What is Real Ear Measurement All About?

October 20, 2022

What is Real Ear Measurement All About?

Which Hearing Aids Are the Best

When a person comes into your office with the consideration of purchasing hearing aids. After the exam, generally, the conversation will gravitate to which hearing aid is the best. Understand that the manufactures job is to create this new hearing aid technology that is going to give the best results. They all have different features or advantages and so forth.

Now, do understand this, that which ever hearing aids that you are recommending, you need to know these instruments very well and which one will work best for your patient.

So, then, which would I recommend?? The one that is offered in your office.

So, then what makes the big difference?

What is Real Ear Measurement All About?

Which Hearing Aids Are the Best

Also understand this… Only about 30% of Practioners use Real Ear Measurement!!!
That means that about 70% do not. They use what we call is Auto Fit or First Fit.
Those procedures are just guess work.
They are assuming that the fitting software is doing a good enough
Job for the Patient.

This course is all about making you a better practioner… USING:

REAL EAR MEASURMENT!!!

What is Real Ear Measurement All About?

Real Ear Measurement 101

History:

Value / Importance:

Definition:

Important Terms:

Method / Procedures:

Prescriptive Fitting Formulas:

Equipment Required and its Components:

What is Real Ear Measurement All About?

History

The first commercially produced real ear measurement was produced by Rastronics. In the early 1980s, the first computerized probe-tube microphone system, entered the U.S. market. This system had a silicone tube attached to the microphone which was then placed in the patients ear, which eliminated the need to place the microphone itself in the ear canal. By early 1985, three or four different manufactures had introduced this new type of computerized probe microphone equipment, and this hearing aid verification procedure became part of the new standard protocol for many hearing aid clinics.

What is Real Ear Measurement All About?

Value / Importance of REM

1. It helps to know the sound level that is being applied to the ear canal correctly. Otherwise, it is just guess work.

2. REM provides data to help limit the amplification of louder sounds when fitting a hearing aid.

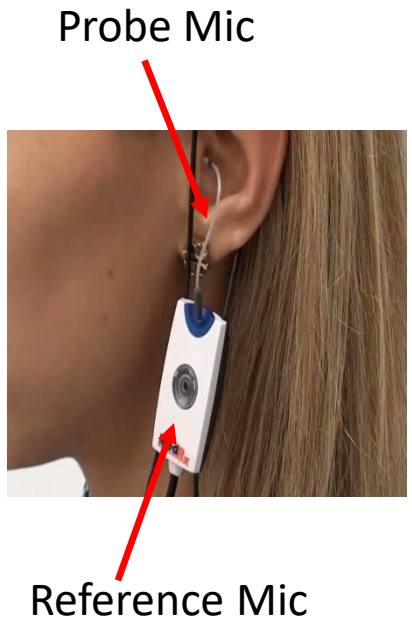
3. It allow the practioner to decide how to best couple the hearing aid to the patients prescriptive fitting.

Otherwise Known As “Otometry”

What is Real Ear Measurement All About?

Definition:

Real ear measurement is the measurement of sound pressure level in a patient's ear canal developed when a hearing aid is worn. It is measured with the use of a silicone probe tube inserted in the canal, connected to a reference microphone outside the ear, and is done to verify that the hearing aid is providing suitable amplification for a patient's hearing loss. It is now recommended that real ear measurement is the preferred method of verifying the performance of hearing aids. It is being used by many hearing healthcare practitioners in the process of hearing aid fitting. Real ear measurements are the most reliable and efficient method for assessing the benefit provided by the amplification. Measurement of the sound level in the ear canal allows the clinician to make informed judgements on the audibility of sound in the ear and the effectiveness of hearing aid treatment.



What is Real Ear Measurement All About?

Definition:

Understanding REM will give you the foundation of understanding:

Sound Physics

Acoustics

Engineering

This is known as Otometry…Which is the measuring and the recording of sound pressure and sound pressure instruments coupled to the damaged cochlea for the purpose of improving hearing audibility.

What is Real Ear Measurement All About?

Definition / KEMAR?

What is KEMAR?? KEMAR is the abbreviation of Knowles Electronic Manikin for Acoustic Research.
KEMAR is the first and the most well documented head and torso simulator for hearing aid testing. The functionality and feature have made it easier to fit any type of analyze input signal.

So, All of the ground rules that are established for Real Ear Measurement starts from KEMAR.

What is Real Ear Measurement All About?

Terms to be Familiar With

- REUR – Real Ear Unaided Response
- REUG – Real Ear Unaided Gain
- REIG – Real Ear Insertion Gain
- REAR – Real Ear Aided Response
- REAG – Real Ear Aided Gain
- REOR – Real Ear Occluded Response
- REOG – Real Ear Occluded Gain
- RECD – Real Ear Coupler Difference
- O.E. ---Occlusion Effect

What is Real Ear Measurement All About?

Method / Procedure

First, the clinician will examine the ear canal with the use of an otoscope to ensure no wax or other debris will interfere with the positioning of the probe tube. The probe tube is placed with the tip approximately 6 mm (1/4 inch) from the tympanic membrane, The probe microphone is placed in the ear canal to measure the resonance of the existing ear canal. The normal ear canal is measured at about 2cc (cubic centimeter) However, for whatever reason if the ear canal has been altered by any means, then the acoustics has changed. The REM system will typically produce a test stimulus from a loudspeaker situated 12–15 inches (30–38 cm) from the patient's head and simultaneously measure the output in the ear canal to determine how much amplification the hearing aid is providing. This is the REUR. Real Ear Unaided
Response.

Probe Tube

What is Real Ear Measurement All About?

Prescriptive Fitting Formulas

Standard Fitting Rules / Rationales:

- NAL-NL1
- NAL-NL2
- DSL v5.0

Half Gain
Third Gain
Berger
Pogo 1
Pogo 2
Independent Manufactures Fitting Formulas

What is Real Ear Measurement All About?

Prescriptive Fitting Formulas

NAL-NL1: The first procedure from the National Acoustic Laboratories (NAL) for prescribing **nonlinear gain ???** was a purely theoretically derived formula aimed at maximizing speech intelligibility for any input level of speech while keeping the overall loudness of speech at or below normal loudness.

