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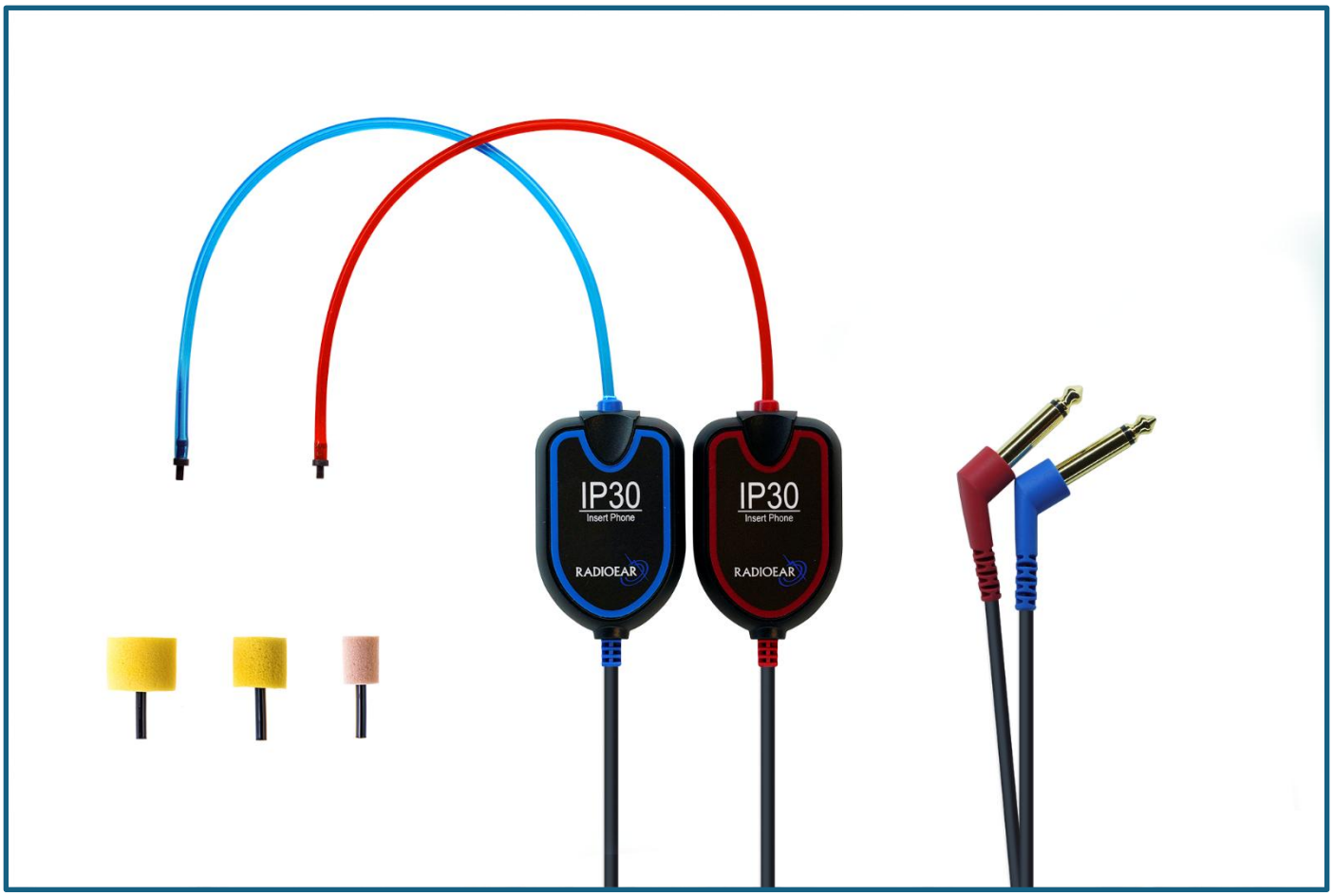

