



# INSERT EARPHONES

Model ER•3C

## USER GUIDE



## INTRODUCTION AND INTENDED USE

Lucid Hearing Insert Earphones are the latest generation of insert earphones, an update to Etymotic's ER•3A Tubeophone earphones, which have been the worldwide standard for audiometric insert earphones since 1985.

Lucid Hearing Insert Earphones are intended for use with audiometric equipment used in hearing testing in audiology clinics, auditory research and screening in industrial and educational settings. They are well suited for unfavorable test environments that may have high ambient noise levels. The frequency response and performance characteristics of Lucid Hearing Insert Earphones are virtually identical to the original ER•3A earphones at all audiometric frequencies and approximate the frequency response of the supra-aural or circumaural headphones commonly used for audiometry.

### Advantages of Lucid Hearing Insert Earphones:

- Incorporates "touch-proof" electrical connection for safety
- Duplicates the ER•3A smooth frequency response
- 30+ dB external noise exclusion – equivalent to a single-wall booth when used with deeply-sealed foam ear tips
- 70+ dB isolation (interaural attenuation) between ears; reduces the need for masking
- Reduces test/retest variability compared to supra-aural or circumaural earphones
- Eliminates test errors due to collapsed ear canals
- Simplifies RECD (Real-Ear-to-Coupler Difference) measurements
- May be calibrated in a 2-cc coupler, occluded ear simulator, or 0.4-cc coupler

### SYSTEM INCLUDES:

- Lucid Hearing Insert Earphones (10 ohm, 50 ohm, or 300 ohm)
- 7' cable with dual-mono 6.3 mm (1/4") plugs
- 20 foam ear tips (regular, 13 mm)
- 20 foam ear tips (small, 10 mm)
- 2 foam ear tips (large, 18 mm)
- Hook-and-loop neckstrap

## WARNINGS

- Do not use insert earphones when medically contraindicated, e.g., draining ear, infection, ear canal laceration or other otologic condition where use of insert earphones could potentially exacerbate a medical condition.
- Lucid Hearing Insert Earphones can produce high sound pressure levels. Use caution when selecting presentation level and duration.
- Reliable test results can be obtained with Lucid Hearing Insert Earphones only when the audiometric equipment they are used with is calibrated before initial use and at subsequent intervals as specified by the audiometric equipment manufacturer, in compliance with national and international standards and regulations.
- Lucid Hearing Insert Earphones are available in 10 ohm, 50 ohm, and 300 ohm impedance. It is essential that the correct impedance be used in accordance with the specifications of the audiometric equipment. Labels on the earphones identify the earphone impedance.
- Use of accessories or replacement parts other than those supplied by Lucid Hearing or its authorized distributors may result in inaccurate results.
- Modification or alteration of any parts may invalidate test results.
- Do not use in or near strong magnetic fields (e.g., MRI).
- Do not reuse ear tips. All ear tips, regardless of material or construction are for single-subject use only. Replace ear tips for each test session.

## Ear Tips

- Foam ear tips are recommended for most uses. They are available in three sizes: standard 8–13 mm (ER3•14A), small 6–9 mm (ER3•14B) and large 10–14 mm (ER3•14C).
- Infant ear tips are available in two sizes: (ER3•14D 3.5 mm and ER3•14E 4 mm). See page 10.
- Multiple sizes of Single-Use Ear Tips 3–16 mm (ER10D•T series) commonly used in immittance and otoacoustic emissions testing can be used with single-use ear tip adapters (ER3•06X).

No data are available on the interaural attenuation or noise exclusion of immittance ear tips.

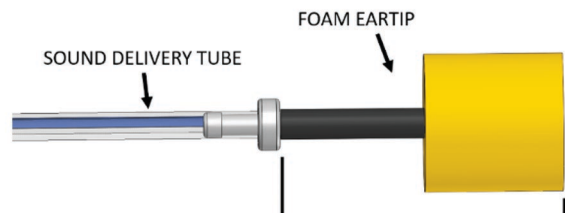


All ear tips, regardless of material or construction are for single-subject use only. Replace ear tips for each test session. Do not reuse ear tips.

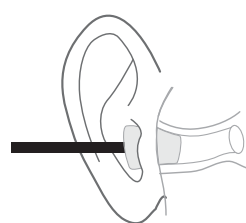
## EAR TIP COUPLING

Foam ear tips developed for Lucid Hearing Insert Earphones have dimensions that ensure proper calibration and test accuracy.

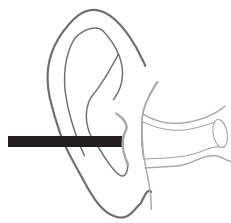
1. The length of black tubing from the end of the sound tube adapter through the foam ear tip is 26 mm. Do not cut the black tubing that connects the foam ear tip to the sound tube.



