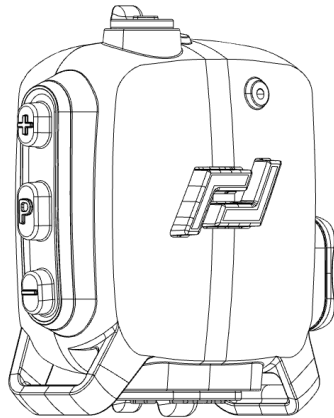


Language

EN

PICOTERA ELECTRONICS INC.  
USER'S MANUAL



R1-H14-F160-A160-2020

**Smart Hearing Protection  
and Communication Device**

**PROPRIETARY AND CONFIDENTIAL**  
**DO NOT DISTRIBUTE**

---

© picoTera Electronics Inc.  
11220 Voyageur Way • Suite 4  
Richmond, BC V6X 3N9  
Phone (778) 918-6040 • Email [info@picotera.co](mailto:info@picotera.co)

---

# Table of Contents

Warnings.....	1
Training .....	1
Smart Earplug .....	1
picoTera Companion Smartphone App .....	2
Terms of Use.....	3
Use with Limitation .....	3
Use in High Risk Areas .....	3
Modifications .....	3
Limitation of Liability.....	3
Entire Obligation .....	4
Applicable Law .....	4
Modification of Terms and Conditions .....	4
Smart Hearing Protection Device.....	5
Smartphone App .....	5
Smart Hearing Protection .....	6
Passive Noise Reduction .....	6
On/Off Switch.....	7
USB Charging .....	7
Technical Information.....	7
Output Port.....	7
Input Port .....	8
Logo Button.....	8
Push to Talk Button.....	8
Volume Buttons.....	8
Microphone .....	8
Digital Ear .....	8
User Notifications.....	9
Audio Playback Priority .....	9
Visual Indicator .....	10
LED Colour Guide.....	10
Social Distancing Alert .....	11

---

Smartphone Companion App .....	11
Disclaimer & Tutorial .....	11
Unlimited Range Push to Talk (URPTT) .....	11
Registered Groups .....	11
My Groups .....	12
Emergency Broadcast .....	12
My Device .....	12
Finding the Device .....	12
Connecting to a Device .....	12
Disconnecting the Device .....	12
Auto-Reconnecting .....	12
My Device Info Screen .....	13
Over the Air Updates .....	13
Find Me .....	13
Settings .....	13
Change Name .....	13
Power Saving Mode .....	13
Noise Reduction .....	14
Impulse Noise Cancellation .....	14
Enable Warning Detections .....	14
Sensitivity Level .....	14
Call Notifications .....	14
Enable Social Distancing Alert .....	15
Registration .....	15
Hotline .....	15
About .....	15
Precautions .....	15

---

# For Your Safety

## Warnings

To prevent damage to your picoTera products or injury to yourself or to others, read the following safety precautions in their entirety before using this equipment. Keep these safety instructions where all those who use the product will read them.



This icon marks warnings. To prevent possible injury, read all warnings before using this product.

## Training

User must attend the potential training session held by picoTera's representative before using the Smart Hearing Protection Device.

### Smart Earplug

There is no guarantee that the Smart Hearing Protection Device will make the wearer more aware of surroundings in all circumstances; the wearer is solely responsible for remaining aware of their environment. Treat this unit like a regular passive hearing protection device.

1. The Smart Hearing Protection Device will not, in any way, prevent accidents, injuries, losses, or damages. User's full attention to his/her surrounding is always required.
2. This hearing protection device meets CSA **Class A** hearing protection requirements.
3. Do not submerge in water.
4. Only charge with standard USB cables.
5. Be aware of surroundings; Smart Hearing Protection Devices do not replace your own eyes and ears, but act as an extra safety and awareness precaution.
6. The user is responsible for maintaining a charged battery.

