



APx511 audio analyzer for hearing instrument production test

## KEY FEATURES

- ◆ Automated routines for IEC60118-7 and ANSI S3.22
- ◆ 4 W Loudspeaker output
- ◆ 0 – 400 mA/m telcoil field strength in Interacoustics TBS25 test chamber
- ◆ Microphone input with 24 V DC constant current
- ◆ 2 V DC battery simulator with current measurement
- ◆ Share tests and results with any APx analyzer
- ◆ Built-in test sequencer or API to VB, C#, LabVIEW, MATLAB
- ◆ THD <-80 dB @ 4 W into 8 Ω (100 Hz - 10 kHz BW)
- ◆ Frequency response ±0.03 dB (100 Hz - 10 kHz BW)

The **APx511** Hearing Instrument Audio Analyzer is designed to meet the needs of hearing instrument manufacturers, providing the specific measurements and I/O required for hearing instrument production test, delivered with Audio Precision’s reputation for high performance and reliability.

All APx models use the same software. An R&D department using an APx525 or APx585 can share tests and results with APx511 analyzers on production lines, ensuring faster product design and increased collaboration, with AP reports from Quality Control that are trusted around the world.

### IEC60118-7 / ANSI S3.22 function library

APx511 supports a .NET library of functions that automate the tests described in IEC60118-7 and ANSI S3.22. For the production environment, these functions can be called from any .NET capable language (including LabVIEW) to control the APx511’s output and measurement settings.

For troubleshooting or test setup, the APx511 can be controlled by the standard APx500 software providing a rich graphical user interface and access to automated reporting, real-time signal monitors, high resolution FFTs and controls for limits & other settings.

In addition to standard audio tests such as level, distortion, frequency response, and attack & release, APx511 can measure battery current using its built-in battery simulator circuit.

### Built-in support for test chamber speaker, telecoil & microphone

The APx511 generator includes an in-line 4 watt loudspeaker amplifier (8 ohms) and a telecoil amplifier, allowing >110 dB SPL and up to 400 mA/m field strength from 100 Hz to 10 kHz in a test chamber such as the Interacoustics TBS25.

On the input side, APx511 supplies 24 V DC of constant current through a single BNC for a pre-polarized measurement microphone.

### Accessories

The APx HA-1 2cc coupler (for In-the-Ear models) and HA-2 2cc coupler (for Behind-the-Ear models) meet IEC 126 and are available for use with any 1/2 inch or 14mm measurement microphone. Couplers and measurement microphones are sold separately.

## APX R&D MODELS

- |               |  |
|---------------|--|
| <b>APx525</b> | 2 or 4 channel low noise analog, ideal for very high performance analog design |
| <b>APx585</b> | 8 or 16 channel low noise analog, ideal for simulating real-world environments |
|               | All R&D models support all I/O options listed to the right.                    |

APx511 is a member of the larger APx family, so tests and results can be shared or modified with any APx.

The APx500 software features one-click audio measurements, no-code automation, automatic reporting, real-time scope monitor, 1.2M point FFTs, documented API, PESQ perceptual evaluation measurements and more.

### DIGITAL I/O & CLOCK OPTIONS

- |                  |   |               |   |
|------------------|---|---------------|---|
| <b>Bluetooth</b> | Adds Bluetooth radios for wireless audio test             | <b>PDM</b>    | Adds direct connectivity for digital MEMS mics                      |
| <b>HMDI+ARC</b>  | Adds HMDI source, sink, monitor aux and ARC i/o           | <b>PDM 16</b> | Adds simultaneous 16 Channel input capability for digital MEMS mics |
| <b>AMC</b>       | Advanced Master Clock adds jitter clock, sync and trigger | <b>ADIO</b>   | Adds advanced Digital I/O and Advanced Master Clock modules         |
|                  |   | <b>DSIO</b>   | Adds interface for I <sup>2</sup> S, TDM, DSP                       |

## IEC60118-7 / ANSI S3.22 DLL

AP has written a library of functions that automate the tests described in IEC60118-7 and ANSI S3.22.

### Calibrate Microphone

Sets the measurement microphone sensitivity based on the output of an acoustic calibrator.

### Bitstream Level Acoustic output

Level the acoustic output of sound chamber.

### Feedback Check

With no generator on, have the analyzer check for feedback and return a Boolean result indicating if feedback is present.

### Peak Gain

Generate a sweep from 200 Hz to 8 kHz at user selected level of 50 or 60 dB SPL. Analyze the results to determine the peak signal level at frequencies from 200 Hz to 8 kHz in 100 Hz steps and the frequency at which it occurs.

### HFA Gain Test

Measure the average acoustic gain at 1.0, 1.6, and 2.5 kHz with 50 and 60 dB SPL sine signal.

### Peak OSPL90

Generate a sweep from 200 Hz to 8 kHz at 90 dB SPL. Analyze the results to determine the peak signal level at frequencies from 200 Hz to 8 kHz in 100 Hz steps and the frequency at which it occurs.

### HFAOSPL90

Measure average level in dB SPL at 1.0, 1.6 and 2.5 kHz with 90 dB SPL sine signal.

### Battery Current

Generate sine signal at 65 dB SPL, 1 kHz; wait 500 ms and measure battery current.