2. To obtain the noise exclusion and interaural attenuation shown on pages 6-7, insertion depth should be 14-15 mm into the ear canal. This depth is achieved when the outside edge of the foam ear tip is 2-3 mm inside the entrance to the ear canal.



Shallow  
Insertion



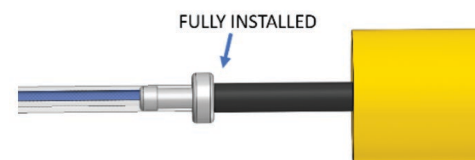
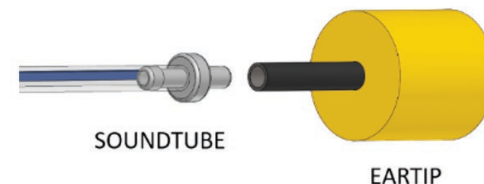
Correct  
Insertion Depth

### NOTES:

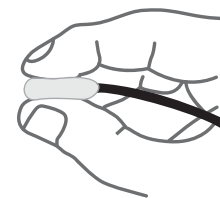
- Do not cut the sound delivery tube. A change of 10 mm in the length of the sound tube will change the frequency response by 0.5 dB at some frequencies.
- Replace the sound delivery tubes (ER3-21) if they crack or harden.
- Calibration is maintained when using single-use ear tip adapters.

## INSTRUCTIONS FOR USE

1. Refer to the audiometer manual for instructions on properly connecting the earphones.
2. Examine the ear canal for obstruction or excessive cerumen.
3. Visually evaluate each ear canal to determine the appropriate size ear tip.
4. Make sure the sound delivery tube is not blocked.
5. Insert the black tubing of an ER3 foam ear tip completely onto the adapter of the sound delivery tube.



6. To facilitate proper placement, firmly roll the foam ear tip into the smallest diameter possible.
7. Insert the ear tip into the ear canal.
  - The purpose of deeply inserted ear tips is to maximize interaural attenuation and noise exclusion.
8. Correct insertion depth: When the outside edge of the ear tip is 2-3 mm inside the entrance of the ear canal.
9. Allow foam to expand to acoustically seal the ear canal.
  - Hold the ear tip in place until it expands.
  - If correct insertion depth cannot be achieved, try rolling the foam into a smaller diameter before insertion. If unsuccessful, use a different size ear tip.
10. If the seal is inadequate, try another ear tip
11. Discard ear tips after each use.



ALLOWABLE A-WEIGHTED ROOM NOISE DURING  
AUDIOMETRIC TESTING

The current ANSI Standard "Maximum Permissible Ambient Noise Levels (MPANLs) For Audiometric Test Rooms" [ANSI S3.1-1999 (R2013)] includes octave band and one-third octave band permissible noise levels for both supra-aural and ER•3 Series insert earphones. See the Lucid Hearing Insert Earphones Calibration Manual for more information.

Room noise below 45 dBA should provide accurate audiometric testing to 0 dB HL. A room noise of 65 dBA should provide accurate screening to 20 dB HL.

Both of those guidelines depend on use of a foam ear tip properly inserted as described on page 4, which provides an average external noise exclusion of approximately 40 dB, with a minimum of 36 dB at 2 kHz.

CALIBRATION

- Before calibration, confirm that the impedance of the earphones matches the requirements of the audiometric equipment. The labels on the earphones identify the impedance. Unless the audiometer was purchased with Lucid Hearing Insert Earphones pre-calibrated by the audiometric equipment manufacturer, the Reference Equivalent Threshold Sound Pressure Levels (RETSPL) values and procedure cited in the current version of the ANSI S3.6 or IEC 60645-1 standard must be used to calibrate the equipment prior to initial use. Re-calibration should subsequently be performed at intervals specified by the audiometric equipment manufacturer, in compliance with national and international standards and regulations.
- Correction factors can be applied where it is necessary to alternate between insert earphones and a supra-aural earphone with audiometers that do not provide a dual-calibration option.

CARE AND CLEANING

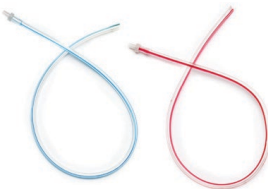
- Use a damp cloth to wipe down any parts that become soiled during normal use.  
Antimicrobials (glutaraldehyde) are safe for external surfaces.  
Any other agents must be tested before using to prevent damage.
- Do not submerge earphones in any liquid or allow liquid into the sound delivery tubes.
- Do not use alcohol or other strong chemicals or solvents to clean earphones or any parts, including cables, sound delivery tubes and ear tips.