It means that the **sound is not amplified at a consistent level**. That the amount of gain added to an incoming sound varies based on the intensity of the sound.

What is it good for???

Power Junkies

What is Real Ear Measurement All About?

Prescriptive Fitting Formulas

NAL-NL2: Is the **second generation of prescription procedures from The National Acoustic Laboratories** (NAL) for fitting wide dynamic range compression (WDRC) instruments. Like its predecessor NAL-NL1 NAL-NL2 aims at making speech intelligible and overall loudness comfortable.

What is Real Ear Measurement All About?

Prescriptive Fitting Formulas

DSL v5.0: (Desired Sensation Level)DSL is typically used for children. (AAA) states that “amplification with hearing instrument should be considered for children who demonstrates a significant hearing loss, including sensorineural, conductive or mixed hearing losses of any degree. You need to keep in mind that small children typically cannot adapt to louder sounds like older adults.

What is Real Ear Measurement All About?

Prescriptive Fitting Formulas

DSL v5.0: Specific prescriptions for severe and profound hearing losses are also provided. DSL v.5.0 recommends increasing compression ratios to maximize comfort, while using lower compression ratios to minimize distortion.

"That rule will apply with any severe degree of hearing loss."

What is Real Ear Measurement All About?

Prescriptive Fitting Formulas

Half Gain Rule: It is essentially the difference between the level of a sound into a hearing aid versus the amplified level of what comes out of the hearing aid. The output is the amount of Sound Pressure Level (in dB SPL) produced by a hearing aid. It includes the incoming sound plus the gain added by the hearing aid. The output is measured with either a calibrated 2cc coupler (HIT) or right in the patient's ear canal (REM).

What is Real Ear Measurement All About?

Required Equipment

MedRx Hearing Instrument Test Box (HIT Box)

Soundfield Speakers

What is Real Ear Measurement All About?

MedRx HIT Box Components

HIT Box

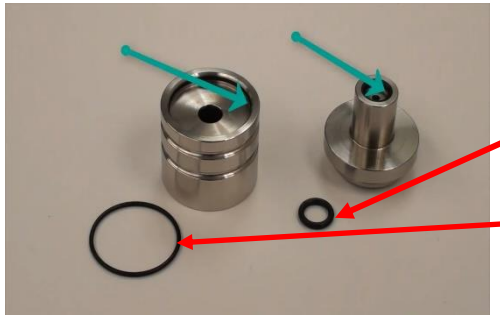
- Coupler Mic
- 2cc Coupler and adapters
- Sealant Putty
- Pads & O-Ring

Battery Pills

What is Real Ear Measurement All About?

Required Equipment

Components Required for the HIT Box

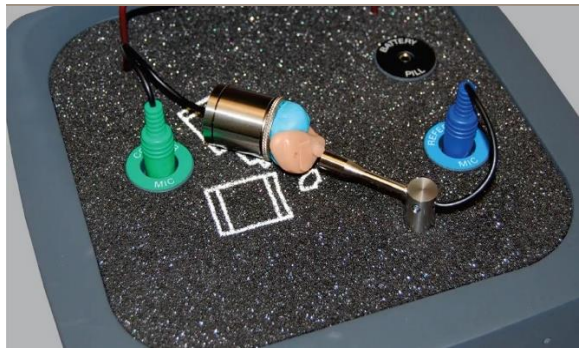


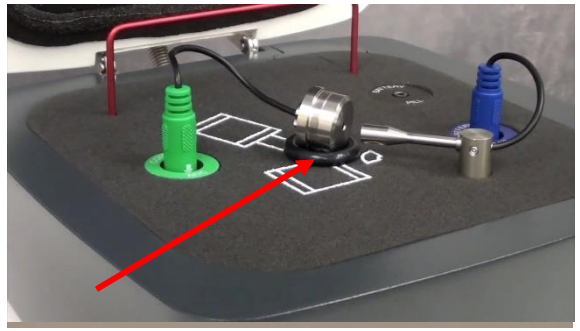
The two “O” Rings must remain in place to work properly

What is Real Ear Measurement All About?

