
$998
Pixel Screen
Too restricted in display



QMK Standard Keyboards with LCD screen
$80+-1000+
Meletrix Zoom 75, OMO 75, RK N80, KNOB, etc
Too simple in display or restricted.
KNOB has a good screen design

Modular Keyboards

In Production



Mountain Everest Max Keyboard
$310
Modular button/knobs, macropad, and wristrest
Doesn't aim at the changing form-factor modular feature via PCB

Concept/Community Mods



Community Modular Keyboard "mod_" - TBD (Link)
$800-1000, 500 units group buy
Modular buttons and macropads
Doesn't aim at the changing form-factor modular feature via PCB



TMICE X Mechanical Modular Keyboard
$350
Modular button/knobs, macropad, and F keys
Doesn't aim at the changing form-factor modular feature via PCB



Community Modular Keyboard "Keymera" - TBD (Link)
$TBD, TBD units
Modular screen + knobs, macropad, and wristrest
Doesn't aim at the changing form-factor modular feature via PCB



Community Modular Keyboard "Ocreeb MK2" (Link)
Personal project, 1 unit
Modular screens, knobs, macropads, and sliders
Doesn't aim at the changing form-factor modular feature via PCB

Keyboards With Alternative Mousing



Libra Mini
$180
Joystick Control
Can be reprogrammed



Naya Create
$1050
Modular Joystick, Touchpad, Knob, and Dial
Modular, and can be further customized via software



Personal Trackball Keyboards
$300-1000
Trackball Mousing
Fully custom - can be cheap or very expensive



Sugar Glider
$90 (no longer available for purchase)
Touchpad Control
Very cheap but buggy firmware

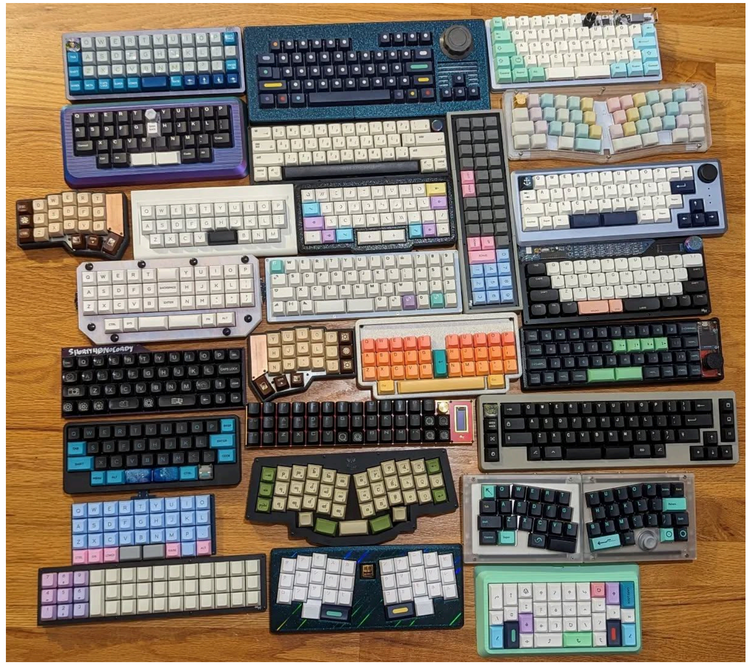


BastardKB Dilemma MAX V3 Choc
$315
Modular Joystick, Touchpad, Knob, and Dial
Modular, and can be further customized via software

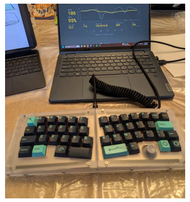


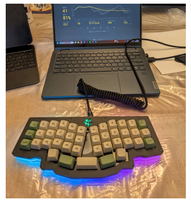
Killer Whale
$200
D-Pad, Trackball, and Joystick
Not modular but swappable

Testing and Benchmarking

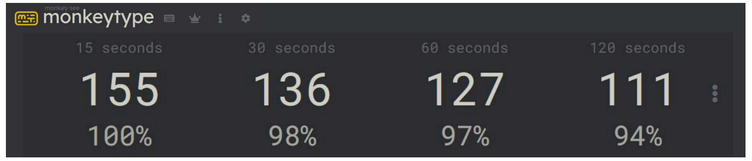












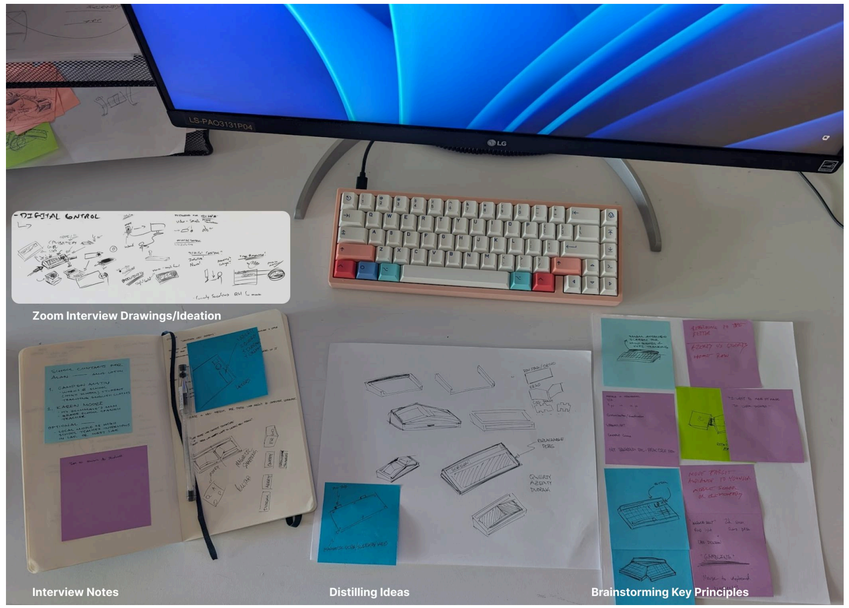
Ideas to Action

Synthesizing all of the rogue ideas into a single package

Establishing Necessary Design Features

I brainstormed concepts that align with the three established areas of improvement for a productivity keyboard: **comfortable hand placement**, **convenient practice and ease of use**, and **minimal reliance on a computer mouse**. Then I sketched and re-sketched many iterations on paper, before the refined designs were drawn with digital sketching.

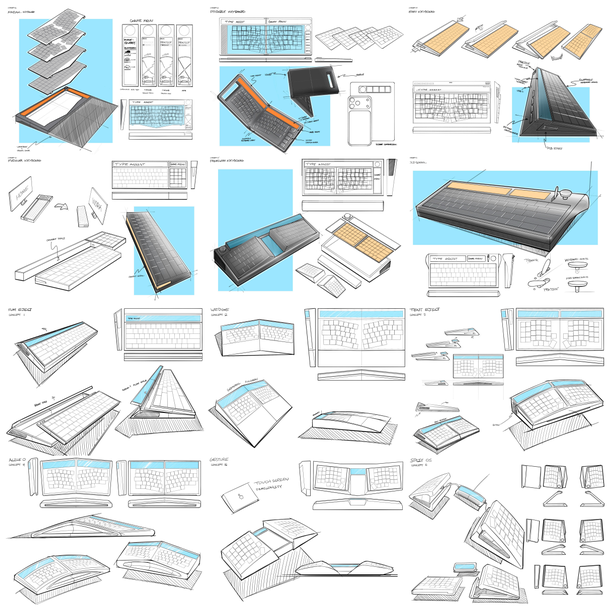
Conceptual Brainstorming



Thumbnail Sketches



Refined Package Designs



Initial Design

Behind every design decision

1. Type-Assist Screen

Letters typed on the keyboard show up on the type-assist screen. A user can keep their eyes down without constantly checking if there are any errors or misinputs. May also include WPM stats?

2. Touchpad

By keeping the touchpad in the middle, users can minimize hand movement when using the mouse. A trackpad is also technologically continuous with previous experiences.

3. Thumb Hotkeys

A thumb input of sorts is ergonomically effective in this area for user customizability.

