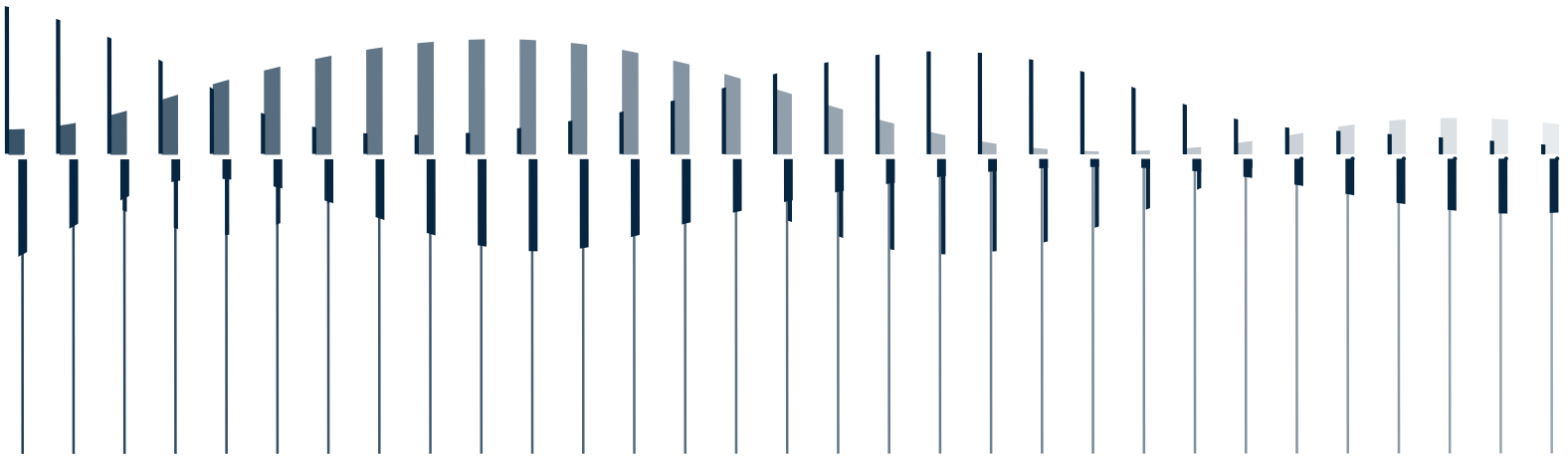
Instruction Manual

GRAS 43AC Ear Simulator Kit

43AC, 43AC-S1, 43AC-S4 to 43AC-S7



LI0068 - 1 June 2022

GRAS

An Axiometrix Solutions Brand

Revision History

Revision	Date	Description
1	17 August 2017	Extracted from Earbook as separate document.
2	11 October 2019	Update with new ear simulators（RA0401 to RA0404）.
3	2 September 2020	Information about calibration at 1 kHz added.
4	1 June 2022	TEDS functionality section added.

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Introduction

The 43AC Ear Simulator Kit is a test jig for measurements on hearing aids and insert-type earphones. Ear simulator, preamplifier and accessories are included.