## SAFETY NOTES

### **picoTera Companion Smartphone App**

picoTera Companion App is intended to customize your picoTera Device and provide you with extra safety and communication features. To achieve that picoTera Companion iOS and Android app requires following permissions:

1. Permissions are required to access and enable the Bluetooth system.
  - a. In addition, the Android app requires location permission to be able to scan for devices and phone permission to be able to notify a user of an incoming call.
2. There is no guarantee that an emergency broadcast will be received by ALL hearing protection devices. Only hearing protection devices that are in range and are turned ON may receive emergency stress signal.

### **FCC Part 15**

This device complies with FCC Rules Part 15 operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Changes or modifications to this device, not expressly approved by XXXX. could void the user's authority to operate the equipment.

### **Industry Canada Notifications**

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage;
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

PMN: Smart Earplug Companion

# Warranty

## Terms of Use

picoTera Electronics Inc. offers its products with the terms, conditions and notices as follows. The following terms and conditions apply to all sales and uses. Please review carefully. These terms and conditions include limited warranties and disclaimers of liabilities.

Keeping, using or allowing use of picoTera Electronics Inc.'s products indicates your agreement to these terms.

The user is advised that the Smart Hearing Protection Device is *in the trial stage* and should not be relied upon to replace normal safety practices in the workplace with non-electronic hearing protection devices.

By using this product, it is assumed that you have read the product manual and, specifically, the Important Warnings and Notices in the product manual.

### Use with Limitation

You may not modify, copy, distribute, transmit, display, perform, reproduce, publish, license, create derivative works from, transfer, or sell, any information, software, products or services obtained, from picoTera Electronics Inc.

### Use in High Risk Areas

This product was designed for use in high risk industrial environments. Your presence in a high-risk environment is voluntary and picoTera Electronics Inc. does not assume any liability associated to your activities in a high risk environment.

### Modifications

picoTera Electronics Inc. prohibits the modification of its products by any person other than its employees. No guarantee can be made of safe use of an illegally modified product.

### Limitation of Liability

In no event shall picoTera Electronics Inc. liability exceed the value of the product(s) sold. In no event shall picoTera Electronics Inc. be liable for any direct, indirect, punitive, incidental, special or consequential damages whatsoever arising out of or connected with the use or misuse of any of its products.

## LEGAL NOTES

### **Entire Obligation**

The PRODUCT LIABILITY DISCLAIMER document states the entire obligation of picoTera Electronics Inc. with respect to the products. If any part of this disclaimer is determined to be void, invalid, unenforceable or illegal, including, but not limited to the warranty disclaimers and liability disclaimers and liability limitations set forth above, then the invalid or unenforceable provision will be deemed superseded by a valid, enforceable provision that most closely matches the intent of the original provision and the remainder of the agreement shall remain in full force and effect.

### **Applicable Law**

Your order from picoTera Electronics Inc., and this disclaimer statement are governed by the laws of the province of British Columbia, Canada. You hereby consent to the exclusive jurisdiction and venue of the Supreme Court of Canada, in all disputes arising out of or relating to the use of this product. Use of this product is unauthorized in any jurisdiction that does not give effect to all provisions of these terms and conditions, including without limitation of this paragraph.

### **Modification of Terms and Conditions**

picoTera Electronics Inc. reserves the right to change the terms, conditions, and notices under which its products are offered.



# At a Glance

## Smart Hearing Protection Device

The Smart Hearing Protection Device is designed to act not only as a hearing protection but also provide situational awareness to the user. Smart detection algorithms are designed to aid in notifying user of any alert sounds that the user might otherwise not be able to hear with a traditional hearing protection device.

picoTera's Smart Hearing Protection Device offers the following main features:

1. **Digital Ear** The device will actively listen to surrounding sounds and search for incoming warning sounds. Once the warning sound (e.g. back-up alarm) was detected, the hearing protection device will vibrate and notify the user.
2. **Noise Reduction** This feature allows users to hear surrounding sounds with less noise. It also amplifies vocal audio, making it easier to communicate.
3. **Built-in PTT** All units are shipped with built-in push to talk service. This service can establish voice communications between multiple users. The key advantage of our service is that it can cover unlimited range (hence the name URPTT).