Required Equipment

Components Required for the HIT Box

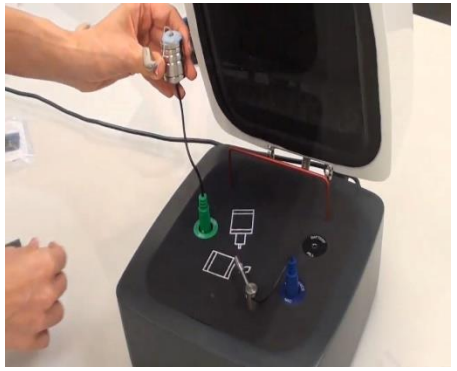


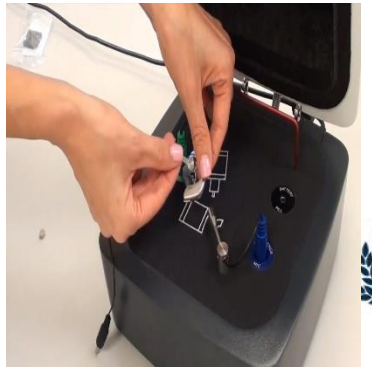


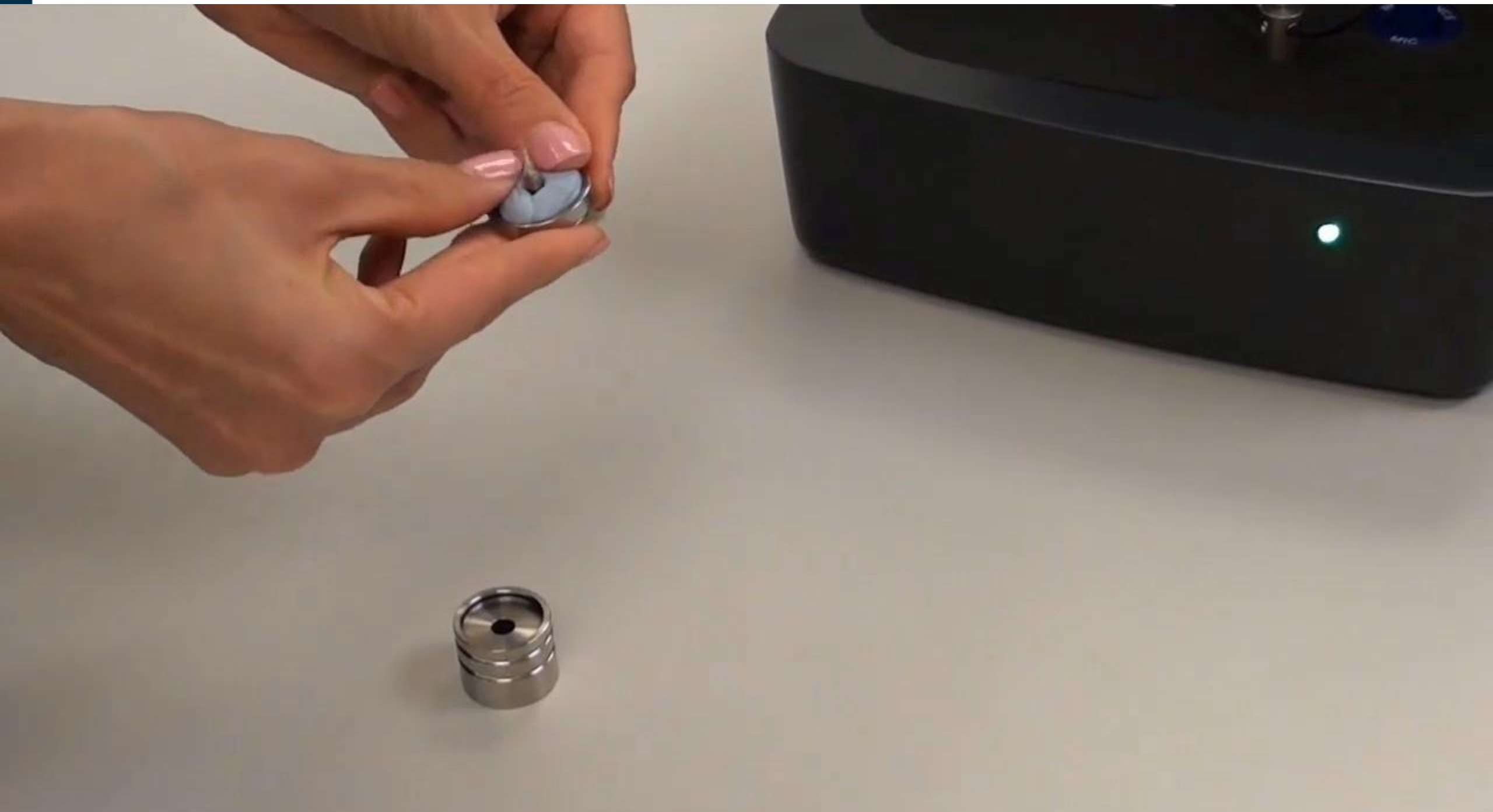
What is Real Ear Measurement All About?