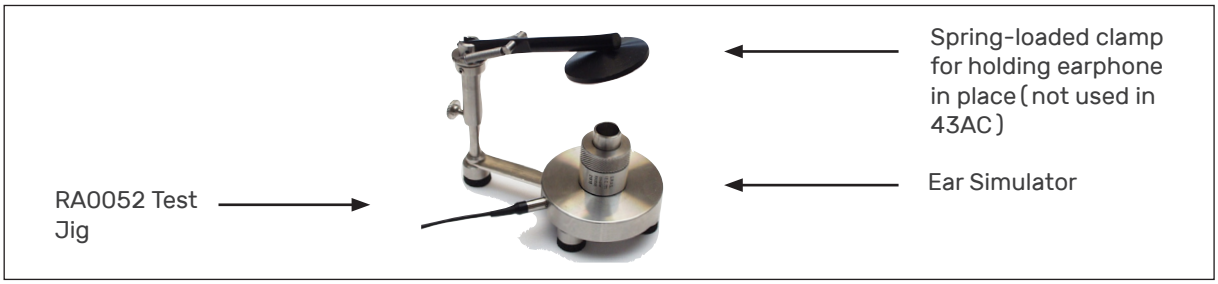

Fig. 1. *Assembled 43AC Ear Simulator Kit*

Delivered Items		
Test Jig		
RA0052	Test Jig with spring-loaded clamp	
Externally Polarized Configurations		
	Ear Simulator	**Preamplifier**
43AC	RA0045 Ear Simulator According to IEC 60318-4, LEMO	26AC (integrated cable)
43AC-S4	RA0401 High-Frequency Ear Simulator, LEMO	26AC (integrated cable)
43AC-S6	RA0403 Hi-Res Ear Simulator, LEMO	26AC (integrated cable)
Prepolarized Configurations		
43AC-S1	RA0045-S1 Ear Simulator According to IEC 60318-4, CCP	26CB
43AC-S5	RA0402 High-Frequency Ear Simulator, CCP	26CB
43AC-S7	RA0404 Hi-Res Ear Simulator, CCP	26CB
Accessories		
GR0408	External Ear Canal	
GR0409	Union Nut	
MI0070	Nylon cord, 1 meter	

Optional Items—not included	
For hearing aids using tube inserts or placed in the ear (See Fig. 3)	
GR0435	In-ear Adapter
GR0436	Tube Stud
GR0438	Ear-mould Simulator
GR0440	Tube Stud
For calibration	
GR0433	Calibration Adapter
GR0434	Stop Washer

TEDS Compatibility

Ear simulator kits with constant-current power (CCP) microphone components (configurations -S1, -S5, and -S7) are IEEE 1451.4 TEDS v. 1.0 compliant. If your measurement platform supports Transducer Electronic Data Sheets (TEDS), you will be able to read and write data like properties and calibration data.

Assembly

Assembling the Test Jig

The exploded view below shows how the 43AC is assembled. When attaching the RA0001 Angled Adapter to the ear simulator, take care to use finger force only - do not use the preamplifier as a lever.