## Smartphone App

The custom app allows users to connect their picoTera device to their phones via BLE connection and allows them to customize settings as desired.

picoTera's Smartphone Companion App offers the following main features:

1. **Customization** Users can enable or disable some of the functions of the device. For example, a user can configure the device to only detect backup alarms and nothing else.
2. **Notifications** App can notify the user of an incoming phone call (through Bluetooth).
3. **Communication** App can enhance vocal communications between users, including an emergency panic button that notifies all surrounding users with picoTera Smart Hearing Protection Devices.

# Products

## Smart Hearing Protection

The Smart Hearing Protection Device is intended to protect users' hearing while keeping them aware of their surroundings and allowing for better communication between workers in noisy environments. The Smart Hearing protection device is typically paired with the picoTera Companion app to customize settings while enabling longer range communications and receiving related notifications. Figure 1 below illustrates the different components of the device.

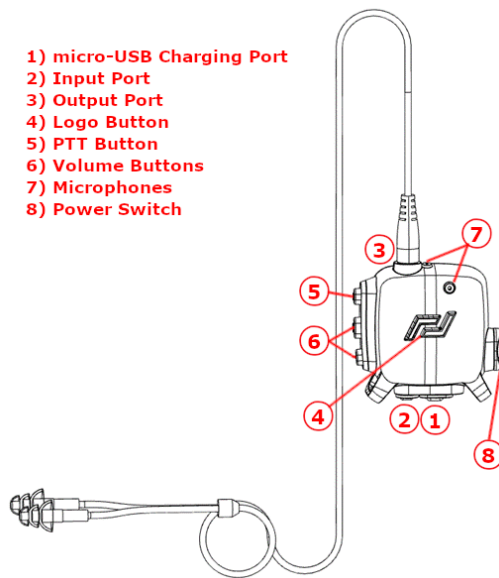


Figure 1: Diagram of the Smart Hearing Protection Device

### Passive Noise Reduction

The Smart Hearing protection device comes with two types of earplugs. The NRR rating of these earplugs are **29 dB** when worn as instructed.

### **On/Off Switch**

The ON/OFF switch is located on the side of the Smart Hearing Protection Device as indicated in Figure 1. When in the 'OFF' position, all active functionality is stopped, though the hearing protection devices will continue to reduce noise with **NRR 29 dB**. The battery can be charged while device is off and doing so will turn on a RED LED.

### **USB Charging**

User needs to know:

1. Charging the device is done using any standard USB micro-B cable and connecting it from any USB port or standard USB adapter to the USB port located on the bottom of the device as indicated in Figure 1.
2. When OFF and charging, a RED LED should turn on.
3. When hearing protection device is ON and is charging, a RED LED should turn on. Once the device has charged about 20% of its capacity the RED Light will change to a GREEN light. When the device has been fully charged, the GREEN and BLUE LEDs will both be on. While device is charging LEDs will be on in breathing fashion.
4. When hearing protection device is low on battery (about 20% or lower), the GREEN strobe light will change to RED strobe light.
5. We recommend charging the hearing protection device overnight when it is not in use.
6. Do not charge the hearing protection device while in use. Doing so may damage the hearing protection device.
7. Do not charge at any voltage other than standard 5V USB. Doing so may permanently damage the hearing protection device.

### **Technical Information**

The hearing protection device charges at approximately 0.26 A and may take up 2 hours for a full charge.

Charging the hearing protection device will slightly increase the temperature of the interior electronics. Avoid charging in extreme hot temperatures or under direct sunlight.

### **Output Port**

The output port on the top of the device is for plugging in picoTera approved earphones Only. Plugging other earplugs may damage the internal drivers and permanently damage the product.

### Input Port

The input port on the bottom of the device is for plugging in a 2-way radio. This allows a user to use a 2-way radio while being protected with the Smart Hearing Protection Device.

### Logo Button

The logo button on the front of the device will toggle streaming audio from the built-in front microphone, allowing the user to hear what is going on around them. Having streaming turned off will prevent the user from hearing surrounding sounds. Basic noise cancellation will be applied to streamed sounds to attenuated unwanted noise. This can help user better hear speech and conversations in noisy sites.

