

# PIXATION HEARING AID or PERSONAL SOUND AMPLIFIER PRODUCT FIRMWARE - VERSION 2.0

**APPLICATION NOTE**

**2/2021-HA-FIRMWARE**

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## BACKGROUND

The development of this firmware for hearing aids or personal sound amplification products has been evolutionary. The project began in 2009. We have changed development platforms four times as newer processor technologies emerged. To cost effectively serve the global market with efficacy and safety, application specific processor hardware was abandoned. As our understanding of psychoacoustics matured, new digital signal processing algorithms were invented (both proprietary and patented). This firmware is the result of the last 12 years of research, development, and testing. – Dean R. G. Anderson and Dean G. Anderson, M.D.

## AVAILABLE FIRMWARE<sup>1</sup> ORDERING SELECTIONS

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|--------------------------|--------------------|
| 1. BEHIND-THE-EAR (BTE): | ORDER CODE: BTEv02 |
| 2. BODY WORN (BW):       | ORDER CODE: BWv02  |
| 3. BONE CONDUCTION (BC): | ORDER CODE: BCv02  |

This firmware is hardware specific and is based on the corresponding Pixation electronic schematics and battery voltages used.

Contact [Pixation@Pixation.com](mailto:Pixation@Pixation.com) for firmware customization.

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<sup>1</sup> Pixation Corp. firmware is provided as Software of Unknown Provenance (SOUP). Pixation Corp. firmware was previously developed and adequate records of the development PROCESSES are not available.

## PERSONALIZE AUDIO (EXAMPLE USAGE INSTRUCTIONS)

Your device has 2 buttons. These buttons are referred to as the “UP” button and the “DOWN” button.

Your device also has a green indicator LED light. Whenever the device is powered ON, pressing either button will cause the green LED to light. The light will also flash after releasing the button to indicate changes to a setting. The number of light flashes corresponds to the setting selected.

### POWER ON/OFF:

For the AAA battery powered device:

1. Insert the earbuds into the headphone jack to turn the device ON. You will hear “welcome” tones when you turn the device ON. The green LED will also light for a short time when the device is turned ON.
2. Remove the earbuds from the headphone jack to turn the device OFF.

For the LiPo powered device:

1. When OFF to turn ON: Momentarily press the “UP” button to turn ON. You will hear “welcome” tones when you turn the device ON. The green LED will also light for a short time when the device is turned ON.
2. When ON to turn OFF: Press and hold down either the “UP” button or the “DOWN” button for 2 seconds or longer to turn the device OFF. As soon as you have held the button down for 2 seconds you will hear a rapidly alternating series of tones to alert you that you have held the button down sufficiently long. When you release the button, you will hear “goodbye” tones. The green LED will also rapidly flash for 5 seconds to indicate that the device is turning OFF.

All device settings are stored when the device is turned OFF and will be restored when the device is turned ON. Holding down a button for more than 2 seconds will cause the device to sound a rapidly alternating series of tones. Holding down a button for more than 10 seconds will cause the device to sound and light an international Morse coded message: "COPYRIGHT 2021 DEAN R. G. ANDERSON - ALL RIGHTS RESERVED - PATENTS PIXATION.COM".

You will hear a “low battery” tone warning when battery power is nearly depleted. A LiPo powered device will automatically turn off when the battery voltage reaches a minimum level.

### SETTING YOUR COMFORTABLE LISTENING LEVEL (VOLUME):

Use the “UP” or “DOWN” buttons to set your Comfortable Listening Level. Momentarily press the “UP” button to make the volume louder. Momentarily press the “DOWN” button to make the volume softer or quieter. With each momentary button press, the volume level is changed. After releasing the button, you will hear a number of beeps to indicate your comfortable listening level. The number of beeps

heard will range from 1 beep to 13 beeps. The number of beeps will be grouped in 3's meaning that there will be a brief pause after each 3 beeps to make it easier to count.

A comfortable level indicated by 13 beeps is the loudest listening level you can set. A comfortable level indicated by 1 beep is the softest listening level you can set. Set the comfortable listening level to the volume level you prefer.

## WARNINGS, RESTRICTIONS, AND DISCLAIMER

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HARDWARE WARNINGS: (1) Small parts choking hazard. (2) Cords strangulation hazard.

Safety guidance provided for the use of Pixation Corp. firmware follows:

1. Instructions to the end user: Use only the earbuds originally provided with the device. Using any other earbuds may produce sound levels which cause hearing loss.
2. For Bone Conduction users: DO NOT USE AS A HEARING AID. MAY PRODUCE SOUND LEVELS WHICH CAUSE HEARING LOSS.
3. Instructions to the end user shall include recommendations to avoid sound environments where sound levels exceed 85 decibels, A-weighted, as an 8-hour time-weighted average (85 dBA as an 8-hr TWA) using a 3-dB exchange rate (see: <https://www.cdc.gov/niosh/topics/noise/default.html> ).
4. Instructions to the end user shall include recommendations to limit device usage to 8 hours/day.
5. Instructions to the end user shall include recommendations to limit device usage to no more than 40 hours/week.

**See additional Application Notes at [www.Pixation.com](http://www.Pixation.com)**