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Service manual

Eclipse 1.1

Interacoustics

Item no. 8507843 – D-0116393 I 2025/07

Table of contents

1. Introduction

1.1 About this manual

This manual is for our multifunctional screening and/or diagnostic device, Eclipse. The contents of this manual cover instrument related data, such as disassembly and calibration. Technical specifications, schematics, parts & accessories list along with an exploded view of the device are found as appendices in the back of the manual.

1.2 About warnings and cautions

The below warnings, cautions and notices are applied throughout the manual, indicating the level of attention required for a given action:

 WARNING	The **WARNING** label identifies conditions or practices that may present danger to the patient and/or user.
 CAUTION	The **CAUTION** label identifies conditions or practices that could result in damage to the equipment.
NOTICE	**NOTICE** is used to address practices not related to personal injury.

1.3 General information

We continuously strive to improve our products and their performance, hence the specifications in this service manual are subject to change without further notice.

The performance and specifications of our products can only be guaranteed if technical maintenance is conducted routinely every year. Technical maintenance should be carried out by qualified personnel authorized by Interacoustics.

We are happy to receive any inquiries about our products. Our contact details are:

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2. Maintenance and disassembly

WARNING

Make sure that the instrument is disconnected from the power supply before starting this procedure

2.1 General maintenance of Eclipse

The performance and safety of the instrument is maintained when the following recommendations for care and maintenance are observed:

1. To maintain electrical safety during the lifetime of the instrument, a safety check must be made regularly according to IEC 60601-1, Class 1, Type BF if used for ABR measurements and IEC60601-1, Class 1, Type B if used for OAE measurements.
2. Before connecting to the mains, be sure that the local mains voltage and the voltage labelled on the instrument correspond.
3. Do not place the instrument next to a heat source of any kind and to ensure proper ventilation, allow sufficient space around the instrument.
4. We recommend at least one annual instrument evaluation. This ensures that the acoustical, electrical, and mechanical properties are correct. The evaluation should be conducted by a Factory trained technician to guarantee proper service and repair.
5. Observe that no damage is present on the mains cable and connector insulation, and that there is no exposure to any kind of mechanical load involving damage.
6. For maximum electrical safety, switch off the mains power when the instrument is not in use.
7. To ensure the reliability of the instrument, periodic biological measurements should be performed on a person with recorded data. This person could be the operator him/herself.
8. If the surface or parts of the instrument are contaminated, use a soft cloth moistened with a mild solution of water and washing-up liquid or similar. Always disconnect the mains power plug during the cleaning process and be careful that no fluid enters the inside of the instrument or the accessories.
9. After each patient examination, proper cleaning ensures that there is no cross contamination via parts between the patients. General precautions must be observed to prevent transmission of disease from one patient to another. Contaminated ear cushions are to be removed from the transducer before cleaning. Frequent cleaning using water may be used, but periodic use of a mild disinfectant may also be used.
10. Great care should be exercised during the handling of earphones and other transducers, as mechanical shock could cause incorrect calibration.

2.2 How to clean our products

Before cleaning, always switch off the device and disconnect from the mains power.

Use a soft cloth, lightly dampened with cleaning solution to clean all exposed surfaces.

Do not allow liquid to meet the metal parts inside the earphones / headphones.
Do not autoclave, sterilize, or immerse the instrument or accessories in any fluid.

Do not use hard or pointed objects to clean any instrument parts or accessories.

Do not allow parts that have been in contact with fluids dry before cleaning.

Rubber ear tips or foam ear tips are single-use only components.

Ensure that isopropyl alcohol does not meet any screens on the instruments.

Ensure that isopropyl alcohol does not meet any silicone tubes or rubber parts.

Recommended cleaning and disinfection solutions:
Warm water with mild, nonabrasive cleaning solution (soap)

Normal hospital bactericides

70% isopropyl alcohol

Procedure:
Clean the instrument by wiping the outer case with a lint free cloth lightly dampened in cleaning solution.

Use a lint free cloth dampened in cleaning solution for the cushions, patient tone switch and other parts.

Make sure to not get moisture in the speaker portion of the earphones and similar parts.

2.2.1 Cleaning the OAE probe tip

To record correct OAE measurements, it is important to make sure that the probe system is kept clean at all times.

Do not use pins or threads/needles to remove deeply positioned deposits in the small tubes inside the probe tip, as two of the channels holding acoustic filters may pop out or be damaged. Instead, use the extra probe tip replacement parts supplied together with the OAE system. The probe and cables can be cleaned with alcohol wipes. If the OAE module is used as an infant screener within a hospital setting, the pediatric ward will specify disinfection procedures and recommend the appropriate agents. In this case, the probe should be cleaned after every measurement. Also, consider wiping Eclipse thoroughly.

Never wash or dry the probe tips with a temperature above 70°C/ 158°F.

Do not immerse the probe tip in water.

NOTICE

Never clean the probe housing by immersion in a solution.

The below illustrates a disassembled OAE probe.

Figure 1

Never attempt cleaning the probe tip while the tip is still fitted to the probe housing. Instead, remove the probe cap by turning it counterclockwise. The probe tip can then be removed from the housing.

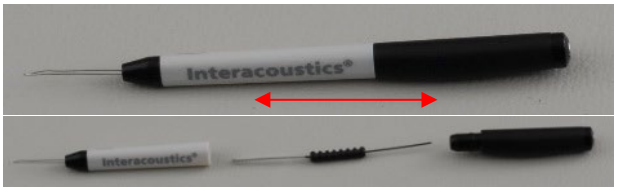


Figure 2

Pull the cleaning tool apart to access the thin brush and thin rigid plastic cord inside.

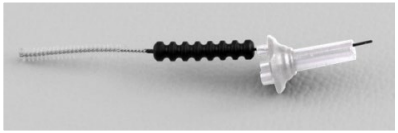


Figure 3

Use the plastic cord or brush to remove debris from the probe tip. Always insert the cleaning tool from larger end of the tip – this prevents accumulation of debris inside the small, round vents. Make sure to insert the cleaning tool into the open channel vent, as the other vents contain small red acoustic filters.

Figure 4

Alternatively, use a Thornton Bridge & Implant Interdental Clearer to remove debris. Thread the stiff end of the cleaning thread into the rear end of the open probe tip tube and pull the floss through.

When finished, place the probe tip back on the probe. Make sure that the holes fit into the corresponding cavities.

Screw the probe cap back onto the probe. Finger force is sufficient to tighten the screw, hence tools to affix the probe cap is not recommended.

2.3 Disassembling Eclipse

WARNING

Make sure that the instrument is disconnected from the power supply before starting this procedure.

The following paragraphs contain the most common actions related to Eclipse, namely, how to disassemble the instrument for service. Carried out by a technician authorized by Interacoustics, the most common action would be replacing the mainboard.

Calibration, another common action that this instrument requires, is described thoroughly in Chapter 3.

Tools required: Torx T10

2.3.1 Opening the cabinet

Disassembling Eclipse is a simple procedure of three steps.

Remove the two screws holding the upper cabinet in place.

Figure 5

Then remove the upper cabinet by sliding it towards yourself, away from the rear panel.

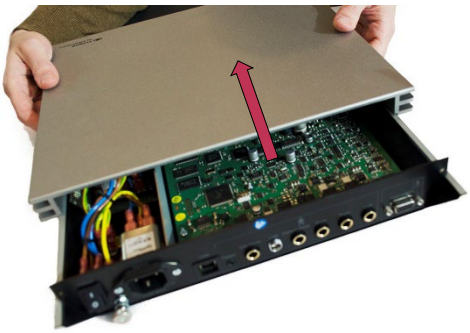


Figure 6

Figure 7

NOTICE

Before sliding the upper cabinet fully back, the ground cable going from the upper cabinet to the lower cabinet ground connection, must be released.

Otherwise, it hinders the upper cabinet from sliding off.

2.3.2 Main board

This chapter describes how the mainboard is removed.

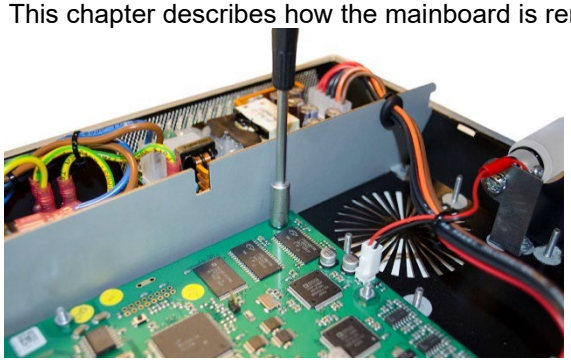


Figure 8

Remove the 5 nuts keeping the mainboard in place.

Figure 9

Remove the nut on the OAE opening.

Figure 10

Remove the 2 screws holding the preamp socket in place.

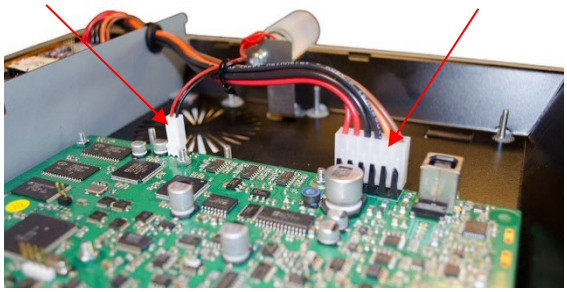


Figure 11

Finally remove the cables indicated to the left.

The mainboard can now be removed from the lower cabinet.

2.3.3 Power supply

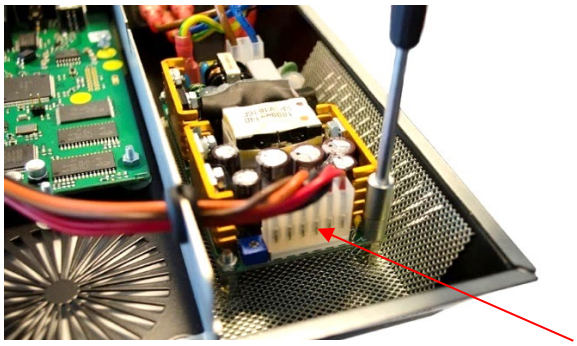


Figure 12

Remove the screws holding the power supply in place.

Remove the cable indicated on the left from its socket.

The power supply can now be removed from the lower cabinet.

3. Calibration

This chapter contains calibration standards for Eclipse. Included here is an explanatory guide and a complete set-up of how to calibrate each transducer type.

3.1 Service, adjustment, and repair

Annual calibration

This instrument can be serviced, adjusted, and repaired without losing the CE marking validity, provided that the measuring equipment used is fulfilling the demands below, the adjustment procedures are followed and technicians are authorized by Interacoustics.

To ensure correct stimuli, we recommend a yearly calibration of the following modules:

TEOAE CALIBRATION	Probe stimuli are calibrated in peSPL values using the IEC 711 ear simulator coupler made in accordance to IEC 60318-4.		
DPOAE CALIBRATION	Probe stimuli L1 and L2 are calibrated individually in SPL values using the IEC 711 ear simulator coupler made in accordance to IEC 60318-4.		
ABR / ASSR CALIBRATION	IEC 60645-1/ANSI S3.6	IEC 60645-3	IEC 60645-7, Type 1

NOTICE

We recommend that a calibration check label with the next date of calibration, is attached to the equipment.

3.2 Equipment requirements

Calibrating Eclipse encompasses both hardware calibration and transducer calibration. In the following paragraphs, the equipment requirements for both types are listed.

3.2.1 Equipment requirements for acoustic calibration

To ensure proper calibration of audiometric equipment, test instruments must be reliable, stable and their calibration certified. The minimum requirements for measuring equipment are:

1) Measuring amplifier with condenser microphone input, or a sound level meter fulfilling the demands of IEC 651 Type 1
2) Acoustical coupler in accordance with IEC60318-4 (IEC 711), Occluded ear simulator IEC60318-1 artificial ear and IEC60318-6 artificial mastoid
3) An acoustic calibrator
4) A general purpose oscilloscope

Figure 13

Figure 14

Figure 15

Appendix B contains an **exploded view** of Eclipse 1.1

3.3 Calibration of test equipment

All test equipment used for the calibration of audiometers is to be calibrated annually. Calibration of all test equipment is to be performed by a laboratory which is traceable to the National Institute of Standards and Technology (NIST) or equivalent. Test equipment calibration documents are to be kept on file.

3.4 Starting up from the OtoAccess® Database

Even with no hardware detection, the selected Eclipse module still opens. However, it is not possible to start the actual test before the hardware is properly detected.

Therefore, make sure that Eclipse is switched on and correctly connected before opening the software module.

To get started from the OtoAccess® Database:

Open the OtoAccess® Database

Select the respective patient.

For new patients:

Click *Add new patient.*

As a minimum, fill in the mandatory fields.

Save the patient details by clicking *Save.*

Click the given module to start the test.

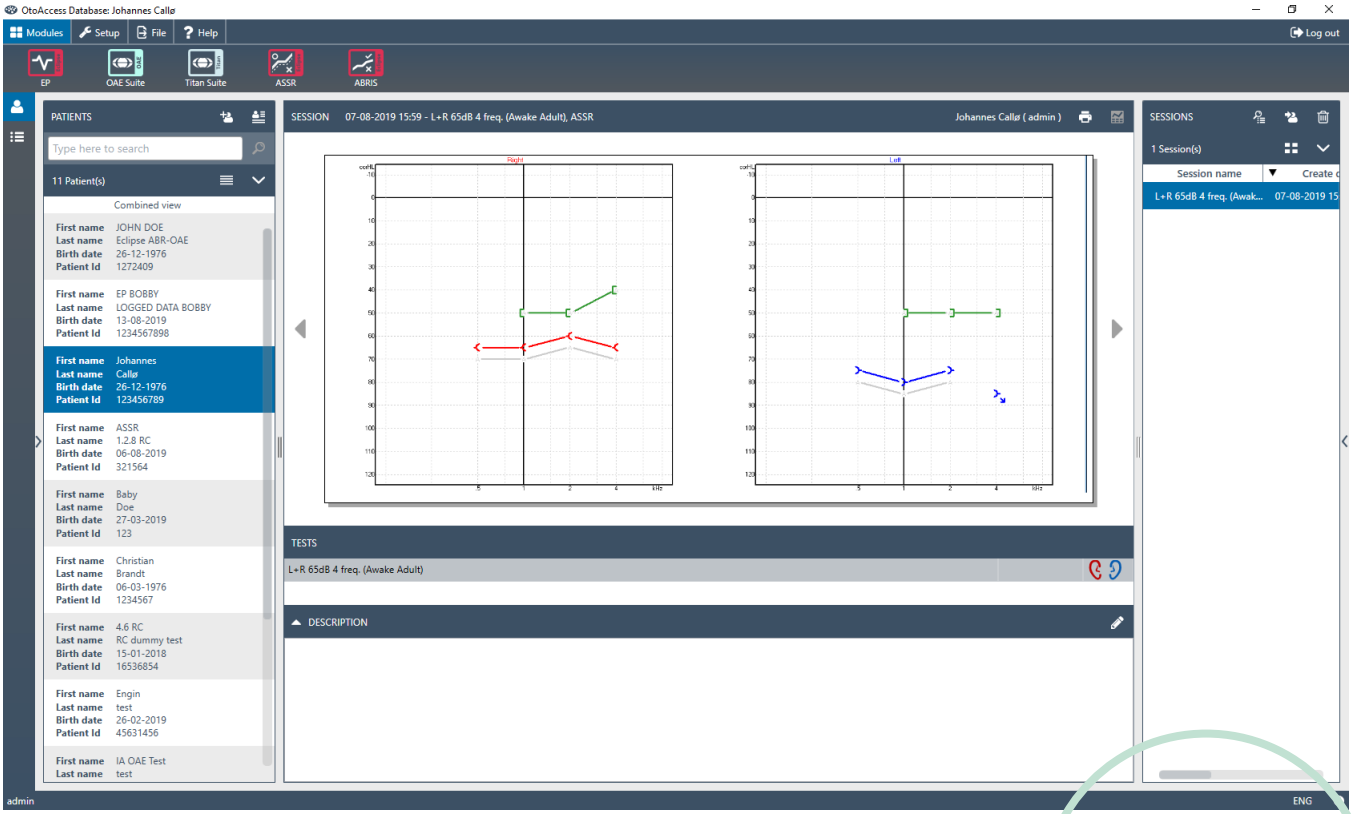


Figure 16

For more information, refer to the OtoAccess® Database Instructions for Use

3.5 Starting up from NOAH

The following concerns use with ASSR only.