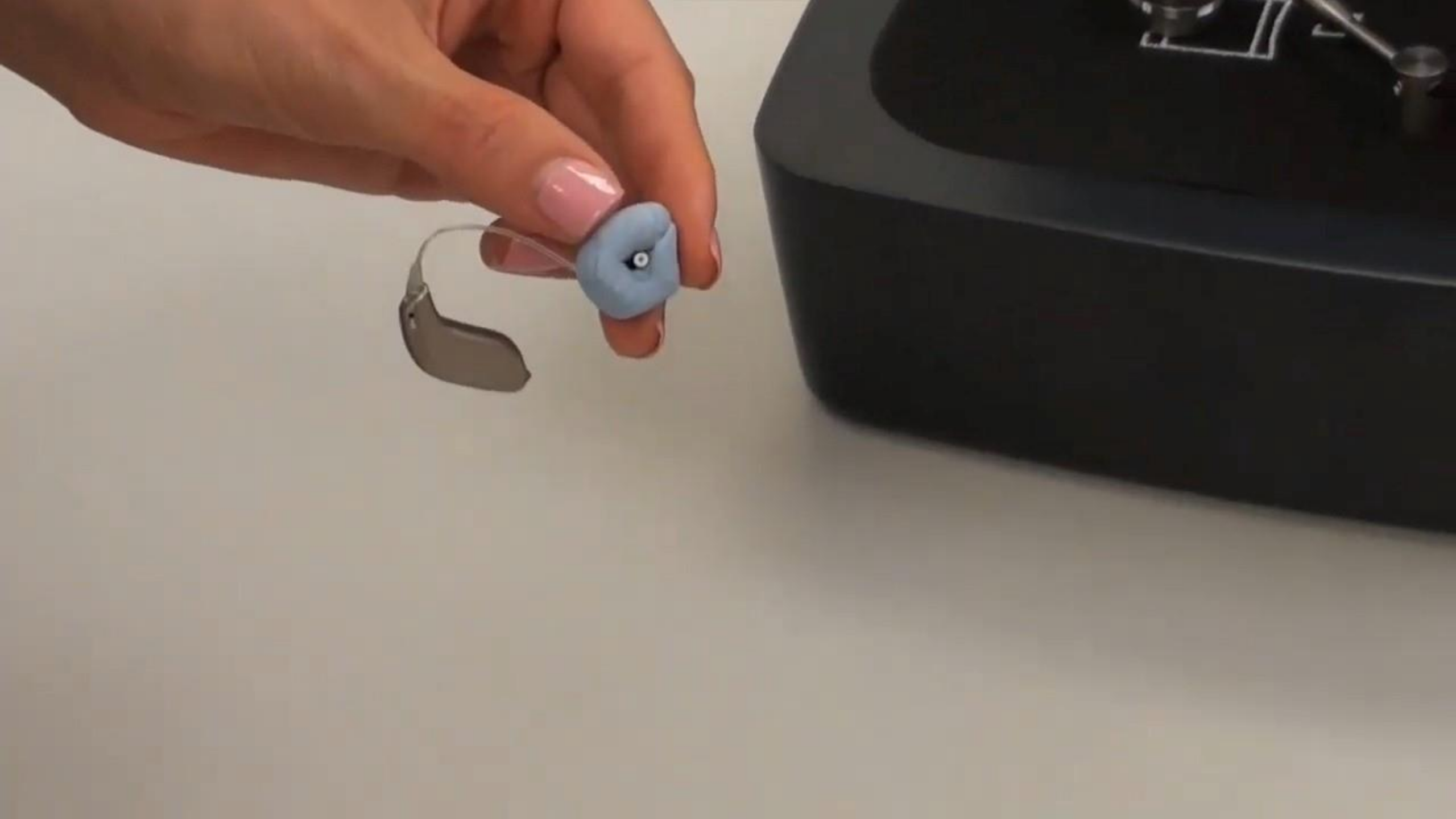
Required Equipment

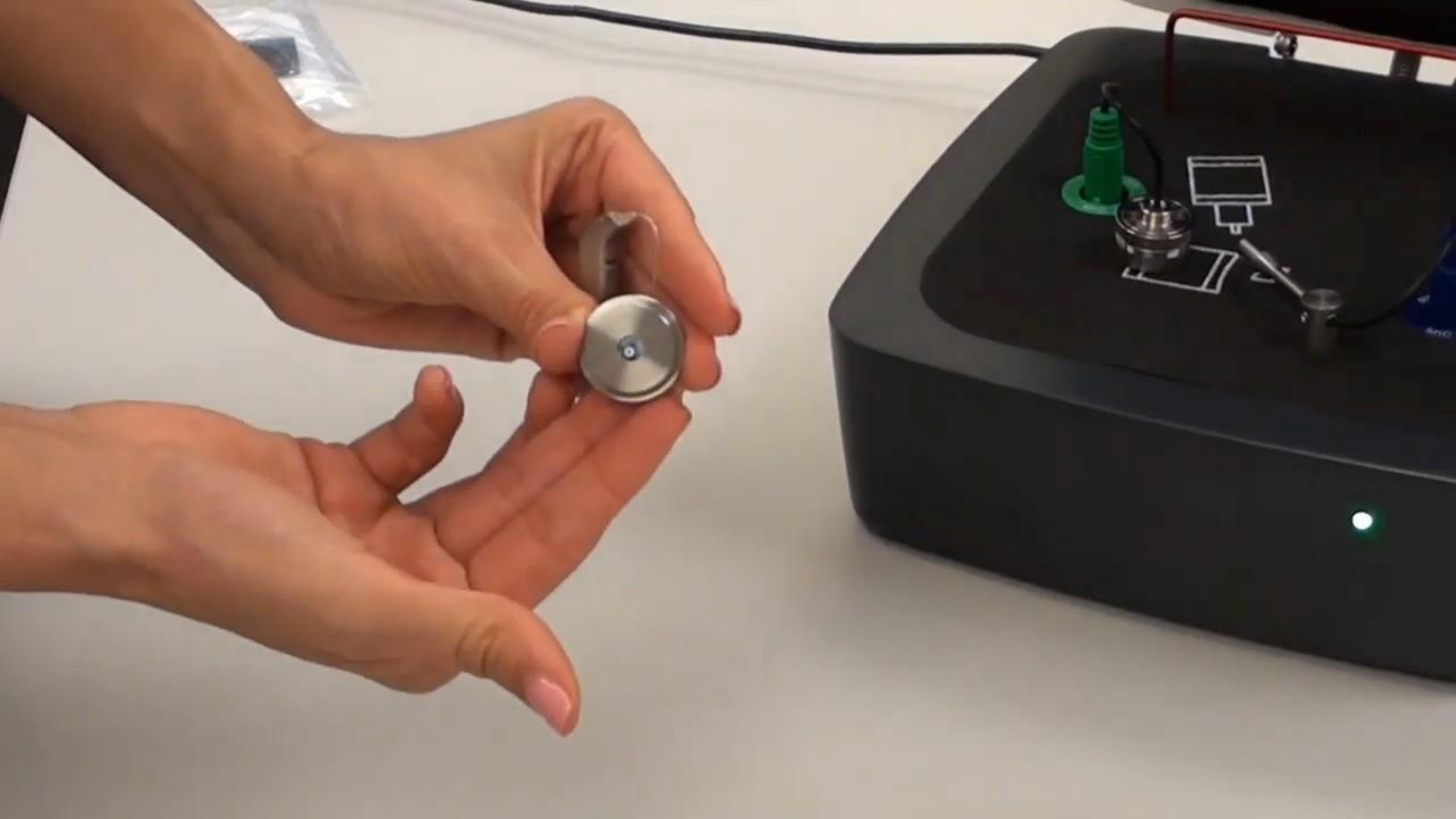
Components Required for the HIT Box

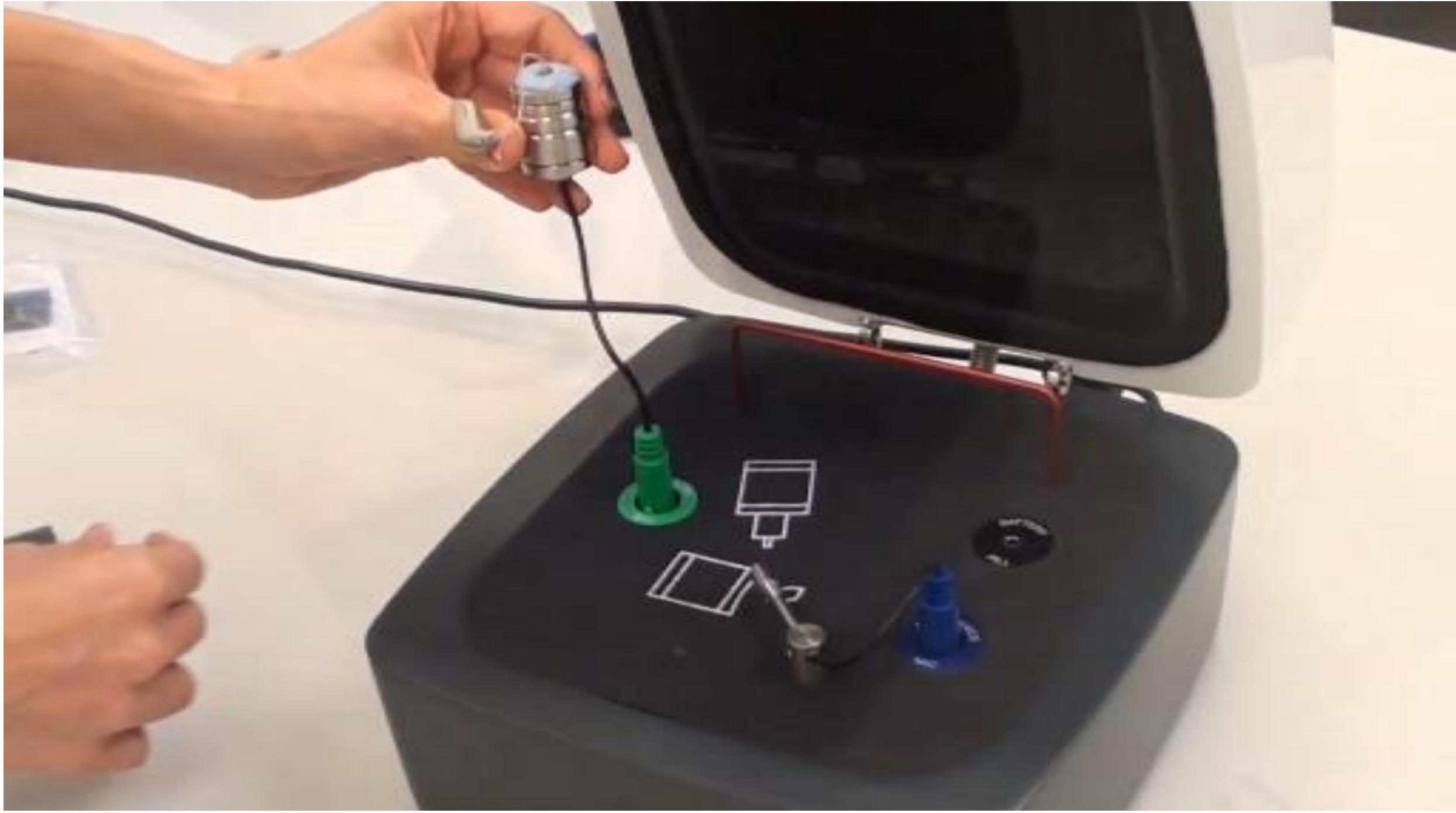