### Push to Talk Button

The push to talk button located at the side of the device with letter P allows user to send audio to other users when the PTT button is held. Alternatively, the PTT button can be pressed twice quickly to lock the PTT mode and enable hands-free mode, allowing the user to send audio without having to hold the button down. Pressing the P button again will unlock the PTT and end the communication. This feature applies to both SRPTT and URPTT.

### Volume Buttons

The volume buttons are located on the side of the device and marked with + and – symbols. Pressing + sign will increase the volume for 1 unit. Holding + button will NOT increase the volume more. To increase the volume one more unit the user needs to release the + button and press it again. Similarly, the – button will reduce the volume by one unit. Similar to + sign to further decrease the volume user should release the – button and press it again.

### Microphone

The device has two microphones, located on the top and on the front of the device.

### Digital Ear

The Digital Ear is a smart program included in the Smart Hearing Protection Device that scans the incoming sounds for warnings, such as sirens or alarms. This feature can be enabled and disabled through the Smartphone app as described in the app section.

Table 1: Environmental characteristics of reliable backup alert detection

Specifications of Backup-Alert	
Minimum detectable Alert SPL at 10 meters	65 dB*
Maximum distance from the source	10 m (33 ft)
Minimum Signal to noise ratio (SNR)	-13 dB**
Supported Backup Alert Frequency range	1000-3000 Hz
Types of Backup alert that can be detected	Beeper Tone Alerts***

Commented [KK1]: @DanielChu is this true?

Commented [DC2R1]: yes

**SMART HEARING  
PROTECTION**

Range	The maximum range of detection (i.e. sensitivity) can be adjusted through the Digital Ear settings in the Smartphone app, using the Sensitivity Level setting:	
	Low:	up to 1 m (3 ft)
	Medium:	up to 3 m (10 ft)
	High:	up to 10 m (33 ft)

\*Standard of measurement: NIOSH. Measured in no background noise.

\*\* Examples of where background sound may hinder digital ear from notifying user are as follows:

1. if you are relatively close from the backup alert source and people are talking the SNR may fall below 4dB and smart hearing protection device would fail to detect the backup alert sound.
2. Loud engine sound may also cause lower or no detection. However, if the engine is idle the back-up alert detection will work as long as the SNR in this case is at least 4dB.

\*\*\* Example, most truck backup sound in North America, fire truck backup alert, and some forklift backup alerts.

### User Notifications

Included with the device are methods of notification for alerts, warnings, and communications. The profile of user notifications can be customized upon ordering, please communicate with us to customize this feature.

Each notification has a corresponding voice prompt that will be heard upon receiving a notification if the device is connected to a smartphone with the companion app. Please note that certain voice prompts have playback priority over others (e.g. Digital Ear voice prompts will interrupt voice prompts for setting changes, and voice prompts for settings changes will not be heard if a Digital Ear voice prompt is already being played).

### Audio Playback Priority

Each audio playback mode (streaming, Push to Talk, and voice prompts) has its own priority, and depending on its priority, it may either interrupt another playback mode, or be ignored by the device. Below is a list of playback modes, and their playback priority relative to one another. Playback modes within the same playback level can interrupt each other (with the exception of Push to Talk, which has the lowest priority within its priority level).

Table 2: Audio playback priorities

Priorities of Audio Playback Modes	
Highest	Digital Ear voice prompts, Social distancing alert voice prompts, Connection state change voice prompts, Notification beeps

High	Incoming call voice prompt, Battery status and power saving voice prompts, Push to Talk
Medium	Streaming Voice prompts for changes in settings
Low	Firmware update voice prompts

## Visual Indicator

Located on the front of the device is an array of RGB-LEDs (Red Green Blue-Light Emitting Diode).

LED flashing and color schemes can be used to indicate battery level, audio mode, charging status, BLE connection status, among many other applications.