Having opened NOAH, select the current patient's name. For patients not yet listed, click *Add a New Patient,* and fill in the required fields.

Then save the patient details by clicking *OK* and select the ASSR module from the list.

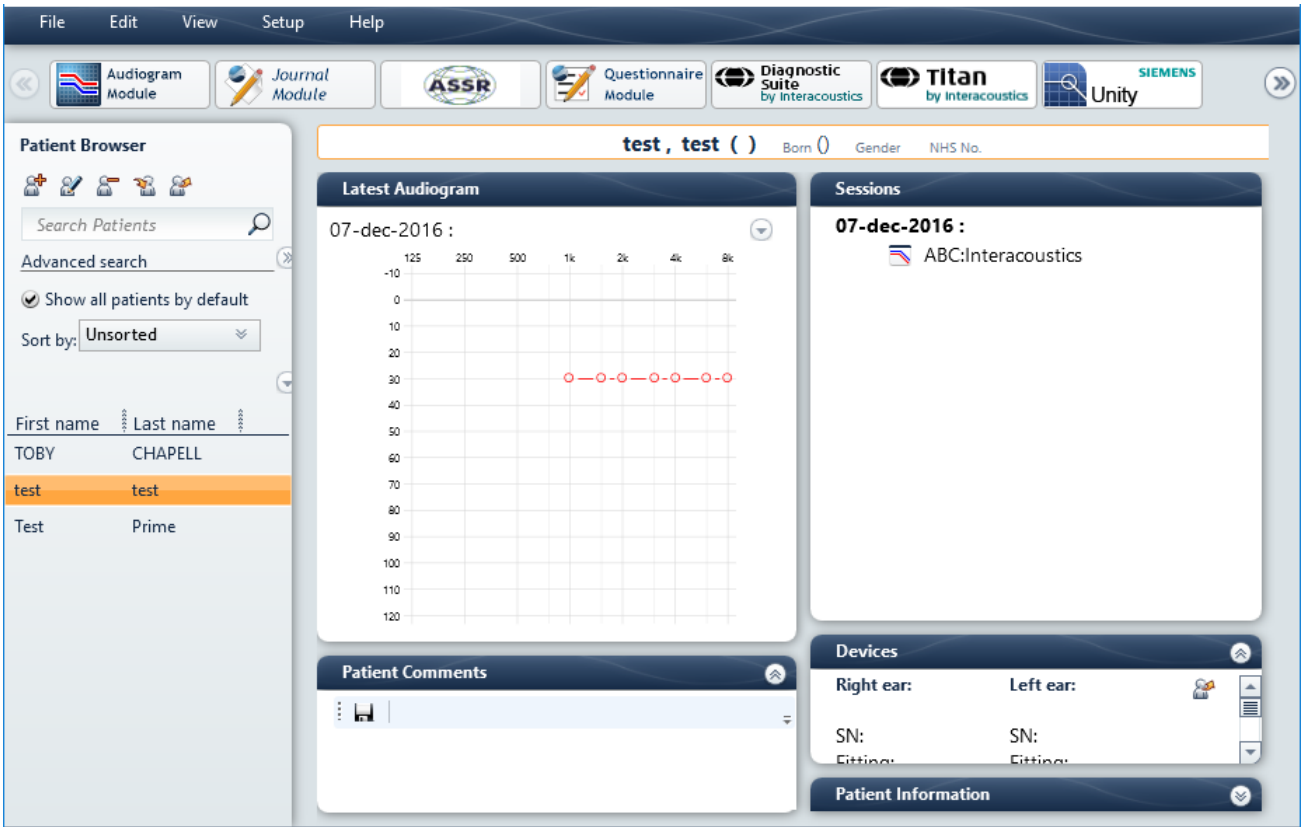


Figure 17

For more information about working with the database, please refer to the operation manual for NOAH

4. Calibration of transducers

This chapter contains a transducer calibration with Eclipse, exemplified with an EARtone ABR transducer.

First, set up the calibration equipment as illustrated below. The calibration setup is in fact a circuit.

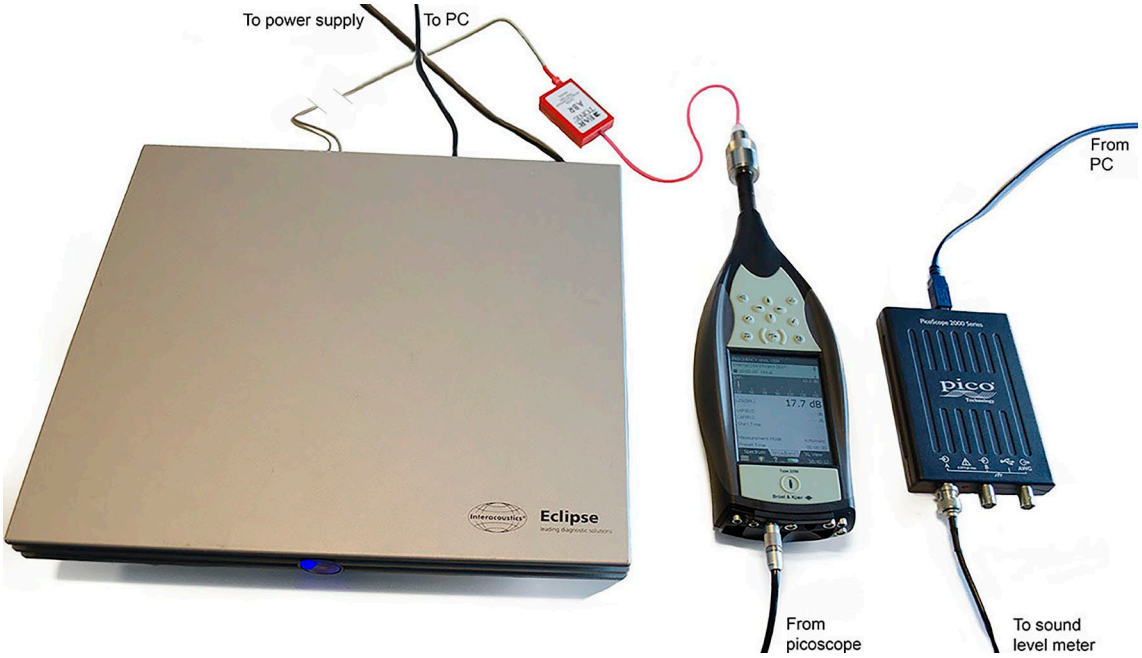


Figure 18

For the following modules, a yearly calibration check to ensure correct stimuli, is recommended.

TEOAE CALIBRATION	Probe stimuli are calibrated in peSPL values using the IEC 711 ear simulator coupler made in accordance with IEC 60318-4.		
DPOAE CALIBRATION	Probe stimuli L1 and L2 are calibrated individually in SPL values using the IEC 711 ear simulator coupler made in accordance with IEC 60318-4.		
ABR / ASSR CALIBRATION	IEC 60645-1/ANSI S3.6	IEC 60645-3	IEC 60645-7, Type 1

4.1 OAE calibration

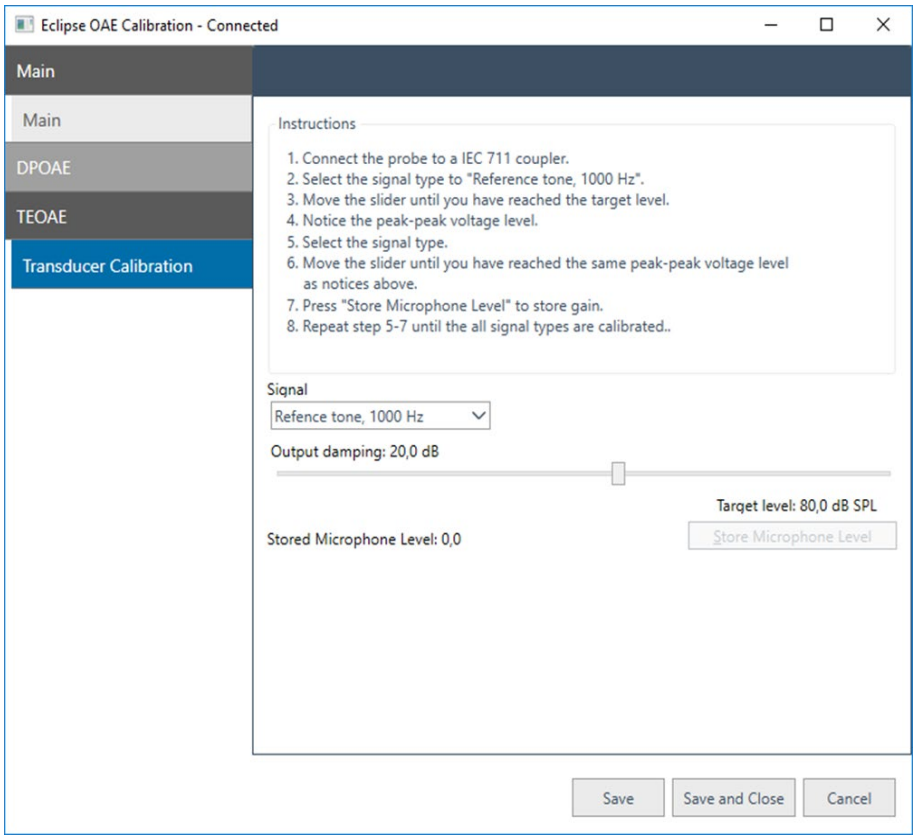


Figure 19

TEOAE

Start the Eclipse OAE Calibration program. Choose *TEOAE* from the main menu, and then *Transducer Calibration.*

Follow the on-screen instructions.

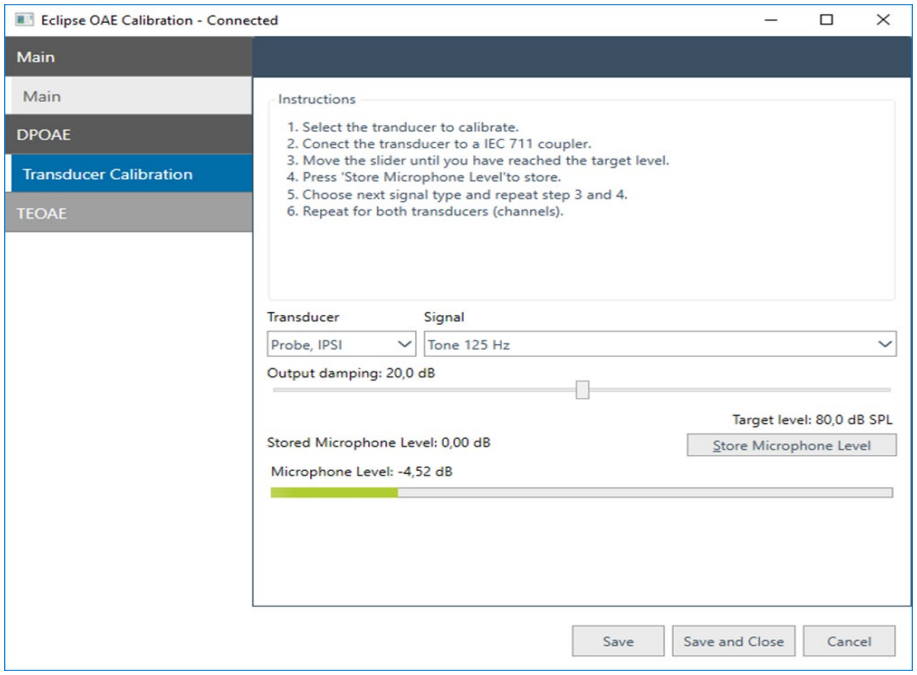


Figure 20

DPOAE

Choose *DPOAE* from the main menu, and then *Transducer Calibration*.

Follow the onscreen instructions.

TEOAE calibration is always required, even when no DPOAE is included

4.2 EP15 - EP25 – VEMP-ABRIS calibration

Then, switch on Eclipse and open the calibration programme via the below path:

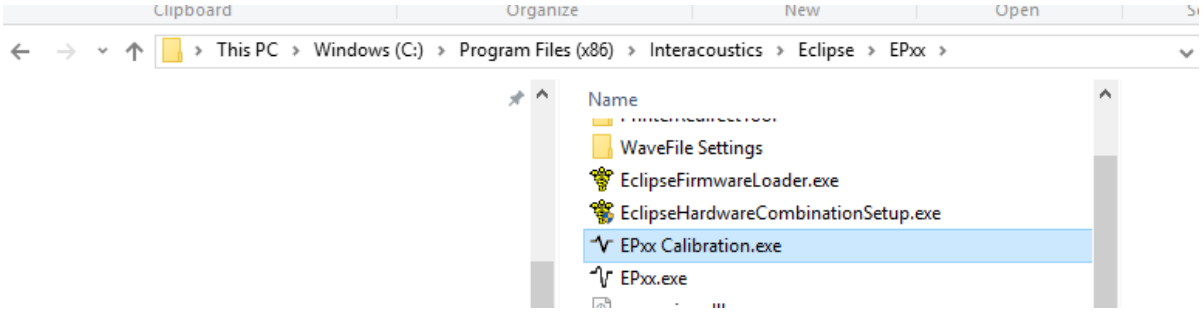


Figure 21

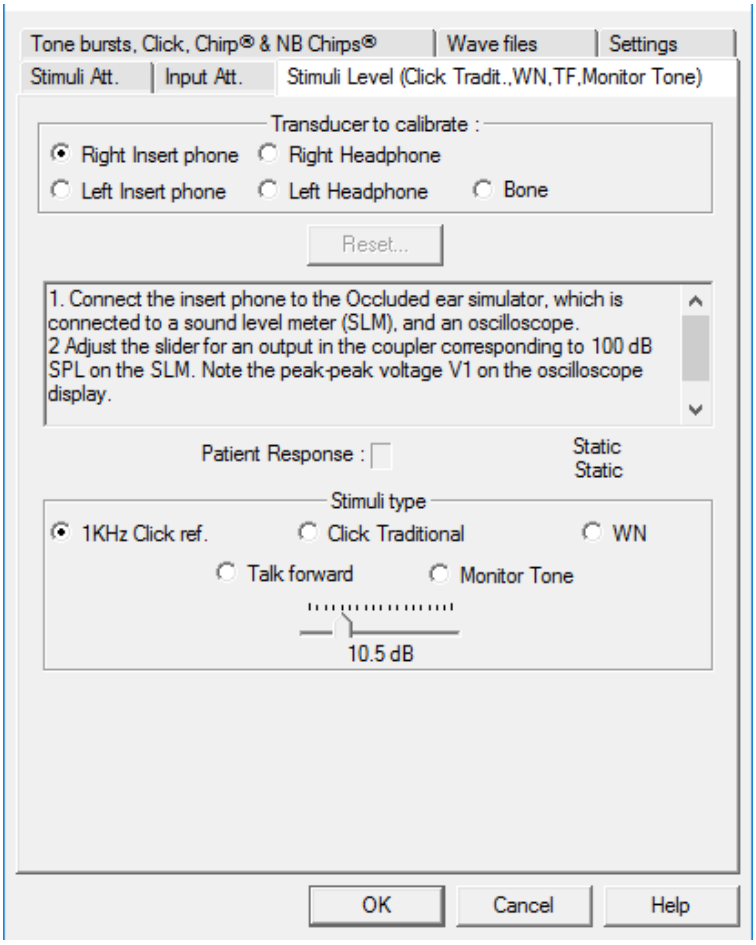


Figure 22

When the calibration program is running, start with the *Stimuli Level* tab, and choose the transducer to calibrate.