USING INSERT EARPHONES FOR AUDIOMETRIC TESTING

V4.7.2025

AUDIO ASSESSOR®

The EI Group, Inc.
Environmental, Health and Safety Solutions.™

800.717.3472
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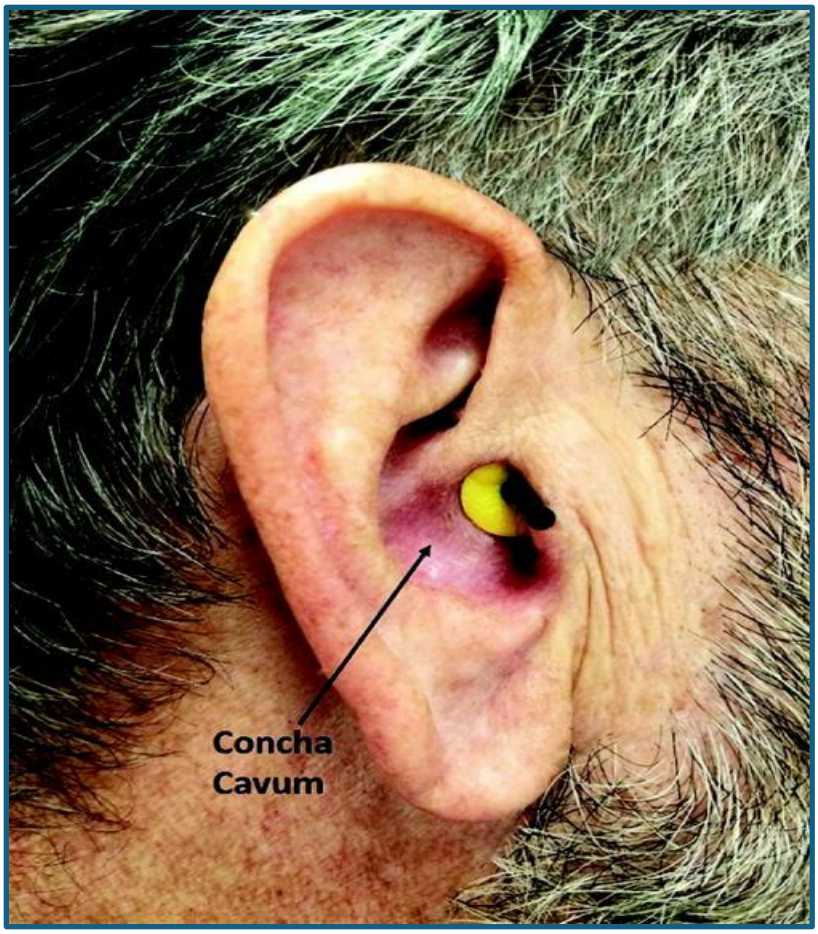
Why Use Insert Earphones?

Audiologists in clinical settings have used Insert Earphones since the 1980s generally preferring them to supra-aural headphones. Their advantages:

- **Increased Interaural Attenuation** – when using supra-aural headphones, it is possible for the non-test ear opposite the test ear to detect the tone when the difference between ears is 40 dB or greater. That is, if the "worse" ear is at least 40 dB worse than the "better" ear at a test frequency, then the tester cannot be sure which ear is responding to the test frequency. Because the skull can conduct sound, the "better" non-test ear may be hearing the tone instead of the "worse" test ear. This makes it difficult to obtain accurate "worse ear" thresholds when there are large differences between ears. Thanks to foam eartips absorbing far more sound than supra-aural headphones, insert earphones largely solve this problem because the interaural attenuation increases from 40 dB to 70 dB. That is, insert earphones can accommodate differences between ears of 70 dB…and this is conservative. It's easier to obtain accurate "worse" test ear thresholds on those with large interaural differences.
- **Increased Noise Reduction** – supra-aural headphones are quite poor at blocking out ambient background noise, particularly low-frequency noise, effectively precluding their use outside of a sound booth. If the foam eartips are properly inserted, insert earphones provide superior background noise attenuation. Compared to supra-aural headphones, foam eartips 100% inserted into ear canals block far more noise, including far more low-frequency noise, making insert earphones feasible for use without a sound booth. Essentially, using well-inserted foam eartips is equivalent to having a single-wall sound booth inside ear canals.
- **Increased Comfort** – supra-aural headphones must fit tightly. The resulting pressure against the skull can produce discomfort. If inserted to a proper depth and not too deeply into a person's ear canals, a high percentage will find foam eartips acceptably comfortable.
- **Insert Earphones are Allowed by OSHA** – since 2013, OSHA explicitly allows use of insert earphones considering them as reliable as supra-aural headphones.

Foam Eartip Sizes

- **Small** – fits about 20% of the population.
- **Medium** – fits about 80% of the population. Also used for daily biological calibration checks.
- **Large** – fits the few with very large ear canals. These are typically used for surgically altered ear canals. It's advisable to have one package of these available.



How Deeply Should Foam Eartips Be Inserted?

First, a caveat: do not insert a foam eartip into an ear canal until it has been verified through otoscopy that the ear canal is not occluded with earwax. Excessive earwax can compromise foam eartip fit and comfort as well as the accuracy of the hearing test. Do otoscopy first!

Insert earphone manufacturers typically recommend an insertion depth of 2-3 millimeters (mm) beyond the opening of the ear canal. This means that the outer edge of the foam eartip is 2-3 mm inside the opening of the ear canal. However, some will find an eartip fitted this deeply to be intolerably uncomfortable. A study conducted in 2020 indicated 97% of subjects tolerated an insertion depth of 0 mm, an insertion depth with the outer edge of the eartip flush with the outer opening of the ear canal. A 0 mm insertion depth is recommended (see picture below) though if this is uncomfortable then back the eartip out of the ear canal just enough to be comfortable.