## LED Colour Guide

**Blinking Red:** At or below 20% battery

**Blinking Green:** Not connected to any devices

**Blinking Blue:** Connected to at least one device but not the maximum number of devices

**Blinking Blue and Green:** Connected to maximum number of devices

### **Notifications:**

**Blink Red 1 time:** Disconnected from a device

**Blink Red 3 times:** Digital-Ear detected a warning

**Blink Blue and Green 1 time:** Settings updated

**Blink Blue and Green 3 times:** Device startup, connected to a device, or received emergency/find me signal from app

**Blink Blue and Red 2 times:** Social distancing alert

### **Charging:**

**Breathing Red:** Charging while battery is at or below 20%

**Breathing Green:** Charging while battery is above 20%

**Breathing Blue and Green:** Device is fully charged and connected to the charger

### **Streaming:**

**Breathing Blue and Green:** Device is streaming

### **PTT:**

**Solid Green:** Sending PTT

Commented [KK3]: what is the style level here? header? please use style

Commented [DC4R3]: changed to header 9

Commented [KK5]: same here what is the style

**Solid Blue:** Receiving PTT

**Voice Prompts:**

**Solid Blue and Solid Green:** Receiving voice prompt

### Social Distancing Alert

The Social Distancing Alert feature enables the device to detect other devices within an approximate 2-meter radius of line of sight using Bluetooth signals. The user will be notified of a social distancing alert by blue and red LEDs flashing twice on the device and a voice prompt will be sounded.



The Social Distancing Alert feature cannot guarantee an exact 2-meter radius due to variation in Bluetooth signals. Do NOT rely solely on the device to detect nearby devices and ensure you are aware of your surroundings at all times.

## Smartphone Companion App

The picoTera Companion app includes many features such as the Unlimited Range Push To Talk and customization of the device. Once connected, the app will show the battery level of the device and can send a notification to the connected device. The user can also send an emergency broadcast to one or all nearby devices. The many features can be accessed through the app menu which displays when you press the three-line menu button at the top left corner or by swiping to the right from the left edge of the screen.

Android permissions required: **Bluetooth ON**, **Location ON** (for BLE scanning to work on Android 6.0 and over), **Phone ON** (to receive a notification when there is an incoming call).

iOS permissions required: **Bluetooth ON** (for BLE scanning to work).

### Disclaimer & Tutorial

A disclaimer will be shown when opening the app for the first time. A general tutorial will follow. The user must go through the tutorial carefully in order to utilize the app efficiently.

### Unlimited Range Push to Talk (URPTT)

The Unlimited Range Push to Talk allows the user to talk to a group of devices for an unlimited range. To use this feature the user must register their device and they must be part of a group.

#### Registered Groups

The "Registered Groups" tab contains the groups that the user is part of and can therefore communicate with. To communicate with a group, select the switch/checkbox to start listening to a group. Then press and hold the PTT button on your device to communicate with other group members, like how you would with SRPTT. When you are listening to a group you will receive any messages from other group members that they send.



Listening to multiple groups at the same time may result in missed communications if a message is received while another is already being sent.

### **My Groups**

The “My Groups” tab allows a user to create groups containing other people in the same company. Groups can be used to separate communications between different groups of people (i.e. Managers, Front desk, etc.). To create a group, press the “Create Group” button and give the group a name. Then add members to the newly created group.

### **Emergency Broadcast**

Press the red emergency button at the top of the page to send an emergency broadcast which will attempt to alert all devices in range. This feature is only fully functional if the phone supports BLE peripheral mode for advertising.

### **My Device**

This feature allows the user to customize their device settings. The user must connect the app with the device first. The footer at the bottom of the app indicates whether a device is connected. Once connected, the footer will show the name of the device that it is connected to and the device battery level.

### **Finding the Device**

In the ‘Scan for Devices’ page on the ‘My Device’ tab, press the yellow bell icon beside the device’s name to send a broadcast to make the corresponding device flash and beep, making its location more apparent. This feature is useful if you are unsure of the device’s name that you want to connect to. This feature is only functional if the phone supports BLE peripheral mode for advertising.

### **Connecting to a Device**

1. Press the “My Device” button on the menu
2. Find the device to connect to in the list
3. Tap the name of the device you wish to connect to. Tapping the yellow icon beside the name will not connect the device.