First, calibrate with the stimuli type *1KHz Click ref.*

Then observe the values and follow the on-screen instructions.

Repeat for each transducer up for calibration.

Use the arrows to scroll for more information in the instructions box

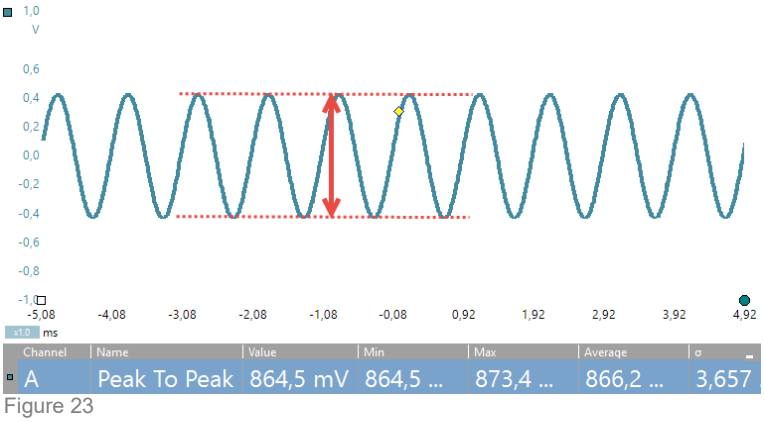


Figure 23

This is what the reference tone curve looks like.

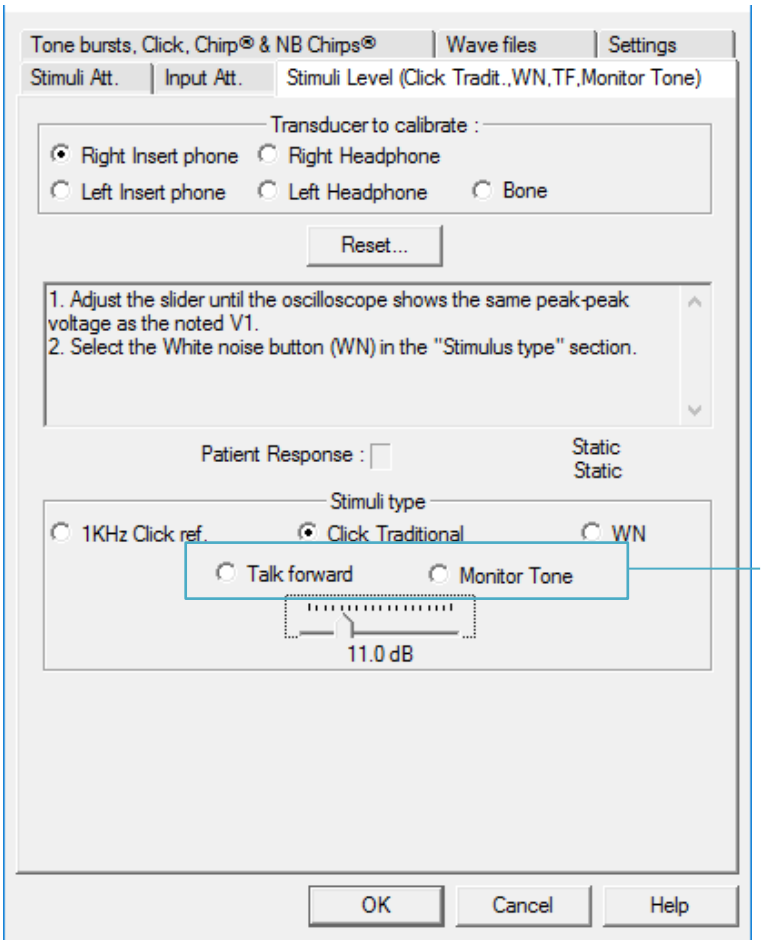


Figure 24

Then, repeat the same for the stimuli type *Click Traditional.*

These options are not in use.

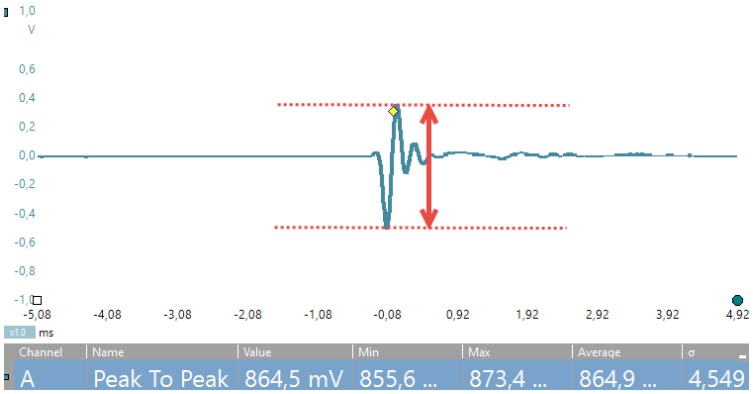


Figure 25

This is what the click looks like on the oscilloscope.

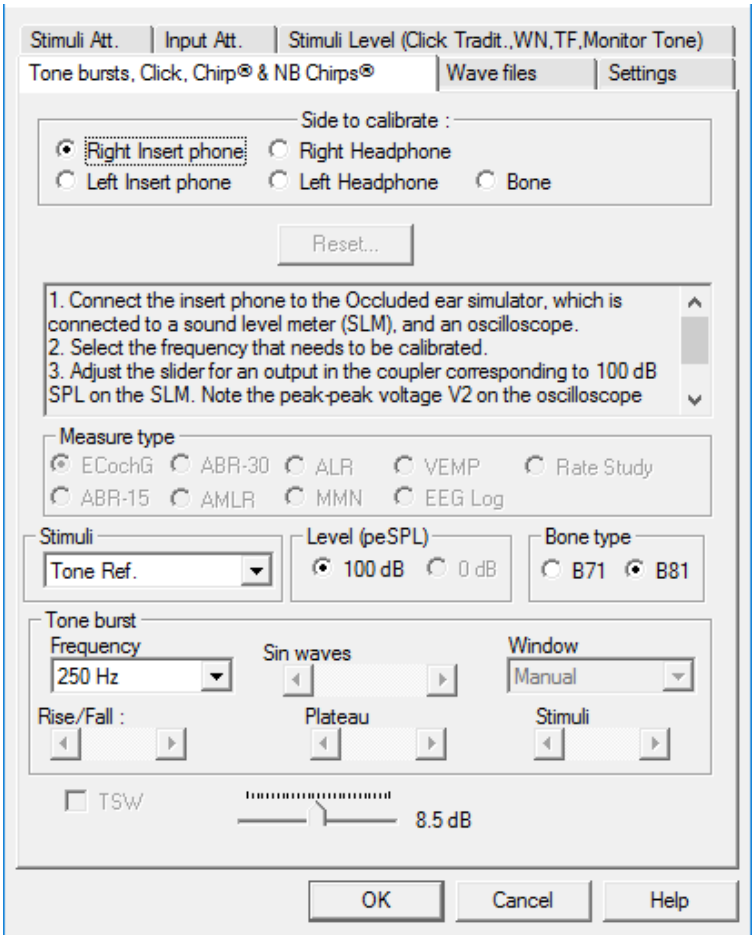


Figure 26

Then click the *Tone Bursts, Click, Chirp® & NB Chirps®* tab, and choose the transducer to calibrate.

Use the below table to adjust the stimuli and frequencies correctly.

Follow the on-screen instructions and observe the values.

Stimuli / Frequency	Burst	NB CE-Chirp	Click	CE Chirp
250 Hz	X			
500 Hz	X	X		
750 Hz	X			
1 kHz	X	X	X	X
1.5 kHz	X			
2 kHz	X	X		
3 kHz	X			
4 kHz	X	X		
6 kHz	X			
8 kHz	X			

Figure 27

This table displays the relevant types of stimuli and their matching frequencies.

NOTICE

Calibrating the stimuli CE-Chirp High and CE-Chirp Low is not required.

4.2.1 What the stimuli type curves typically look like

REFERENCE TONE

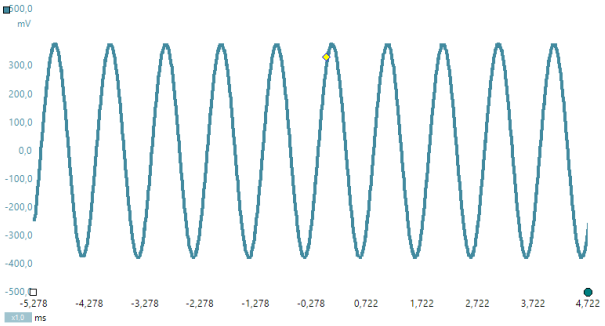


Figure 28

TONEBURST

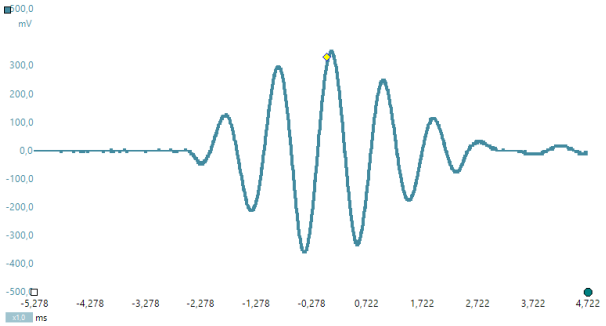


Figure 29

NARROW BAND CE-Chirp

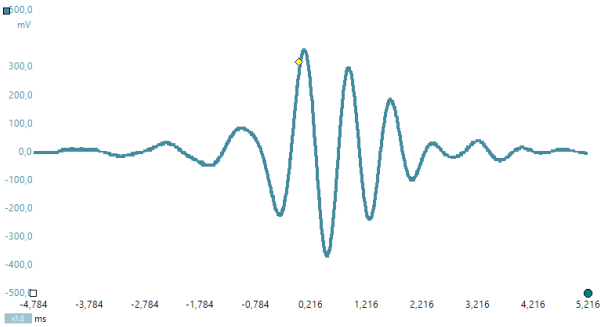


Figure 30

CLICK

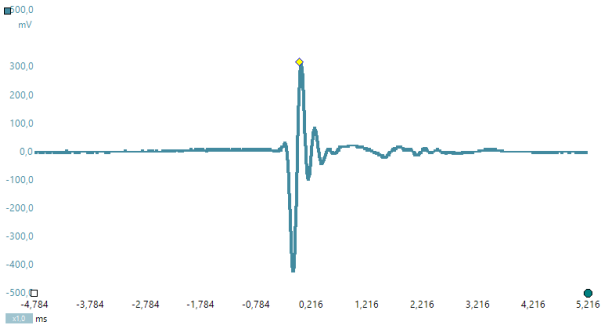


Figure 31

CE-Chirp

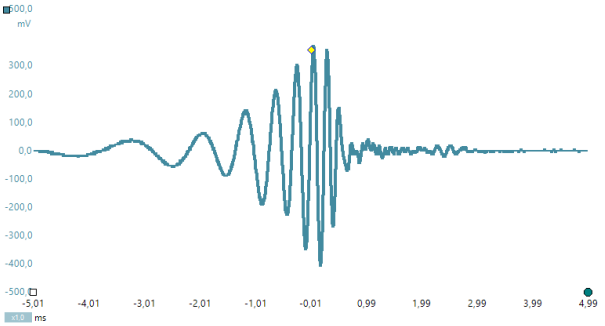


Figure 32

4.2.2 Installation of research stimuli

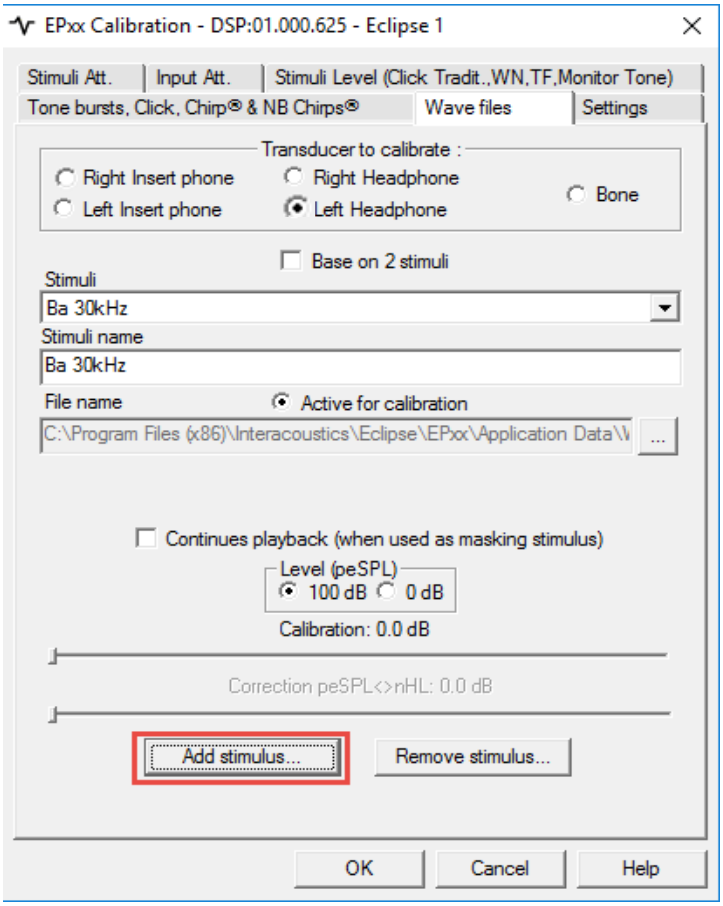


Figure 33

Open the *Wave files* tab and click *Add Stimulus…* to import the research stimuli. Also import 1kHz_warble.wav for calibration.

NOTICE Free field calibration requires a dedicated transducer (e.g. the Left Headset).[1]

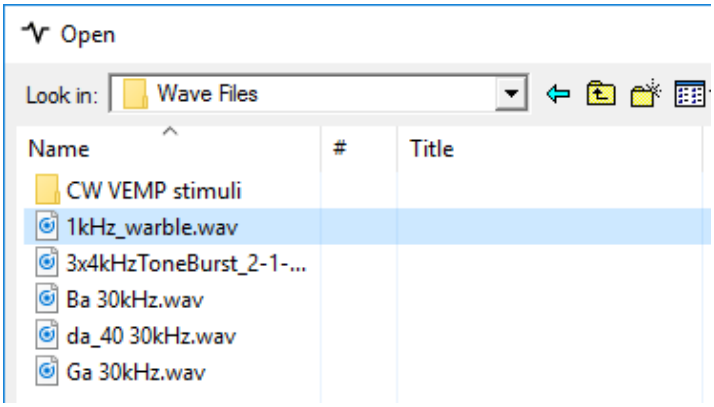


Figure 34

[1] When calibrated to free field speakers, the selected output cannot be used for the original transducer. In this example, the Left Headset must be selected in the EP25 software in order to present stimuli to the speaker.