### EIN (Equivalent Input Noise)

Measure HFA Gain at 50 dB SPL (HFA50). Measure HFA Gain at 0 dB SPL (HFA0).  $EIN = HFA0 - HFA50$ .

### Distortion

Measure THD w/ 500 Hz & 800 Hz signal at 70 dB SPL; w/ 1.6 kHz signal at 65 dB SPL.

### Frequency Response

Generate a sweep from 200 Hz to 8 kHz at user selected level of 50 or 60 dB SPL. Return the level results at frequencies from 200 Hz to 8 kHz in 100 Hz steps.

### Input Output Response

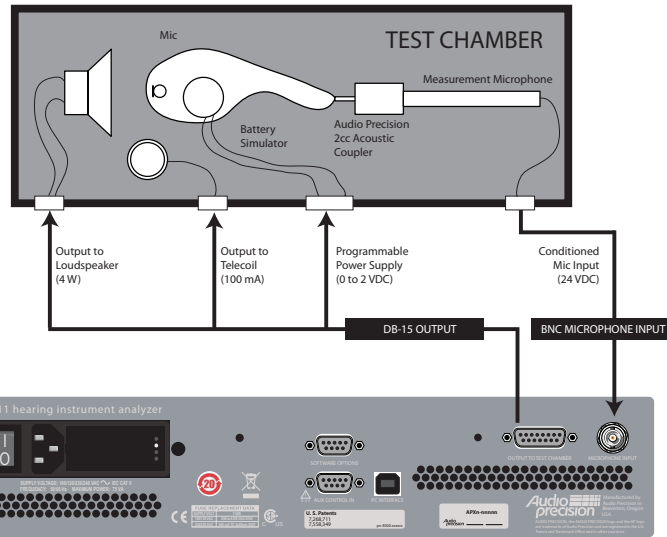
Conduct a Stepped Level Sweep at 2 kHz from 50 to 90 dB SPL in steps of 5 dB and return the results.

### Attack & Release

Measure attack and release times.

### Telecoil Sensitivity

Generate a stepped sine at 31.6 mA/m output and frequencies of 100, 1600 and 2,500 Hz and find the average HI output level.



All audio & power connections are located on the back of the instrument in line with production test standard practices. The microphone input is a standard BNC connector. The outputs connect via a standard DB-15 connector to reduce cabling errors in the production environment. A DB-15 break-out cable terminating in the required connectors for specific test chambers is provided with each APx511.

## KEY SPECIFICATIONS

### LOUDSPEAKER OUTPUT

**Maximum output**  
4 W RMS into 8  $\Omega$  (100 Hz - 10 kHz BW)

**THD+N**  
-80 dB @ 4 W / 8  $\Omega$  (100 Hz - 10 kHz BW)

**Frequency Response**  
 $\pm 0.1$  dB (100 Hz - 10 kHz)

**Amplitude Accuracy**  
 $\pm 0.03$  dB (+15° C to +30° C)

**Frequency Accuracy**  
2 ppm

### TELECOIL OUTPUT

**Maximum output**  
100 mA RMS up to 20  $\Omega$  (100 Hz - 10 kHz BW)  
(400 mA/m field strength in Interacoustics TBS25)

**Total Harmonic Distortion**  
-80 dB @ 100 mA into 1  $\Omega$  (100 Hz - 10 kHz BW)

**Frequency Response**  
 $\pm 0.1$  dB (100 Hz - 10 kHz)

**Frequency Accuracy**  
2 ppm

### BATTERY SIMULATOR

**Maximum Current**  
30 mA

**DC Output**  
Range: 0 to 2V; Resolution: 0.5 mV;  
Accuracy:  $\pm (1\% + 10 \text{ mV})$

**Output Impedance**  
4.3  $\Omega$

**Current Measurement**  
Range: 0 to 30mA; Resolution: 10 $\mu$ A;  
Accuracy:  $\pm 5\%$

SO/IEC:17025 ACCREDITED

Accredited by A2LA  
under ISO/IEC: 17025  
for equipment calibration



Specifications subject to change.

### MICROPHONE INPUT

#### Connector type

BNC (includes constant current power for a standard pre-polarized measurement microphone. CCP can be also disabled for use with an external microphone power supply)

#### Power

24V DC constant current

#### Maximum Input

8.5 Vrms (equivalent to 151 dB SPL at mic sensitivity of 12.5 mV/PA)

#### Residual Noise (20 kHz BW)

< 1.3  $\mu$ V (equivalent to 20 dB SPL at mic sensitivity of 12.5 mV/PA)

#### Frequency Response

$\pm 0.03$  dB (100 Hz - 20 kHz)

### OTHER MEASUREMENT FEATURES

In addition to IEC60118-7 / ANSI S3.22 tests, APx511 can operate as a fully functional audio analyzer.

#### Audio measurements

Level, Gain, Frequency response, THD+N, IMD, DC level, Noise, SNR, SINAD, Stepped frequency sweep, Stepped level sweep, Maximum output, PESQ (optional), more.

#### Real time signal monitors

Level, THD+N, Frequency, scope, FFT

#### Max FFT length

1248K points

#### Reporting

PDF, MS Word, CSV, PNG

#### Measurement recorder

Record all audio measurements continuously up to 160 hours

#### Measurement technologies

Sine, chirp, multitone

#### Derived results

stics, normalize, invert, compare, offset

#### API

.NET compatible plus LabVIEW driver