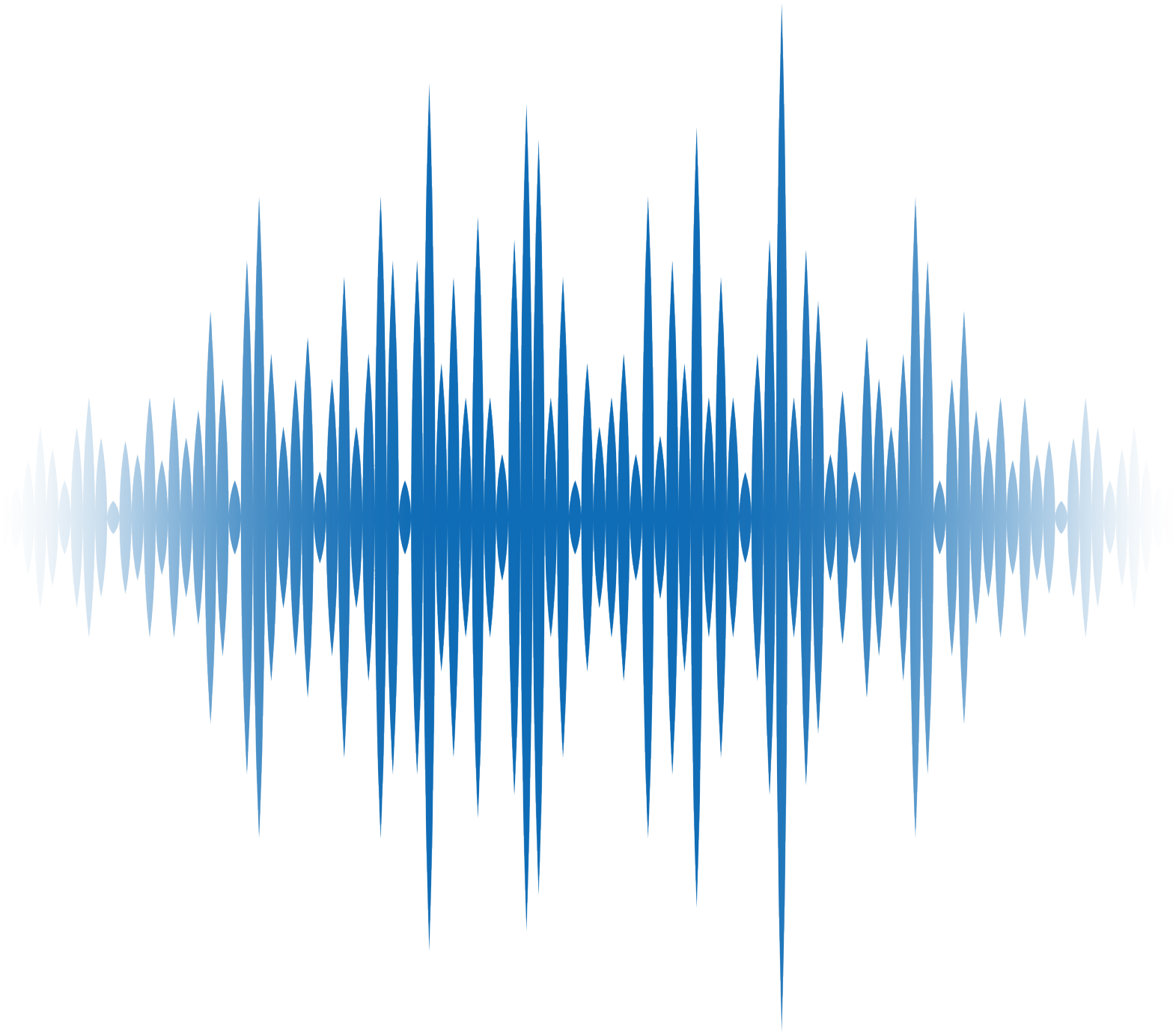
An Axiometrix Solutions Brand



AUDIO PRECISION

PRODUCT CATALOG

ES France - Département Tests & Mesures
127 rue de Buzenval BP 26 - 92380 Garches

Tél. 01 47 95 99 45

e-mail : tem@es-france.com
Site Web : www.es-france.com

AUDIO PRECISION (AP) is the recognized standard in audio test and measurement, providing the preeminent solutions for electronic and electro-acoustic test instrumentation. Since 1984, AP's analyzers have helped engineers to design and manufacture innovative solutions ranging from semiconductor devices to consumer, automotive, and professional audio products.