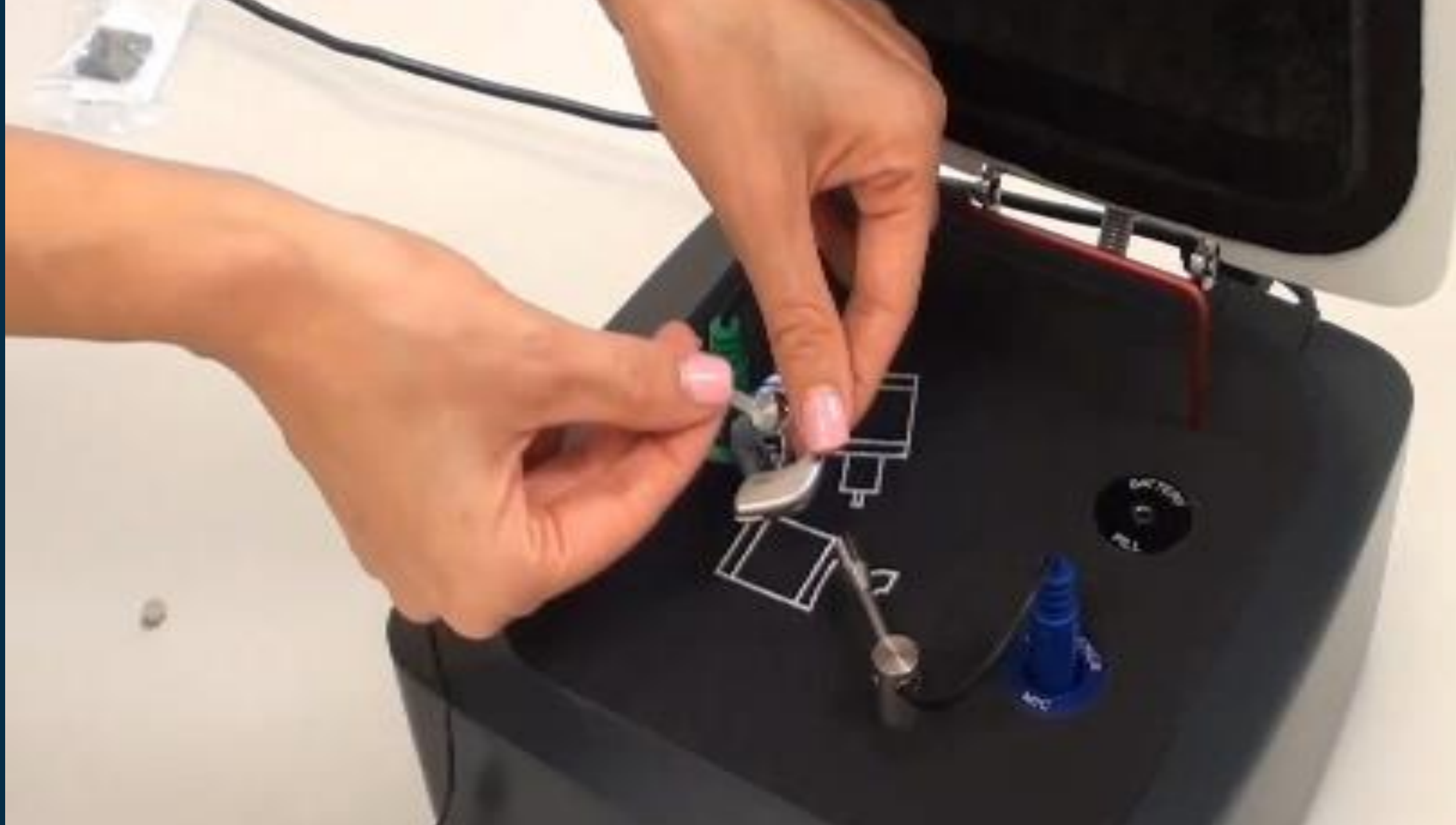









BATTERY
FILL
MIC



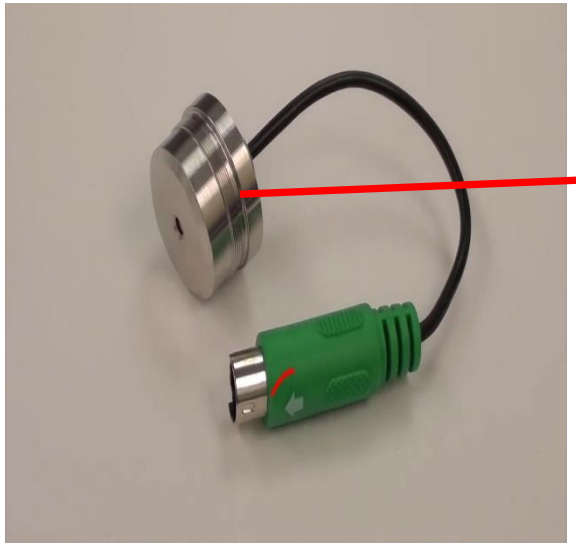

BATTERY
PILL
MIC
MIC

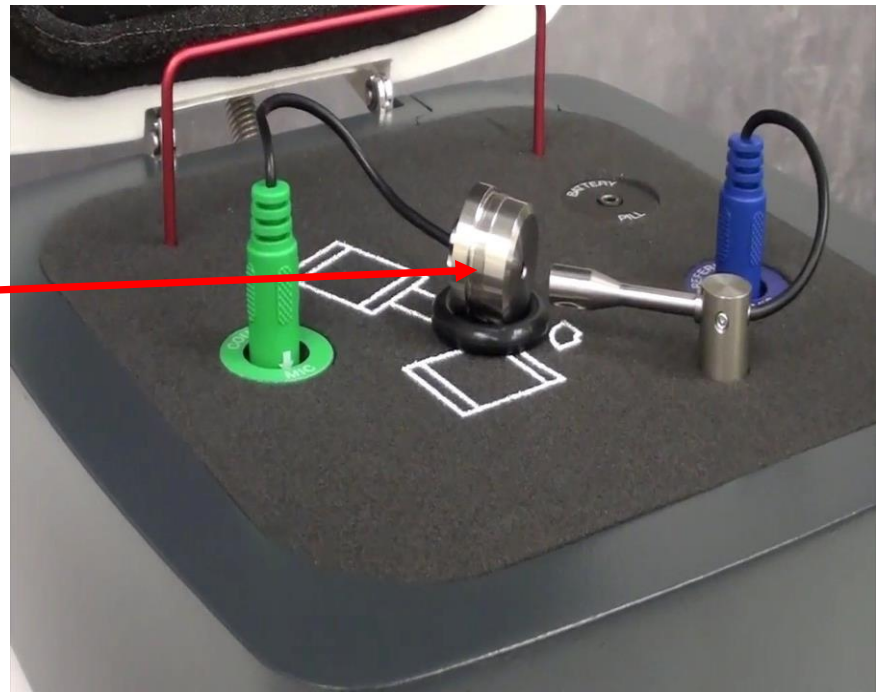
What is Real Ear Measurement All About?

