

# ER-2 TUBEPHONE™ Insert Earphones

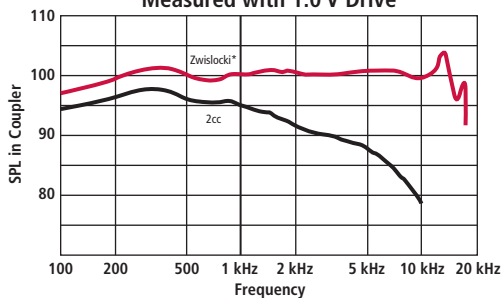


# ETYMÖTIC RESEARCH INC.

## ER-2 TubePhone Insert Earphones

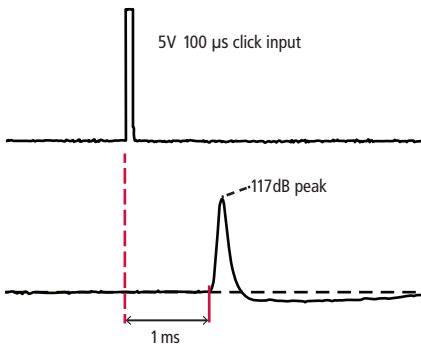
- Differences between ER-1 and ER-2 insert earphones:
  - ER-1 earphones were designed to imitate the normal resonance of the open ear and are used for speech audiometry where the goal is to reproduce the same frequency response at the eardrum for speech that would be produced in a live situation (sound field).
  - ER-2 earphones are equalized to remove the 2.7 kHz ear canal resonance to create a flat pressure response at the eardrum.
- For research with humans and animals
- Accurate reproduction of signals recorded at the KEMAR manikin eardrum
- 16-kHz bandwidth
- 70+ dB isolation between ears; reduces the need for masking
- 30+ dB external noise exclusion
- Eliminates collapsed ear canal problem
- Convenient coupling to the ear with multiple eartip options
- Small, constant diameter sound-delivery tubes (1.35 mm ID x 2.16 mm OD)

Typical Frequency Response  
Measured with 1.0 V Drive



\*IEC 60318-4 type coupler response is similar

Typical Click Response  
Measured on IEC 60318-4 Coupler



## SPECIFICATIONS

**1 kHz Sensitivity:** 100 dB SPL for 1.0 Volt (100 mW) AC Drive; limits  $\pm 3$  dB

**Impedance:** 10 Ohms, nominal (12 Ohms at 100 Hz; 8 Ohms at 20 kHz)

**Safe Operating Limits:** Maximum continuous sine wave drive: 2.5 V RMS

**Maximum Peak Voltage for 1% duty cycle:** 20 Volts

**Acoustic Polarity:** + Electric (small pin) = + Acoustic

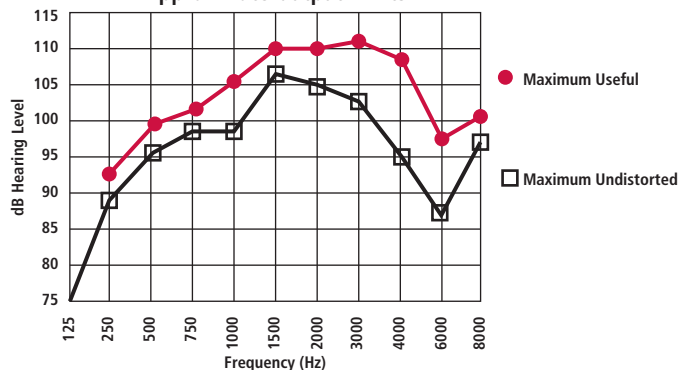
## SYSTEM INCLUDES

- TubePhone insert earphones
- 7' cable assembly with dual-mono 1/4" male connectors
- 50 regular foam eartips (13 mm)
- 10 baby foam eartips (10 mm)
- 2 immittance-eartip adapters with tubing
- 2 extra sound-delivery tubes
- 1 Velcro neckstrap and 2 shirt clips