Today we continue to lead the way offering:

The highest performance analog audio instruments, the only audio analyzer with superior performance to AP is another AP instrument. The APx555 offers an incomparable 1 PPM, -120 dB analog system THD+N residual.

The widest library of digital audio interfaces and connectivity solutions, including:

- S/PDIF, AES3, & Toslink
- I^2S, TDM, DSP, and other chip level serial digital audio interfaces
- Bluetooth® Classic & Bluetooth LE Audio
- HDMI
- Pulse Density Modulation (PDM)
- Computer Audio Interface (ASIO or Windows Audio / WASAPI)
- Open Loop Test for universal test of devices, regardless of the physical interface

The easiest to use software interface making it possible to perform measurements within 5 minutes of receiving an analyzer, including generating reports, and setting up automated test sequences.

The longest track record of continuously updated and supported products in the industry. With an average of two APx500 software updates each year for the past 18 years. In addition, all APx analyzers are currently actively supported, serviced, and calibrated products. Audio Precision is the only audio analyzer on the market that ships from the factory with an accredited, ISO 17025 calibration.

With worldwide service and support, Audio Precision is unique in offering live, human tech support with 1st-party support in North America, Europe, and Asia. The sun never sets on Audio Precision, which is part of Axiometrix Solutions, a leading test solutions provider comprised of globally-recognized brands.

www.axiometrixsolutions.com

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CONTENTS

APx500 AUDIO ANALYZERS

APx audio analyzers represent the state of the art in audio test, with models and options to suit every need from R&D to high-speed production test. Industry-leading analog performance, digital audio interfaces to connect to all devices, and facilities for analog and electro-acoustic test.

APx555B

The highest performance analog audio analyzer in the world, with a groundbreaking -120 dB typical THD+N residual and < 1 µVrms of system noise. The ideal analyzer for semiconductor component testing and for all applications that push the limits of analog audio performance.

- 2 Ultra High-Performance Analog Generator Channels
- 2 Ultra High-Performance Analog Analyzer Channels
- 4 Available Digital Audio I/O Modules

APx52x

High-performance, general-purpose audio analyzer. With analog performance suitable for testing most devices and broad digital connectivity options, this instrument is suitable for the broadest range of audio test applications.

- 2 High-Performance Analog Generator Channels
- 2 (APx525) or 4 (APx526) High-Performance Analog Analyzer Channels
- 4 (APx525) or 2 (APx526) Available Digital Audio I/O Modules

APx516B

Value oriented, with flexible digital audio connectivity. The system of choice for testing consumer electronic devices and other applications that do not require the very highest level of analog performance.

- 2 Analog Generator Channels
- 2 Analog Analyzer Channels
- 1 Available Digital Audio I/O Module

APx58x

The highest analog performance available in a multi-channel platform. The ideal platform for testing of surround sound system, many channel power amplifiers, and other applications requiring high analog performance with many simultaneous input and output channels.

- 2 (APx582) or 8 (APx585, APx586) Analog Generator Channels
- 8 (APx582, APx585) or 16 (APx586) Analog Analyzer Channels
- 4 (APx582, APx585) or 2 (APx586) Available Digital Audio I/O Modules

APx500 AUDIO ANALYZERS (CONT'D)

APx517B ACOUSTIC ANALYZER

The only all-in-one electro-acoustic test system which integrates all the elements required to test loudspeakers, headphones, headsets, and microphones. Includes modern digital audio connectivity options.

- 1 Power Amplifier Output Channel
- 2 Headphone Output Channels
- Integrated, 4-wire Kelvin Impedance Measurement
- 2 Microphone Input Channels
- 1 Available Digital Audio I/O Module

APx511 HEARING AID AUDIO ANALYZER

The only completely integrated solution for testing hearing aids according to IEC60118-7 and ANSI S3.22.