Required Equipment

MedRx Hit Box

2 CC Coupler Mic





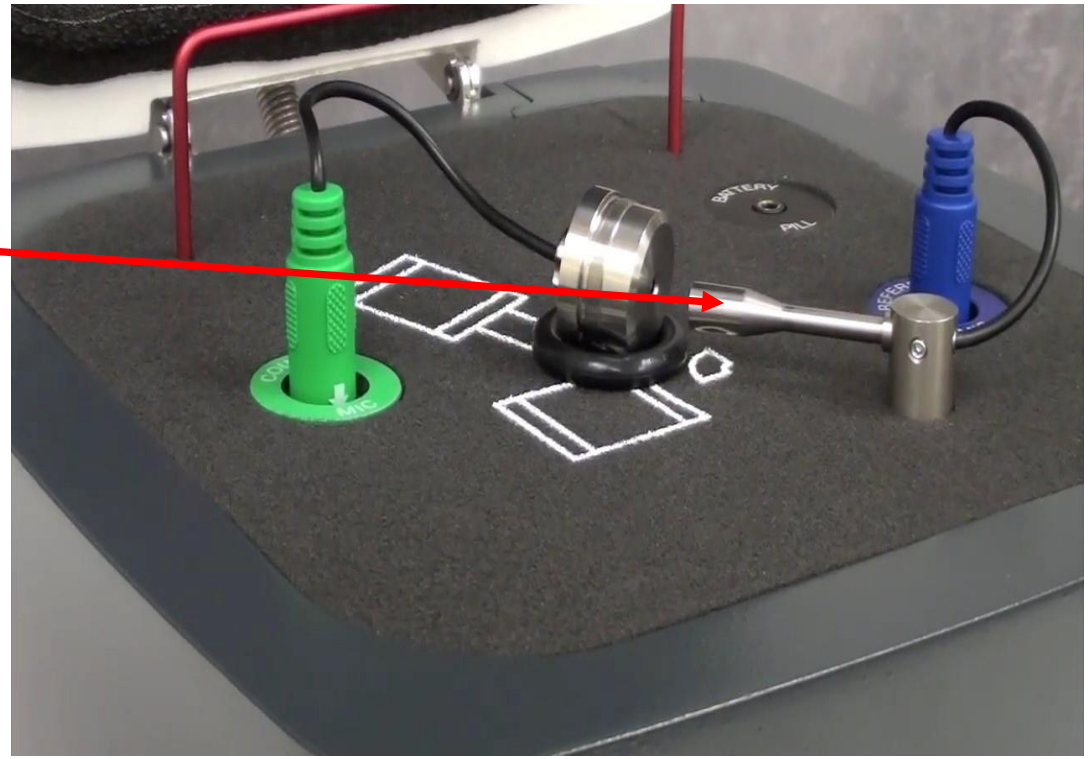
Both the Coupler Mic and the Reference Mic has to be calibrated each day.