Remember: any part of the foam eartip outside of the ear canal is not reducing ambient background noise inside the ear canal and can compromise the accuracy of the hearing test. As close to 100% of the eartip as possible should be inside the ear canal to an insertion depth of 0 mm.

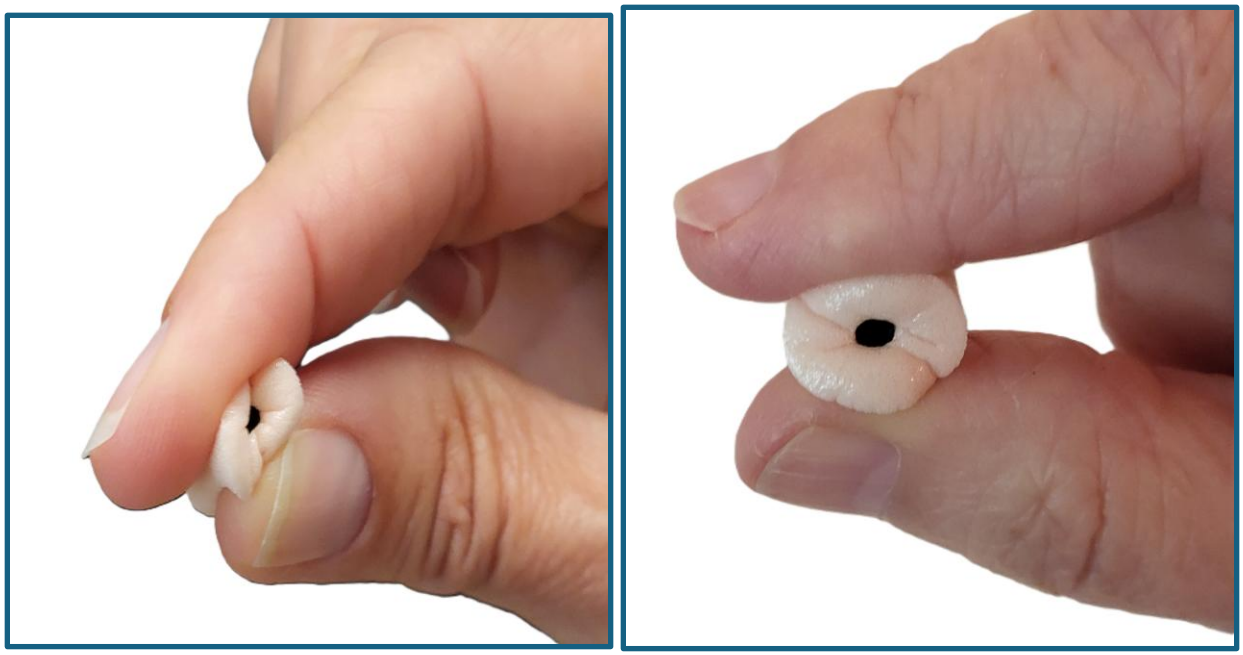
Can Earmuffs Be Used with Insert Earphones to Enhance Noise Reduction?

Yes! Placing hearing-protector type earmuffs over well-fitted foam eartips can significantly reduce ambient noise entering the ear canals, especially low-frequency noise, and is recommended.

Foam Eartip Insertion Procedure

After performing otoscopy, choose the proper size foam eartip Small, Medium or Large. If in doubt, choose Medium. Place each eartip on the black eartip connector at the end of the red and blue tubes.

Now it's time to prepare the foam eartip for ear canal insertion. Roll the foam eartips into an approximately round cylinder…do not flatten!



INCORRECT CORRECT

The proper procedure is to roll the foam eartip between thumb and first two fingers, compressing it into a tight cylinder…just as one would for inserting a foam earplug as a hearing protector. Then, gently pull the top of the pinna up and out to slightly open the ear canal. Gently insert the foam eartip aiming for the 0 mm insertion depth discussed above. Give the foam up to a minute to fully expand. Repeat the process for the opposite ear canal.

Foam Eartip Removal Procedure

Do not attempt to remove foam eartips from ear canals by pulling on the red and blue tubes! This greatly increases the risk of damaging the tubes and will likely result in a black eartip connector being pulled out of its tube.

Instead, hold the black eartip connector with one hand while using the other hand to gently pull up and out on the pinna. Gently pull on the black eartip connector removing the eartip from the ear canal.

Once removed, continue to hold the black eartip connector while using the other hand to remove the foam eartip. If using medical gloves, the foam eartip can be grabbed anywhere. But if not using medical gloves, then it's most hygienic to remove the foam eartip from the black connector by pushing on the outer edge of the foam eartip…the part of the eartip not in contact with the ear canal. Discard the used eartips.

Once removed, inspect each tube to make sure that the black eartip connector is still in place. If it has fully or partially come out of the tube, then gently reinsert. It's advisable to have replacement black eartip connectors and red/blue tubes in case of loss or damage.

Foam eartips are to be replaced for each person tested. No sharing foam eartips!