ACCESSORIES AND REPLACEMENT PARTS

Accessories and replacement parts are available from Lucid Hearing and its authorized distributors.



Lucid Hearing Insert Earphone Model ER•3C-84  
7" Cable with Dual-Mono  
6.33 mm (1/4") plugs or Alternate Cables  
ER3-19  
ER3-31  
ER3-32



ER3-21  
Sound Delivery Tube  
Replacements with  
Adapters  
ER3-21-CL (clear)  
ER3-21-BR (blue & red)



ER3-06  
Single-Use Ear Tips  
Adapter with  
Tubing

DISPOSABLE  
FOAM Ear tips



SINGLE-USE  
Ear tips



ACCESSORIES



ER3-04  
Sound Delivery  
Tube Adapters



ER3-05  
Hook-and-Loop  
Clips

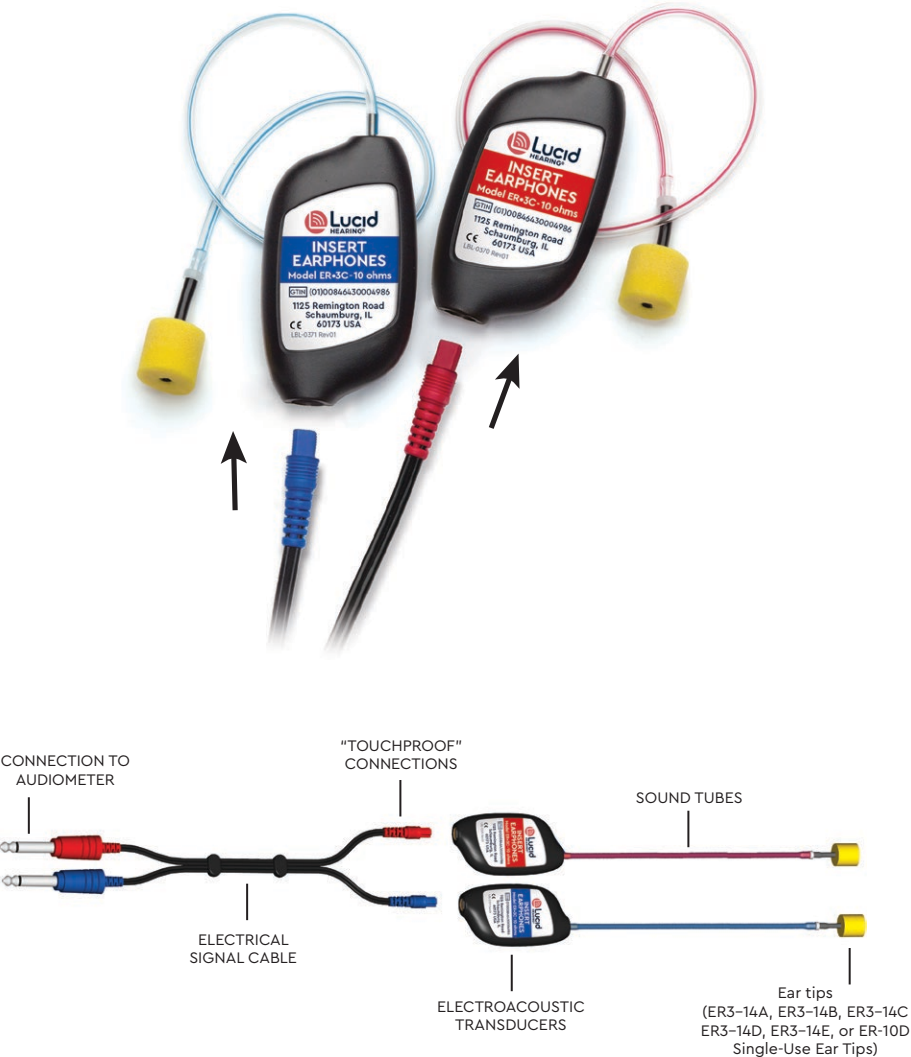


ER3-06X

## CABLE ATTACHMENT AND REPLACEMENT

Firmly insert the cable connector in the corresponding transducer housing socket until fully seated. Replacement cables are available through Etymotic Research and its authorized representatives.

Re-calibration of audiometric equipment is not required with cable replacement.