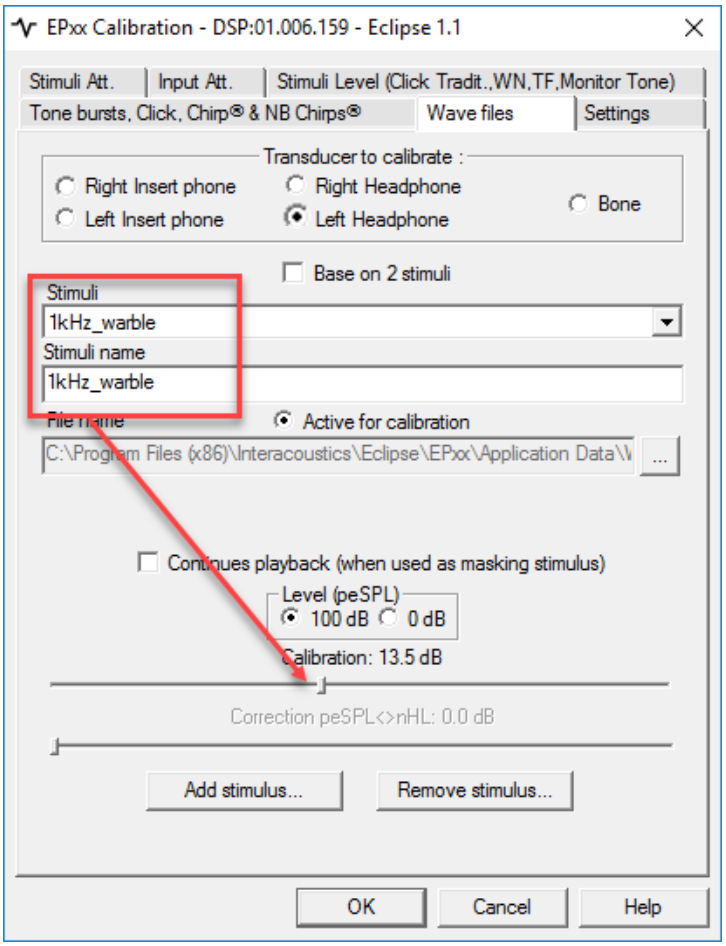


Figure 35

Select 1 kHz warble.wav and adjust to the given level (e.g. 100dB SPL).

Measure the peak-peak voltage on the oscilloscope.

EQUIPMENT REQUIREMENTS
711 coupler (IEC60318-4) for insert phones
Artificial ear (IEC60318-1) for supra aural phones
Artificial mastoid (IEC60318-6) for bone conductors
Sound level meter
Oscilloscope (connected to the output of the sound level meter)

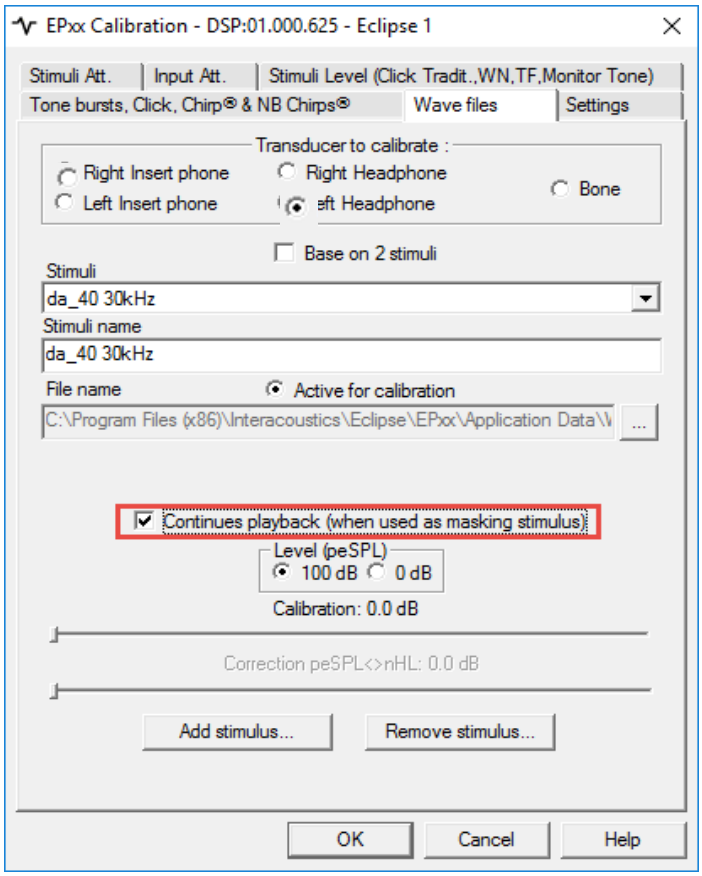


Figure 36

Then, check the 100 dB peSPL level and adjust the calibration slider until the same Vp-p as the reference tone in the previous steps is reached.

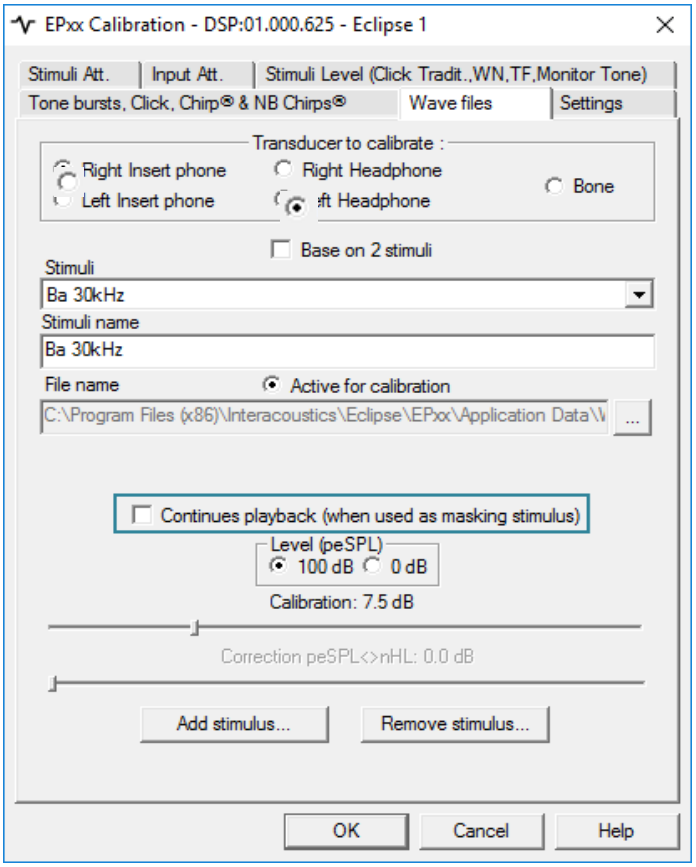


Figure 37

Uncheck the box *Continues playback (when used as masking stimulus).*

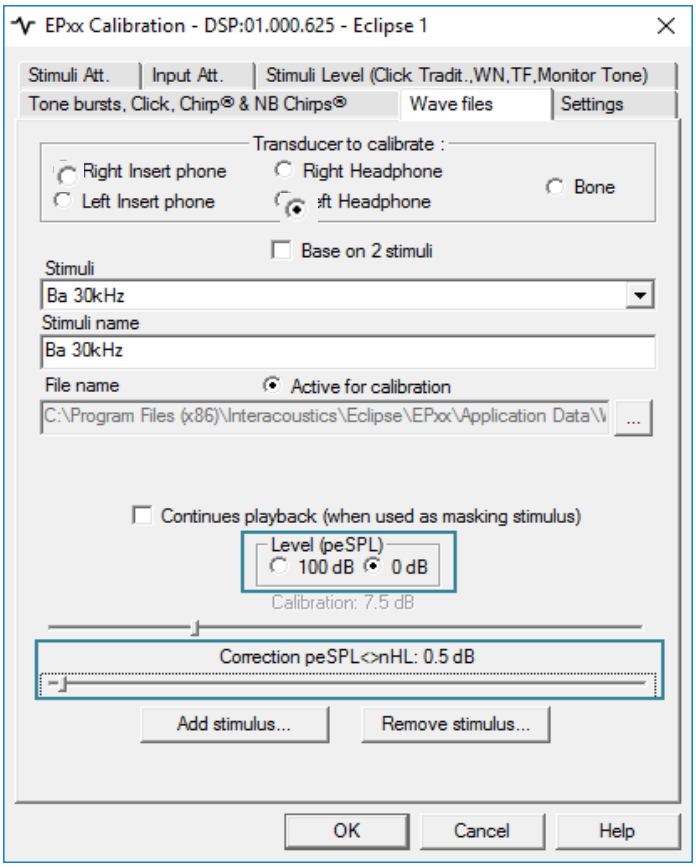


Figure 38

Select *0 dB* in the *Level (peSPL)* box.

Then adjust the slider *peSPL<>nHL* to 0.5 dB.

4.3 ASSR calibration

Open the ASSR calibration software from the file as below:

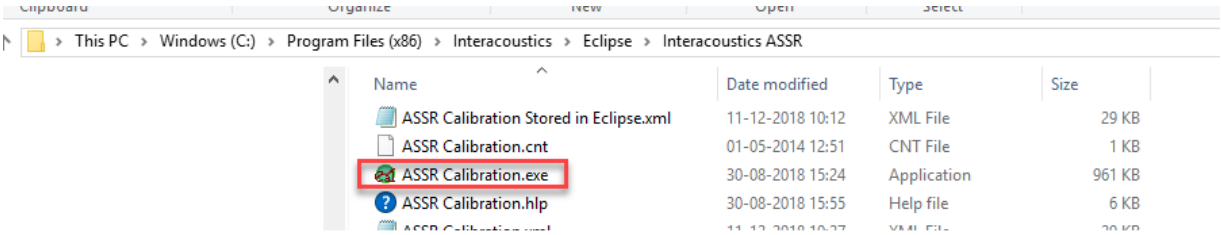


Figure 39

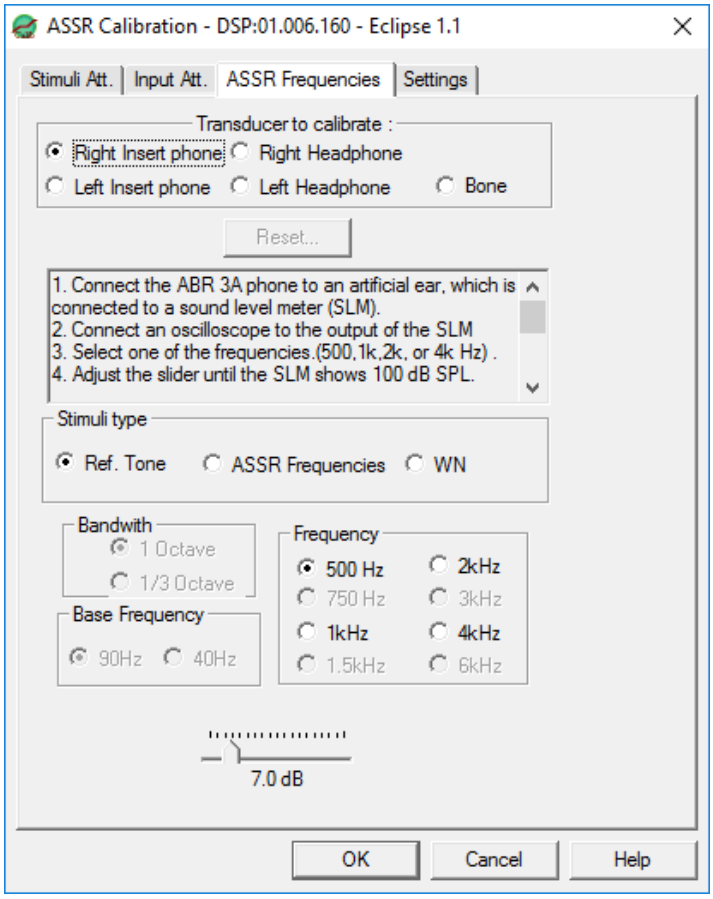


Figure 40

In the ASSR calibration program, start with the *ASSR Frequencies* tab and choose the transducer to calibrate.

Start with *Ref. Tone and follow instructions. Follow this guide through ASSR Frequencies and WN.*

Then observe the values and follow the on-screen instructions.

Repeat for each transducer up for calibration.

Write down the reference tones' peak to peak value for each frequency on a piece of paper

4.4 Aided Cortical calibration

NOTE: Unlike the other transducers and modules delivered with the Eclipse, the Aided Cortical module and loudspeaker are NOT calibrated from the factory. Hence, a calibration of the Aided Cortical setup is ALWAYS needed before first time use.

For the calibration of the Aided Cortical module, the following calibration equipment is needed.

- A Sound Level Meter (SLM) (i.e. B&K Type 2250 or similar)
- A stand or tripod to position the SLM in the correct position/height

Installation:
Before calibration can begin, the equipment needs to be installed. The speaker stand must be assembled and the speaker placed on top (secure it with the supplied finger-screw on the bottom). Adjust the height of the speaker to ensure its center is roughly in the same height as where the patient's head is expected to be. Secure the height with the pin and tighten the knob by hand.

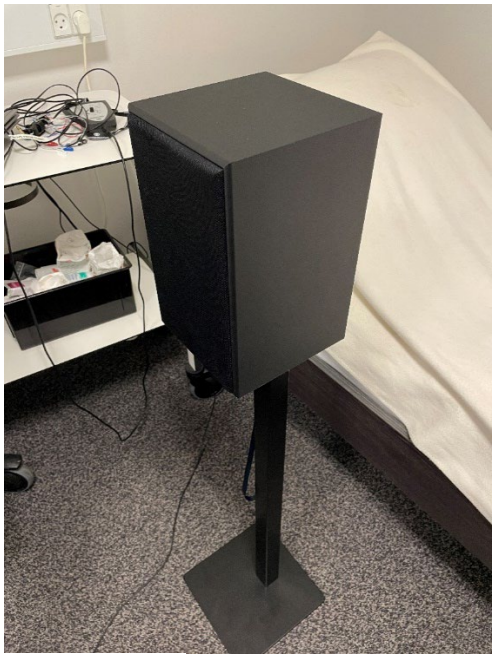


Figure 41

Setup:
The speaker is connected via socket “LINE 2” with the supplied cable. The power supply is connected to either of the power sockets. Do not switch on the speaker before it has been connected to the Eclipse.

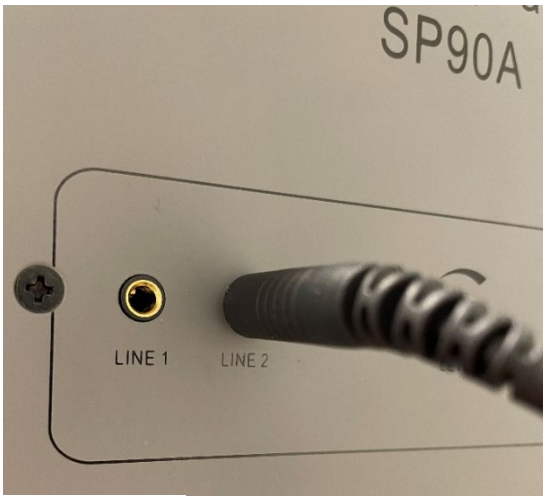


Figure 42

Figure 43

Volume:
It is recommended to turn the overall speaker volume up with the slit positioned vertically (at “12” o’clock) for the initial setup. This will set the volume at roughly 50% and it will be adjusted during the calibration.

Figure 44

Microphone stand assembly:
Assemble the microphone stand including the microphone adapter at the top of the pole. The microphone is attached by sliding the cable into the groove and pushing the microphone gently into the holder until fixed.

Figure 45

Figure 46

Figure 47

Connection:
To connect the speaker and microphone cable to the Eclipse, the supplied 3.5 mm to 6.5 mm stereo-jack adaptors are used for both cables.
The speaker is connected to the Eclipse via the “Bone” socket and the microphone is connected to the Eclipse via the “Talk Forw.” socket.