Approximate Output Limits

Frequency in Hz	Maximum Undistorted Output < 3% THD		Maximum Useful Output < 10% THD	
	SPL in Zwislocki Coupler	Equivalent dB HL	SPL in Zwislocki Coupler	Equivalent dB HL
125	105	75		
250	108	89	111	92
500	108	96	111	99
750	108	99	111	102
1000	108	99	115	106
1500	117	107	120	110
2000	120	105	125	110
3000	118	103	126	111
4000	109	96	123	110
6000	100	87	110	97
8000	112	98	115	101

Approximate Output Limits



## ER-2 TUBEPHONE INSERT EARPHONES



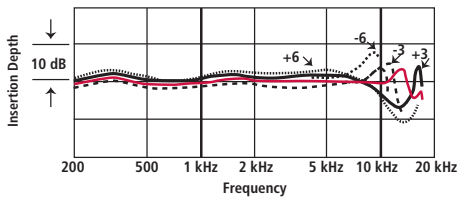
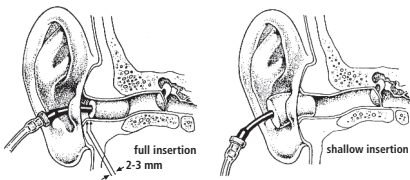
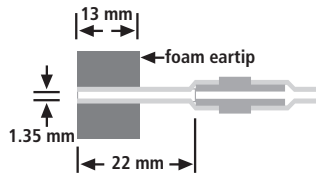
### CALIBRATION ACCESSORIES AVAILABLE

ER1-07 Adapter for B&K DB-0138 2-cc (HA-2) coupler

ER1-08 Adapter for DB-100 (Zwislocki) coupler

ER1-12 Adapter for FRYE 2-cc (HA-2) coupler

Note: IEC 60318-4 (formerly IEC 60711) type Occluded Ear Simulator adapter made upon request. (Also fits Knowles DB-100 "Zwislocki" ANSI S3.25 type Occluded Ear Simulator.) Contact Customer Service for details.



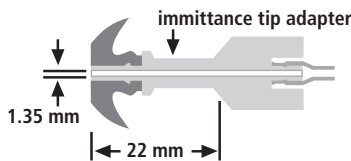
### EARTIP COUPLING

Foam eartips developed for insert earphones are produced with consistent dimensions to ensure proper calibration and test accuracy.

- Do not cut the sound 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.
- ER-2 foam eartips have clear tubing which should be fully inserted on the tip of the sound tube, leaving 22 mm from the end of the eartip. The eartips are 12 mm long, so the required insertion depth into the ear canal is obtained when the edge of the eartip is 2-3 mm past the entrance of the ear canal. Consistent insertion is important for test repeatability above 8 kHz. The graph to the left shows the importance of proper insertion depth on frequency response above 8 kHz ("+" indicates deeper insertion; "-" indicates shallower insertion in mm).
- Immittance-eartip adapter permits the use of any of the standard immittance eartips. Foam eartips are recommended for most uses; however when using immittance adapters, calibration is maintained if the eartip is seated on the adapter so that the opening of the eartip is flush with the tip of the adapter.

### TUBING LENGTH

The smooth frequency response of the ER-2 earphones depends on maintaining a total of 292 mm (11.5 inches) of sound channel between the case wall and the eartip outlet. Of this 292 mm total, 22 mm is provided in the eartip, 5.5 mm is provided by the small metal tip, and 264.5 mm is provided by the sound-delivery tubes. Extra sound-delivery tubes are included with the earphones. Replacement sound-delivery tubes are available from Etymotic Research.



Slowly roll and squeeze the eartip into as small a diameter as possible

### INSTRUCTIONS FOR USE

- Examine the ear canal for obstruction or excessive cerumen.
- Examine the eartip and the sound-delivery tubes to ensure they are not blocked.
- Insert the clear tubing of the foam eartip completely onto the tip of the sound tube.
- Roll the foam tip to a size that will fit the ear canal.
- Insert the eartip well into the ear canal. Interaural attenuation is improved with deep insertion.
- Allow foam to expand to acoustically seal the ear canal.
- Eartips are single use only.
- Replace the sound-delivery tubes if they crack, harden, discolor or otherwise appear unusable.