4. Center Interface Cluster

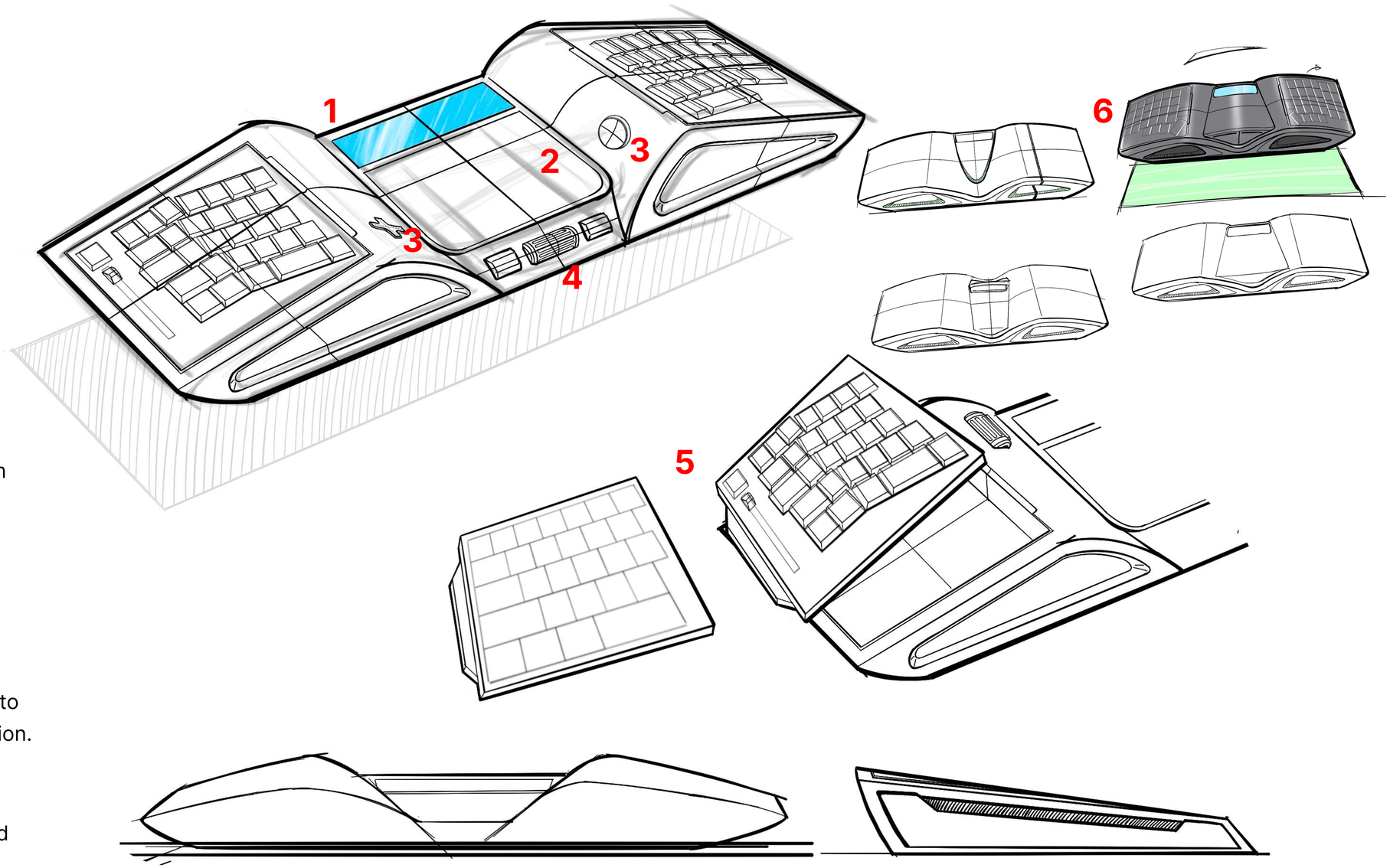
Buttons or a scroll knob for user customizability.

5. Keyboard Layouts

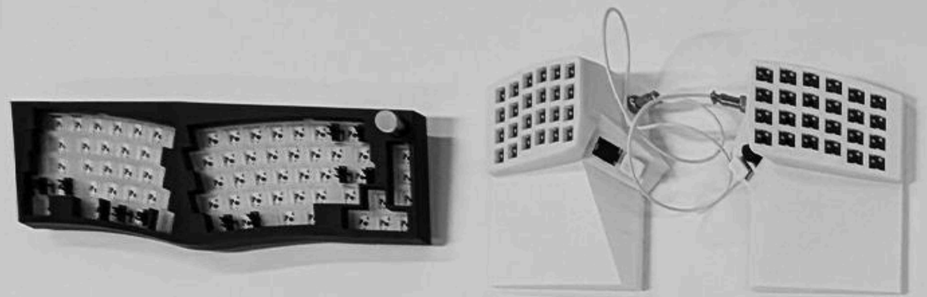
Traditional keyboard layouts with minute changes to establish keyboard continuity and ease the transition.

6. Form Exploration

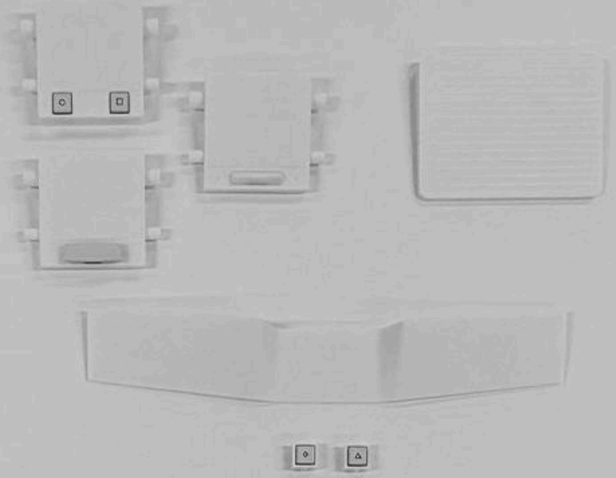
Playing around with the split keyboard, screen, and touchpad combination design.



Putting the Sketches to the Test
Mockups

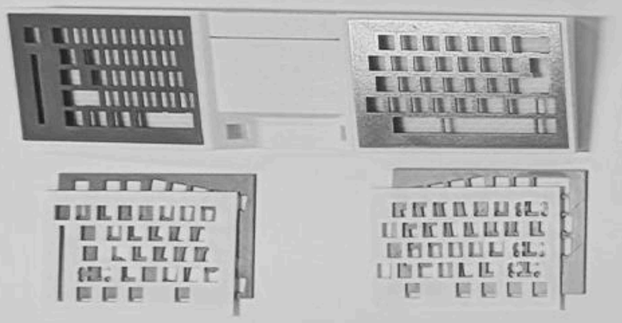


Ergonomic References



Fine Tuning Other Interaction Points

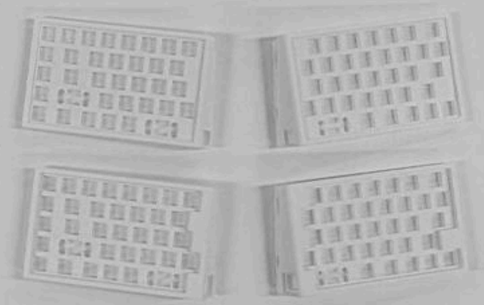




Mockup #1



Mockup #2



Mockup #3+4



High Fidelity Mockups + White Model

Mockup 1

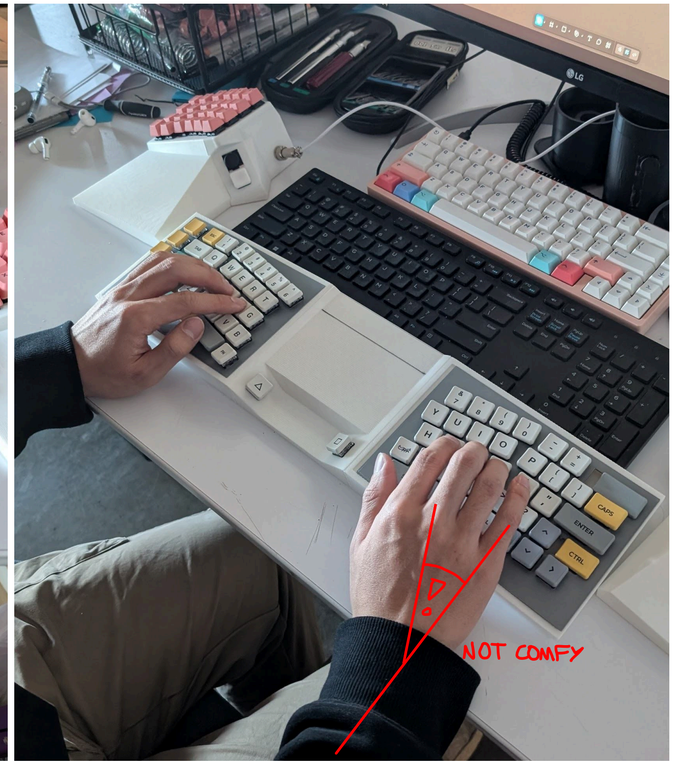
Exploration Purpose:

Initial proportions
Ergonomic testing
Swappable keyboard layouts

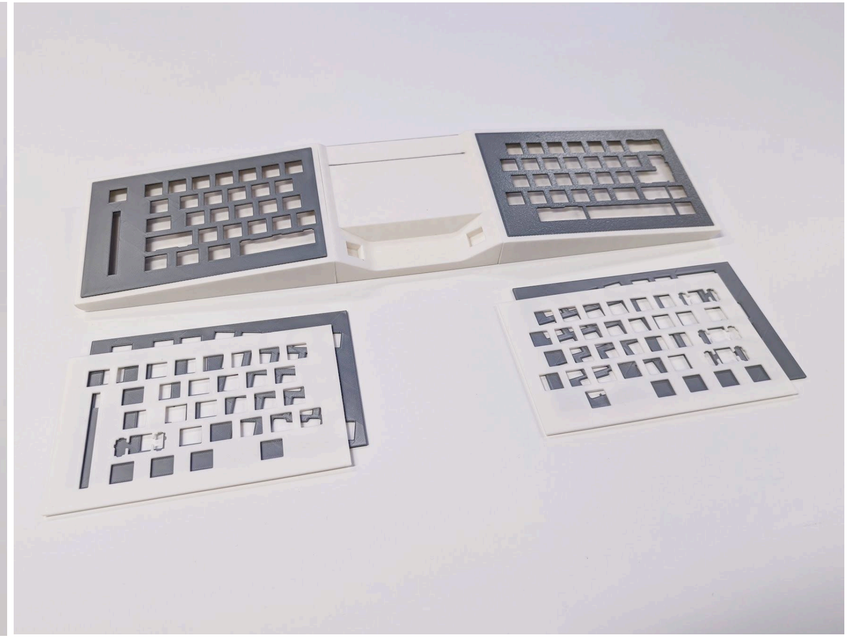
Future direction:

Look to shrink the size
Alice keyboard layout ergonomics is too wide apart
Regular keyboard layout ergonomics worked better
Get rid of swappable keyboard layouts









Mockup 2

Exploration Purpose:

Downsizing footprint as much as possible for 60% layout
Ergonomic testing
Center interaction point testing

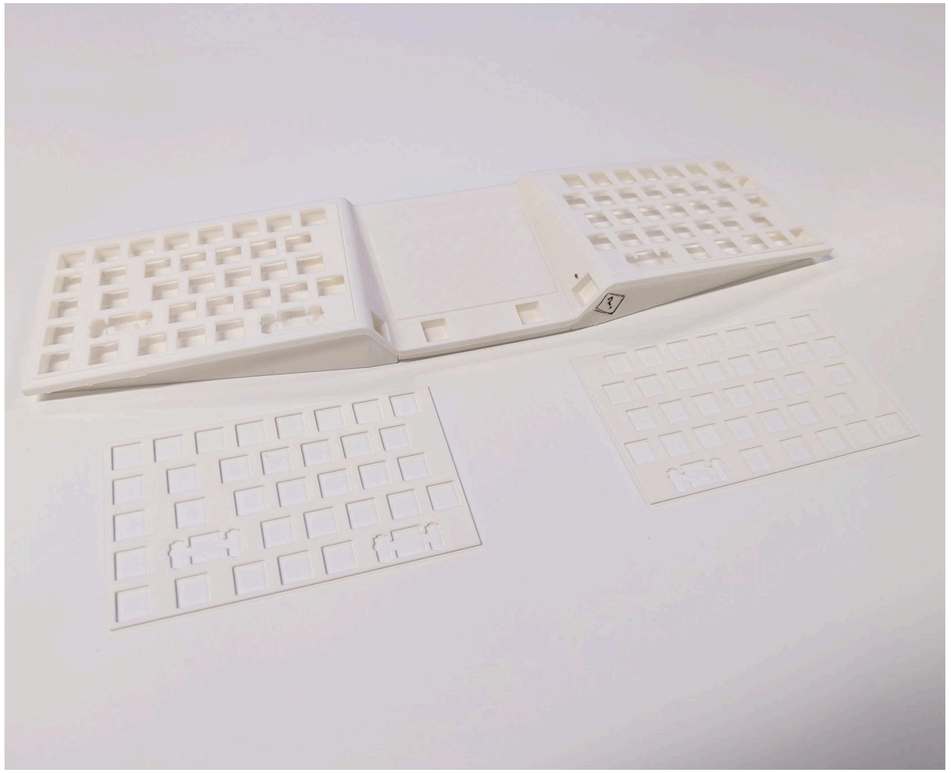




Future direction:

Integrate regular keyboard layout instead of gasket mount
Test different center interaction points by the touchpad





Mockup 3

Exploration Purpose:

Center interaction point testing
Integrated switch testing (establishing an idea for PCB space)
3mm switch height

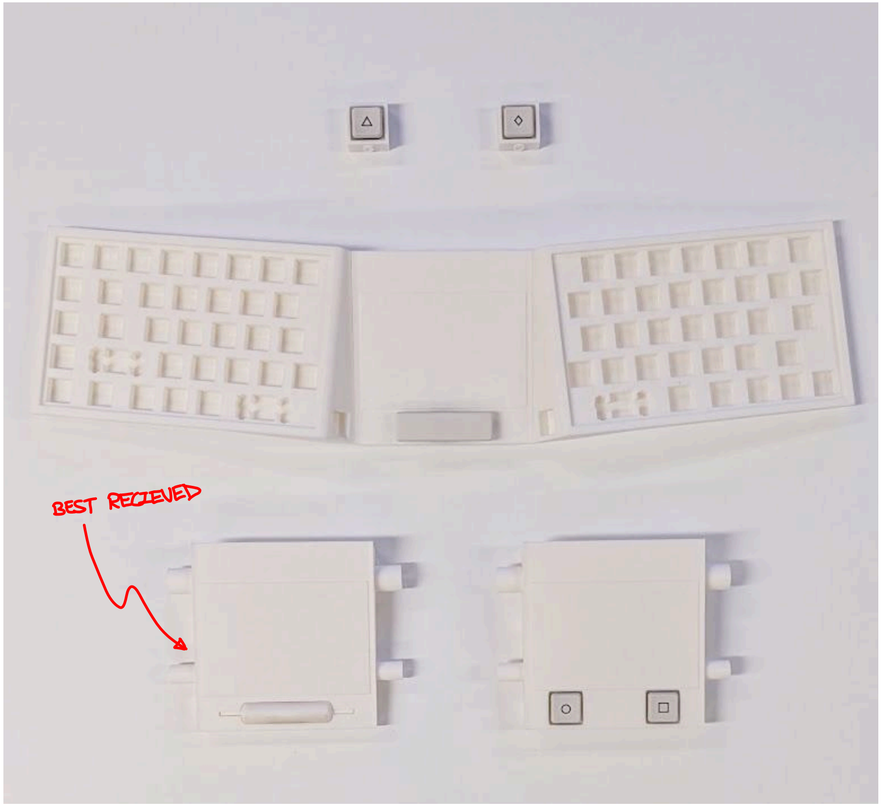




Future direction:

Increase switch height walls (5mm or 6mm)
Fill in blank switch spots to be form fitting





Mockup 4

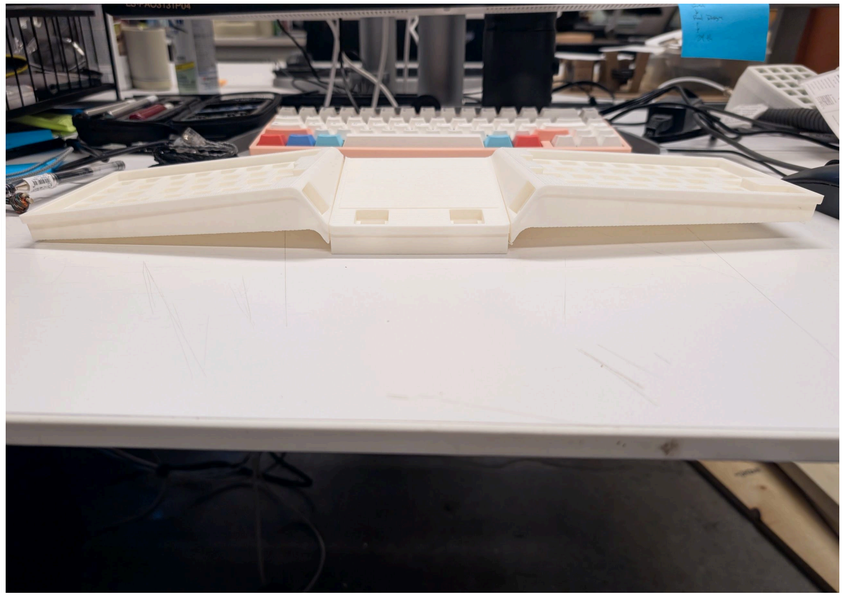
Exploration Purpose:

Form exploration
Center interaction point testing
Integrated switch testing (establishing an idea for PCB space)
5mm vs 6mm switch height for low profile switches
Form-fitting layout

Future direction:

Have flat base design, gullwing design is too unstable







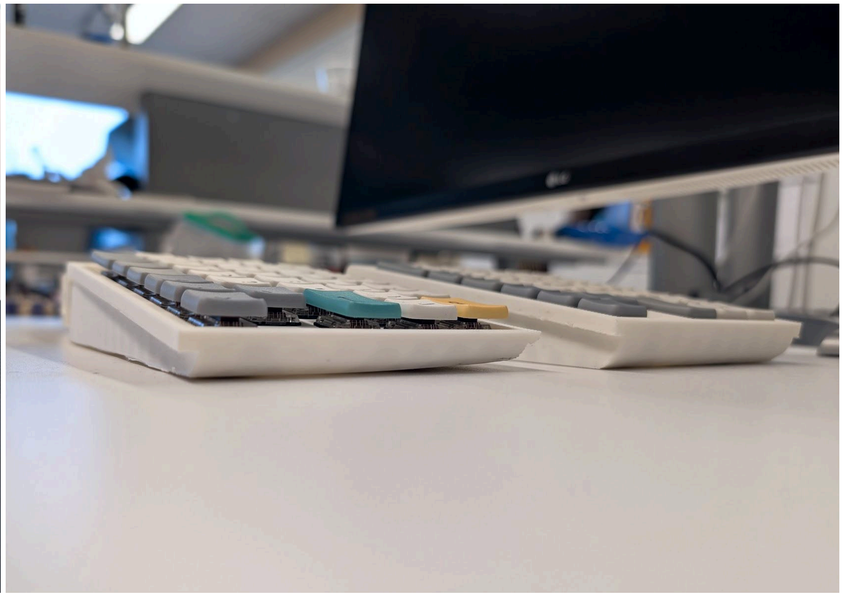


Mockup 5

Exploration Purpose:

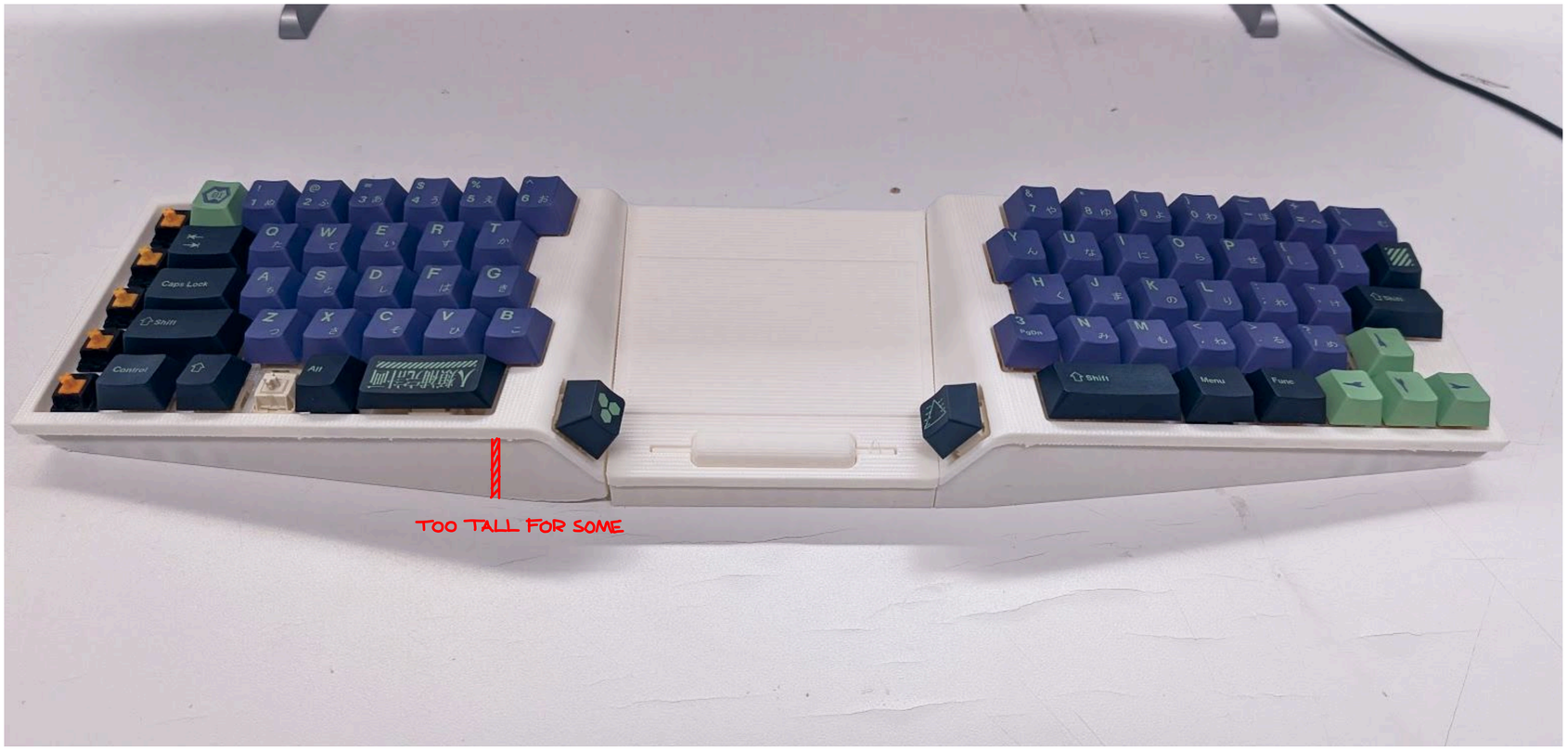
6mm switch wall height
Testing with Choc v1 switches (low profile) and MX switches
Choc v1 switches are uncomfortable to press when flush
MX switch profile is more comfortable for some people





Future direction:

Create a MX version with taller switches and keycaps
Sink switch depth by 3 mm to for better MX switch fitment
Design a matching wrist rest for the taller board



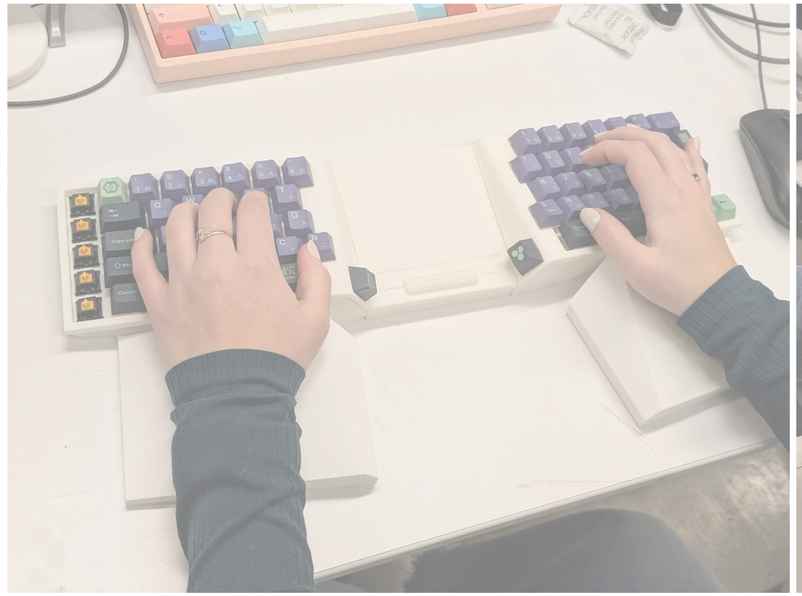
Mockup 5.5

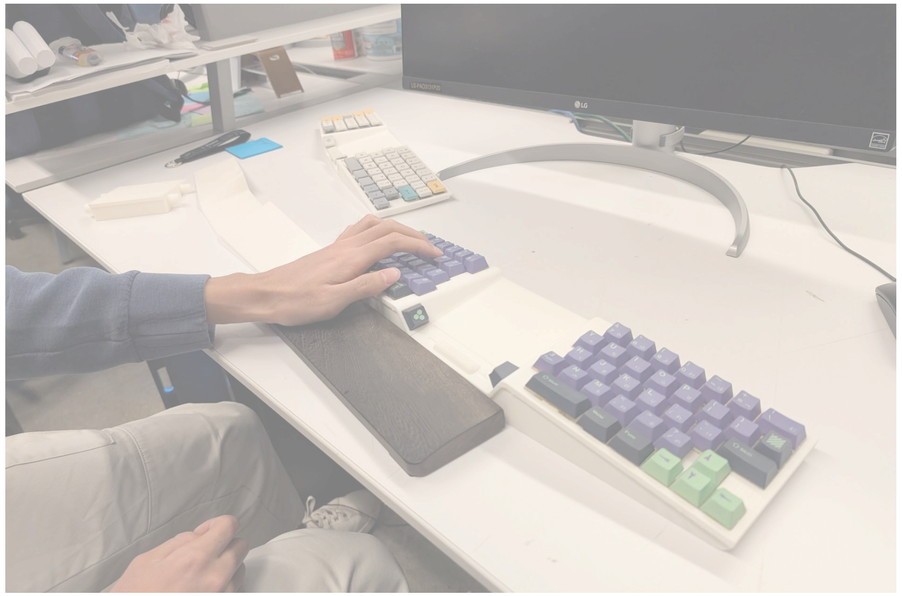
Exploration Purpose:

Wrist rest ergonomic exploration
Tested existing wrist rests for reference

Future direction:

Make the final wrist rest out of wood





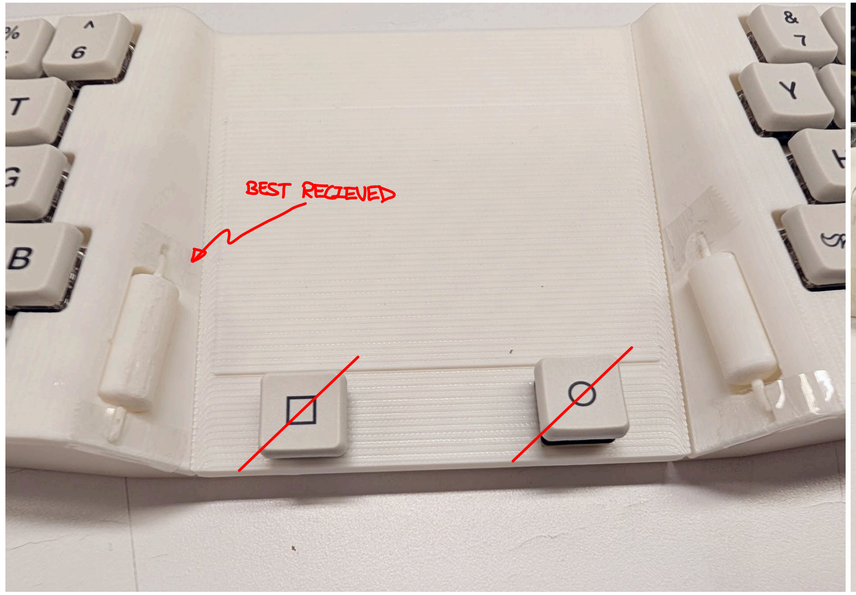


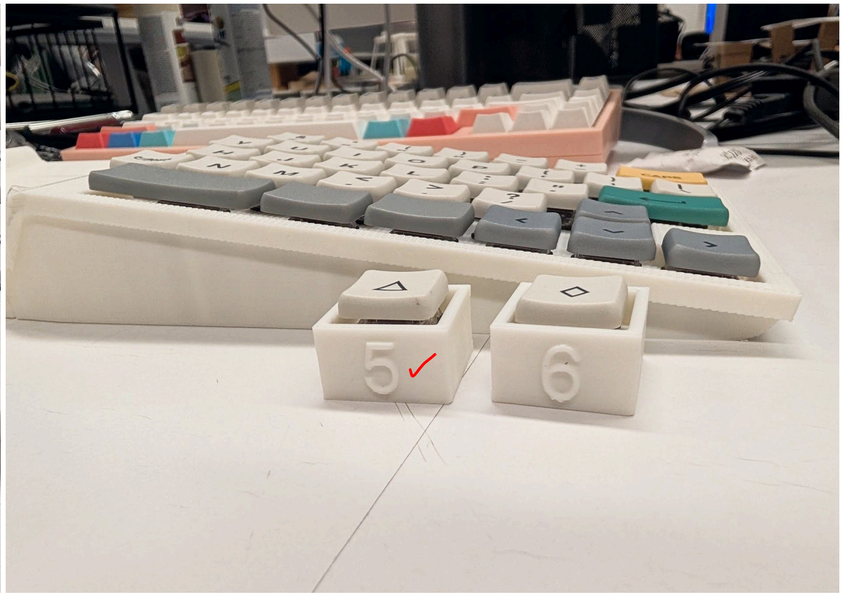


Mockup 6

Exploration Purpose:

5mm switch wall height
Optimizing for Choc v1 switches (low profile)
A lot more comfortable when pressing down on keys
Refined center user interaction







Future direction:

Keep the 5mm switch wall height
Change to 40% layout instead of 60%
Shrink the center user interaction hardware

White Model 1

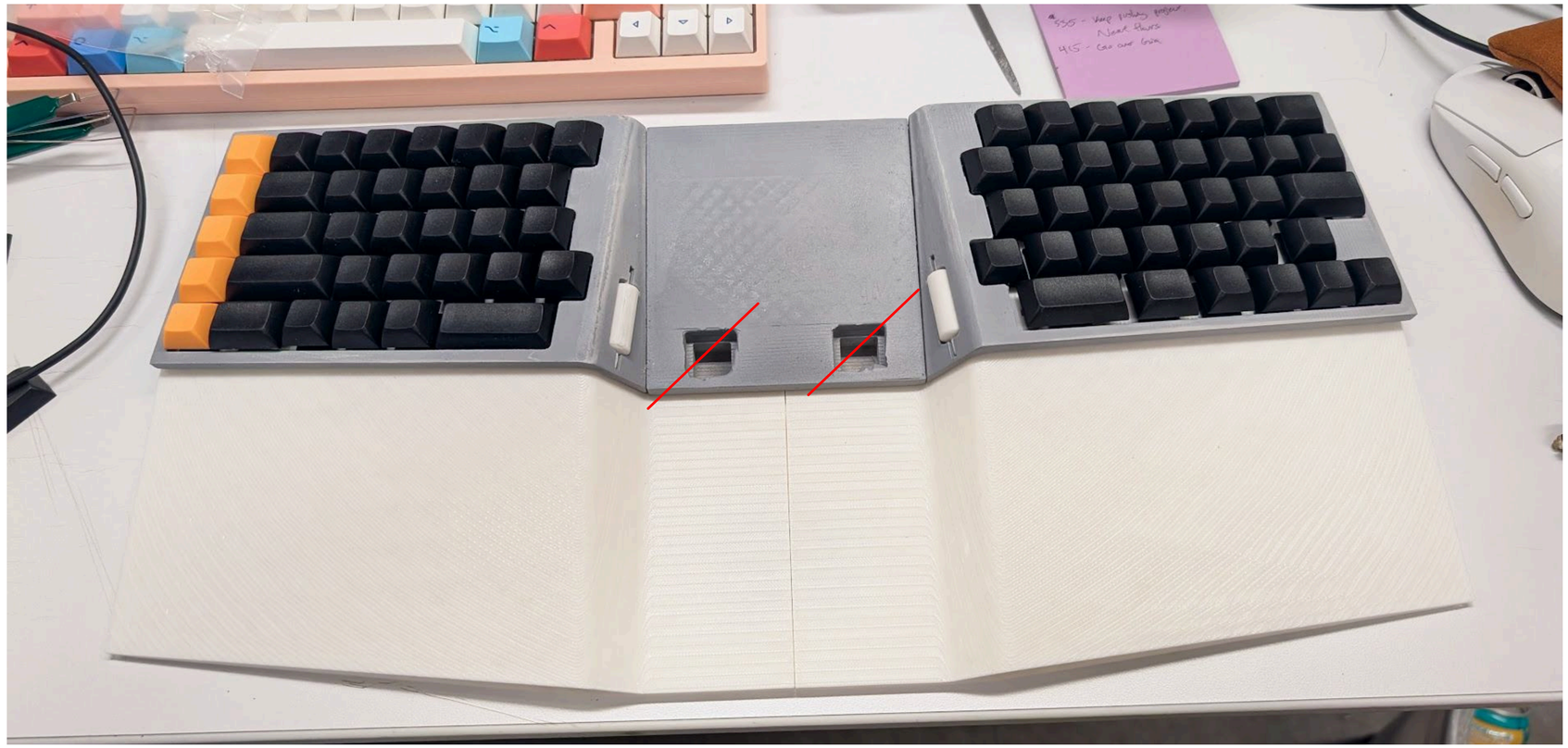
Exploration Purpose:

Deeper switch depth for better MX switch fitment
Sanding the model to look a bit more refined

Future direction:

Center hardware (screen, touchpad, PCs) subject to change
Get rid of the 2 switches in center interaction





Finalizing Plans

Getting Ready For Manufacturing

Hardware Layout

Design a travel 40% low-profile acrylic board
Design a desktop 60% standard aluminum board

Hardware References:

60%

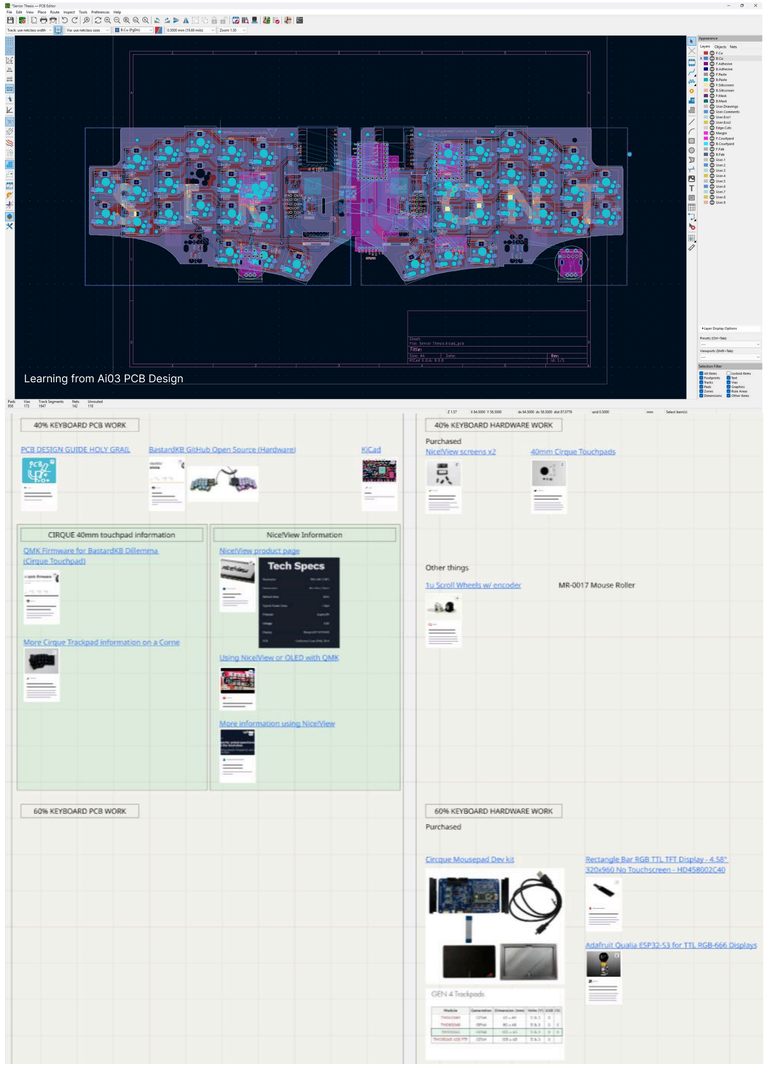
Cirque Mousepad Dev Kit
Adafruit 4.58” Display
Adafruit Qualia ESP32 for Display driver

40%

Cirque glidepoint 40mm touchpad
Nice!View screen



PCB Design and Hardware planning



Hardware Mockup 1 (60%)

Off-the-Shelf Hardware

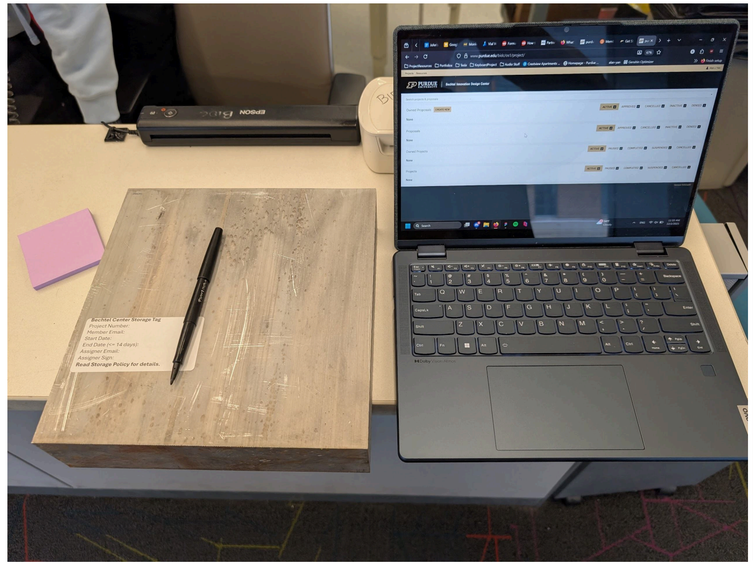
In case of no manufacturers:

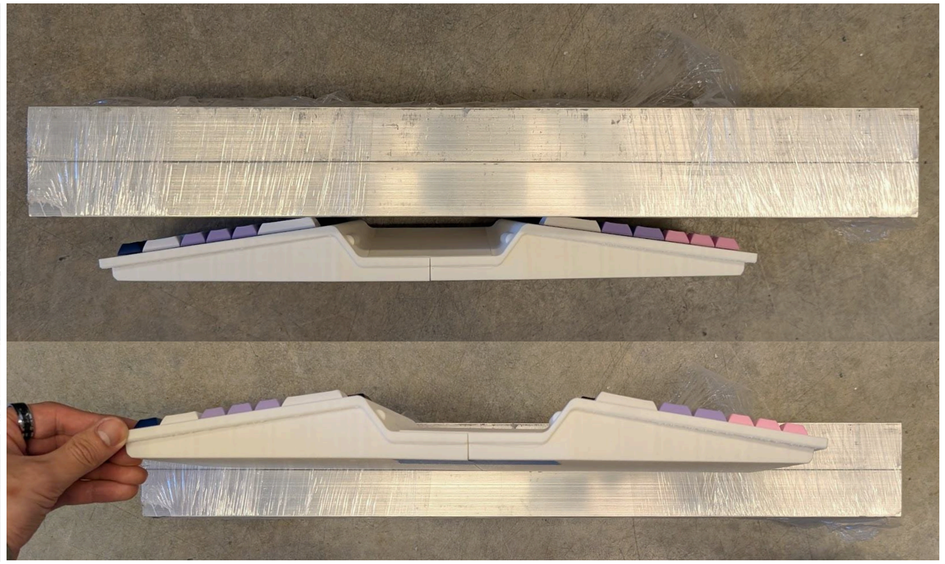
Using fully functional and capable hardware to create a high-fidelity working prototype



Aluminum CNC Prototyping

Using fully functional and capable hardware to create a high-fidelity working prototype





Partnering w/ Manufacturer

Design Intent and Production

Design a desktop 60% standard aluminum board

Manufacturing Capabilities:

Custom touchpad designs
Custom roller encoders
Custom screen displays







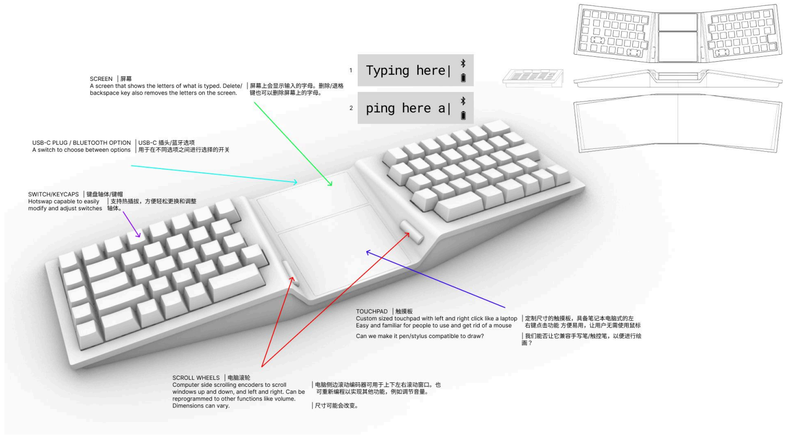
Hardware Mockup 2 (60%)

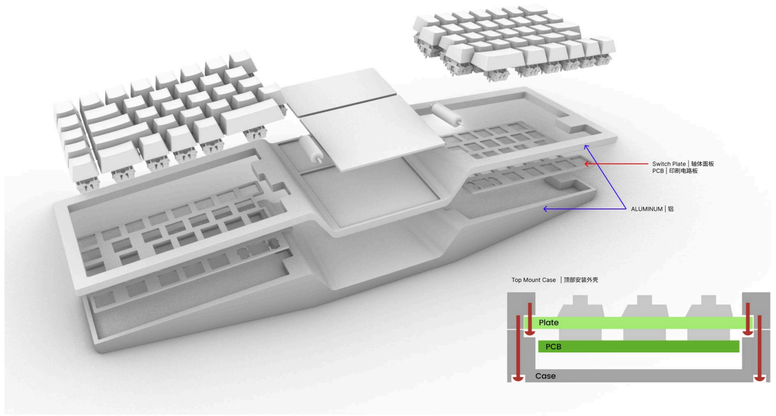
Custom Suppliers

Relying on custom supplier manufacturer

New proportions from original design intent

Design Patent Pending









Hardware Mockup 3 (60%)

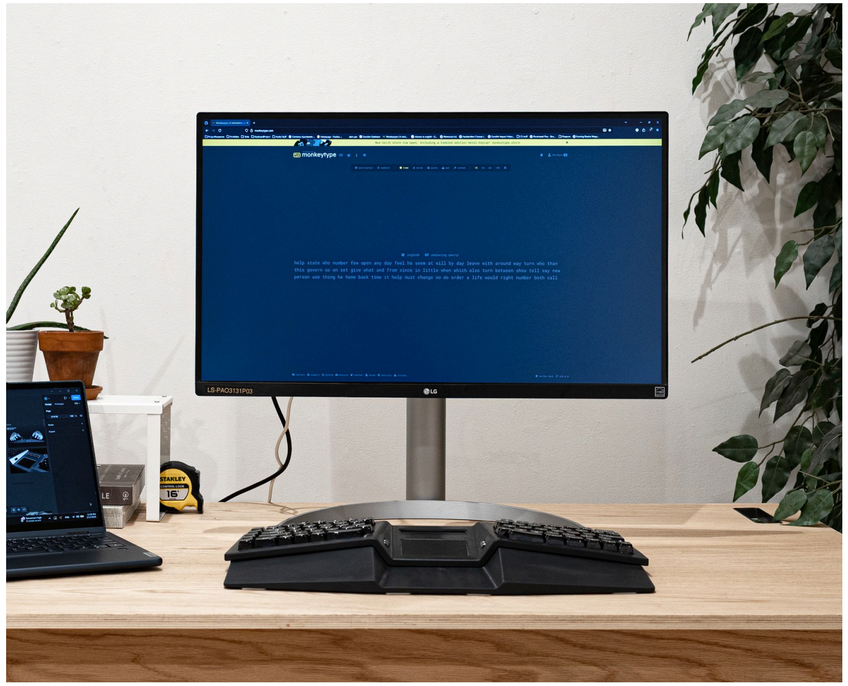
Supplier Prototype

Testing working prototype

Stress-testing prototype for typical and edge-cases







Design Change Notes:

Current design is too expensive to manufacture to achieve design intent. Researching methods to cut costs.