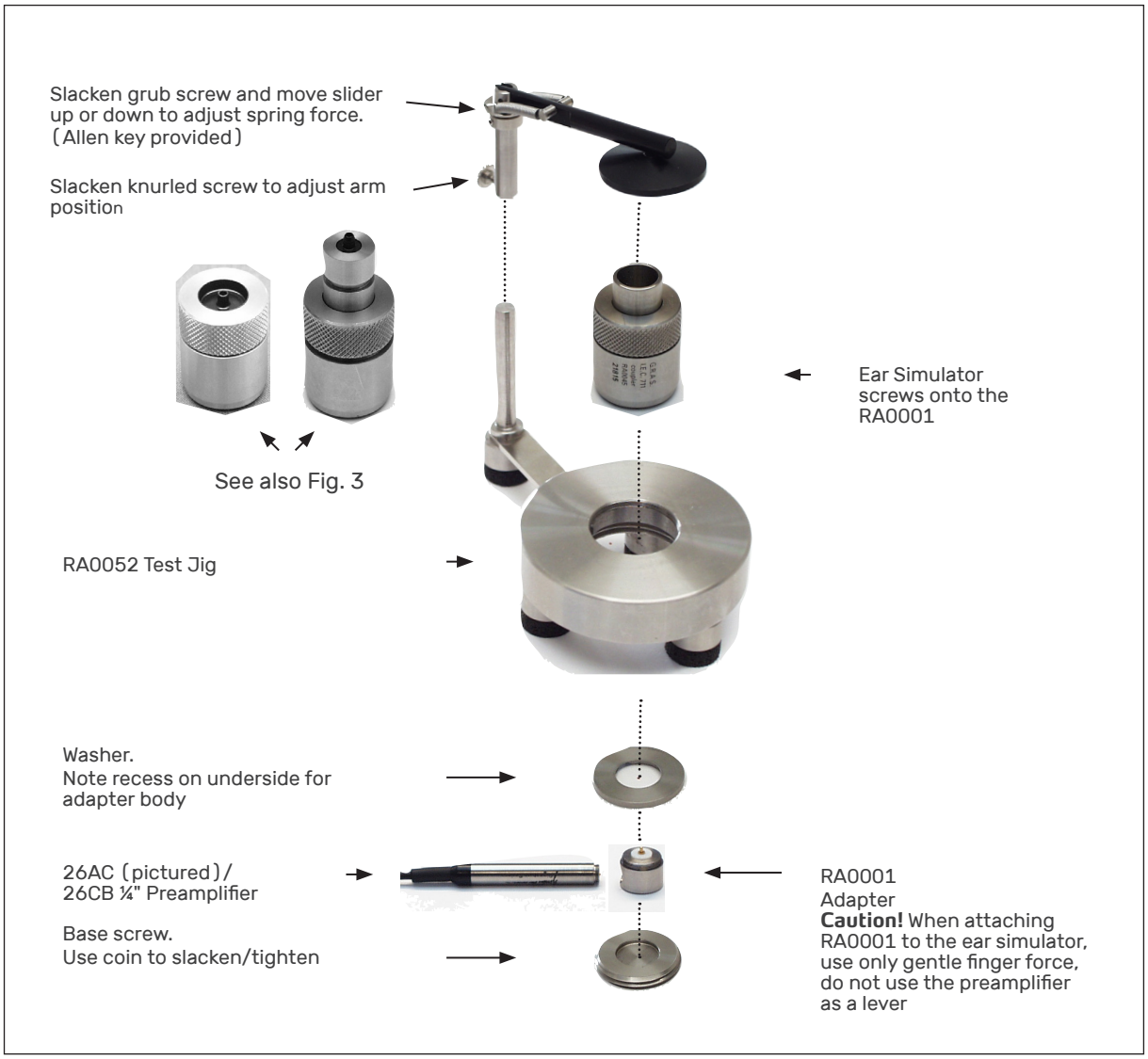

Fig. 2. *Exploded view of the user-serviceable components of the 43AC Ear Simulator Kit*

Note: The spring-loaded arm is part of RA0052 Test Jig as delivered, but in 43AC it is normally not used to hold the DUT when testing ITE and BTE transducers, so it can therefore be ignored.

Assembling Accessories for Testing ITE and BTE Transducers

Below is shown how the accessories for measuring on in-the-ear (ITE) and behind-the-ear (BTE) hearing aids are mounted onto the ear simulator.