Figure 48

The speaker can also be connected using the optional 10 m SP100 cable with one 6.35 mm plug and one 3.5 mm plug.

Placement:
Place the speaker in the desired position – it is recommended to use a position away from the walls in the room. Place a chair 1.5 m in front of the speaker. Make sure that there is room for this setup.

During calibration, the patient chair is removed, and the microphone stand is placed in the location where the chair was placed. Adjust the height of the microphone stand to be in the same level as the patient’s ear will be while they are sitting in the chair. Face the tip of the metal tube of the microphone toward the loudspeaker.

Assemble the SLM to the tripod and place the tip of the SLM so it is facing the speaker and parallel with the microphone. The SLM should be in a similar height as the microphone but the two may not touch. The SLM tip must be at the same plane as the tip of the microphone.

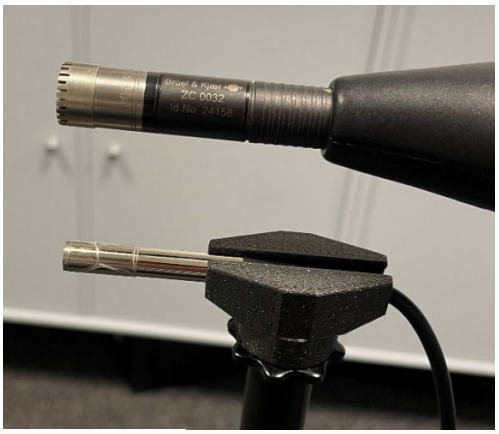


Figure 49

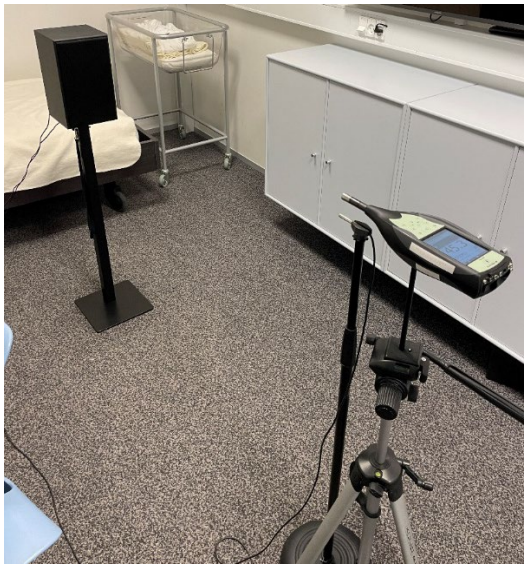


Figure 50

Turn on the SLM and set the testing parameters as follows:
- Fast mode
- C frequency weighting – alternatively LIN or Z weighting (do not use A weighting)
- Ideally with large numbers for easy view during the calibration

The free field setup is sensitive to influence from environmental noises like fans, doors slamming, people talking and so forth. Thus, it is a must to minimize or remove any such noise sources during the calibration process.

Calibration software:
Once all parts are placed and turned on (speaker and SLM), open the calibration software on the PC connected to the Eclipse. Choose the tab labeled “Aided Cortical stimuli”.
Note that as soon as you choose this tab, a sound will be played constantly from the loudspeaker!

Once in the tab, the steps are explained in the dialog box.

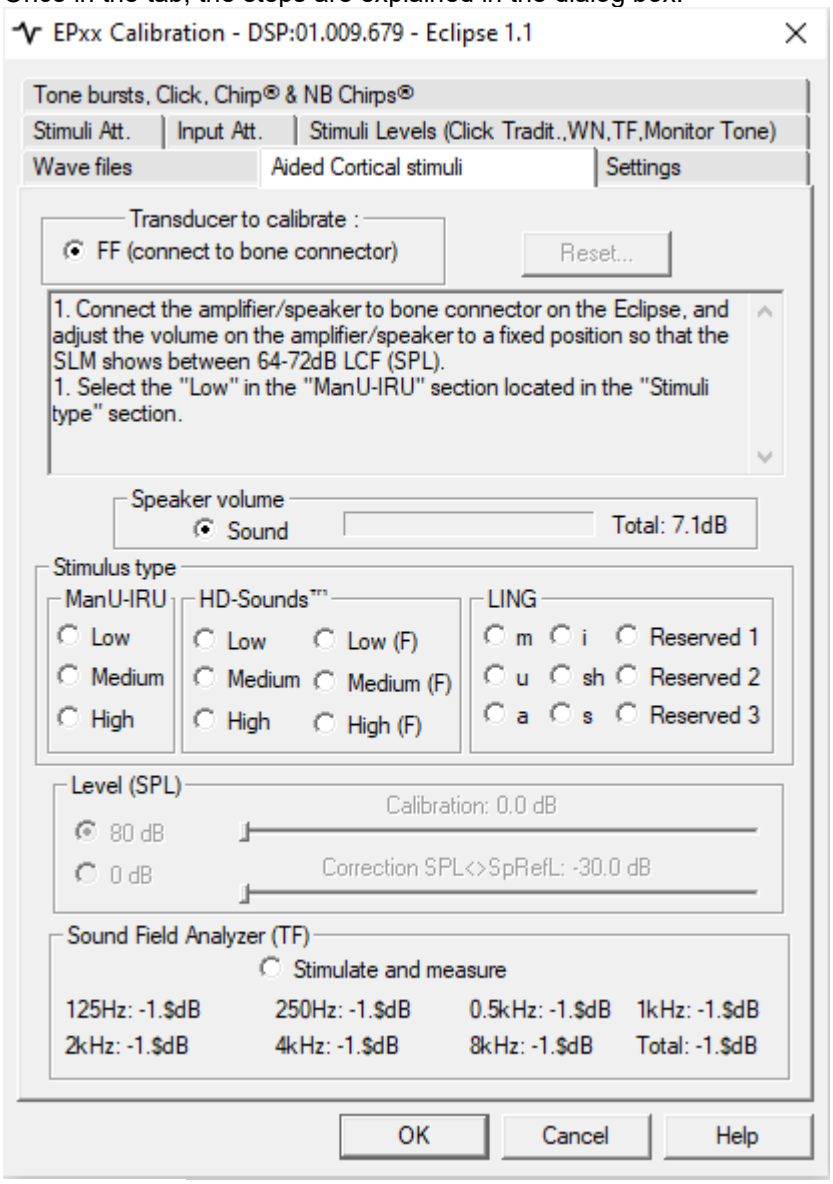


Figure 51

The first step is to adjust the overall volume of the setup using the volume control of the speaker (on the SP90A, use the volume control on the rear of the speaker to reach the required level).

Figure 52

Note that the “Speaker volume” can be used as a visual guide to ensure the system is working correctly. The displayed volume is the SPL picked up by the microphone near the SLM. The value of the SLM and the value displayed by the “Speaker volume” may not be completely the same. Within 10 dB of each other is acceptable.

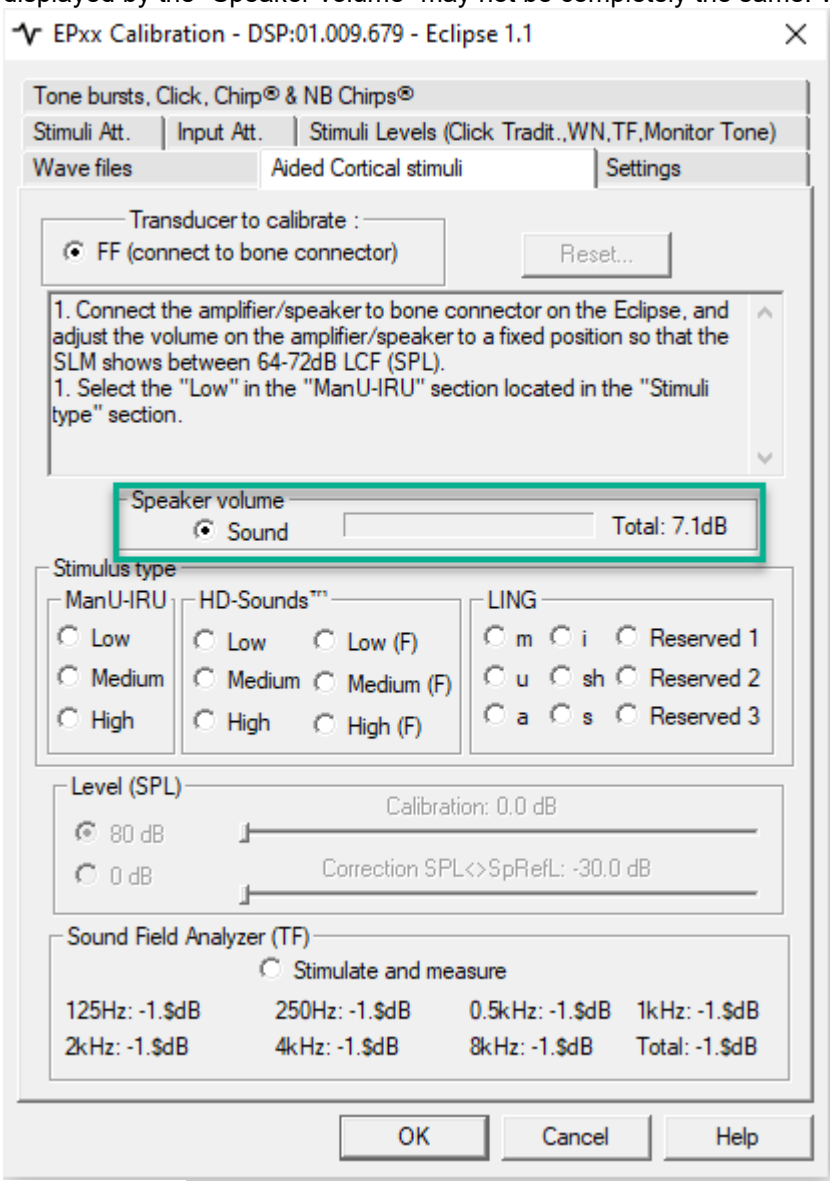


Figure 53

Next step is to choose the first stimuli for calibration – the ManU-IRU Low.

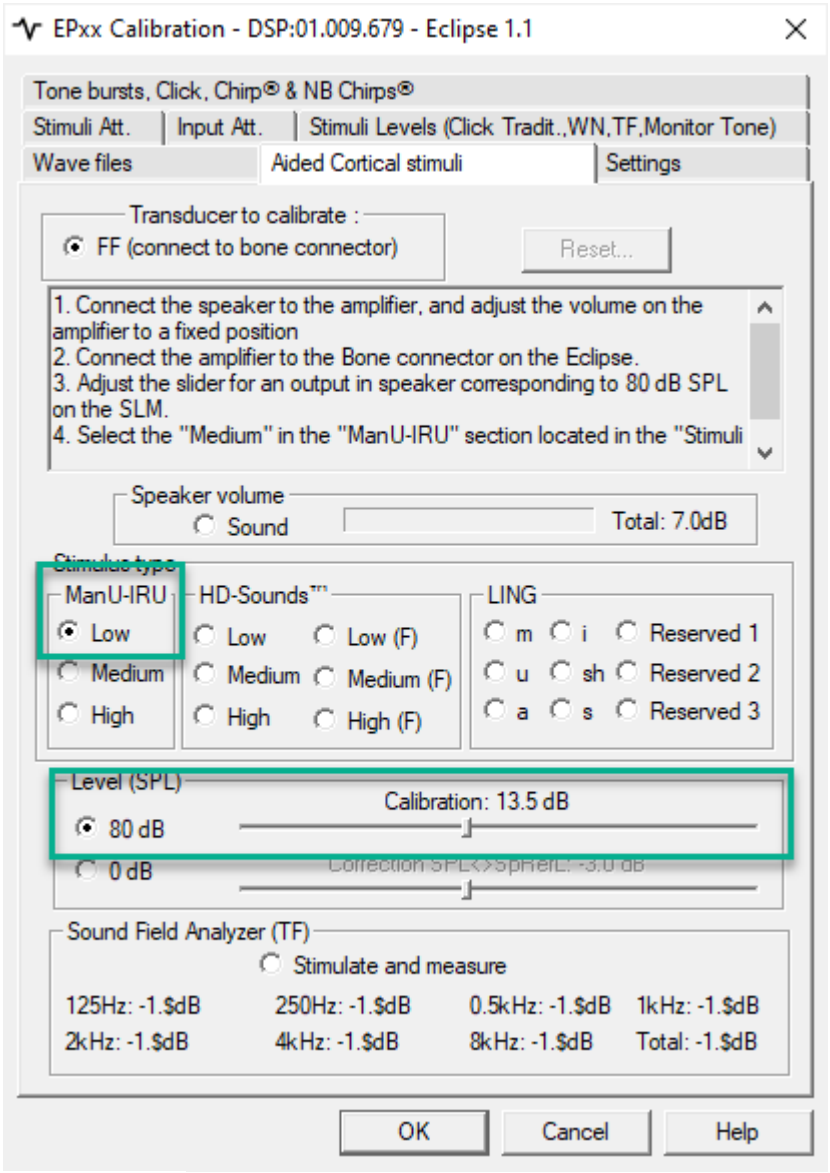


Figure 54

Once selected, the stimulus will start playing and the SPL value can be read from the SLM. The target is 80.0 dB. If the value is incorrect, use the slider to either make the stimulus louder or softer. The slider moves in steps of 0.5 dB, so choose the value closest to 80.0 dB.

Once the value is adjusted, click on the ManU-IRU Medium and repeat the process.

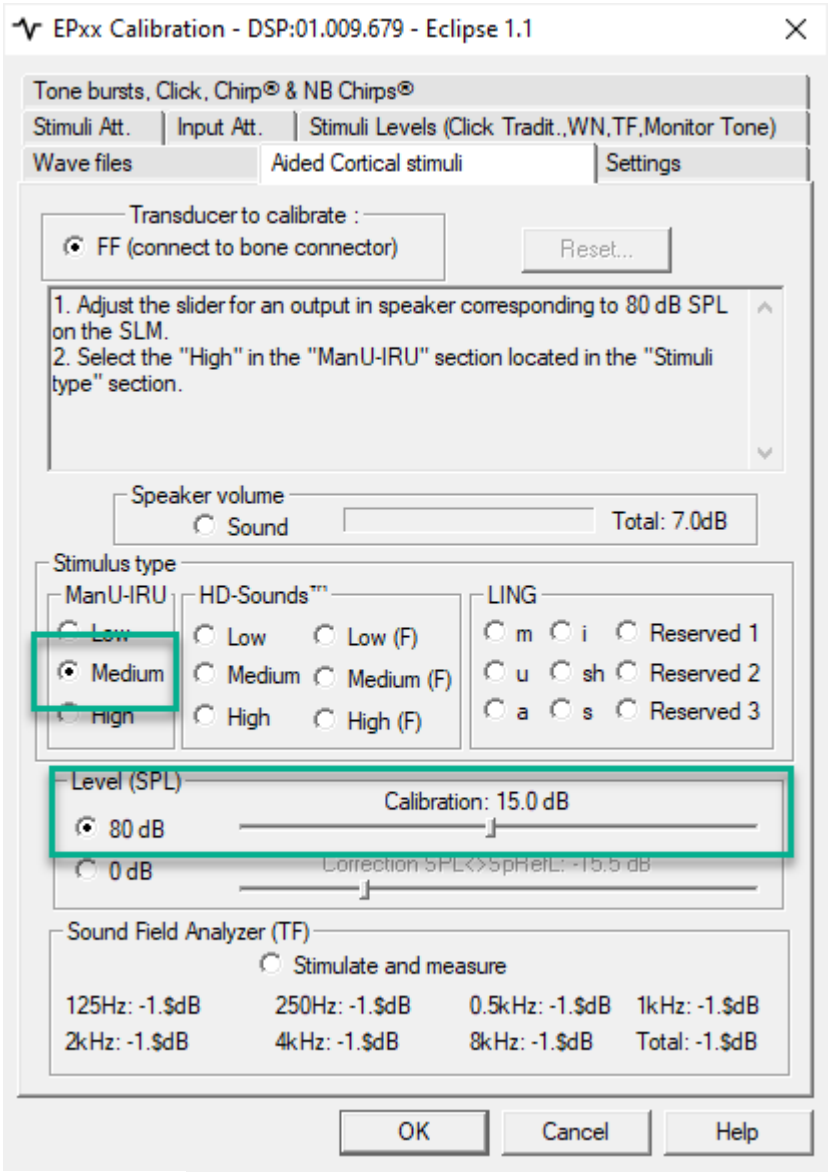


Figure 55

Repeat the steps for all the HD-Sounds and LING. Note the “Reserved 1-3” do not contain any stimuli and should be skipped during the calibration.