Change wrist rest angle to be higher to reduce wrist strain

Change screw placements on the bottom of the chassis
Slightly change surface design for smoother read

Hardware Mockup 1 (40%)

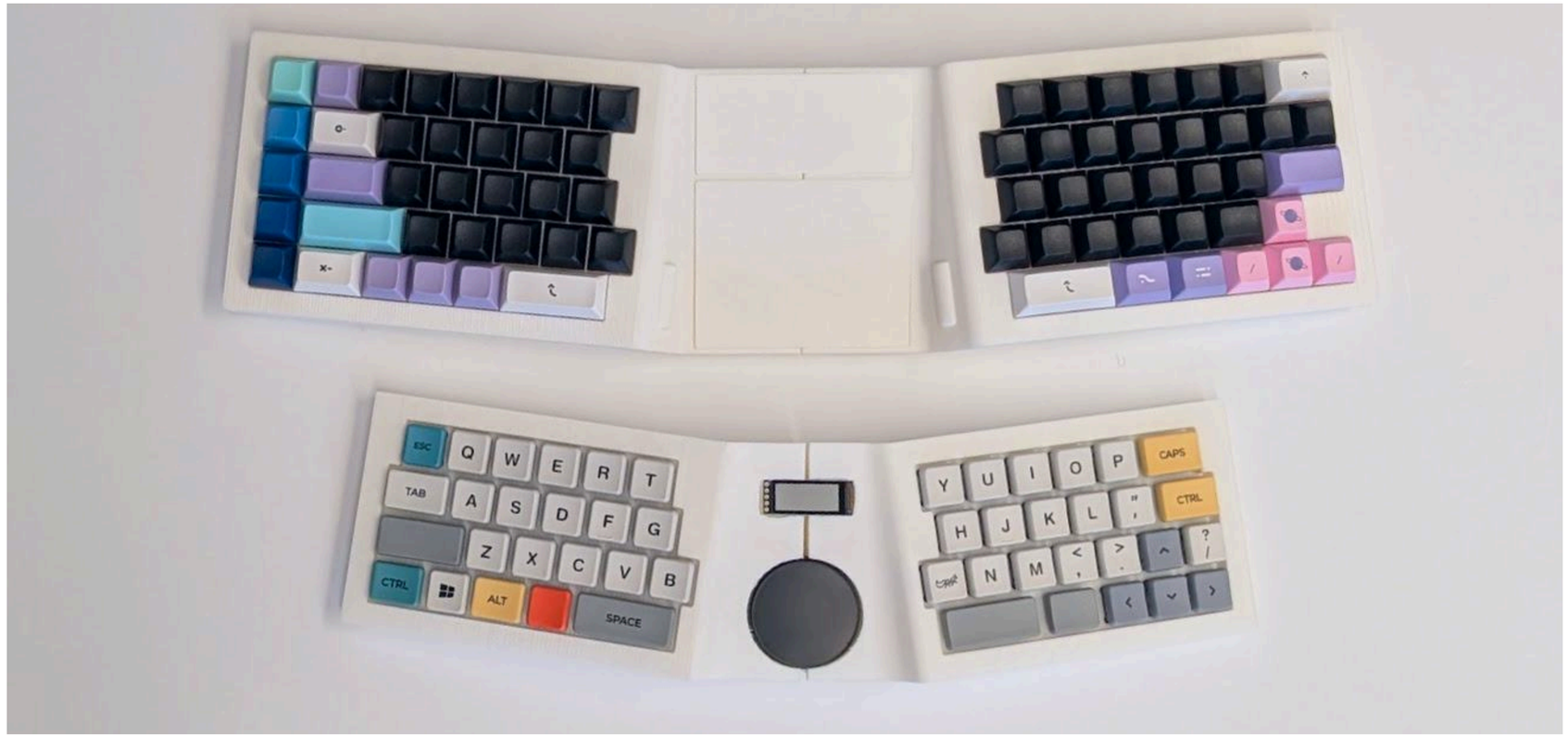
Off-the-Shelf Hardware

Designing a hobby level 40%

Using common consumer-off-the-shelf hardware for small custom keyboards

Custom PCB Prototyping

Working with PCB designer to make a custom hobby-level and mass-production level versions of the PCB





Hardware Mockup 2 (40%)

Custom Prototype



To Be Continued...