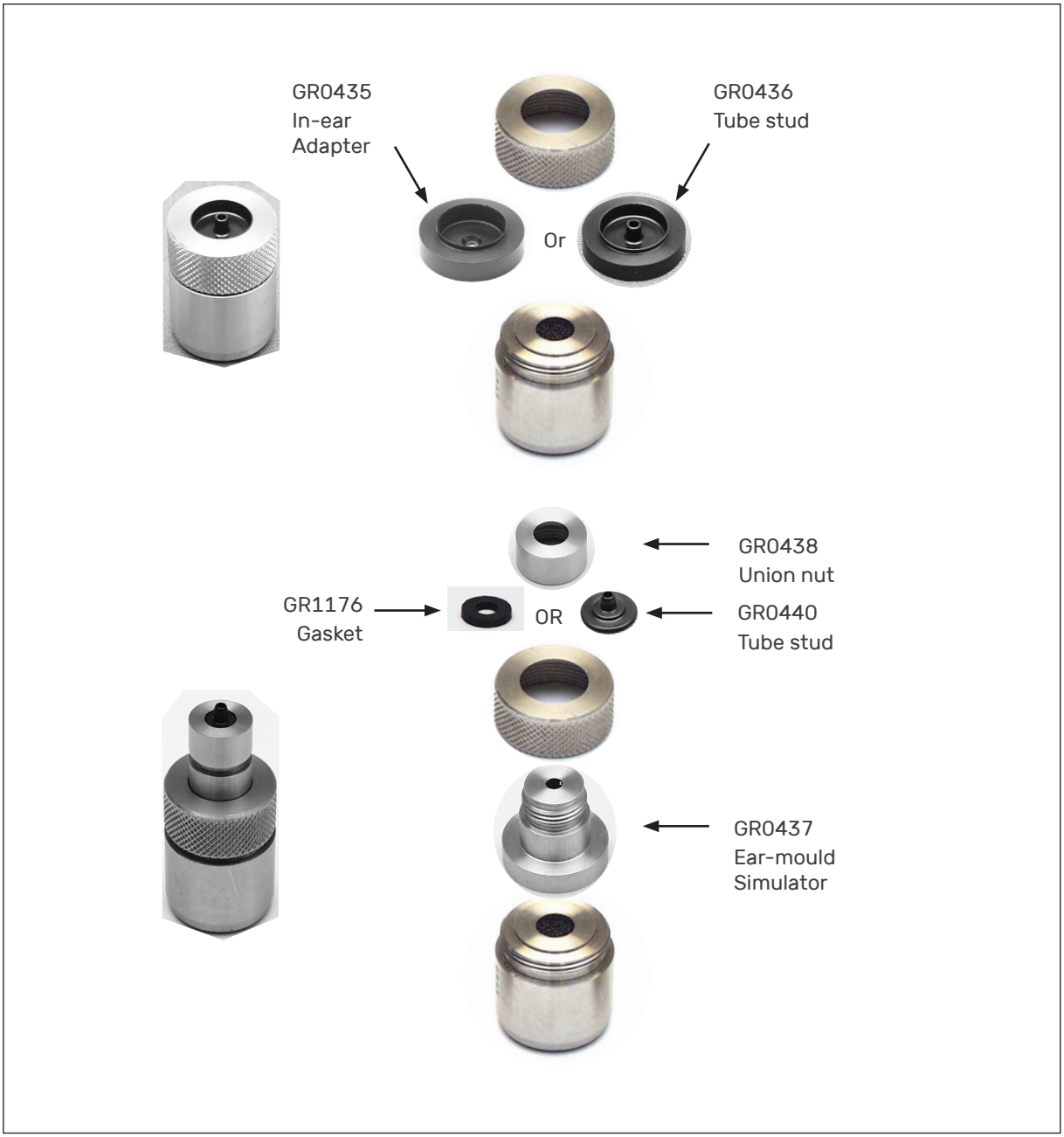

Fig. 3. *Assembled and exploded views of the ear simulator itemizing user-serviceable accessories for testing earphones either coupled to the ear via tube inserts or placed in the ear*

Calibration

Level Calibration

This paragraph describes level calibration. How to perform a frequency calibration is described on page 8. In the following, a pistonphone is used, the procedure when using a sound calibrator is the same. However, do note that the corrections factors differ.

Correction Factors

The correction factors for calibration with a 42AP/42AA Pistonphone or a 42AG Multifunction Calibrator are listed below. These correction factors are needed to account for the effective volume resulting from using a pistonphone or the 42AG Multifunction Sound Calibrator.

Correction factors		
	External Ear Canal	**Correction factor**
42AP and 42AA	GR0408	-1.03 dB
42AG @250 Hz, 114 dB	GR0408	-0.09 dB
42AG @250 Hz, 94 dB	GR0408	-0.09 dB
42AG @1KHz, 114 dB	GR0408	-0.2 dB*
42AG @1KHz, 94 dB	GR0408	-0.2 dB*

Fig. 4. *Correction factors for 42AA/AP Pistonphone and 42AG Multifunction Sound Calibrator*

* Se the following section **Calibration at 1 kHz**.

Calibration at 1 kHz

At 1 kHz, the frequency response changes from unit to unit. The actual value for the specific ear simulator is stated on the calibration chart and must be added to the correction. For example:

If the response of the specific ear simulator at 1 kHz is + 1.45 dB (re 500 Hz), the final correction value will be -0.2 + 1.45 = 1.25 dB. GRAS recommends calibrating at 250 Hz whenever possible.

Procedure

Before calibration, mount the external ear canal as shown below.

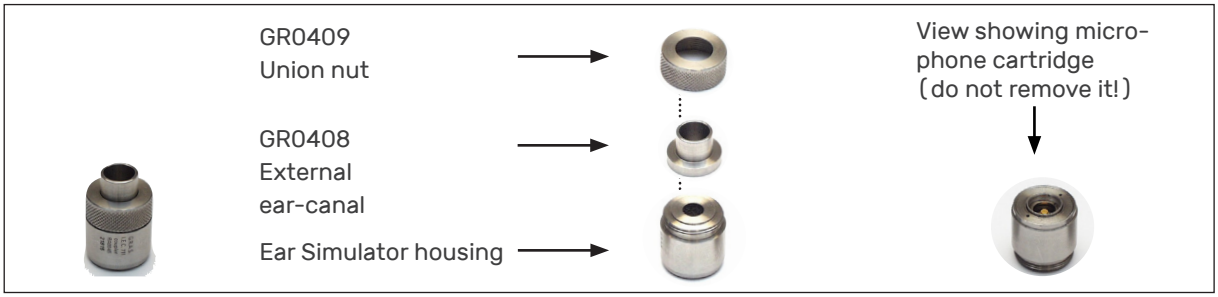

Fig. 5. *Ear simulator ready for level calibration, with External Ear Canal and Union Nut.*

Important! Do not extract the microphone housed in the ear simulator since this would invalidate the factory calibration. You will be calibrating the ear simulator as a whole with a pistonphone or sound calibrator fitted with a ½" coupler.

