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Not for clinical use

ER-10X Extended-bandwidth research probe system

Interacoustics Research

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by Interacoustics

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Audiometry Tympanometry ABR OAE Hearing Aid Fitting Balance

Extended-bandwidth research probe system

The ER-10X PROBE SYSTEM is a state-of-the-art hearing research instrument, designed to address the needs of advanced hearing research applications. While especially suited for otoacoustic emissions, it is flexible enough for a wide variety of hearing measurements. The system is capable of providing multiple stimuli from independent integrated transducers and measuring response with a wide bandwidth, high dynamic range microphone system. It is designed to be integrated into all types of aquisition and measurement systems. The integrated Forward Pressure Level (FPL) calibration system allows for the prediction of SPLs to 20 kHz in humans and even higher in laboratory animals.

Performance highlights include extended high frequency bandwidth, low distortion, low noise, and enhanced calibration capabilities. The system controller contains two dicrete channels, allowing for the use of two probes for simultaneous measurements in both ears.

Features

- Extended Measurement Bandwidth
- Three Independent Speakers
- Very-Low Distortion Amplifiers
- Two-Channel System Controller
- High Output Capability
- Very-Low Noise Microphone
- Programmable Microphone Gain
- Real-Time Probe Temp and %RH
- Unique Mic Channel Access Port
- Integrated Thevenin / FPL Calibrator
- Analog Inputs and Outputs
- USB 2.0 Compliant Interface
- Selectable Output Limiter
- PC Utility / Interface Program
- Power Input: 100-240Vac, 50/60 Hz
- All-Aluminum Probe Construction

Probe features

Small and Durable
The all-aluminum construction of the ER-lOX probe allows for the most compact integrated probe while also providing a lightweight and durable structure. The probe is small enough to fit under earmuff-style noise attenuators for effective use in noisier environments.

Disposable Probe Tube
The ER-lOX Probe uses a novel multi-lumen probe tube to allow the stimulus and microphone ports to align flush with the end of the eartip. This tube interfaces with the eartip and provides the acoustic coupling to the ear canal. The probe tube is disposable and inexpensive, providing a buffer for biological material which reduces the likelihood of contaminating the probe. A variety of eartips are available in a full range of sizes.

Center Access Port
The ER-lOX Probe provides a unique access channel through the center of the probe. This microphone-channel access tube allows for the use of a probe microphone, boroscope, etc. with the probe in place. This channel is 1 mm in diameter and gives the user direct access through the center of the probe body, all the way through to the probe tube and eartip. In normal use this channel is sealed with the Mic Channel Pin, which screws into the back of the probe.

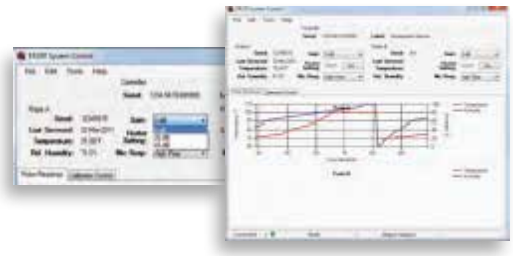
Dynamically-Controlled Heater
An integrated heater system can maintain the probe temperature to a user-set level. The heated probe can minimize the shift in microphone sensitivity which can be present when a probe is transitioned from room temperature to body temperature. This is controlled in real-time with the probe temperature and% relative humidity indicated on the display of the system controller.

Calibration
Calibration of the sensitivity of the probe system to the users measurement system is required to achieve the performance specified for this probe. A stainless steel adapter is provided to interface the probe with an IEC60318-4 {IEC 60711) Occluded Ear Simulator. This coupler adapter provides the accuracy of placement and repeatibility of acoustic seal that will achieve a consistent calibration.

Programmable Microphone Gain
The microphone gain is independently selectable for each probe. Gain may be set to 0-40 dB in 1 dB steps, allowing for measurement in different environments, compliance with different audio inputs, or different stimuli. The probe maintains its serial number and calibration data in EEPROM memory located internal to the probe body. Upon connection of a probe the controller initializes the probe channel, reading the calibration data and adjusting the controller gain to be within+/- 1 dB of the nominal microphone sensitivity setting. Any time a probe is plugged into the system the gain level is automatically adjusted.