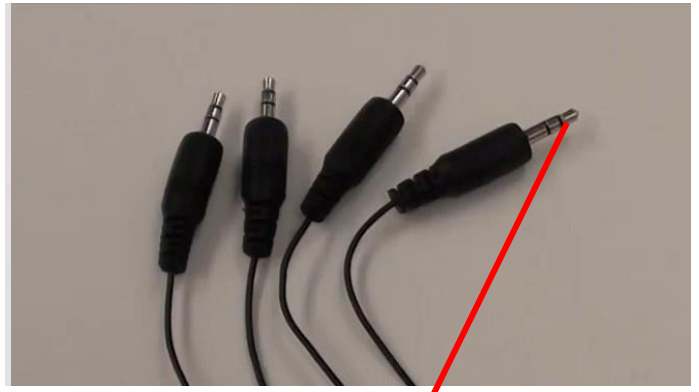
What is Real Ear Measurement All About?

Required Equipment

MedRx Hit Box

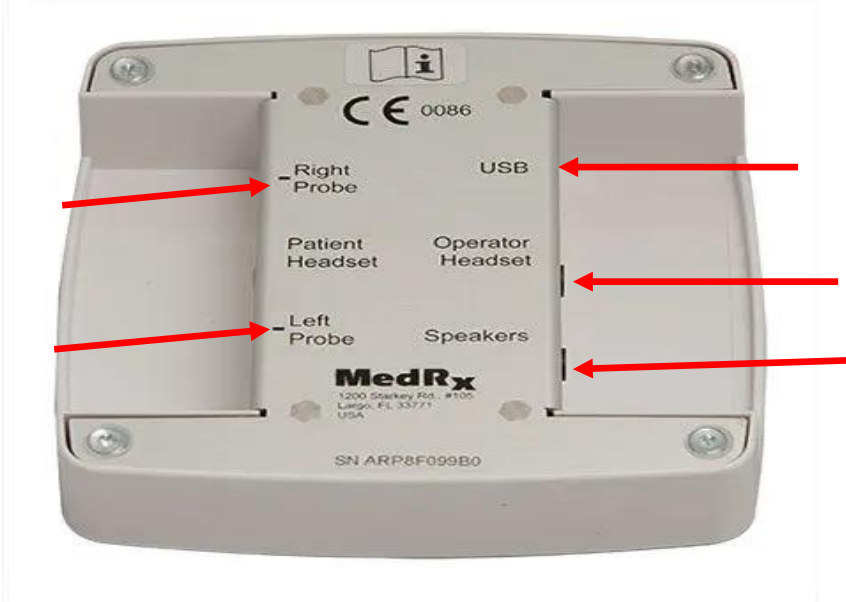
Reference Mic





What is Real Ear Measurement All About?

Live Speech Mapping Equipment Required



Back Side of LSM Unit

Speakers and Probe Mics

HEARLIFE LIVE INSTRUCTOR WORKSHOPS

THANK YOU
ANY QUESTIONS?

What is Real Ear Measurement All About?

Fitting Formulas

The majority of REM users, use either what we call the **NAL-NL1, or NL2 prescription formula**, or the DSL version 5 formula, and then also a lot of them will use the proprietary prescription formulas from hearing aid manufacturers as well. But all of them are pretty similar to the NAL-NL2.

What is Real Ear Measurement All About?

Live Speech Mapping

Live Speech mapping (also known as output-based measures) involves testing with a speech or speech-like signal. The hearing aid is adjusted so that the speech is amplified to the approximate middle of the patient's residual auditory area (the amplitude range between the patient's hearing threshold and upper limit of comfort) while observing a real-time spectrum display of the speech in the patient's ear canal. Many multi-channel hearing aids allow each frequency channel to be adjusted separately. The aim is to find a good compromise between intelligibility and loudness discomfort. This approach to hearing aid testing is implemented in most current real ear systems and there has been a significant increase in audiologists selecting to verify using the output method. Using a real speech signal to test a hearing aid has the advantage that features that may need to be disabled in other test approaches can be left active, and the effects of these features in normal use are included in the test.

What is Real Ear Measurement All About?

Insertion Gain

The traditional method of real ear measurement is known as insertion gain, which is the difference between the sound pressure level measured near the ear drum with a hearing aid in place, and the sound pressure level measured in the unaided ear. First a measurement is made with the probe tube in the open ear (Real Ear Unaided Response, or REUR), then a second one is made using the same test signal with the hearing aid in place and turned on (Real Ear Aided Response, or REAR). The difference between these two results is the insertion gain. This gain can be matched to targets produced by various prescriptive formula based on the patient's audiogram or individual hearing loss.

What is Real Ear Measurement All About?