This, in effect, increases the coupler volume such that the signal will be reduced. Therefore, the corrections factors listed in Fig. 4 on page 7 must be used.

Pistonphone

The procedure listed below is for using a pistonphone.

1) Snap the spring-loaded clamp (see Fig. 1) to its upright position, or remove it.
2) Unscrew the collar of the pistonphone and remove the O-ring (see Fig. 6).

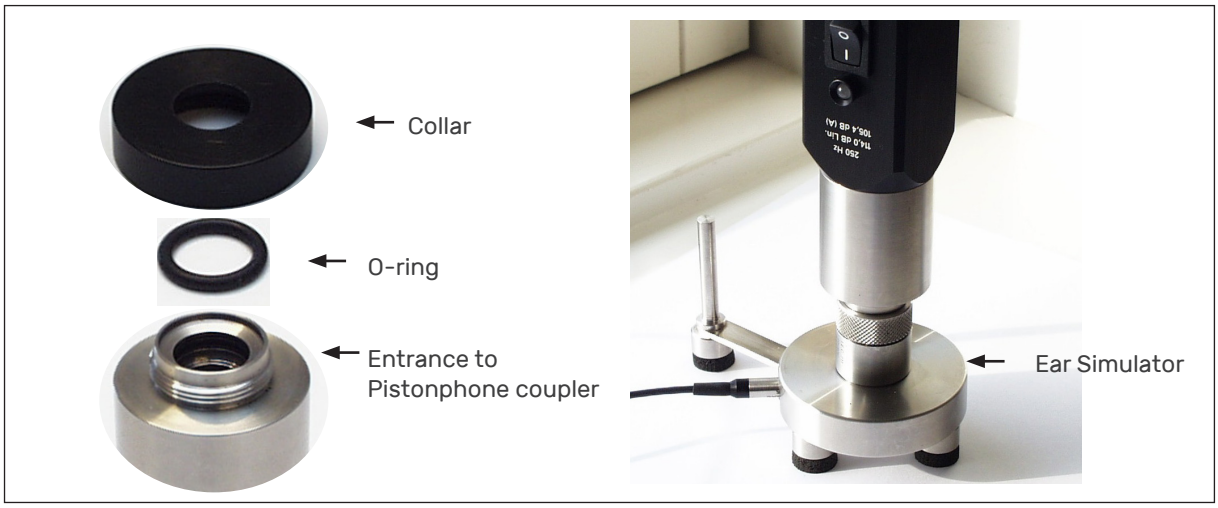

Fig. 6. *Level calibration using a pistonphone*

3) Place the coupler of the pistonphone over the ear simulator and push it gently down to the stop and switch on.
4) Set the analyzer to either wideband or to the ⅓ octave band whose center frequency is 250 Hz.
5) When conditions are stable, adjust the analyzer so that it correctly gauges the calibration signall (nominally e.g 114 dB, corrected with the correction factor). See the pistonphone manual for making barometric corrections.
6) Switch the Pistonphone off and remove it from the ear simulator.

Multifunction Sound Calibrator

The 42AG fits directly onto the ear simulator.

It automatically corrects for ambient calibration conditions.

The correction factor is listed in Fig. 4 on page 7.

Frequency Calibration

This section describes how to perform a frequency calibration using a 40BP ¼" Microphone as sound source. Fig. 7 shows how to configure the coupler for calibration using the accessories provided, and Fig. 8 shows how these should be used with:

- 40BP ¼" Microphone
- RA0086 Transmitter Adapter

Fig. 7. *Assembled and exploded views of the coupler itemizing user-serviceable accessories for individual calibration*

The ¼" microphone is used as a high-impedance sound source. The complete set-up is shown in Fig. 9 on page 10. The computer is capable of concurrently generating and measuring audio frequency signals. The 14AA Actuator Supply receives a swept tone generated by the computer and sends this to the coupler mounted in the jig, also shown in Fig. 9. The coupler picks up the resulting audio signal and sends this back to the computer which traces out and displays the coupler response. An example of a displayed response is shown in Fig. 10.