### IMPEDANCE

Since the ER-2 input impedance is 10 Ohms, a low-output impedance signal source is required for constant voltage drive. Note the specifications and frequency-response graph on page 1. Etymotic recommends an amplifier with an output impedance of  $\leq 1$  Ohm.

### CALIBRATION

If ER-2 earphones are simply plugged into the audiometer calibrated for 10-Ohm THD-39 headphones, a rough estimate of output in HL will be the dial setting minus 20 dB. More accurate calibration can be performed by use of this table with the correct coupler insert.

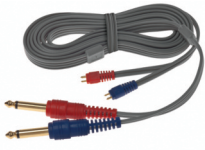
### DATA SUPPLIED

Individual frequency-response curves and distortion measurements are provided with each pair of ER-2 earphones.

### ANSI S3.6 (1996) and ISO 389.2 (1994) Reference Thresholds

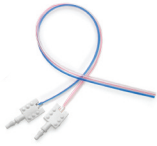
Sound Pressure Levels in dB re: 20 $\mu$ Pa

Frequency (Hz)	Occluded Ear Simulator	HA-2 with Rigid Tube	HA-1
125	28.0 (98.0)	26.0 (96.0)	26.5 (86.5)
250	17.5 (87.5)	14.0 (84.0)	14.5 (84.5)
500	9.5 (79.5)	5.5 (75.5)	6.0 (76.0)
750	6.0 (76.0)	2.0 (72.0)	2.0 (72.0)
1000	5.5 (75.5)	0.0 (70.0)	0.0 (70.0)
1500	9.5 (79.5)	2.0 (72.0)	0.0 (70.0)
2000	11.5 (81.5)	3.0 (73.0)	2.5 (72.5)
3000	13.0 (83.0)	3.5 (73.5)	2.5 (72.5)
4000	15.0 (85.0)	5.5 (75.5)	0.0 (70.0)
6000	16.0 (86.0)	2.0 (72.0)	-2.5 (67.5)
8000	15.5 (85.5)	0.0 (70.0)	-3.5 (66.5)



**ER1-02**  
7' cable assembly with  
dual-mono 1/4" male connectors

Go to: [www.etymotic.com/pro/er2-acc.aspx](http://www.etymotic.com/pro/er2-acc.aspx) for additional connectivity solutions.



**ER1-06**  
Immittance-eartip adapters with tubing  
2/pkg



**ER1-08**  
Adapter for Knowles DB-100 (ZWISLOCKI) coupler



**ER1-14A**  
Disposable foam eartips (regular, 13 mm)  
50/pkg



**ER1-14C**  
Disposable foam eartips (jumbo, 18 mm)  
24/pkg



**ER1-21**  
Sound-delivery tube replacements with adapters  
4/pkg



**ER10D-T03**  
3 mm Single Use Eartips™  
100/pkg



**ER10D-T05**  
5 mm Single Use Eartips™  
100/pkg



**ER10D-T07**  
7 mm Single Use Eartips™  
100/pkg



**ER10D-T09**  
9 mm Single Use Eartips™  
100/pkg



**ER10D-T011**  
11 mm Single Use Eartips™  
100/pkg



**ER10D-T013**  
13 mm Single Use Eartips™  
100/pkg



**ER10D-T016**  
16 mm Single Use Eartips™  
100/pkg



**ER1-04**  
Sound-delivery tube adapters  
10/pkg



**ER1-07**  
Adapter for B&K DB-0138 2CC (HA-2) coupler



**ER1-12**  
Adapter for FRYE 2cc (HA-2) coupler



**ER1-14B**  
Disposable foam eartips (baby, 10 mm)  
50/pkg



**ER3-05**  
Velcro clips  
6/pkg



**ER10D-T04**  
4 mm Single Use Eartips™  
100/pkg



**ER10D-T06**  
6 mm Single Use Eartips™  
100/pkg



**ER10D-T08**  
8 mm Single Use Eartips™  
100/pkg



**ER10D-T010**  
10 mm Single Use Eartips™  
100/pkg



**ER10D-T012**  
12 mm Single Use Eartips™  
100/pkg



**ER10D-T014**  
14 mm Single Use Eartips™  
100/pkg



**ER10D-KIT**  
156 assorted eartips in storage box  
1 kit

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