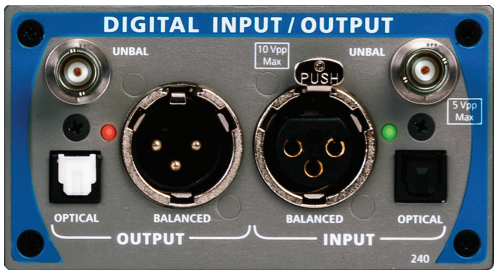
- 1 Power Amplifier Output Channel
- 1 Telecoil Output Channel
- 1 Battery Simulator Channel
- 1 Microphone Input Channel

APx500 FLEX SOFTWARE AUDIO ANALYZER

The most cost-effective solution, combine APx500 software with any 3rd party computer audio interface (ASIO or Windows Audio / WASAPI). Ideal for production test, portable electro-acoustic tests, or any application calling for the capabilities of APx audio analysis, but which does not require dedicated, high-performance hardware.

- Up to 16 Simultaneous ASIO or Windows Audio (WASAPI) Generator Channels
- Up to 16 Simultaneous ASIO or Windows Audio (WASAPI) Analyzer Channels

APx DIGITAL AUDIO I/O OPTIONS

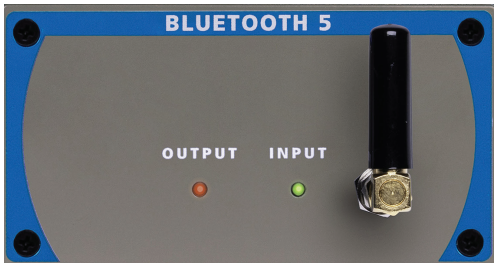


DIGITAL I/O, ADVANCED DIGITAL I/O

- S/PDIF, AES3, & Toslink digital audio interface
- 2 Channel I/O
- Jitter analysis with Advanced Digital I/O and Advanced Master Clock options

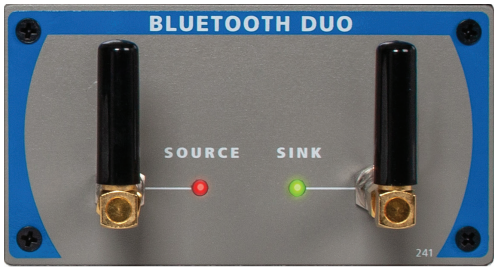
PROGRAMMABLE SERIAL I/O

- I²S, TDM, DSP, and other chip level serial audio data
- 16 Channel I/O
- Independent Tx, Rx clocks
- Programmable clock source or sync, word width, bit depth, NxFS, etc..
- Jitter analysis with Advanced Master Clock option



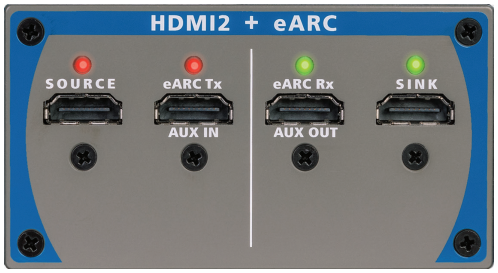
BLUETOOTH 5

- LE Audio
- Unicast Music & Voice
- Auracast
- LC3 Audio CODEC



BLUETOOTH DUO

- Source & Sink Testing
- Profiles: A2DP, HFP, HSP, and AVRCP
- CODECS: SBC, AAC, aptX, aptX-LL, aptX-HD, CVSD, and mSBC Sample Rates: 48, 44.1, 32, 16, and 8 kHz
- Programmable CODEC priority



HDMI2 + EARC

- 2.1 Source and Sink
- 1K, 4K, and 8K video resolution support
- 1.4 ARC Tx and Rx
- 2.1 eARC Tx and Rx
- Transmit and Receive pre-encoded Dolby and DTS audio Audio bit error rate test

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APx DIGITAL AUDIO I/O OPTIONS (CONT'D)

PDM

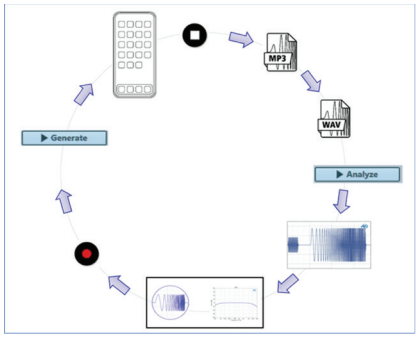
- 2 Channel Pulse Density Modulator (PDM) and demodulator
- x16-x800 4th or 5th order modulator
- x1 (Raw Bitstream) – x800 decimator
- Programmable DC power supply with Power Supply Rejection test functionality
- Clock source or sync
- Jitter analysis with Advanced Master Clock option