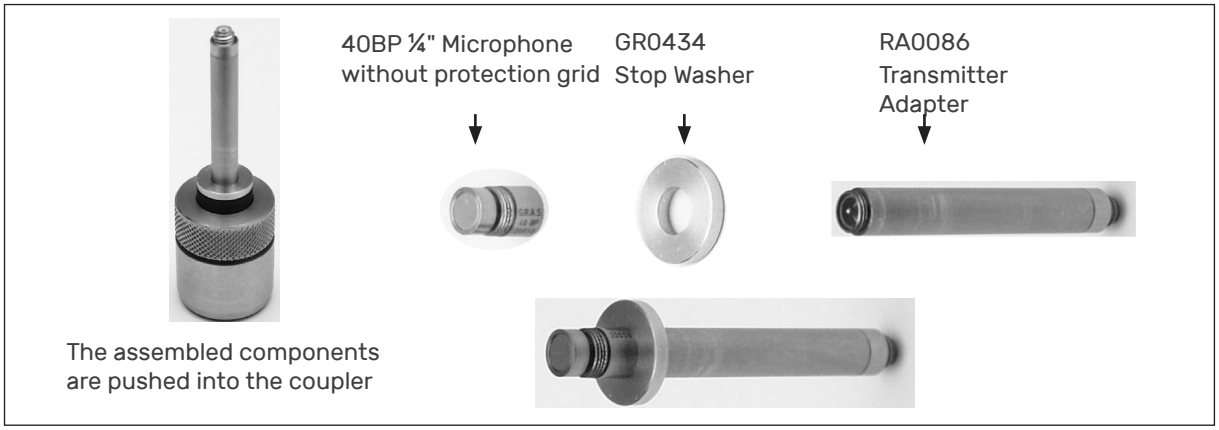

Fig. 8. *Assembled and exploded views showing how the GR0434 is used when calibrating the ear simulator. 40BP and RA0086 are available from GRAS.*