FPL Calibration System
The patent-pending Forward-Pressure-Level (FPL) calibration system developed by Jonathan Siegel at Northwestern University has been integrated into the system controller. This calibration system is accessible through a probe coupler located on the front panel of the controller. The calibration sequence can be initiated via the front panel interface, the PC utility program, or through the use of the provided Dynamic Link Library (DLL). The configuration of the calibration sequence can be completely customized. Settings in the PC utility provide the ability to change the number of discrete positions to be used in the sequence, the distance or volume of each position, and the speed of travel, all in user selectable units.

Controller Features



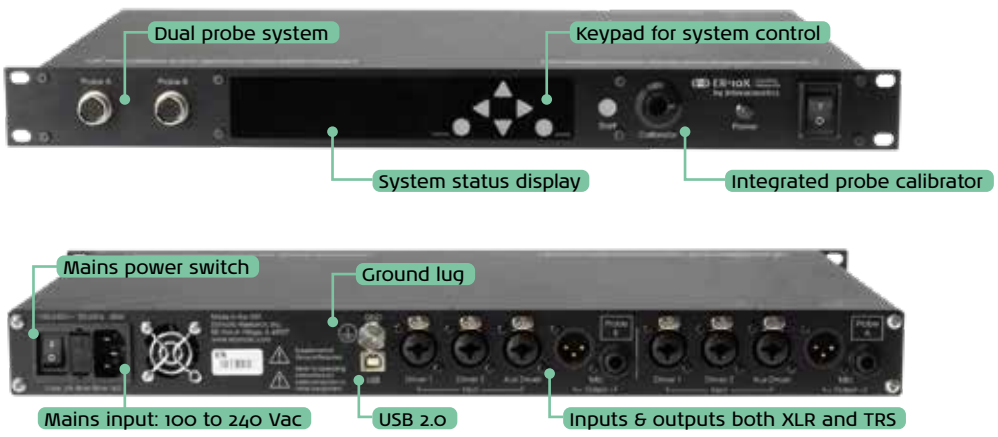
System Controller
The controller system is designed to drive the probe to its full capability, with enough headroom for large output swing while contributing no discernable distortion throughout the audio band. This controller gives the user access to all of the functions and connections to interface the probe system with their measurement system.

Extended Bandwidth
The microphone frequency response is flat within+/- 5 dB (re 1 kHz) through 20 kHz. The microphone has usable sensitivity (i.e., noise floor low enough to measure OAEs) to at least 40 kHz, and should be sufficient for widespread application to study cochlear mechanisms in the most sensitive part of the hearing range of many animal species.

Front Panel User Interface
The user interface on the front panel of the controller facilitates access to many of the settings for the probe system. The user can enable and set the temperature control, mic channel gain, high-pass filter, control the calibrator, find the probe serial number, and see the controller firmware version. The display also provides a real-time indication of temperature and% relative humidity of the probe.

Two Channel System
The controller has been designed as a two-channel system, providing the ability to drive two probes simultaneously. Each probe is paired with a dedicated plug-in circuit board module which is placed into a slot on the main board in the controller housing. This feature allows the user to add an additional probe at a later time, to use different types of probes, or to send a probe in for calibration or repair.

PC Software Control
Two means for interfacing with the PC have been developed; a Dynamic Link Library (DLL) and a stand-alone utility program. The DLL provides code-level access to all of the addressable functions within the controller system, allowing for the development of 3rd party software interfaces with the system.
A utility program has been developed for Windows-based PCs that provides access to the functions and settings for the probe system, and also serves as an example application of the DLL functions. This program communicates with the controller through the USB 2.0 port on the rear panel of the ER-10X System Controller. This utility allows for the same access as the front panel controls, but with some additional features not possible on the front panel, such as logging of the probe temperature.



Specifications

Microphone Specifications

Microphone Frequency Range: 200 Hz to 16 kHz, ±5 dB
Sensitivity: 50 mV/Pa, ±1 dB (-46 dB re 1V/µbar) : 0 dB SPL= 0 dBµV
Dynamic Range: > 90 dB (200 Hz to 16 kHz)
Acoustical Crosstalk: < -20 dB (Speaker to Speaker)
Output Impedance: < 100 Ω
Noise Level: 1 kHz spot noise typically below -17 dB SPL (1 Hz BW)
Programmable Gain: +0 to + 40 dB in 1 dB increments

