

Technical Specification: OrbiTouch-Style Virtual Keyboard Mapping (Accessibility, Legacy, and Pro)

1. Document Overview and Purpose

This technical specification defines the 64-chord mapping architecture for a dual-dome virtual input system based on the "Keybowl" (OrbiTouch) logic. The objective is to provide a complete framework for software developers and UX engineers to implement an input system that eliminates fine motor dependency. By replacing traditional key presses with simultaneous 8-direction movements of two domes (joysticks), the system accommodates users with significant physical or cognitive impairments while offering a high-efficiency path for professional power users. This document formalizes the coordinate systems and the logical distribution of characters across three distinct operational modes.

2. Core Operational Logic and Coordinate System

The system utilizes a "Chord" process: a character is registered only when both the Left Dome (Selector) and Right Dome (Character) are moved into discrete directional sectors simultaneously.

Directional Mapping

Both domes operate on a 360-degree field divided into eight 45-degree discrete sectors. To prevent input jitter, a central "Deadzone" must be implemented where no input is registered.
| Direction | Abbreviation | Degree Sector (Discrete) |
|-----|-----|-----|| North | N | 337.5° – 22.5° || Northeast | NE | 22.5° – 67.5° || East | E | 67.5° – 112.5° || Southeast | SE | 112.5° – 157.5° || South | S | 157.5° – 202.5° || Southwest | SW | 202.5° – 247.5° || West | W | 247.5° – 292.5° || Northwest | NW | 292.5° – 337.5° |

A character is "typed" upon the synchronized entry of both domes into their respective sectors.

3. Accessibility Mode Mapping (Simple Mode)

The Accessibility Mode is designed for users with physical or mental disabilities (e.g., Autism) by prioritizing a strict alphanumeric progression. This reduces cognitive load through logical sequencing.

Accessibility Mode 64-Chord Mapping Table
Left Dome (Selector) Right Dome (Character) Output Character
----- ----- ----- N N A N NE B N E C N SE D N S E N SW F N W G N NW H NE N I NE NE J NE E K NE SE L NE S M NE SW N NE W O NE NW P E N Q E NE R E E S E SE T E S U E SW V E W W E NW X SE N Y SE NE Z SE E 0 SE SE 1 SE S 2 SE SW 3 SE W 4 SE NW 5 S N 6 S NE 7 S E 8 S SE 9 S S Space S SW Enter S W , (Comma) S NW . (Period) SW N ! SW NE @ SW E # SW SE \$ SW S % SW SW ^ SW W & SW NW * W N (W NE) W E _ W SE + W S - W SW = W W W NW NW N { NW NE } NW E \ NW SE \ NW S : NW SW ; NW W " NW NW ''

4. Legacy Mode Mapping (Standard Research Layout)

This mode reconstructs the layout used in the original Keybowl research studies (Figure 11) and incorporates standard research symbols identified in "The Bat" keyboard documentation.

Legacy Mode 64-Chord Mapping Table| Left Dome (Selector) | Right Dome (Character) | Output Character || ----- | ----- | ----- || **S (Inner Ring)** | N | E || **S (Inner Ring)** | NE | R || **S (Inner Ring)** | E | T || **S (Inner Ring)** | SE | F || **S (Inner Ring)** | S | D || **S (Inner Ring)** | SW | C || **S (Inner Ring)** | W | S || **S (Inner Ring)** | NW | A || **N (Outer Ring)** | N | U || **N (Outer Ring)** | NE | I || **N (Outer Ring)** | E | O || **N (Outer Ring)** | SE | P || **N (Outer Ring)** | S | L || **N (Outer Ring)** | SW | M || **N (Outer Ring)** | W | N || **N (Outer Ring)** | NW | H || **E** | N | B || **E** | NE | G || **E** | E | J || **E** | SE | K || **E** | S | Q || **E** | SW | V || **E** | W | W || **E** | NW | X || **W** | N | Y || **W** | NE | Z || **W** | E || **Space** || **W** | SE | Enter || **W** | S | , (Comma) || **W** | SW | . (Period) || **W** | W | 0 || **W** | NW | 1 || **NE** | N | 2 || **NE** | NE | 3 || **NE** | E | 4 || **NE** | SE | 5 || **NE** | S | 6 || **NE** | SW | 7 || **NE** | W | 8 || **NE** | NW | 9 || **SE** | N | ! || **SE** | NE | @ || **SE** | E | # || **SE** | SE | \$ || **SE** | S | % || **SE** | SW | ^ || **SE** | W | & || **SE** | NW | * || **SW** | N | (|| **SW** | NE |) || **SW** | E | _ || **SW** | SE | + || **SW** | S | - || **SW** | SW | = || **SW** | W | || **SW** | NW | || **NW** | N | { || **NW** | NE | } || **NW** | E | \ | || **NW** | SE | \ | || **NW** | S | : || **NW** | SW | ; || **NW** | W | < || **NW** | NW | > |