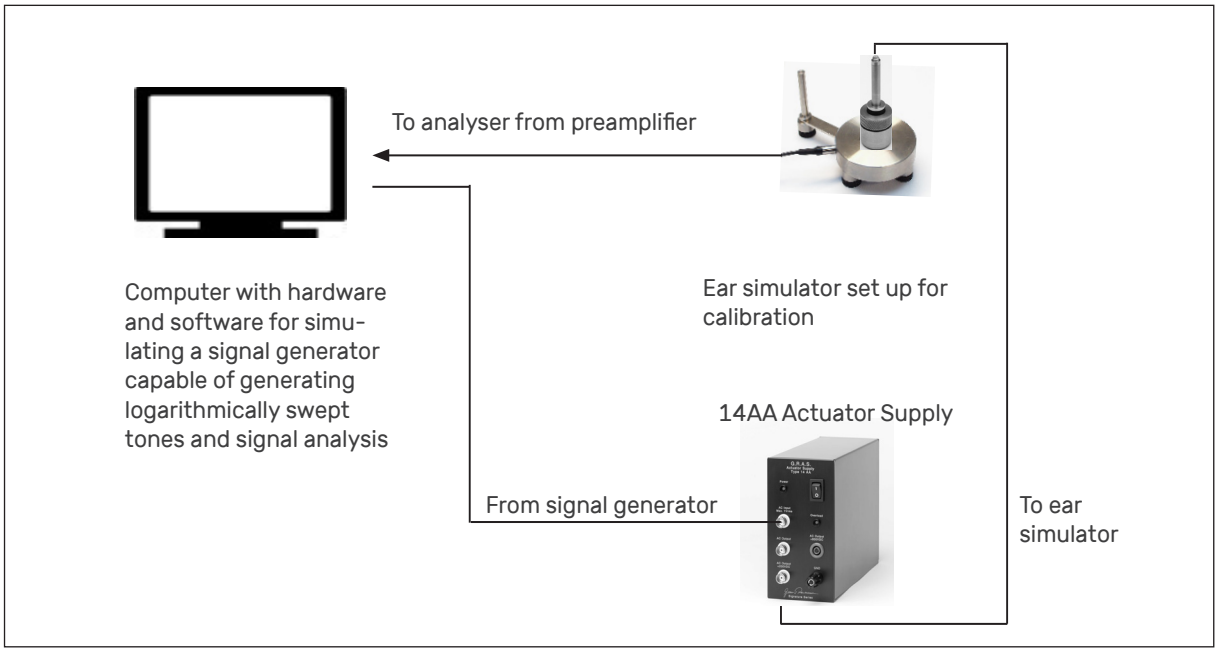

Fig. 9. *Block diagram of a complete set-up for calibration*

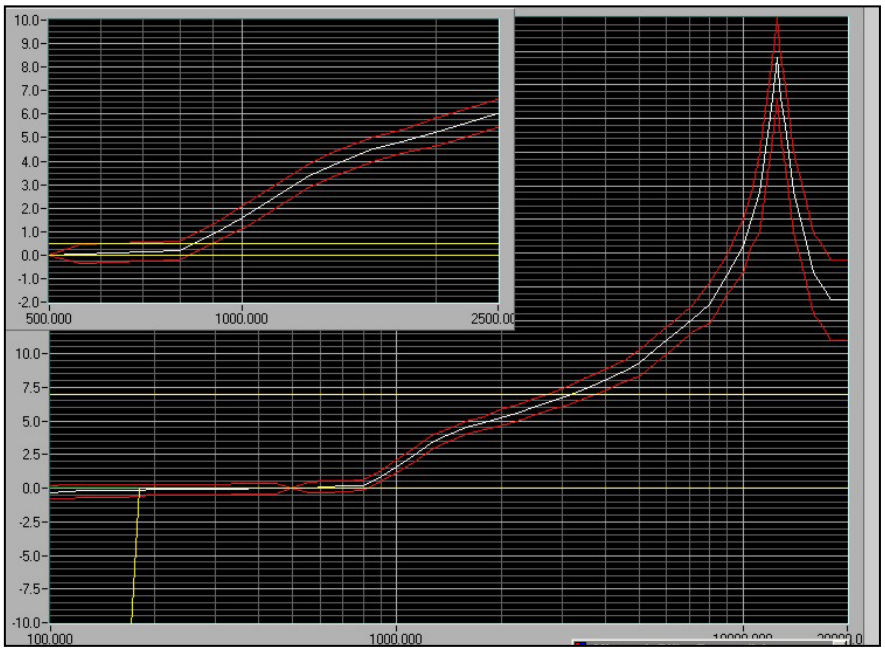

Fig. 10. *Example of a calibration result using a swept tone*

Warranty, Service and Repair

Calibration

Before leaving the factory, all GRAS products are calibrated in a controlled laboratory environment using traceable calibration equipment.

We recommend a yearly recalibration at minimum, depending on the use, measurement environment, and internal quality control programs.

We recommend calibration prior to each use to ensure the accuracy of your measurements.

Warranty

Damaged diaphragms in microphones can be replaced. The microphone diaphragm, body, and improved protection grid are made of high-grade stainless steel, which makes the microphone resistant to physical damage, as well as corrosion caused by aggressive air or gasses. This, combined with the reinforced gold-plated microphone terminal which guarantees a highly reliable connection,enables GRAS to offer 5 years warranty against defective materials and workmanship.

The warranty does not cover products that are damaged due to negligent use, an incorrect power supply, or an incorrect connection to the equipment.

Service and Repairs

All repairs are made at GRAS International Support Center located in Denmark. Our Support Center is equipped with the newest test equipment and staffed with dedicated and highly skilled engineers. Upon request, we make cost estimates based on fixed repair categories. If a product covered by warranty is sent for service, it is repaired free of charge, unless the damage is the result of negligent use or other violations of the warranty. All repairs are delivered with a service report, as well as an updated calibration chart.

Manufactured to conform with:

CE marking directive:
93/68/EEC

WEEE directive:
2002/96/EC

RoHS directive:
2002/95/EC

GRAS Sound & Vibration continually strives to improve the quality of our products for our customers; therefore, the specifications and accessories are subject to change.