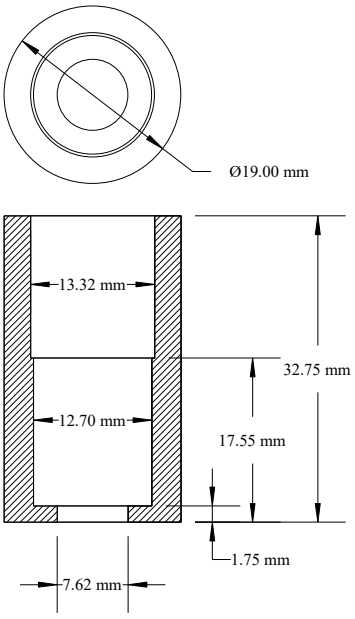
HEARING AID RECEIVER CALIBRATION

APPLICATION NOTE 3/2020-HA-RCVR-CAL

RECEIVER CALIBRATION:

Pixation's hearing aid firmware provides an in-situ acoustic test signal to enable hearing aid receiver calibration. During the hearing aid manufacturing process, the hearing aid receiver must be calibrated using a digital sound level meter. When properly implemented, Pixation's hearing aid firmware allows the test signal output to be adjusted so that the output equals 85 dBA +/- 0.25 dBA.



Before beginning any testing, be sure to follow the manufacturer's instructions for calibrating the digital sound level meter.

A coupler having a 2 cubic centimeter air conduction internal volume is fitted to the ½ inch diameter microphone stem of the digital

sound meter. Oil-based clay or other suitable putty material is used to seal the coupler to the ½ inch microphone stem of the digital sound level meter. Note that the coupler may be a 3D printed component and attached to the digital sound meter as shown in the figure above.

POWER ON THE HEARING AID:

For the AAA battery powered device:

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.

For the LiPo powered device:

Momentarily press the "UP" button 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.

TO BEGIN THE RECEIVER CALIBRATION ACOUSTIC TEST SIGNAL, PRESS BUTTONS IN THE FOLLOWING SEQUENCE WHILE LISTENING TO THE HEARING AID:

1. Press both the "UP" and "DOWN" buttons at the same time. You will hear 10 ascending tones.
2. Press the "UP" button. You will hear a number of beeps to indicate a new volume setting.
3. Press the "UP" button. You will hear a number of beeps to indicate a new volume setting.
4. Press the "DOWN" button. You will hear a number of beeps to indicate a new volume setting.
5. Press the "DOWN" button. You will hear a number of beeps to indicate a new volume setting.
6. Press the "UP" button. You will hear a number of beeps to indicate a new volume setting.
7. Press the "UP" button. You will hear a number of beeps to indicate a new volume setting.
8. Press the "DOWN" button. You will hear a number of beeps to indicate a new volume setting.
9. Press the "DOWN" button. You will hear a number of beeps to indicate a new volume setting.
10. Press the "UP" button. You will hear a number of beeps to indicate a new volume setting.
11. Press the "DOWN" button. You will hear a number of beeps to indicate a new volume setting.
12. Press the "UP" button. You will hear a number of beeps to indicate a new volume setting.
13. Press the "DOWN" button. You will hear 5 measures from "America the Beautiful". Following these 5 measures, you will hear an acoustic test signal consisting of noise between 1000 Hz and 1260 Hz.
14. If you reached this point and did not hear 5 measures of "America the Beautiful" followed by the acoustic test signal, repeat these instructions.

INSERT THE HEARING AID EARBUD SILICONE TIP INTO THE 7.62 mm HOLE OF THE 2cc COUPLER MOUNTED ON THE DIGITAL SOUND LEVEL METER AS SHOWN IN THE PICTURE ABOVE.

ADJUST THE HEARING AID OUTPUT TO 85 dBA +/- 0.25 dBA:

1. Press the "UP" button one time to increase the acoustic test signal output by 0.5 dBA.
2. Press the "DOWN" button one time to reduce the acoustic test signal output by 0.5 dBA.
3. Continue pressing "UP" and/or "DOWN" buttons as many times as required until the calibrated digital sound level meter indicates 85 dBA +/- 0.25 dBA.
4. Press either button for more than 2 seconds to abort receiver calibration. The receiver calibration setting will not be stored. Aborting the receiver calibration procedure will mean that receiver calibration must still be performed at some future time.

5. Press both the “UP” and “DOWN” buttons at the same time to permanently store the receiver calibration setting. At this point you have completed the receiver calibration.
6. Turning off the hearing aid after performing receiver calibration will prevent any future modification of receiver calibration setting. The receiver calibration setting will become permanently stored and will not be alterable in the future.
7. If the hearing aid power has not yet been turned off, this procedure may be repeated and the receiver calibration may be readjusted. The most recent receiver calibration setting will then be permanently stored once the power to the hearing aid has been turned off.
8. For quality control purposes, this in-situ receiver calibration test signal is available at any time in the future by repeating the above button press sequence. The test signal output level will initially reflect the receiver calibration permanently stored. Button presses may then be used to change the acoustic test signal output level but the permanently stored value will not be altered.
9. NOTE DURING RECEIVER CALIBRATION: The green LED will light whenever the environmental sound level in the testing area exceeds 70 dBSPL. Calibration should be performed in a testing area where the environmental sound level is below 70 dBSPL (when the LED is OFF).
10. NOTE DURING RECEIVER CALIBRATION: Use the volume control of an environmental tone source to trigger the LED. When the environmental tone source is louder than 70 dBSPL, the green LED should light. When the environmental tone source is below 70 dBSPL, the green LED should be OFF. Microphone triggering of the green LED will only occur during this receiver calibration procedure.

POWER OFF THE HEARING AID:

For the AAA battery powered device:

Remove the earbuds from the headphone jack to turn the device OFF.

For the LiPo powered device:

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.

WHY IS RECEIVER CALIBRATION PERFORMED AT 85 dBA?

The National Institute for Occupational Safety and Health (NIOSH) has published a Recommended Exposure Limit (REL) for occupational noise exposure of 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).

Receiver calibration at 85 dBA is required to satisfy the NIOSH REL criteria when the device is used in accordance to the hearing aid manufacturer’s instructions.

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