# Note from the Inventor

Thank you for ordering the ReadRing 2021 Prototype handcrafted by the inventor. As early adopters of the technology, your feedback will shape the development of ReadRing funded by your purchase. The sales of the prototypes may not cover the cost of development in the past years, but this is to make them affordable by most buyers while keeping the project running.

As valued contributors to our mission to bring literacy, independence, and happiness to blind people, you are eligible of buying production version of ReadRing at a special discounted price after the mass production starts.

# Technical Specifications

## Mechanical

| **Description** | **Value** | **Unit** |
| --- | --- | --- |
| Width | 64 | mm |
| Length | 100 | mm |
| Height | 65 | mm |
| Reading opening width | 25 | mm |
| Device operating weight | 95 | g |
| Refreshable braille technology | Sequentially preset reciprocating braille dots on a rotary wheel | - |
| Simultaneously readable cells | 4 | - |
| Auxiliary wheels count | 2 | - |
| Braille actuators count | 3 | - |
| Braille cells per revolution | 20 | - |
| Apparent braille cell spacing | 6.22 | mm |
| Braille dots per cell | 6 | - |
| Braille dot width | 1.4 | mm |
| Raised braille dot height | 0.5 | mm |
| Adjacent dot spacing, horizontal | 2.5 | mm |
| Adjacent dot spacing, vertical | 2.5 | mm |
| Maximum refreshing speed | 10 | cells/sec |

## Electrical

| **Description** | **Value** | **Unit** |
| --- | --- | --- |
| Microcontroller | ESP32-WROVER-B | - |
| Connectivity | Bluetooth 4.2 / BLE | - |
| Data/charging port | Micro USB | - |
| Input buttons | 8 | - |
| System voltage | 3.3 | VDC |
| Battery voltage | 3.7 | VDC |
| Battery capacity | 800 | mAh |
| Battery type | Lithium-polymer | - |
| Estimated continuous reading time | 4 | hours |
| Estimated maximum standby time | 6 | hours |
| Estimated maximum charging time | 2 | hours |
| Braille actuators type | Piezoelectric bimorph bender, parallel 3 poles | - |
| Actuator operating voltage | 170 | VDC |
| Actuator drive circuit type | Complementary emitter follower | - |

# Instruction for Prototypes with 2021 Firmware

Now the firmware that comes with 2021 version prototypes uses classic Bluetooth protocol that requires an Android app to navigate and drive the braille output. A better firmware that works with accessibility mode in any mobile operating system is being developed on BRLTTY platform and will be rolled out on future update. Please check out <https://www.read-ring.com/downloads> for access to files, instructions, and future updates on firmware and apps.

## Physical Explanation

ReadRing 2021 Prototype is like a computer mouse with 1 big braille wheel at the rear and 2 auxiliary wheels at the front. You can read braille by touching the braille surface inside the braille wheel through the opening only when the braille wheel is turned to the right. The dots will be cleared if the wheel is turned to the left. The micro-USB data/charging port and the sliding power switch are in the front. There are 8 navigation tactile buttons on the sides of the device. Numbered from rear to front, there are buttons L1 to L4 on the left and R1 to R4 on the right.

## Getting the Demo App

Go to <https://www.read-ring.com/downloads> to download the ReadRing\_Demo.zip, then unzip and install the extracted ReadRing\_Demo.apk file on your Android device. There might be some warnings and permissions required to access Bluetooth and camera for some features in the app.

## Turning on the ReadRing Prototype

Slide the power switch next to the micro-USB port in front of the device to the left. You may hear slight movements of the actuators and subtle squeaking of the electric converter. If you turn the braille wheel or move the device to the right, you will hear some mechanical movement and the reading surface will display some dot test patterns.

## Pairing with ReadRing via Bluetooth

Open the ReadRing Demo app and tab on “Pair a device” button. Select your ReadRing 2021 Prototype from the list and wait until the pairing is successful. You may hear “connected” confirmation voice from the app.

## Sending Text and Reading Braille

Input an English paragraph in the editable text box, then tab “Send Braille”. Place your reading finger on the braille display surface in the braille wheel inside the opening, then move the device to the right or manually turn the wheel to read the corresponding braille. The text input modes, “Capture OCR” and “Open file...”, are not fully functioning at the time this instruction was written.

## Navigation Control

As the handcrafted mechanism may not operate perfectly, you may find some dots hard to read. To repeat the previous word, press L1 or L2. To skip to next word, press R1 or R2. To go back to the first word, press L3 or L4.

# Future Development

The firmware can be developed to enable working with accessibility mode on various mobile operating systems as well as customizable navigation key mapping. The future hardware for production will include an optional OCR scanning camera, braille input keys, steering control to keep the camera on the text line being scanned, etc. Your feedback can shape the future development.