Universal Smart Box

auditory, visual, & somatosensory evoked potentials
& otoacoustic emissions
The Universal Smart Box was the first auditory evoked potential and otoacoustic emissions system to use USB connection to connect to a PC. Since then, through a number of design improvements, it has become the most powerful clinical and research platforms for AEP & OAE.

stellar performance
Over 30 years of engineering design experience, combined with unsurpassed expertise in evoked responses, have culminated in the next generation bio-amplifier to bring you superior data quality for evoked potentials and otoacoustic emissions.

- Repeatable, reliable data you can count on
  - High definition responses
  - Cleaner, more robust responses
  - Increased signal-to-noise ratio (SNR)
  - Lower residual noise

- Reduced test times without compromising data quality

the Smart Box that does it all

Standard SmartEP modules:
- ECochG
- ABR (click, tone burst, iChirp)
- MLR
- LLR/CAEP

Standard SmartOAE modules:
- DPOAE
- TEOAE
- SOAE

Optional SmartEP modules:
- P300/MMN
- eABR
- Chained-Stimuli ABR
- cVEMP, oVEMP
- ASSR
- ENoG
- VEP

for all your research needs

Advanced options for SmartEP:
- CLAD for high-rate stimulation
- Notched Noise Masking
- Advanced Auditory Research Module
- Complex ABR
- Frequency Following Response
- Acoustic Change Complex
- CHIRP Stimulus Generation Module
- USB Development Kit
- SmartEP-CAM continuous acquisition module
- Auditory PS0
- High Frequency ABR up to 32kHz

Advanced options for SmartOAE:
- Contralateral, ipsilateral, and binaural TEOAE suppression
- Dual OAE probe system
- High Frequency DPOAE for ototoxicity monitoring & animal research

Somatosensory Evoked Potentials
IHS offers an integrated ENoG & Somatosensory EP solution; we manufacture our own Electrical Stimulator Box and Probe.
- Electroneuronography (ENoG) & SSEP on the limbs
- Electrode leads can be connected to surface snap electrodes to deliver stimulus: no need to hold the probe during the test.
- Low current stimulator option for transtympanic eABR animal research

Visual Evoked Potentials
Ellicit VEP responses using the patterns on a LED light array on the IHS VEP Stimulator.
- Visual patterns can be programmed to stimulate full, half, or quarter fields.
- Stimulator includes centering point to facilitate test subject focusing
- Select from up to 138 different pre-programmed patterns

the ultimate in flexibility & versatility
The Universal Smart Box can be configured to be an EP system, and OAE system, or an EP/OAE system and can have a maximum of 8 channels. For evoked potentials, the system can be configured to have 1, 2, 4, 6, or 8 channels. OAE systems can have up to two OAE channels. Choose from a variety of add-on modules for the ultimate in flexibility and versatility.
Upgrade anytime with minimal or no down time.

our flagship platform

designed for an improved clinical experience
SmartEP

The ideal clinical tool for recording ECochG, ABR, and more.

new and improved user interface simplifies acquisition

- Improved toolbar and button design for fast access to key features
- Easy access to all parameters from a simplified control panel and streamlined menus
- Quickly load your own or preset protocols
- Easily view ongoing EEG display for quick assessment of patient state during testing
- Great variety of options allow you to perform the tests the way you want
- Choose from a variety of stimuli, or generate or import your own custom stimuli
- Display or hide a subtle vertical grid or horizontal baseline

iChirp™ stimuli included

The intelligent Chirp for SmartEP and SmartEP-ASSR is included in the base package.
- Broadband and narrowband (500, 1000, 2000, 4000 Hz)
- Improved threshold detection
- Robust amplitude responses
- Optimized wave V identification
- Optional, innovative custom chirp design utility

Beneficial for recording ABR in awake and active patients.

smart features

- Change most test parameters with a single click
- Set your own display scale
- Easily mark waveforms using over thirty pre-defined peak labels, or create your own custom labels
- View latency and amplitude of peaks directly on the waveform
- Latency-Intensity graphs indicating normative data ranges are automatically generated from marked waveforms
- Quickly add, subtract, invert, time shift, or cross-correlate recordings
- Cross-correlation value displayed in information panel

superior electrocochleography

Our next generation amplifiers combined with the non-invasive IHS Lilly TM-Wick Electrodes produce more robust and repeatable ECochGs.

• Improved SP/AP amplitude and area ratio analysis and automatic calculation.

streamlined workflow

- Easily mark waveforms using over thirty pre-defined peak labels, or create your own custom labels. Easily adjust them using a mouse or keyboard
- View latencies and amplitudes of peaks directly on waveforms and in newly embedded recording information panel.
- Automatically arrange recordings by intensity, acquisition order, stimulus frequency, or rate
- Quickly resize the waveforms using the zoom in/out buttons
- Multi-page display and reports
- Easy PDF report generation
- Auto-save reports on program exit

2000 Hz tone burst ABR (left) vs 2000 Hz iChirp ABR (right)

Improved SP/AP amplitude and area ratio analysis and automatic calculation.
SmartDPOAE

Screening and diagnostic distortion product otoacoustic emissions.

- Fast and easy setup with up to 41 frequencies per ear in a single test
- Automatic probe-fit check and in-ear calibration for increased accuracy
- Easy-to-interpret colorful DP-Grams and detailed information for each frequency tested
- Clear Pass or Refer indications based on user-selected passing criteria
- User-customizable display of normative ranges on the DP-Gram facilitates response analysis
- High frequency option for ototoxicity monitoring
- Built-in scripting feature allows you to define sequences of frequencies and intensities for automated data collection
- Optional graphical display of noise standard deviation for improved interpretation

SmartEP-ASSR

Full-featured screening and diagnostic Auditory Steady State Response System.

