

# NHSP Guidelines for ERA Equipment Calibration

## Part 1: Procurement Form.

To be completed by department requesting the calibration and forwarded to chosen calibration laboratory

### **Audiology department and responsible individual's details**

Name	
Department	
Address	
E mail	
Tel	

### **Calibration laboratory**

Name	
Address	

### **Equipment details**

Make	
Model	
Serial number (s)	
Asset number	
Date of acquisition	

### **Transducer details**

	Model	Serial number(s)
Supra-aural earphones		Lt: Rt:
Insert earphones		Lt: Rt:
Bone conductor		

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**Please indicate (by ticking in the appropriate columns) what this equipment is used for and which transducers are used**

Test (mark the primary use "*" )	Stimulus type	Supra-aural earphones	Insert earphones	Bone conductor
Threshold ABR	Click			
	500 Hz tone pip			
	1 kHz tone pip			
	2 kHz tone pip			
	4 kHz tone pip			
Neurological ABR	Click			
Threshold CERA	Tone bursts			
Other - specify				

**Notes:**

1. It will be assumed that tone pips are 2:1:2 cycle and that clicks are 100µs (IEC 60645-3)
2. It will be assumed that, in the absence of official ISO reference zero values, the user wishes the equipment to be calibrated using the reference zero values on the NHSP website
3. It will be assumed that tone bursts (for CERA) are sufficiently long (>20ms) to allow standard audiometric reference zero values (ISO 389-1 to -4) to be used and that all available frequencies should be calibrated unless the user states to the contrary. Users should note that the use of tone bursts shorter than 200ms may introduce a threshold bias caused by temporal integration effects.

**Special requirements / explanatory notes from the user:**

*(An example: Please calibrate clicks & pips using the "nHL" scale on the system and calibrate tone bursts using the "SPL" scale on the system)*

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## Part 2: Recommended scope of calibration & limits of accuracy.

### General Notes:

1. The measurement methods advocated in IEC 60645-3 shall be used for clicks and tone pips (2:1:2 cycle tone bursts) and be calibrated to reference zero values published on the NHSP website until ISO 389-6 is formally available;
2. Tone burst stimuli (lasting > 20 ms or having > 10 cycles) should be calibrated by extending the plateau to provide a near-continuous tone, and be calibrated to reference zero values given in ISO 389 parts 1-4.
3. Equipment is deemed to be *within calibration* if its performance lies within specified limits. Where possible, the limits shall be analogous to those given in IEC 60645-1 for a type 1 instrument. The limits are listed below.

Item	Accuracy	Achieved?
Signal level (All signals & transducers listed in part 1)	±3dB	
Masking level	+5dB to – 3dB	
Tone frequency	±1%	
Attenuator linearity	±1dB per 5dB	
Total harmonic distortion (250Hz & 1kHz) (CERA tone bursts. All transducers listed in pt 1)	2.5% AC 5.5 % BC	
Visual check of waveform at max O/P for freedom from clipping / saturation / obvious distortion	check	
Stimulus polarity (clicks) (All transducers listed for clicks in part 1)	check	
Attenuator breakthrough	<-70dB	
R/L crosstalk	<-70dB	
Cursor amplitude accuracy (using internal or external test pulse)	±10%	
Cursor latency accuracy (using internal or external test pulse)	±1%	
Electrode impedance accuracy (5kΩ)	±10%	

## Part 3: Calibration Correction Values

Tables of correction values have been provided for:

ABR stimuli

CERA stimuli

Date of calibration:

Calibrated by:

on behalf of:

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## Appendix: Notes on the provision & use of calibration Correction Values

It is not always possible to calibrate an audiometer so that its indicated output is the same as the hearing level (HL) of the stimulus. In these circumstances a correction value is needed. Correction values should be tabulated and should use the following terminology.

### Definitions

*Indicated hearing level:* sometimes referred to as the "dial level", the nominal output of the audiometer in dBHL as indicated, for example, on the display screen or on the attenuator dial.

*True hearing level:* the actual hearing level of the stimulus corresponding to a given indicated hearing level

*Correction value:* a number of decibels,  $h$  dB, to be added to the *indicated hearing level* so as to obtain the *true hearing level*. That is,

$$\text{true hearing level} = \text{indicated hearing level} + h \quad \text{dB HL}$$

### Notes:

- o All items of equipment that have correction values should have a table of correction values, rounded to the nearest 0.5 dB, fixed in clear view of the operator. When values of  $h$  are tabulated, the stimulus, transducer and the application or test to which the values apply should be shown.
- o It may sometime be appropriate to account for additional types of correction when reporting test results (one example is a correction for ear canal volume when using inserts). All such corrections should all be applied without rounding. Rounding is appropriate only to the final result.
- o When reporting hearing test results, a corrected threshold value (true hearing level) should be quoted to the nearest 1dB when written numerically but when represented graphically (e.g. on an audiogram form), the result should be rounded to the nearest 5dB.
- o Care should be taken to ensure that the algebraic signs attached to the tabulated values of  $h$  are consistent with the above equation.

### Example

'For a 2 kHz tone pip, the correction value applicable to the left insert phone used for ABR tests is  $-6.5$  dB'

When the audiometer indicates 45 dB the true hearing level is  $45 + (-6.5) = 38.5$  dB HL.

On an audiogram form, this value would be indicated by a symbol at 40 dB HL whilst it would be written or tabulated as 39 dB HL.