Driver Specifications

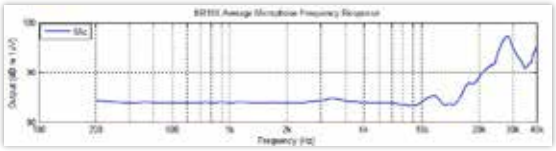
Speaker Frequency Range: 100 Hz to 20 kHz, usable to >40 kHz
Max Stimulus Output: 90 dB nominal @ <0.2% THD @ 1 kHz, 115 dB max
Distortion: DPOAE 2f1-f2 distortion: 1 kHz to 20 kHz
≥ 90 dB SNR @ 70 dB SPL (P1, P2)
≥ 80 dB SNR @ 80 dB SPL (P1, P2)
Impulse Response Decay: Ringing down 20 dB or more within 1 ms

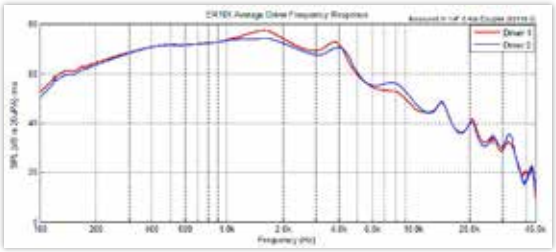
FPL Calibrator Specifications

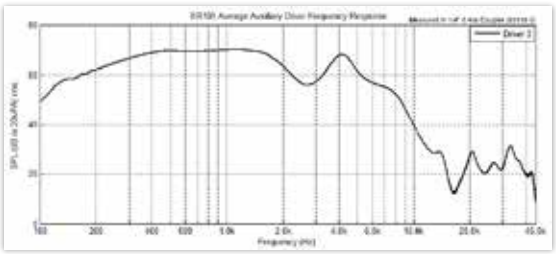
Step Increment: 0.05 mm / 0.002 in / 0.004 cc
No. of Positions: 4, 5, or 6 programmable positions
Minimum Length (Vol): 13.9 mm / 0.55 in / 0.69 cc
Maximum Length (Vol): 90.2 mm / 3.55 in / 4.46 cc
Heater Setpoint: 26.7°C - 40.6°C / 80°F - 105°F

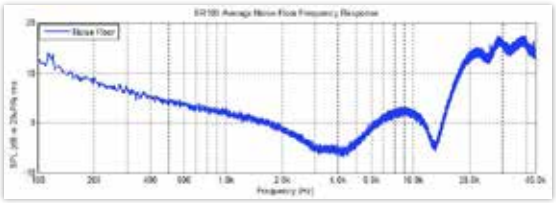
System Specifications

Mains Supply (input) 100 -240 VAC, 50 / 60 Hz
Chassis Dimensions: 483 x 292 x 45mm (19 x 11.5 x 1.75 in.)
Input Connections: Balanced, XLR / 6.3 mm T RS (2kOhm Imp.)
Output Connections: Balanced, XLR / 6.3 mm T RS
Probe Cable Length: 2.4 meters/ 8 ft.

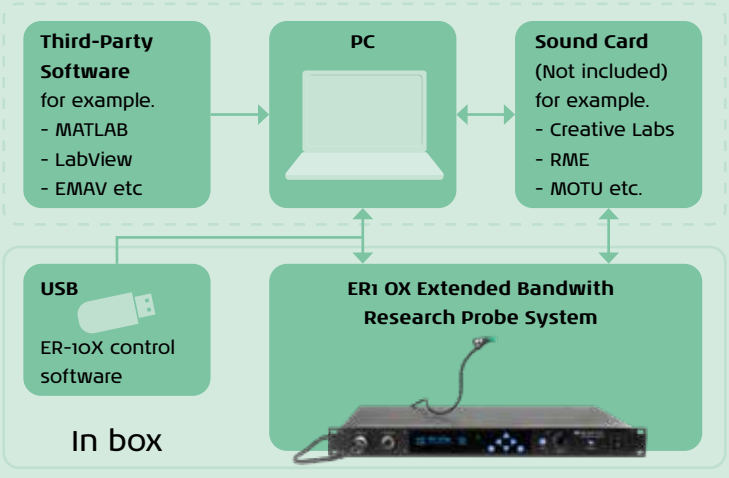








Typical Use Typical Use



Ordering

ER10X-CB	System Controller	
ER10X-P	Probe	1 for single system, 2 for binaural systems
ER10X-1	Extension cable, 12 feet (3.5 m)	
ER10X-2	Extension cable, 20 feet (6 m)	

Major components included each system: Eartip Selection, Replacement Probe Tubes, XLR to TRS Cables, USB Cable, US and European Power Cable, GRAS Coupler Adapter, Ground Cable

Probe tubes and a complete line of replacement eartips are available from Sanibel Supply: www.sanibelsupply.com

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