Once all the stimuli are calibrated, an optional correction factor adjustment is possible. For most applications, these values should NOT be adjusted. Only in special cases where the end-user has specific requirements should these be adjusted. If no adjustment is required, jump to the final step in the calibration process.

The process is similar to the 80 dB calibration – a specific stimulus is selected and the “0 dB” slider is selected. With the slider, the correction factor for the chosen stimulus is adjusted. Once set, the next stimulus is selected and the process is repeated.

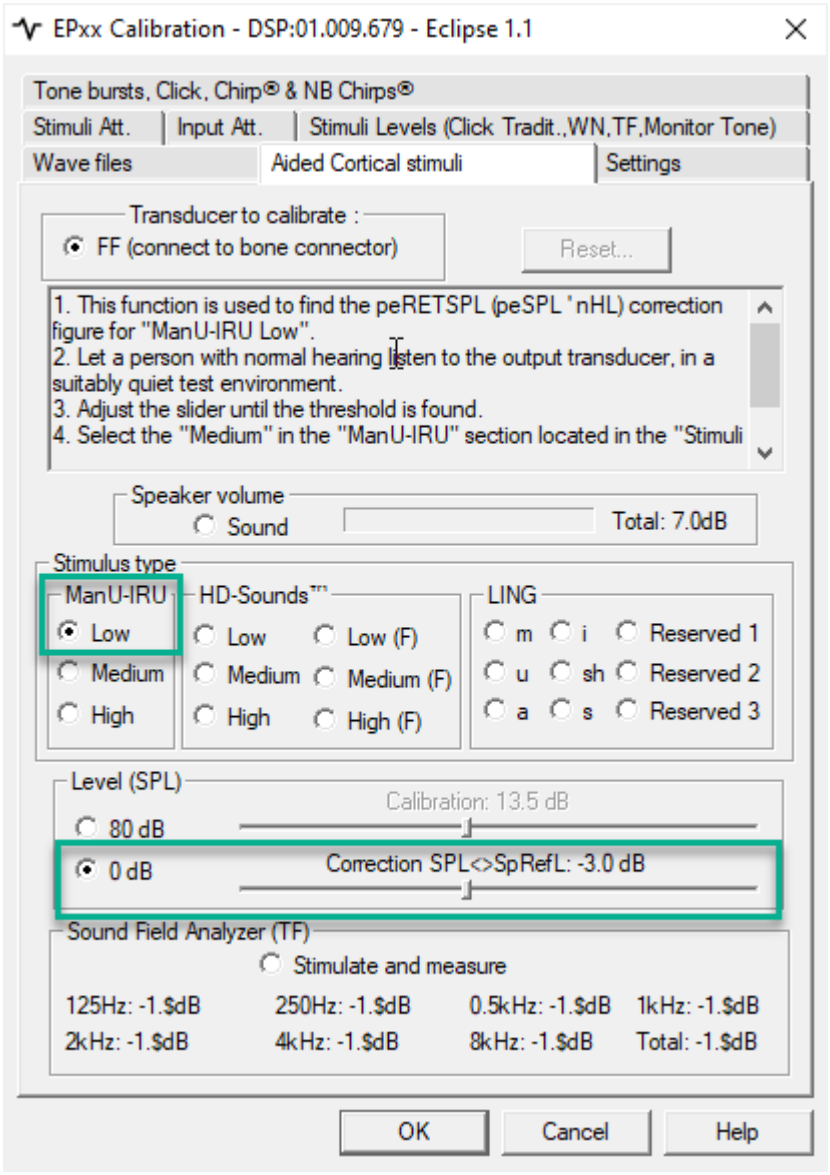


Figure 56

The final step in the calibration is to set the reference level for the Sound Field Analyzer. This is done by clicking on “Stimulate and measure” in the bottom section of the calibration tap.
Note as soon as this is selected, a Pink Noise signal will be played from the loudspeaker.

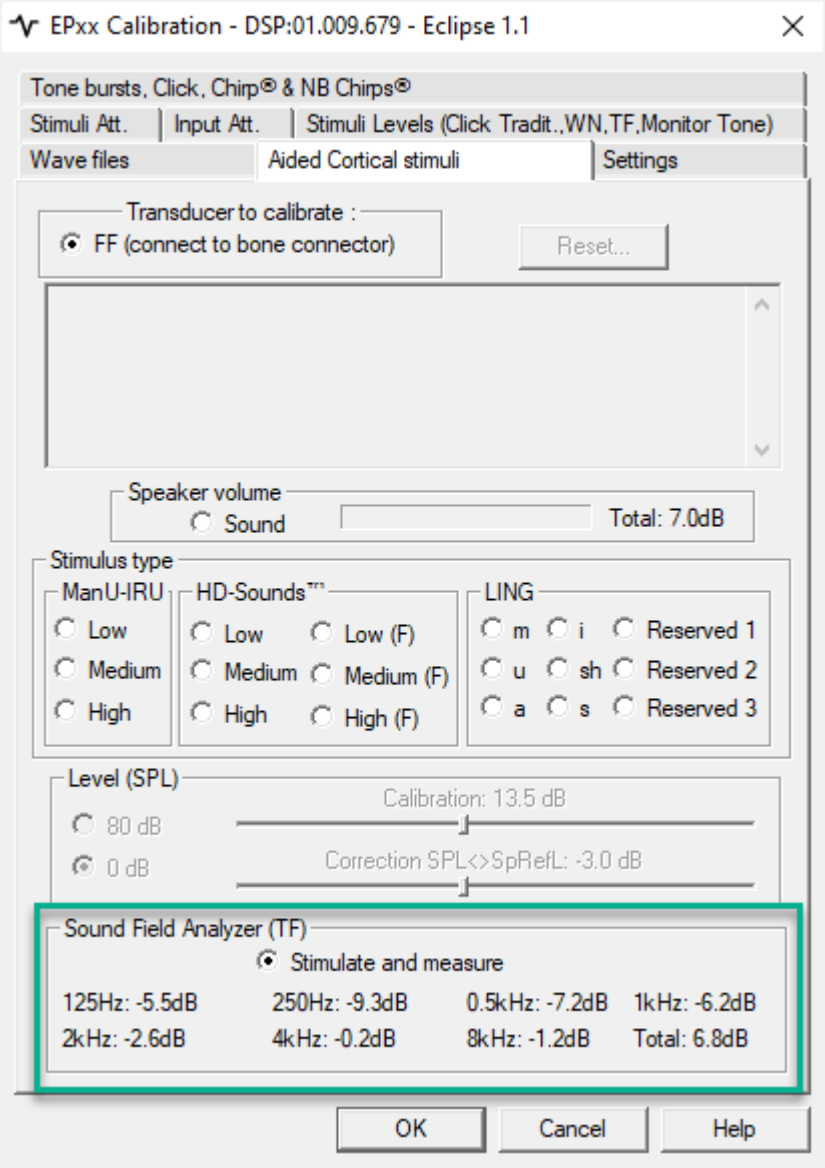


Figure 57

The Pink Noise signal will be recorded by the Sound Field Analyzer via the connected microphone and the values for each frequency will stabilize at a fixed level. Small (up to ~1 dB) fluctuations to the dB value are acceptable. Once stable, the calibration is done. Press the “OK” button below to store the results and exit the calibration setup.

There is an option to set the level of the test signal used by the Sound Field Analyzer in the “Settings” tab. It is recommended to use 75 dB. If needed, another level can be chosen.

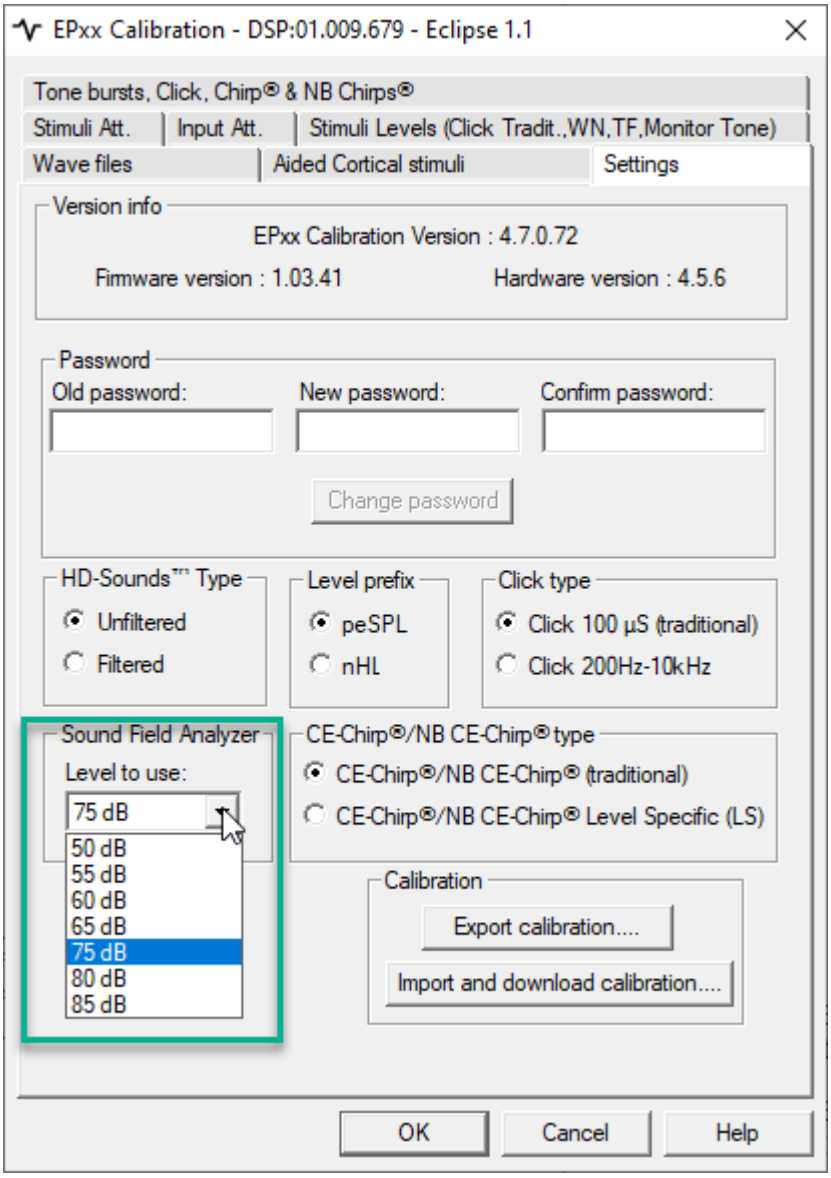


Figure 58

Appendix A - technical specifications

Medical CE-mark:	The CE-mark in combination with MD symbol indicates that Interacoustics A/S meets the requirements of the Medical Device Regulation (EU) 2017/745 Annex I Approval of the quality system is made by TÜV – identification no. 0123	
Standards:	**Safety:**	IEC 60601-1:2005+AMD1:2012+AMD2:2020 (Class I, Type BF) IEC 60601-2-40:2016 CAN/CSA-C22.2 No.60601-1:2014/A2-2022 ANSI/AAMI ES60601-1:2005/A2:2021
	EMC:	IEC 60601-1-2:2014+AMD1:2020
Power Supply:	**Input Volts:**	100 –240VAC, 50/60Hz.
	Consumption:	26W (0.3A Max)
	Safety marking	
Operating environment:	**Operating Temperature:**	15 – 35 °C (59 - 95°F)
	Rel. Humidity:	30 – 90%
	Ambient Pressure:	98kPa – 104kPa
Transport & Storage:	**Storage Temperature:** **Transport Temperature:** **Rel. Humidity:**	0°C – 50°C (32°F - 50°F) -20 – 50 °C (-4°F - 122°F) 10 – 95% (non condensing
Warm up time:		10 minutes at room temperature (20 °C) (68°F).
General		
PC control:	**USB:**	USB 1.1 or 2.0 for input/output for computer communication. Eclipse if fully operated from a PC
Construction:		Metal cabinet
Eclipse Dimensions		(L x W x H) 28 x 32 x 5.5 cm (11 x 12.6 x 2.2 Inches)
Eclipse Weight		2.5kg / 5.5 lbs excluding accessories

EP15/EP25/VEMP/Aided

Medical CE-mark:	The CE-mark in combination with MD symbol indicates that Interacoustics A/S meets the requirements of the Medical Device Regulation (EU) 2017/745 Annex I Approval of the quality system is made by TÜV – identification no. 0123	
Standards:	**Test Signal:**	IEC 60645-3, 2007
	AEP	IEC 60645-7, 2009. Type 1
EPA Preamplifier:	**Two channels standard**	EPA4 Cable Collector (4 electrodes). Standard 50 cm. Option: 5 cm or 290 cm
	One Channel (optional)	EPA3 Cable Collector (3 electrodes). 50 cm
	Gain:	80 dB/60 dB (60dB = VEMP (-20dB))
	Frequency response:	0.5 – 11.3kHz
	CMR Ratio:	Minimum 100 dB. Typical 120 dB @55 Hz
	Noise (RTI)	=< 15 nV/√Hz
	Radio frequency immunity:	Typically 20 dB improvement over previous available designs
	Max input offset voltage:	2,5 V
	Input impedance:	>=10 MΩ/=< 170 pF
	Power from main unit:	Insulated power supply with 1500 V isolation. The signal is digitally/capacitive insulated.
Specifications as EPA4		
	Impedance measurement:	Selectable for each electrode
	Measurement frequency:	33 Hz
	Waveform:	Rectangular
	Measurement current:	19µA
	Range:	0.5 kΩ – 25 kΩ
Stimulus:	**Stimulus rate:**	0.1 to 80.1 stimuli per second in steps of 0.1.
	Envelopes/Windows:	Bartlett, Blackman, Gaussian, Hamming, Hanning, Rectangle and Manual (Rise/Fall and Plateau)
	Masking:	White noise. Calibrated and presented in peSPL.
	Transducer:	Insert phone, calibrated on an IEC 711 coupler. Headphone with independent calibration (optional) Bone conductor (optional) Free field loudspeaker (optional)
	Level:	20 – 135.5 dB peSPL, please refer to chapter stimulus maximum intensity for converted nHL as this depends on the frequency.
	Polarity:	Condensation, Rarefaction, Alternating.
	Click:	100 µs (200Hz -11kHz)
	Tone Burst Frequency:	250, 500, 750, 1000, 1500, 2000, 3000, 4000, 6000 and 8000 Hz.
	Tone Burst Stimulation Time:	Stimulation up to 780 ms
	NB CE-Chirp® LS Freq.:	500, 1000, 2000 and 4000 Hz
	Broadband CE-Chirp®: LS	200Hz -11kHz
	Relative Masking Level:	+30dB to -40 dB relative to stimulus level. The stimulus level is presented in nHL. The masking level is only presented in SPL, and can therefore not exceed the loudness of the stimulus. E.g. a stimulus presented at 100dBnHL, and relative masking level at 0dB would provide a masking level of 100dB peSPL. This would equal a level 75dBnHL. Maximum masking levels: Insert phones: 110dB SPL, relative levels 0 to -40. Headphones: 110dB SPL, relative levels 0 to -40. Insert phones: 110dB SPL, relative levels +60 to -40.
	Absolute Masking Level:	0dB to 110 dB SPL absolute level. The masking level is only presented in SPL, and can therefore not exceed the loudness of the stimulus. E.g. a stimulus presented at 100dBnHL, and relative masking level at 0dB would provide a masking level of 100dB peSPL. This would equal a level 75dBnHL. Maximum masking levels: Insert phones: 110dB SPL, relative levels 0 to -40. Headphones: 110dB SPL, relative levels 0 to -40. Insert phones: 110dB SPL, relative levels +60 to -40.
Recording:	**Analysis Time:**	-150 ms prior to stimuli and up to 1050 ms (license dependent).
	A/D Resolution:	16 bit.
	Sampling frequency	30 kHz
	Artifact Reject System:	Standard voltage based system
	Rejection levels:	Manual 0.2 - 640 µV input with 0.1uV steps.
	Anti-aliasing filter:	Internal filter in ADC
	Dots per Trace:	450 displayed.