5. Pro Mode Mapping (Complex Efficiency Layout)

The Pro Mode is optimized for typing speed by adhering to the "Minimization of Diagonal Travel" principle. Most frequent English characters are mapped to cardinal directions (N, S, E, W) to exploit biomechanical advantages. Cardinal movements require simpler muscle activation patterns and generate lower torque on the wrist compared to intercardinal (diagonal) movements, which require complex, multi-tendon coordination.

Pro Mode 64-Chord Mapping Table| Left Dome (Selector) | Right Dome (Character) | Output Character || ----- | ----- | ----- || **N** | N | E || **N** | E | T || **N** | S | A || **N** | W | O || **N** | NE | I || **N** | SE | N || **N** | SW | S || **N** | NW | H || **E** | N | R || **E** | E | D || **E** | S | L || **E** | W | U || **E** | NE | C || **E** | SE | M || **E** | SW | F || **E** | NW | Y || **S** | N | P || **S** | E | W || **S** | S | G || **S** | W | B || **S** | NE | V || **S** | SE | K || **S** | SW | X || **S** | NW | J || **W** | N | Q || **W** | E | Z || **W** | S | Space || **W** | W | Enter || **W** | NE | . || **W** | SE | , || **W** | SW | 0 || **W** | NW | 1 || **NE** | N | 2 || **NE** | E | 3 || **NE** | S | 4 || **NE** | W | 5 || **NE** | NE | 6 || **NE** | SE | 7 || **NE** | SW | 8 || **NE** | NW | 9 || **SE** | N | ! || **SE** | E | @ || **SE** | S | # || **SE** | W | \$ || **SE** | NE | % || **SE** | SE | ^ || **SE** | SW | & || **SE** | NW | * || **SW** | N | (|| **SW** | E |) || **SW** | S | _ || **SW** | W | + || **SW** | NE | - || **SW** | SE | = || **SW** | SW | || **SW** | NW | || **NW** | N | { || **NW** | E | } || **NW** | S | \ | || **NW** | W | \ | || **NW** | NE | : || **NW** | SE | ; || **NW** | SW | < || **NW** | NW | > |

6. Comparison of Mode Characteristics

Feature, Accessibility Mode, Legacy Mode, Pro Mode

Target User, Individuals with physical or cognitive disabilities., Researchers and legacy hardware users., Professionals and ergonomic power users.

Mapping Logic, Strictly Alphanumeric/Logical rotation., Concentric Ring (Inner/Outer) Research Layout., Frequency-Optimized (Cardinal Priority).

Biomechanical Effort, High (Relies on rotation over frequency),, Moderate (Balanced for research tasks),, Minimal (Optimized muscle activation for common digraphs).

Learning Curve, Lowest (Hunt-and-peck friendly), Moderate (Requires ring-system memorization), High (Requires kinesthetic memorization of frequency).

7. Developer Implementation Requirements

To ensure the integrity of the Keybowl architecture, the following constraints must be met:

1. **Deadzone Management:** Implementation must define a central neutral zone of at least 15% of total dome travel. No signal should be transmitted if either dome is in this zone.
2. **Discrete Sector Logic:** Input must be snapped to the nearest 45-degree vector. North is strictly defined as the arc centered at 0° (e.g., ±22.5°).
3. **Chord Timing and Debouncing:** A character is only outputted when both domes reach a discrete direction within a 50ms window. If one dome lingers in a direction without the other, the system should hold the selector until the chord is completed or timed out.
4. **Visual Scaffolding:** Developers must provide on-screen "Character Rings" or color-coded feedback bands. This visual assistance is critical for the transition from the "Hunt-and-Peck" phase to full kinesthetic memorization.
5. **Extended Modifiers:** For "Complex Mode" users, the implementation should allow for back-of-controller triggers to act as "Extended Shift Modifiers," potentially expanding the 64 base chords to 128 or 256.