### **Disconnecting the Device**

Scroll to the bottom of the Device Info screen at ‘My Device and press the ‘Disconnect’ button.

### **Auto-Reconnecting**

Once the user has successfully established a connection between the app and the device, the app automatically pairs the device. If the app is disconnected with the paired device due to the device being out of range, the device turning off or the Companion app closing etc., the app will attempt to auto-reconnect to it whenever the device is turned on and in range again.



In order to stop auto-reconnecting with the paired device, manually disconnect the device in the 'My Device' page (See [Disconnecting the Device](#)) and the app will unpair the device and stop auto-reconnecting to it.

## **My Device Info Screen**

### **Over the Air Updates**

Updates the connected device with the latest software. A red exclamation mark at the top right indicates that a new update is available for the device.

Steps To Performing OTA Updates:

1. Make sure the device is not low on power or is charging.
2. Press the Update Firmware button at the top right corner.
3. Follow the instructions on the app and do NOT turn off the device or close the app or turn off Bluetooth during the update.
4. Once OTA is successfully completed, the device revision number should reflect the revision number of the update.
5. If the OTA update failed, restart the app and then navigate to My Device. Connect to the device named 'OTA Metis (Model #)' to retry the update and repeat steps 3-4.

Updating the hearing protection device to the latest version is strongly recommended.



Once OTA has started, the device will be unresponsive until the update is complete. Do NOT use the device when it is in the middle of an update.

### **Find Me**

Sends a notification to the connected device making it flash. This function can be used to identify which device is currently connected.

## **Settings**

### **Change Name**

Allow the user to change the displayed name of the device.

### **Power Saving Mode**

This setting can be enabled through the settings page or automatically when the device reaches 30% battery. The following are features affected by power saving mode:

## SMART HEARING PROTECTION

- Increased time taken to establish connections with other devices, emergency broadcast, and Find Me broadcast.
- Device LEDs will light up less often.
- Number of allowed connections will be limited to 1. If the Power Saving Mode is enabled on the phone, the device will remain connected only to the phone. Otherwise, if the device is not connected to a phone and the Power Saving Mode is enabled, the device will disconnect from all existing connections except the device closest within range using Bluetooth signals.

### Noise Reduction

Three different enable/disable settings can be specified from within the smart phone companion app to reduce unwanted background noise interfering with short range streamed and push-to-talk communication:

- Directional selection preferentially amplifies short range communication from the direction inline with the two Metis microphones. Applies to short range streamed communication.
- Dynamic filtering removes persistent background noises occurring at fixed frequencies. Applies to short range streamed communication
- Quality improvement removes irritating background noise from otherwise intelligible speech. Applies to short range streamed and push-to-talk communication.

### Impulse Noise Cancellation

If you are working in an environment that is quiet for most of the time, but have some impulse loud noise (e.g., operating jackhammer or nail-gun) it is recommended to use the Compression feature. With the Compression feature enabled, the device will detect any sudden loud sound and block it in 1/1000 of a second. To experience this feature, you need to bring the volume slider up to have some hearing from your surrounding sounds.

### Enable Warning Detections

Enable/Disable the warning detection/digital ear feature. Disabling/Enabling the 'Enable Warning Detections' will disable/enable all types of warning detection. You can also disable/enable detection for individual warnings. *When disabled, the user will NOT be notified if a loud sound or warning sound is detected.*

### Sensitivity Level

Setting the sensitivity for detecting truck backup alerts. *When the sensitivity is at low, the user may NOT be notified of some detections.*

### Call Notifications

Enable/Disable notifications to your device whenever you are receiving a call.

### **Enable Social Distancing Alert**

Enable/Disable the social distancing alert feature for the device. *When disabled, the user will NOT be notified if another user with a device is within an approximate 2-meter radius.*

### **Registration**

Users will register their devices on this page. The steps for registration are as follows:

1. Enter the company registration key.
2. Enter the name of the company.
3. Enter the employee ID of the person that will be using the device.
4. Enter the name to give the device.
5. Turn on then connect to a device by tapping on its name.
6. Press the "Register Device" button.
7. Disconnect from the device.
8. Repeat steps 3-7 for each device to register.