	Low Pass Filter:	None or 17 – 12000 Hz, depending on the measurement type. 33 taps FIR Filter without wave peak latency displacement.
	High Pass Filter:	0.83 Hz to 500 Hz depending on the measurement type.
	DSP Low Pass Filter:	None, 100, 300, 750, 1k, 1,5k, 2k, 3k, 4k, 5k, 7,5k Hz
	DSP High Pass Filter:	0.5, 1.0, 3.3, 10, 33, 100 Hz
Display Gain:		General Display Gain. Applicable during testing. Single Curve Display Gain. Applicable during testing.
Controlled parameters:		Stimuli Rate, Number of stimuli, Polarity, Click, Tone Burst (Frequency, no. of sine waves, window), Stimulus intensity, Number of curves per intensity, Intensity (Ascending, Descending), Soft attenuator, Stimulus ear, Transducer, Masking level, Preliminary filter setting, Recording onset, Automatic next intensity (Wave repro level on screen), General Display Gain, Single Curve Display Gain, Baseline, Latency norm, Report templates, Print out, Manual stimulus to familiarization, Talk Forward.
Data collection:		Impedance test, Waveform buffer (A/B, Contra, Ipsi-Contra, A-B = Noise), Curve (Hide, Fixate, Merge, Delete), Online EEG, Waveforms storage in unlimited storage database.
Data Recovery:		Lost data due to crash of Windows® will in almost all cases be available upon re-establishing Windows® operation.

NOTICE

The transducer settings match the individual Eclipse, as the calibration data is stored on the instrument. Using other transducers require individual calibrations of the transducers.

Two types of calibration are used with AEP:[2]

peSPL (peak equivalent Sound Pressure Level)	**nHL** (normal Hearing Level)
Objective measure of the sound stimulus pressure level.	Compensating correction for deviation in perceived loudness of the brief stimuli like Clicks and Tone bursts.
For a given peSPL dB value, the max. acoustical or vibration level is calibrated to match the level of continuous tones used to obtain the sound level meter dB SPL reading. As the duration of sound stimuli for AEP are short, the energy delivered is not perceived with the same subjective loudness as the equivalent stimulus would provide, were it a continuous tone. Hence, the acoustical or vibration value given in dB peSPL does not correspond accurately with normal HL figures. For Clicks, there is a 35.5 dB deviation (70 dB peSPL sounds as 35 dB HL), and for Tone Bursts, the deviations are in the 20-30 dB range (depending on frequency and number of sine waves used in burst). The transducers limit the stimulus intensity to 135.5 dB peSPL.	There is a direct similarity between the indicated level in nHL and the HL levels well known from normal audiometry. Brief tone burst correction values from peSPL to nHL are based on a 2-1-2 manual burst as specified in ISO 389-6-2007. Longer duration tone bursts for AMLR and ALR are employing peRETSPL values similar to continuous pure tones (as used in conventional audiometers) since the temporal integration of tones lasting at least 50 ms is considered sufficiently trivial to ignore.

The calibration values are found on the next page.

[2] Reference calibration values for the CE-Chirp® stimulus family are not specified in the current international calibration standard (ISO 389-6), and the applied peRETSPL values have therefore been derived from two studies: (1) by PTB in Germany (2008), and (2) by DTU in Denmark (Gøtsche-Rasmussen et al., 2012). The mean of the values obtained in the two studies, rounded to the nearest 0.5 dB, are used by Interacoustics A/S to calibrate the broad-band CE Chirp® LS and the four frequency specific NB CE-Chirp® LSs delivered by the EAR-3A earphone.

Toneburst ECochG/ABR15/ABR30/AMLR/RATE STUDY/VEMP 0 dB 2-2-2 cycle linear envelope				Toneburst ALR/MMN dB 25-50-25 ms			
Hz	Insert phone	Headphone	Bone	Hz	Insert phone	Headphone	Bone
250	28.0	38.0	74.5	250	17.5	27.0	67.0
500	23.5	25.5	69.5	500	9.5	13.5	58.0
750	21.0	23.0	61.0	750	6.0	9.0	48.5
1000	21.5	21.5	56.0	1000	5.5	7.5	42.5
1500	26.0	23.0	51.5	1500	9.5	7.5	36.5
2000	28.5	24.5	47.5	2000	11.5	9.0	31.0
3000	30.0	26.5	46.0	3000	13.0	11.5	30.0
4000	32.5	32.0	52.0	4000	15.0	12.0	35.5
6000	36.5	37.5	60.0	6000	16.0	16.0	40.0
8000	41.0	41.5	65.5	8000	15.5	15.5	40.0
	ISO 389-6:2007				ISO 389-1:2000, ISO 389-2:1994, ISO 389-3:1994		
Click ECochG/ABR15/ABR30/AMLR/RATE STUDY/VEMP 0 dB				Click ALR/MMN 0 dB			
	Insert phone	Headphone	Bone		Insert phone	Headphone	Bone
Click	35.5	30.0	51.5	Click	35.5	30.0	51.5
NB CE-Chirp® LS ECochG/ABR15/ABR30/AMLR/RATE STUDY/VEMP 0 dB				NB CE-Chirp® LS ALR/MMN 0 dB			
Hz	Insert phone	Headphone	Bone	Hz	Insert phone	Headphone	Bone
500	25.5	27.5	74.0	500	25.5	27.5	74.0
1000	24.0	24.0	61.0	1000	24.0	24.0	61.0
2000	30.5	26.5	50.0	2000	30.5	26.5	50.0
4000	34.5	34.0	55.0	4000	34.5	34.0	55.0
CE-Chirp® LS ECochG/ABR15/ABR30/AMLR/RATE STUDY/VEMP 0 dB				CE-Chirp® LS ALR/MMN 0 dB			
	Insert phone	Headphone	Bone		Insert phone	Headphone	Bone
	31.5	26.5	51.0		31.5	26.5	51.0
Only tone burst correction values change for ALR & MMN testing. For Click and CE-Chirps® LS, the same correction is applied.							

Table 1

Stimulus maximum intensity

From software 4.5, the stimulus maximal is increased for all transducers. Insert earphones and headphone can now go even louder.

To get the increased intensity maximal for the bone conductor, first, take the B81 BC, then ensure that the correct bone vibrator is chosen in the calibration setup (this allows more output for the bone vibrator).

When using a new transducer, always make sure that it is calibrated prior to use, and follow the procedure described in this service manual.

The below table is an overview of the minimum intensity performance of the various transducers when using software 4.5. Individual systems may perform even louder as this depends on the individual transducer sensitivity per frequency.

		ABR3A		DD45		DD45S		B81	
Stimulus		short 2-1-2	Long	short 2-1-2	Long	short 2-1-2	Long	short 2-1-2	Long
Burst	250	105	115	105	110	105	110	50	55
Burst	500	110	120	115	120	115	120	70	80
Burst	750	110	120	120	120	120	120	70	85
Burst	1000	110	120	120	120	120	120	75	90
Burst	1500	110	120	115	120	115	120	80	95
Burst	2000	110	120	115	120	110	120	75	90
Burst	3000	110	120	120	120	115	120	65	85
Burst	4000	105	120	115	120	110	120	65	80
Burst	6000	90	110	100	120	100	120	45	65
Burst	8000	70	95	95	120	90	115	35	60
CE-Chirp		100	105	110	110	110	110	70	70
Click		100	100	105	105	105	105	70	70
Click 200Hz-10kHz		95	95	105	105	105	105	70	70
NB CE-Chirp	500	105	105	115	115	115	115	60	60
NB CE-Chirp	1000	110	110	115	115	120	120	70	70
NB CE-Chirp	2000	105	105	115	115	110	110	70	70
NB CE-Chirp	4000	105	105	115	115	110	110	60	60

TEOAE

Medical CE-mark:	The CE-mark in combination with MD symbol indicates that Interacoustics A/S meets the requirements of the Medical Device Regulation (EU) 2017/745 Annex I Approval of the quality system is made by TÜV – identification no. 0123	
Standards:	**Test signal**	IEC 60645-3:2007
	OAE	TEOAE IEC 60645-6:2022, Type 1 & 2 Otoacoustic emissions
Stimulus:	**Type:**	Click Non-linear
	Bandwidth:	500 – 5500 Hz
	Level:	30 to 90 dB peSPL, peak to peak calibrated, AGC controlled
	Level Step:	1 dB SPL
	Transducer:	Dedicated DPOAE/TEOAE probe (Accuracy 0.5 dB)
Recording:	**Analysis time:**	5 seconds to 30 minutes
	Sampling frequency	30 kHz
	A/D Resolution:	16 bit, 3.7 Hz resolution
	Artifact Reject System:	0 to +60 dB SPL or off Applicable during testing
	SNR Criteria:	Adjustable between 5 and 25 dB
Display gain:		
	General display gain:	Applicable during testing

OAE Probe Specifications:		
Probe:	**Application:**	TEOAE measurements
	Dimensions:	(W x D x H) 12 x 26 x 11 mm (exc. Eclipse)
	Weight:	3 g (exc. Cable, exc. Eclipse) 39 g (incl. cable, exc. Eclipse)
Cable:	**Length:**	2980 mm cable

NOTICE

The OAE probe settings match the individual Eclipse, as the calibration data is stored on the instrument. Using other transducers require individual calibrations of the transducers.

TEOAE
Probe stimuli are calibrated in peSPL values using an ear simulator coupler made in accordance with IEC 60318-4

DPOAE

Medical CE-mark:	The CE-mark in combination with MD symbol indicates that Interacoustics A/S meets the requirements of the Medical Device Regulation (EU) 2017/745 Annex I Approval of the quality system is made by TÜV – identification no. 0123	
Standards	**Test Signal:**	IEC 60645-1:2012 /ANSI S3.6
	OAE	DPOAE IEC 60645-6:2022, Type 2 Otoacoustic emissions
Stimulus:	**Frequency Range:**	500-10000 Hz
	Frequency Step:	25 Hz
	Level:	30 to 70 dB SPL
	Level Step:	1 dB SPL
	Transducer:	Dedicated DPOAE/TEOAE probe
Recording:	**Analysis time:**	minimum 2 sec to unlimited test time
	A/D Resolution:	16 bit, 3.7 Hz resolution
	Sampling frequency	30 kHz
	Artifact Reject System:	-30 to +30 dB SPL or off. Applicable during testing
	Stimulus Tolerance:	Adjustable between 1 and 10 dB
	SNR Criteria:	Adjustable between 3 and 25 dB
	Probe check window	256 points frequency response of the ear canal due to a click stimulus presented with a rate of 100 Hz at 80 dB SPL
	DP-Response window	4096 points frequency response
Display gain:		
	General display gain:	Applicable during testing

OAE Probe Specifications:		
Probe:	**Application:**	DPOAE measurements
	Dimensions:	(W x D x H) 12 x 26 x 11 mm (exc. Eclipse)
	Weight:	3 g (exc. Cable, exc. Eclipse) 39 g (incl. cable, exc. Eclipse)
Cable:	**Length:**	2980 mm cable

NOTICE

The OAE probe settings match the individual Eclipse, as the calibration data is stored on the instrument. Using other transducers require individual calibrations of the transducers.

The DPOAE module uses an improved method of stimuli level control, which more accurately delivers the specified intensity in the full range of ear canals, from infants to adults. The applicability of the IEC 60645-6 standard is currently limited to adult ears. Therefore, in order to better serve a market with a product that provides more accurate stimulus levels to a wide range of ear canal volumes (specifically infants), we have chosen utilization of a more comprehensive calibration procedure for DPOAEs that is outside the scope of IEC 60645-6 for some protocols.
This improved method of stimulus control is enabled when the *Use Microphone compensation* checkbox is checked. To apply the IEC60645-6 calibration method, uncheck the *Use Microphone compensation* in the *Advanced* tab of the protocol setup.

DPOAE
Probe stimuli L1 and L2 are calibrated individually in SPL values using an ear simulator coupler made in accordance with IEC 60318-4

ABRIS

Medical CE-mark:	The CE-mark in combination with MD symbol indicates that Interacoustics A/S meets the requirements of the Medical Device Regulation (EU) 2017/745 Annex I Approval of the quality system is made by TÜV – identification no. 0123	
Standards:	**Test signal**	EC 60645-3:2007
	AEP	IEC 60645-7:2009 Type 2
EPA Preamplifier:	**Two channels standard:**	EPA4 Cable Collector (4 electrodes). Standard 50 cm. Option: 5 cm or 290 cm
	One Channel (optional):	EPA3 Cable Collector (3 electrodes). 50 cm
	Gain:	80 dB
	Frequency response:	0,5 – 11.3 kHz
	CMR Ratio:	Minimum 100 dB. Typical 120 dB @55 Hz
	Noise (RTI)	=< 15 nV/√Hz
	Radio frequency immunity:	Typically 20 dB improvement over previous available designs
	Max input offset voltage:	2,5 V
	Input impedance:	>=10 MΩ/ =<170 pF
	Power from main unit:	Insulated power supply with 1500 V isolation. The signal is digitally/capacitive insulated.
Specifications as EPA4 Impedance measurement:		
		Selectable for each electrode
	Measurement frequency:	33 Hz
	Waveform:	Rectangular
	Measurement current:	19µA
	Range:	0.5 kΩ – 25 kΩ
Stimulus:	**Stimulus rate:**	93 Hz
	Level:	30, 35, 40 dBnHL
	Click:	100 µs
Recording:	**Analysis time:**	120 seconds
	A/D resolution:	16 bit
	Sampling frequency	30 kHz
	Artifact rejection system:	Standard voltage based system
Display:		Stimulus level and type, Graph view
Security:		Password protection of test parameters possible.
Algorithmic Sensitivity:	**Click:**	99.99%
Specificity:	**Click:**	≥ 97%