## SPECIFICATIONS

Impedance:	10 ohms or 50 ohms or 300 ohms
Sensitivity:	102.5 dB SPL in HA-2 coupler at 0.1 Vrms (10 ohms) 102.5 dB SPL in HA-2 coupler at 0.2 Vrms (50 ohms) 103.5 dB SPL in HA-2 coupler at 0.49 Vrms (300 ohms)
Temperature:	15–35 °C
Relative Humidity:	30–90% (non-condensing)
Ambient Pressure:	98–104 kPa
Maximum Output:	Meets or exceeds 110 dB HL at standard audiometric frequencies between 0.5 and 4kHz
Safe Operating Limits:	Maximum continuous sine wave drive: 2.5 Vrms (10 ohms) 5 Vrms (50 ohms) 13.75 Vrms (300 ohms)

## REFERENCES

1. American National Standards Institute. ANSI S3. 7-1995 (R2008). Methods for Coupler Calibration of Earphones.
2. American National Standards Institute. ANSI S3.1-1999 (R2013). Maximum Permissible Ambient Noise level for Audiometric Test Rooms.
3. American National Standards Institute. ANSI S3.6-2010. Specifications for Audiometers
4. Botsford JH (1973). How to estimate dBA reduction of ear protectors. Sound Vib 7(1 ):32-33.
5. International Electrotechnical Commission. IEC 60601-1 :2005. Medical Electrical Equipment-Part 1: General Requirements for Safety and Essential Performance.
6. International Electrotechnical Commission. IEC 60645-1 :2012. Electroacoustics- Audiometric Equipment-Part 1: Equipment for Pure Tone Audiometry
7. International Organization for Standardization. ISO 389-2 (1996). Acoustics- Reference zero for the calibration of audiometric equipment. Part 2 – Reference equivalent threshold sound pressure levels for pure tones and insert earphones
8. Organization for Standardization. ISO 389-5 (2006). Acoustics – Reference zero for the calibration of audiometric equipment. Part 5 – Reference equivalent threshold sound pressure levels for pure tones in the frequency range 8 kHz to 16kHz.
9. Killion MC (1978) Revised estimate of minimum audible pressure. Where is the missing 6dB? J. Acoust Soc. Am, 63 (5), 1501-1508



## SYMBOL DEFINITIONS



Indicates the entity importing the medical device into the locale



Indicates the medical device Manufacturer



Indicates Date of Manufacture



Identifies the European Union Authorized Representative



Identifies the Switzerland Authorized Representative



Symbol indicating separate collection for WEEE – Waste of electrical & electronic equipment



Consult instructions for use or consult electronic instructions for use



To indicate that caution is necessary when operating the device or warning of use is needed when operating the device



Indicates Do not reuse



Indicates Medical device



Indicates shock protection



Indicates Non-Sterile medical device



Indicates Prescription required



Indicates Unique device indicator (UDI)



Indicates Serial number



Product reference or part number

## WARRANTY

Lucid Hearing warrants each insert earphone it manufactures to be free of defects in material and workmanship for a period of one year from the date of sale to the original purchaser. Lucid Hearing's obligation under this warranty is fulfilled, at Lucid Hearing's option, by replacing the product in kind without charge to the original purchaser, repairing the part, or crediting the original purchaser with the purchase price of the returned defective part. For a part to be covered by the warranty it must be returned to Lucid Hearing, postage prepaid, within the warranty period, and the part must not show evidence of misuse, neglect, incorrect wiring by others, or improper installation.

## DISPOSAL

Within the European Union it is illegal to dispose of electrical and electronic waste as unsorted municipal waste. Electrical and electronic waste may contain hazardous substances and therefore must be disposed of separately. Such products will be marked with the WEEE symbol as shown below. User cooperation is important in order to ensure a high level of reuse and recycling of electrical and electronic waste. Failure to recycle such waste products in an appropriate way may endanger the environment and consequently the health of human beings. Outside the European Union, local regulations should be followed when disposing of the product after its useful life.



Etymotic Research, Inc.  
1125 Remington Road,  
Schaumburg, IL 60173 USA



Medical Device Safety Service (MDSS) GmbH  
Schiffgraben 41  
D-30175 Hannover  
Germany



MDSS CH GmbH,  
Laurenzenvorstadt 61,  
5000 Aarau, Switzerland



MDSS-UK RP Ltd  
6 Wilmslow Road  
Rusholme, Manchester M14 5TP  
United Kingdom



**MedEnvoy Switzerland**  
Gotthardstrasse 28  
6302 Zug  
Switzerland

**MedEnvoy Global BV**  
Prinses Margrietplantsoen 33  
Suite 123  
2595 AM The Hague  
The Netherlands

**MedEnvoy UK Limited**  
85, Great Portland Street, First Floor  
London, W1W 7LT, United Kingdom

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Lucid Hearing Holding Company, LLC.  
PO BOX 535596, Grand Prairie, TX 75053

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