Mass Manufacturing Refinement



Design Intent

Indigo Series

Introducing a New Way to Navigate the Computer



Establishing a Standard

The Next Steps For Everyone



Supportive Ergonomics

Addressing Posture



Intuitive Placement

Learned Behaviors







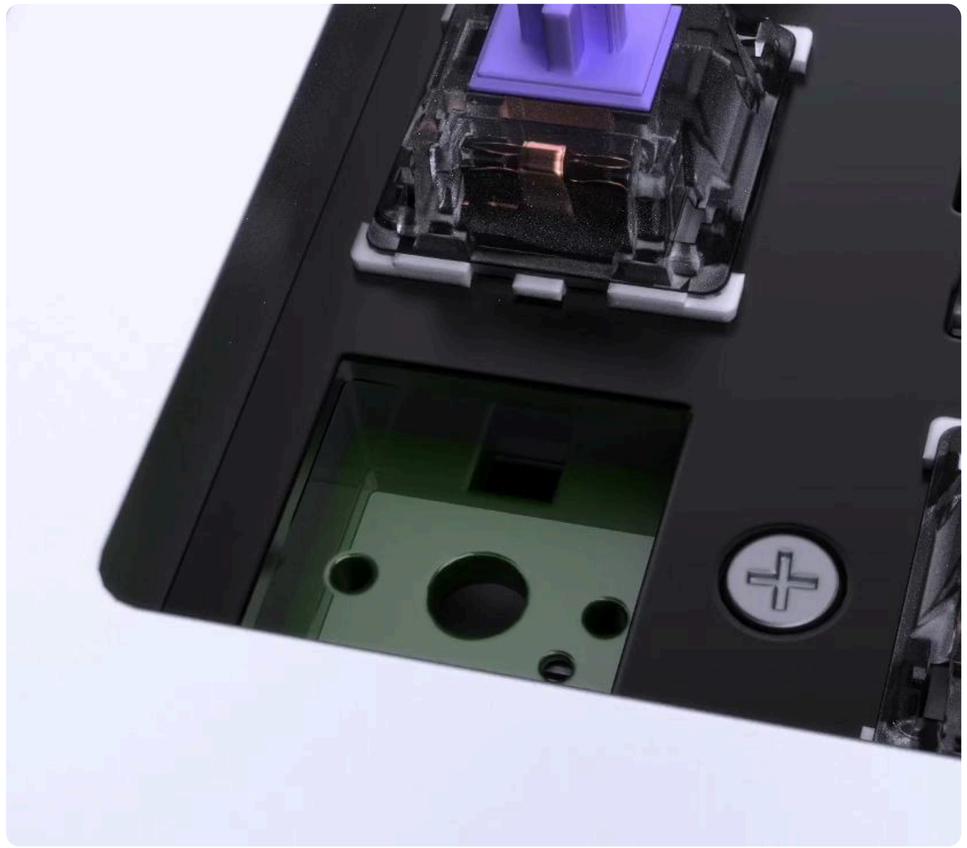
Streamlined Attention

Reduced Cognitive Load



Fully Customizable

A Touch of Me, Myself, and I



Indigo65

Standard Desktop
Productivity Keyboard



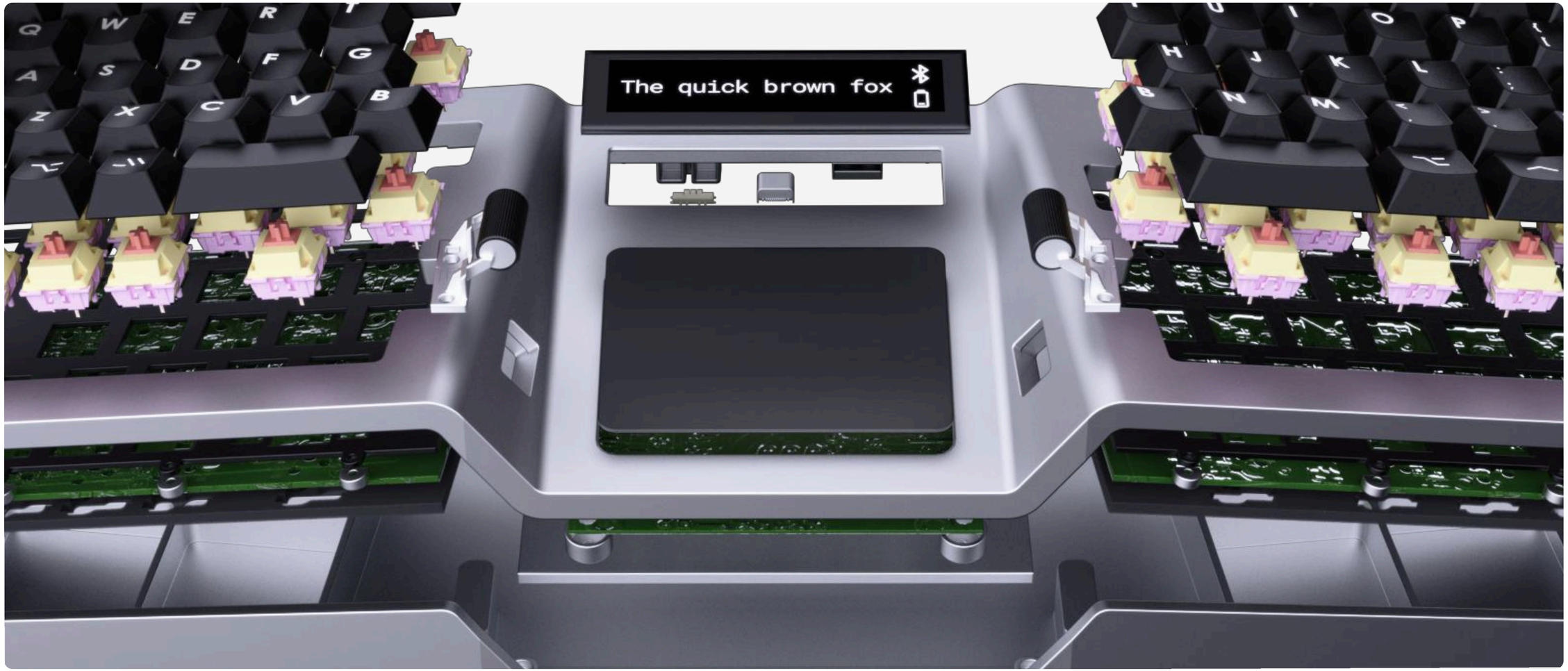
Indigo40

Travel Ergonomic
Keyboard



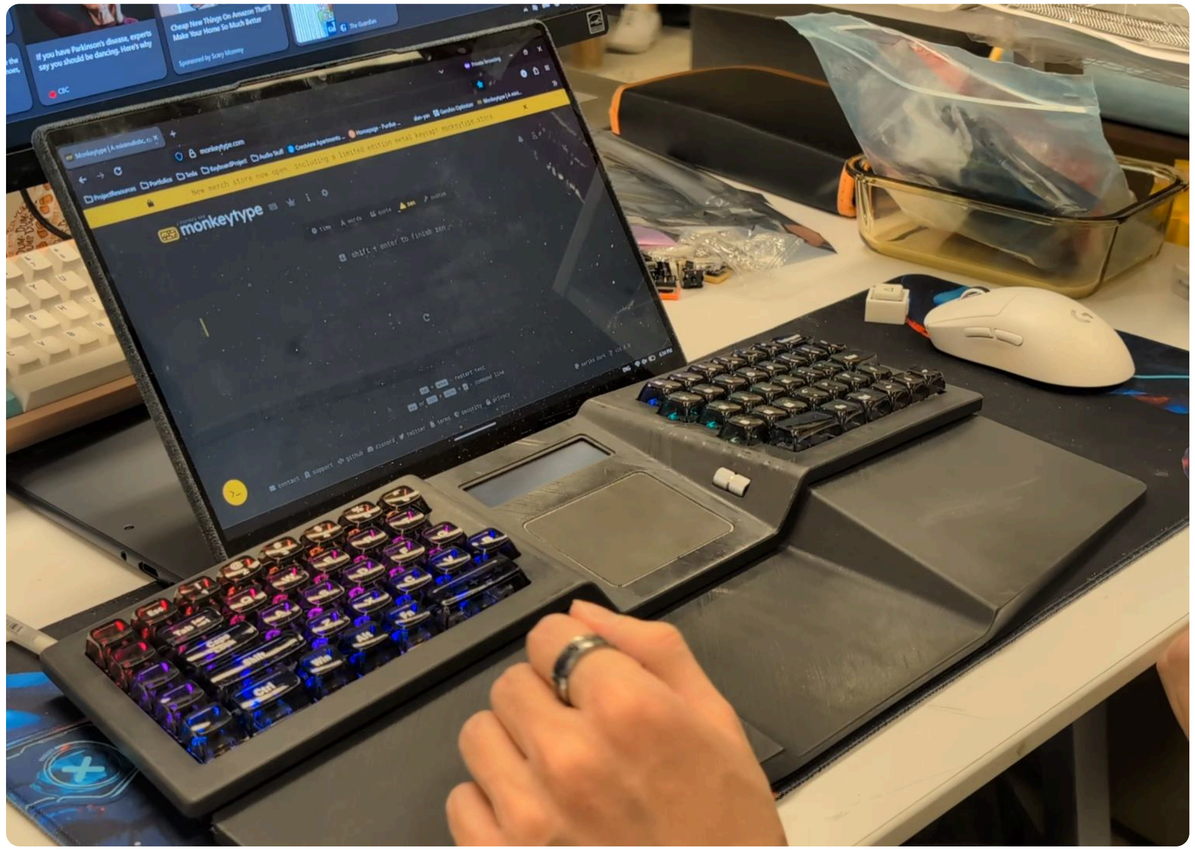
Step by Step

Taking Apart Every Detail



Manufactured Prototype Sample

Product Demo





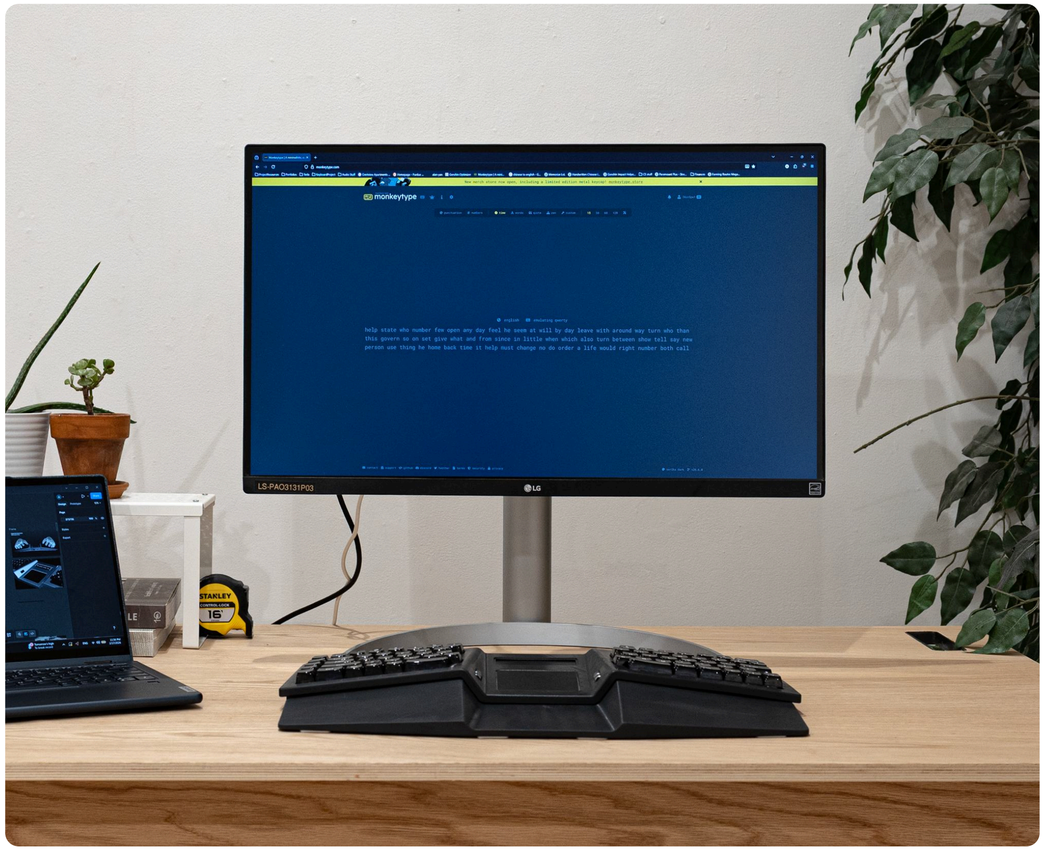
What’s Next?

I WANT ONE

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