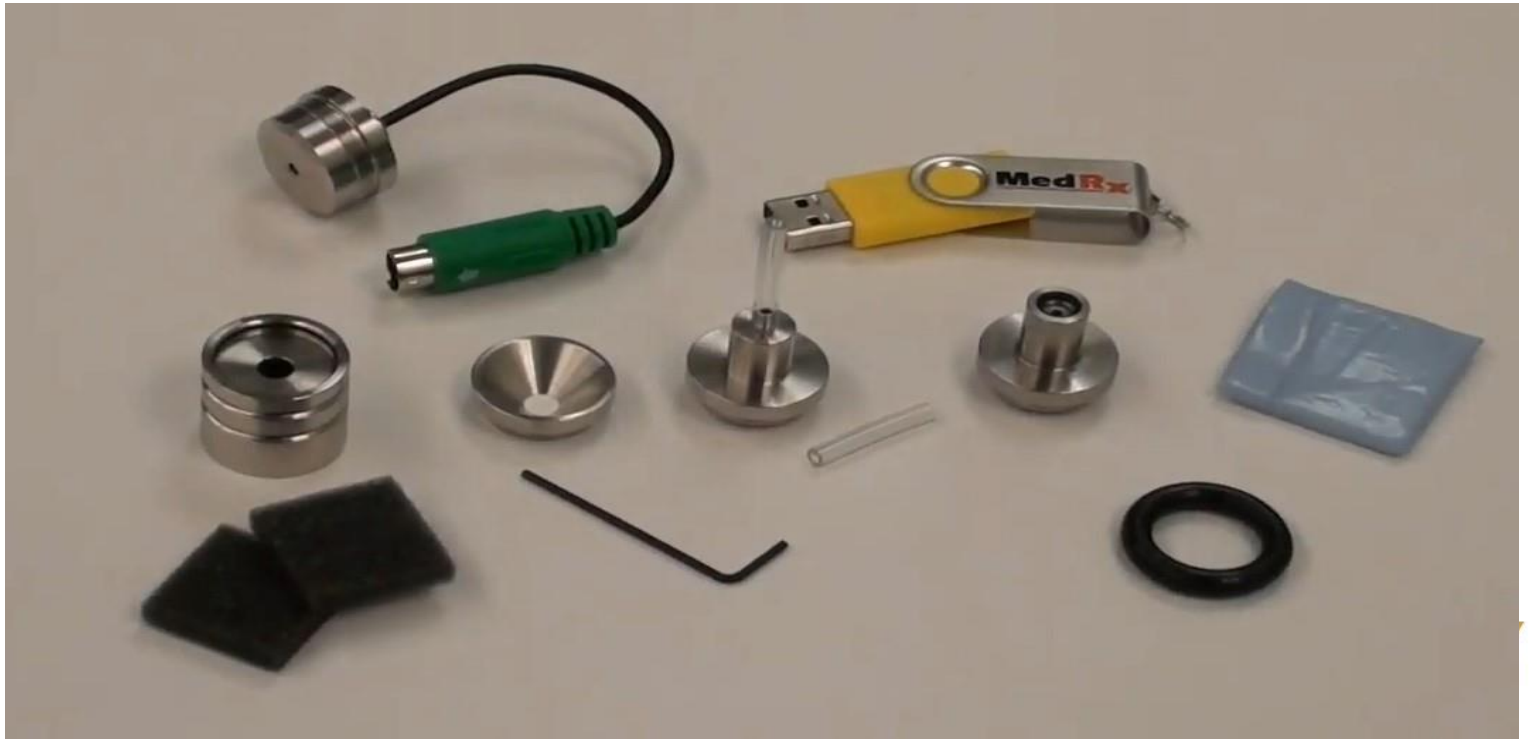
Required Equipment

MedRx Hit Box (Hearing Instrument Test Box)

What is Real Ear Measurement All About?

Required Equipment

Components Required for the HIT Box



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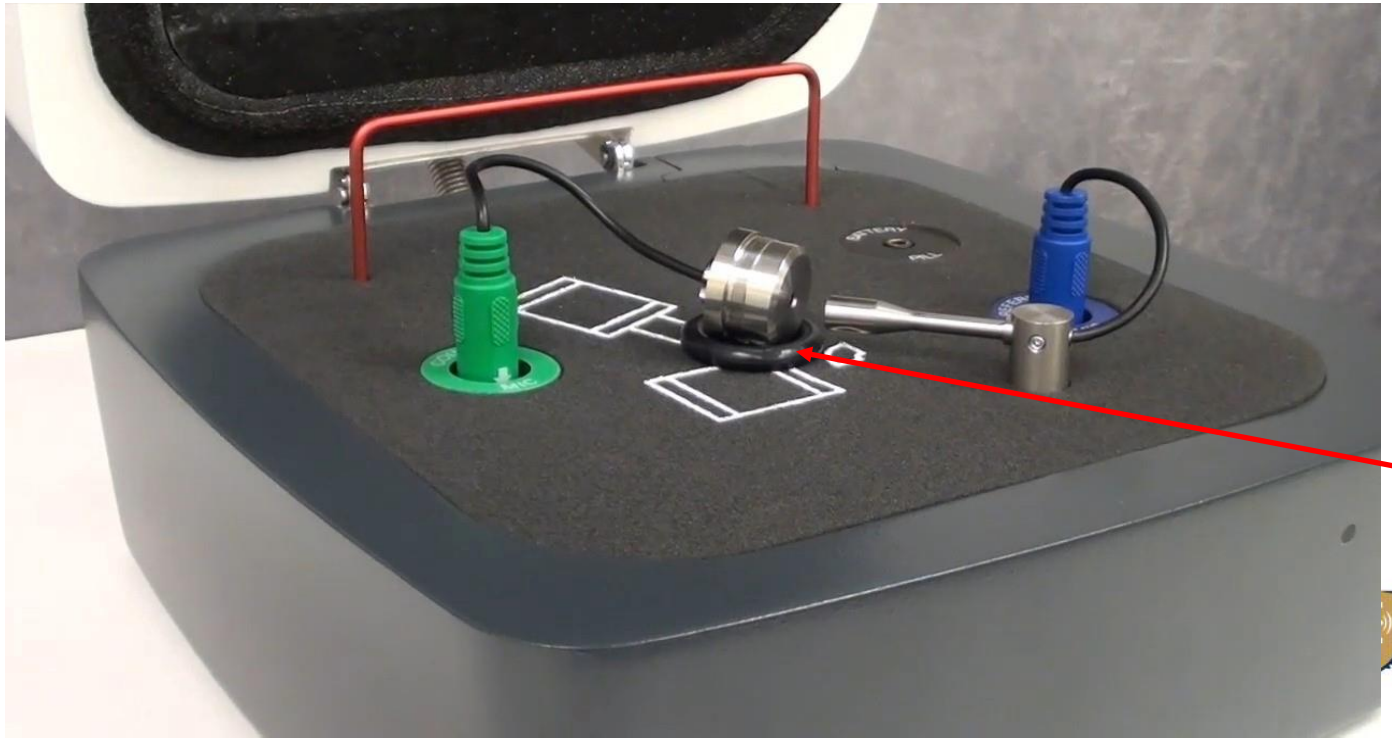

LIVE INSTRUCTOR WORKSHOPS