The company key and company name entered must always be the same for all devices to be able to have them connect to each other.

### **Hotline**

This page allows a user to ask us a question that they need answered. Users will enter at least one method of contact (email or phone) and send their question. We will reply within 24 hours.

### **About**

This screen displays the version of the app currently installed and a link to our privacy policy. The user can also view the tutorial of the app again by pressing the 'View Tutorial' button. We strongly recommend reading the Safety and Legal notes that are also displayed on this page.

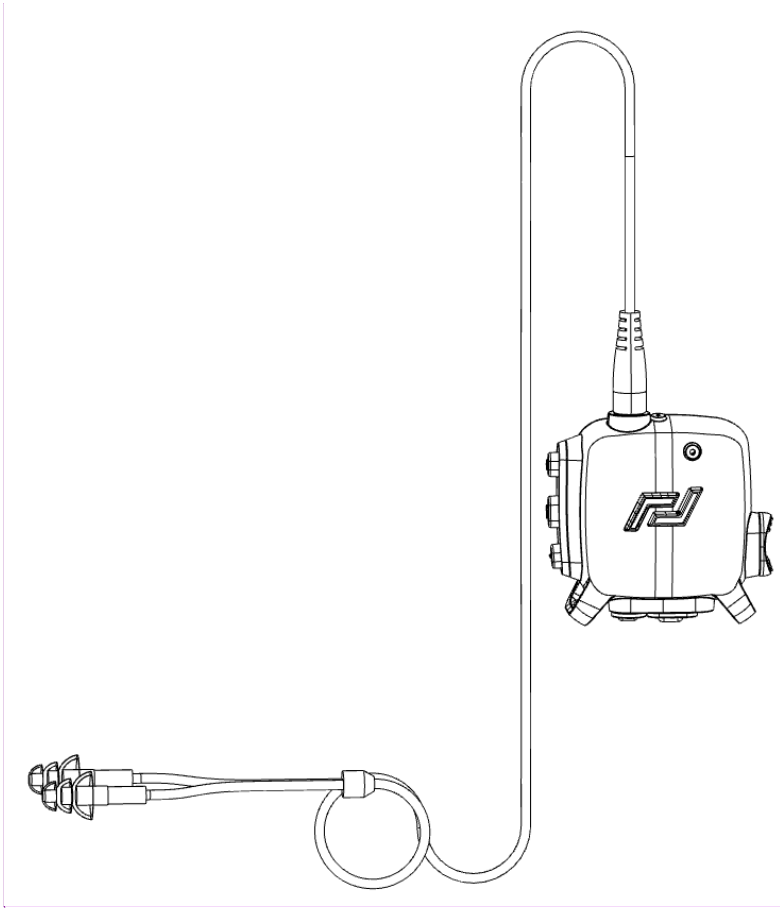
### **Precautions**

1. Disabling the speaker on the hearing protection device would turn off the streaming and thus you would not hear anything from the hearing protection device. There is a chance that you may not hear any warning or sounds to alert you of danger.

**SMART HEARING  
PROTECTION**

- a. The hearing protection device will not notify you when the sound detection is disabled through the app. You will not be alerted if there are any presence of dangers.
2. Disabling both the speaker and the sound detection means that your hearing is attenuated, and the hearing protection device will not notify you if there is any danger. This setup makes your hearing protection device a regular passive hearing protection device.
3. There is no confirmation on the app whether the device received the notification or not. There is no confirmation on the app whether the device received the notification or not.
4. There is no guarantee that the device will receive a notification from the app every time the user pushes the button.
5. There is no guarantee that all devices will receive the notification for an emergency broadcast. Traditional means of alerting employees should continue to be used in conjunction.
6. There is no confirmation on the app whether the device received the Push to Talk message or not.
7. There is no guarantee that the device will hear coherent speech from the Push to Talk.
8. Note that having Wi-Fi turned on may reduce the quality of audio received from URPTT.

SMART HEARING  
PROTECTION



**Commented [Kk6]:** Just added here we can use it later @daniel