- Provides quick, accurate threshold detection using automated statistical analysis
- Test both ears at the same time, four frequencies per ear
- iChirp (broadband & frequency specific) for robust amplitudes and harmonic component analysis for improved threshold detection and reduced test times
- Automated audiogram generation in SPL and HL
- Cost effective add-on to SmartEP

Intelligent VRA

Automated visual reinforcement audiometry.

- Increased reliability & accuracy by a single examiner
- Choose from our variety of 4 and 10 second colorful, animated wide-screen video clips, or use your own video clips
- Use one of our three automated test routines, administer a speech discrimination paradigm (IVRISD), or run a VRA test manually
- Probe Trials maintain patient attention while testing near threshold
- Control Trials allow you to determine the reliability of a test
- Trial-by-trial reports include detailed information for each test sequence
- Final report includes audiogram and threshold for each frequency tested

Available in the Universal Smart Box is a dual-probe option that allows for the acquisition of contralateral, ipsilateral, and binaural TEOAE suppression recordings.

This option includes a Suppression Analysis module for temporal and spectral comparison of control and suppression data.

CAST™

Classification of Audiograms by Sequential Testing selects the best-fitting audiogram from 9 patterns, for fast and efficient screening.

OHTA™

Optimized Hearing Test Algorithm is designed to test four frequencies, non-sequentially in an intensity staircase fashion.

5-up/5-down

Automated ‘step-up, step-down’ intensity staircase procedure for testing thresholds at up to four selected frequencies.
Specifications

**SmartEP**
- **Adjustable Gain:** 5K - 300K
- **Adjustable High Pass and Low Pass filters** (-6 dB/Oct)
- **Stimulus:** Clicks, Tones, iChirps, Complex, and user-defined files
- **Stimulus duration in usec or cycles**
- **Stimulus Envelopes:** Rectangular, Blackman, Cosine, Hamming, Hann, Bartlett, Trapezoidal (Rise/fall time), Extended Cosine (Rise/fall time), Triangular, Gaussian
- **Stimulus** presented continuously or only while acquiring
- **Ipsilateral and Contralateral noise masking. Specified level or tracking the stimulus level**

**EP Amplifier**
- **Two channels**
- **A/D Converter:** 16-bit
- **Sampling rate:** 200 to 40000 Hz
- **High Pass:** 1 - 500 Hz
- **Low Pass:** 30 - 5000 Hz
- **Adjustable artifact rejection level and time region**
- **Line Frequency Notch Filter** (-12 dB/Oct)
- **Common Mode Rejection:**
  - $\geq 105 \text{ dB} @ 1 \text{ kHz}$
  - $\geq 120 \text{ dB} @ 60/50 \text{ Hz}$, notch filter off
- **Noise Level:** $\leq 0.333 \mu \text{V RMS}$
- **Input Impedance:** $> 5 \text{ MOhm}$

**SmartEP-ASSR**
- **Gain:** 100K
- **High Pass Filter:** 30 Hz
- **Low Pass Filter:** 300 Hz
- **Stimulus:** Clicks, Tones, iChirps, and user-defined files
- **Frequencies:** 250, 500, 1000, 2000, 4000, and 8000 Hz
- **Simultaneous testing of both ears**
- **Test up to four frequencies per ear**

**SmartDPOAE**
- **Up to 41 frequencies per DPgram**
- **DP I/O Function**

**SmartTrOAE**
- **Response window:** 300 - 6000 Hz
- **Stimulus:** Clicks and Tones
- **Contralateral, Ipsilateral, and Binaural suppression**
- **Dual probe option**

**Power Requirements**
- **115 - 230 VAC, 50/60 Hz, 560 - 350 mA, 30 W**

**Operating Environment**
- **Portable Equipment**
- **Indoor use**
- **Operating temperature:** 15 °C - 40 °C
- **Relative humidity:** 15% to 90% at 40 °C non-condensing
- **Altitude:** 0 - 3000 m

**Storage**
- **Temperature:** 0 °C - 50 °C
- **Atmospheric Pressure:** none specified

**Transducers**
- **ER-3C Insert Earphones:**
  - **Intensity:** 0 - 130 dB SPL
  - **Frequency Range:** 125 - 10000 Hz
- **ER-2 Insert Earphones:**
  - **Intensity:** 0 - 94 dB SPL
  - **Frequency Range:** 2000 - 32000 Hz
- **TDH Headphones:**
  - **Intensity:** 0 - 120 dB SPL
  - **Frequency Range:** 125 - 12000 Hz
- **Bone Conductor:**
  - **Intensity:** 0 - 98 dB SPL
  - **Frequency Range:** 250 - 8000 Hz
- **ER-10D OAE Probe:**
  - **Intensity:** 0 - 100 dB SPL
  - **Frequency Range:** 125 - 16000 Hz
- **ER-10B+ OAE Microphone:**
  - **Sound field amplifier and speakers**
  - **Auxiliary output channel for ipsilateral masking and stimulus mixing**

**Standards Compliance**
- **Safety:** IEC 60601-1 Class II, Type BF
- **EMC:** IEC 60601-1-2
- **EP:** IEC 60601-2-40
- **Medical Device Directive:** 93/42/EEC

**Computer Requirements**
- **Windows 10 operating system**
- **Minimum 4 GB RAM**
- **Minimum 5 GB hard drive space**
- **Min display vertical resolution of 900 px, Full HD recommended.**
- **Grounded, 3-prong power supply**
- **Compliant with IEC 60950**
- **Mouse or other pointing device**
- **One available USB Port**
- **Removable media, network drive, or secure Internet storage site for data backup (recommended)**
- **Printer (optional)**

*May not be available in all markets*