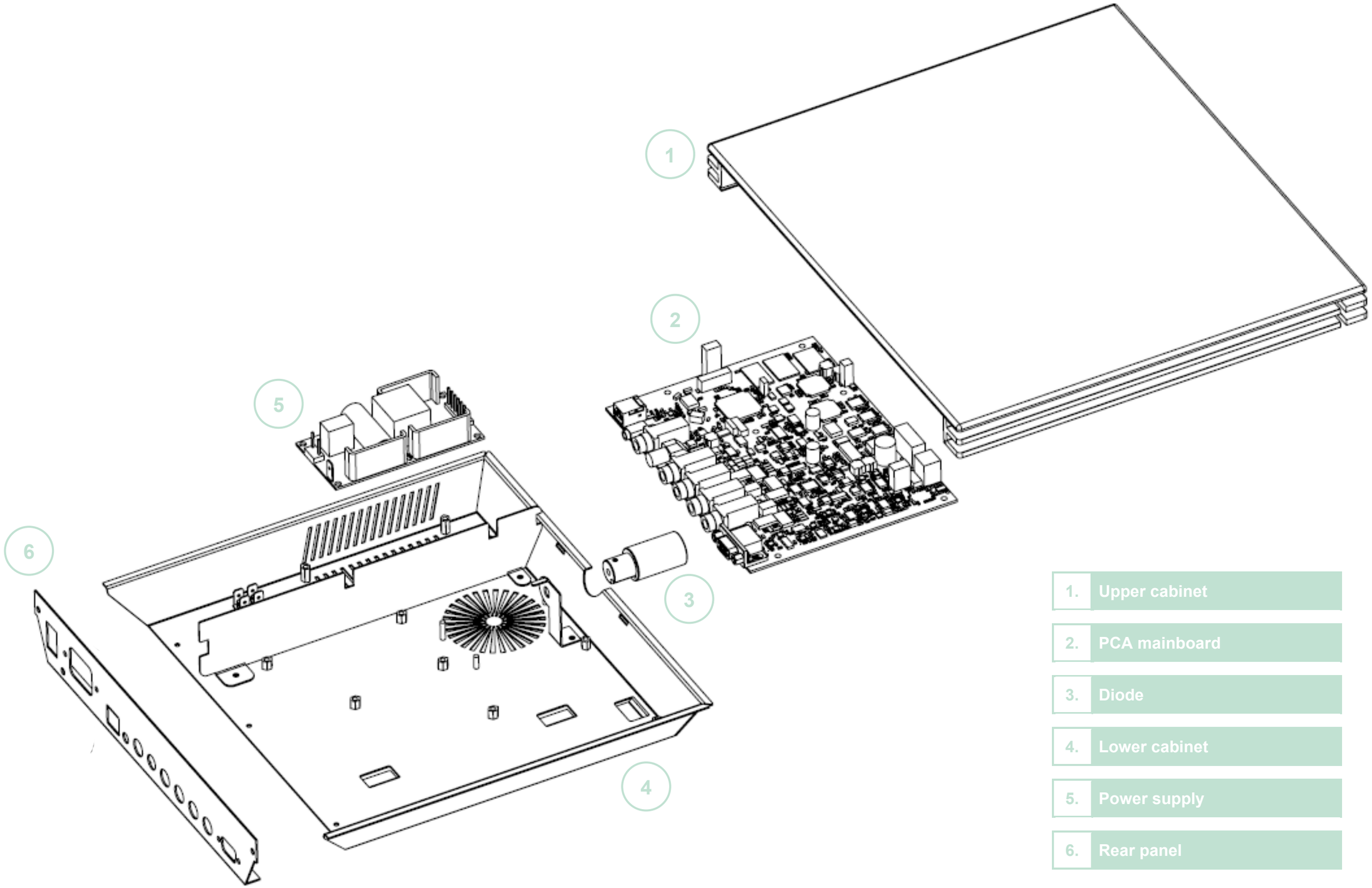
ASSR

Medical CE-mark:	The CE-mark in combination with MD symbol indicates that Interacoustics A/S meets the requirements of the Medical Device Regulation (EU) 2017/745 Annex I Approval of the quality system is made by TÜV – identification no. 0123.	
Standards:	**Test signal:**	IEC 60645-3:2007
	AEP	IEC 60645-7:2009, Type 1.
EPA Preamplifier:	**Two channels standard:**	EPA4 Cable Collector (4 electrodes). Standard 50 cm. Option: 5 cm or 290 cm
	One Channel (optional):	EPA3 Cable Collector (3 electrodes). 50 cm
	Gain:	80 dB
	Frequency response:	0,5 – 11.3 kHz
	CMR Ratio:	Minimum 100 dB. Typical 120 dB @55 Hz
	Noise (RTI)	=< 15 nV/√Hz
	Radio frequency immunity:	Typically 20 dB improvement over previous available designs
	Max input offset voltage:	2,5 V
	Input impedance:	10 MΩ/ 170 pF
Impedance measurement:	**Waveform:**	Rectangular
	Measurement current:	19µA
	Range:	0.5 kΩ – 25 kΩ
Stimulus:	**Stimulus rate:**	40 or 90 Hz
	Transducer:	Ear Tone ABR insert phone, calibrated on an IEC 711 coupler. Headphone (optional) Bone conductor (optional)
	Level:	0 – 100 dB nHL in 5 dB steps.
	NB CE-Chirp® Freq.:	500, 1000, 2000, and 4000 Hz, both ears same time.
	Bandwidth:	1 octave ± ½ octave – 3 dB
	Masking:	White noise 0 – 100 dB SPL
	Analysis Time:	6 minutes to detect a ASSR signal – can be extended up to 15 minutes
Recording:	**Sampling frequency:**	30 kHz
	Artifact Reject System:	Standard voltage based system
	Gain:	74 – 110 dB. Auto or Manual selection.
	Channels:	2, with separate detection algorithm
	Algorithmic Sensitivity:	99% or 95% , false pass probability
	Rejection levels:	Manual 5, 10, 20, 40, 80, 160, 320, 640 µV input
	Anti- aliasing filter:	Analog 5kHz, 24 dB / octave
Display:		Independent control of up to 8 simultaneous stimuli (max 4 per ear)
Display Gain:		Independent start, stop control for each of the 8 stimuli
Controlled parameters:		Stimulus level control for each of the 8 stimuli
		False pass probability 1 or 5%
		Test protocols included for children and adult
NOAH:		NOAH 4 compatible

NOTICE

The transducer settings match the individual Eclipse, as the calibration data is stored on the instrument. Using other transducers require individual calibrations of the transducers.

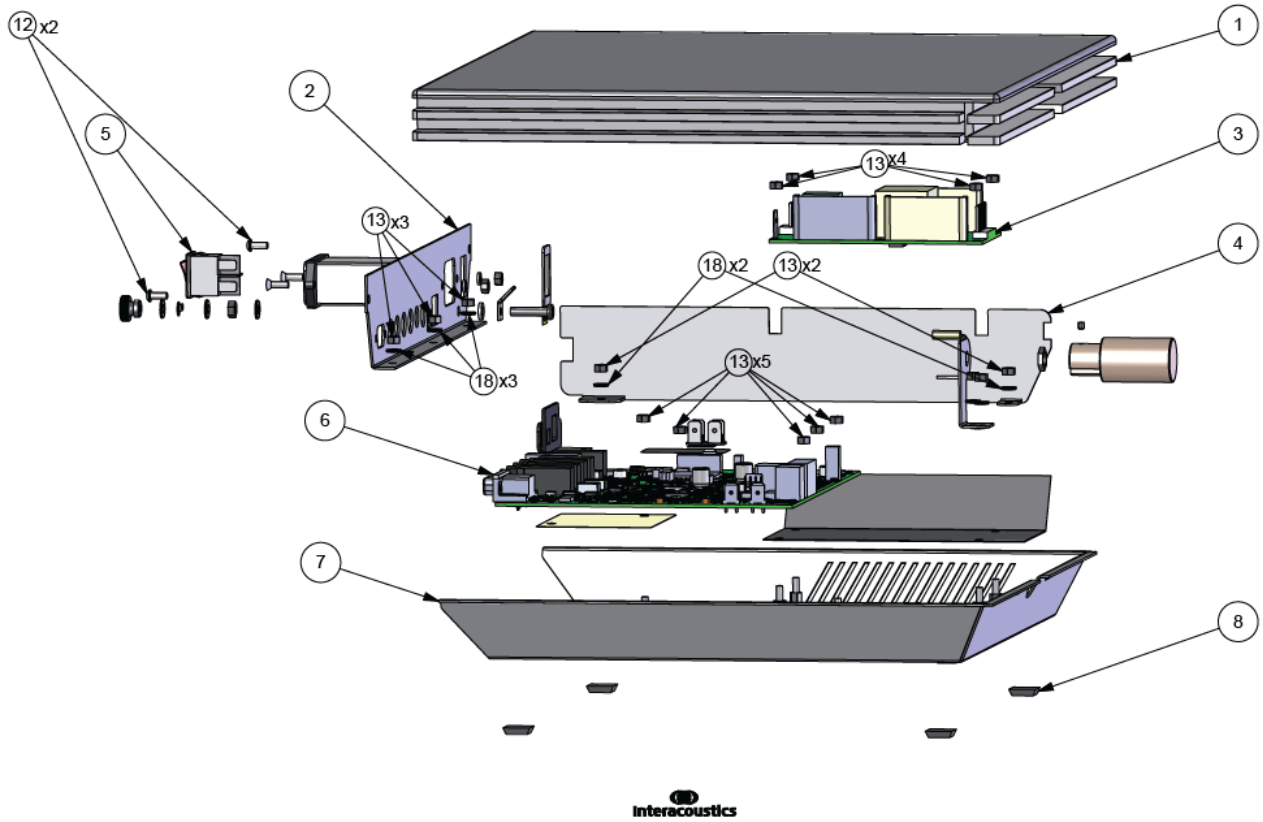
Appendix B - exploded view



1. Upper cabinet
2. PCA mainboard
3. Diode
4. Lower cabinet
5. Power supply
6. Rear panel

Appendix C - spare parts & accessories/disposables

Exploded view of Spare parts:

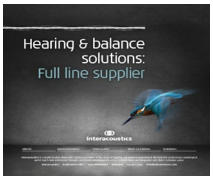


When ordering spare parts, please supply SN of the product to ensure the correct parts to be supplied.

POSITION NO.	SPARE PARTS	PART NUMBER	DESCRIPTION
1		8001498	Upper cabinet
2		8503874	Rear panel
3		8006026	Power supply
4		8001239	Guard plate
5		8009908	Power switch
6		8514201	PCA mainboard 1.1 1086
7		8001461	Lower cabinet
8		8001790	Bumpers
		8104639	Ground cable – internal
12		8003041	M3x8 torx pan head
13		8003218	M3x2.4 hex nut
18		8003285	Ø3.2xØ7x0.5 flat w. chamfer

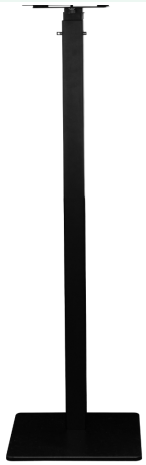
ACCESSORIES / DISPOSABLES	PART NUMBER	DESCRIPTION
	8011175	OAE probe
	8101892	IP30 insert phone ABR
	8107307	DD45 shielded headset with HB7 headband
	8107307	DD45 shielded headset with HB7 headband – non-stretched
	8517075	B81 bone conductor headset
	8103467	Accessory kit EP
	8103992	Clothing clip kit
	8513986	eABR trigger kit Eclipse 1.1

ACCESSORIES / DISPOSABLES	PART NUMBER	DESCRIPTION
	8013229	EPA3 cable collector 500 mm
	8013232	EPA4 cable collector 2.9 m
	8013231	EPA4 cable collector 50 mm
	8507803	Shielded preamplifier EPA4 cable connector 500 mm
	8507804	Shielded preamplifier EPA4 cable connector 500 mm and 50 mm
	8507805	Shielded preamplifier EPA3 cable connector 500 mm
	8532394	Standard preamplifier EPA4 cable connector 500 mm
	8533838	Standard preamplifier EPA4 cable connector 500 mm and 50 mm

ACCESSORIES / DISPOSABLES	PART NUMBER	DESCRIPTION
	8533841	Standard preamplifier EPA3 cable connector 500 mm
	8011241	Cable USB 2m
	8011252	LBK15 loop back
	Sanibel Supply	Eartips of various sizes Types: umbrella, mushroom, flanged
	8013209	TM electrode for EChoG starter kit
	8101622	IA mouse pad
	8011348	Probe cleaning tool Assembled / open
	8011380	Assortment box BET 25 TEOAE/DPOAE Including probe cleaning tool

ACCESSORIES / DISPOSABLES	PART NUMBER	DESCRIPTION
	8500140	Nipple tube kit (for earphones), 20 pcs
	8012960	Probe tip kit (for OAE probe, Ø3,3), 8 pcs
	8500370	Gold tip trode, 13 mm, 20 pcs
	8500440	Gold tip trode, 10 mm
	8507327	Blue and red replacement silicone tube kit for IP30™ (Sanibel)
	8537295	EARtone replacement velcro col
	8500330	Ten-20 electrode paste, conductive gel
	8500320	NuPrep gel 4 oz/114 g tube, preparation gel

ACCESSORIES / DISPOSABLES	PART NUMBER	DESCRIPTION
	8500050	Alcohol pads
	8500040	Gauze swabs
	8500740	Spectra 360 Electrode gel
	8012952	Abrasive paste, preparation gel
	8003566	Floss bridge implant
	8500380	Sonavelle gel
	8107483	SP90A speaker incl accessories
	8600546	Adapter 3.5 to 6.5mm stereo jack

ACCESSORIES / DISPOSABLES	PART NUMBER	DESCRIPTION
	8533283	Speaker stand SP90A
	8536952	Sound field microphone
	8534403	Microphone stand (**without** microphone adapter)
	8603923	Microphone adapter
	8527167	Loudspeaker cable 10m (6.3mm jack plug & 3.5mm jack plug)

Appendix D - update news

The following modifications have been made to the instrument and/or the manual:

DATE	ACTION	REMARKS
2025/07	Revision of service manual	- Appendix C updated with new part number from 8600014 to 8603923.
2024/05	Revision of service manual	- Section 4.4 Aided Cortical calibration added - Appendix A: Technical specifications updated with Aided Cortical - Appendix C: part numbers updated
2024/02	Revision of service manual	- Appendix A: Technical specifications updated
2023/02	Revision of service manual	- Block diagram removed - ABRIS added under 4.2 - 8500720 replaced by 8507327
2022/06	Revision of service manual	- Part numbers are updated - Fax number is removed
2022/01	Spare part list is updated and aligned against BOM. Exploded view of spare part list is included.	
2020/02	Revision of service manual for Eclipse (8507843): This is a part of the Rabbit software update project: IA OAE Suite 1.1 - new Eclipse FW This revision concerns: - Appendix A: New tech specs added. - 4.2.2: Addition of research stimuli content - provided by KLIN (no relation to Rabbit) - 3.4: OtoAccess® Database start-up updated to new format. - smaller visual updates - Appendix C: Addition of LBK loop back: 8011252 Appendix C: Correction of PCA mainboard part no.: 8513815 -> 8514201	Valid from software version EP15/25 v4.6, IA OAE suite 1.1, ABRIS v1.06.1, VEMP v4.6 and ASSR v 1.2.8. PCA 8514201: From serial SN0958585 valid with first release of this manual
2019/06	Revision Eclipse 1.1 - service manual: - Addition of OAE probe in calibration chapter. - Update to revised technical specifications. - Parts & Accessories list: - EABR kit: new part number (not yet provided by PM), and new photo to display mini-jack. - Addition of EABR kit with cable (no part number created yet. - Assortment box: revision: 8012838 ->8011380 + new photo. - Mainboard: revision to calibrated mainboard kit, from previous 8108687 to 8513815. - New screenshot: 0 dB should be added. Addition of ASSR calibration paragraph. Addition of Stimulus Maximum Intensity passage in appendix A. New CVI.	
2017/12	Release of service manual	