PDM16

- 16 Channel Pulse Density Demodulator, Input Only x32-x512 decimator
- MEMS microphone tesing
- Programable DC power supply

COMPUTER AUDIO INTERFACE (ASIO AND WINDOWS AUDIO)

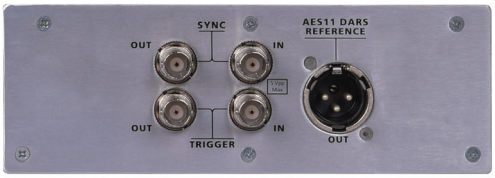
- Software interface to 3rd party data acquisition interfaces
- Up to 16 simultaneous I/O channels
- Interface to pro-audio standards including 802.11 AVB, Dante, MADI, etc…
- Interface to non-standard interfaces including A2B



FILE ANALYSIS & OPEN LOOP TEST

Test playback only and record only devices:

- Mobile handsets without requiring cell site simulator
- Smart speakers and devices without Internet connectivity
- Any device that digitally records and plays back audio



TRIGGER, SYNC AND JITTER

- The Advanced Master Clock (AMC) module handles input and output clock signals for synchronizing an APx with external equipment (or vice versa). AMC also provides jitter generation and measurement functionality for jitter-enabled I/O modules such as ADIO, PDM and PSIO.

APx COMPARISON

FEATURE	APx511B	APx516B	APx517B	APx525B
Analog Output Channels	1 (Power Amplifier) 1 (Telecoil) 1 (DC Battery Simulator)	2	1 (Power Amplifier) 2 (Headphone Amplifier)	2
Analog Input Channels	1 (Microphone) 1 (DC Battery Simulator Voltage or Current)	2	2 (Microphone Inputs)	2
Microphone Power	Yes (CCP)	No	Yes (CCP, DCV, Phantom Power)	No
Max Analog Output Level Sine, Balanced/Unbalanced	5.7 Vrms, 4 W into 8 Ω (Power Amplifier) 110 mA rms into 4 Ω (Telecoil)	14.4 / 7.2 Vrms	17 Vrms, 35 W into 2 - 16 Ω (Power Amp) 9 Vrms, 100 mW into 2 - 800 Ω (Headphone Amp) Integrated, impedance measurement	21.21 / 10.6 Vrms 26.66 / 13.33 Vrms (Option)
Max Input Level	23.9 Vpeak	125 Vpeak	40 Vpeak	230 Vpeak
Analog Generator Frequency Range	2 Hz - 21.6 kHz (44.1 kHz DAC)	DC - > 80.1 kHz (192 kHz DAC)	DC - > 80.1 kHz (192 kHz DAC)	DC - > 80.1 kHz (192 kHz DAC)
Analog Analyzer Bandwidth	< 10 Hz - > 90 kHz (192 kHz ADC) AC Coupled Mic Input	DC - > 90 kHz (192 kHz ADC) AC/DC Selectable Input Coupling	DC - > 90 kHz (192 kHz ADC) AC/DC Selectable Input Coupling	DC - > 90 kHz (192 kHz ADC) 1 MHz (2.5 MHz ADC) Option AC/DC Selectable Input Coupling
Analog Residual THD+N (20 Hz - 20 kHz)	-80 dB	-100 dB -109 dB Typical	-80 dB (Power Amplifier) -84 dB (Headphone Amplifier) -98 dB (Microphone Inputs)	-105 dB -108 dB Typical -110 dB Option
Analog Residual Noise (20 Hz - 20 kHz)	2.0 µVrms	2.0 µVrms	35 µVrms (Power Amplifier) 15 µVrms (Headphone Amplifier) 1.9 µVrms (Microphone Inputs)	1.3 µVrms
Square Wave Function Generator	No	No	No	Option
Sine Burst Function Generator	No	No	No	Option
Digital Audio I/O Modules	None	1	1	4
AES3/SPDIF/TOSLINK I/O	No	Option	Option	Option
HDMI2, ARC, eARC I/O	No	Option	Option	Option
Bluetooth 5.4 I/O	No	Option	Option	Option
Bluetooth 4.2 I/O	No	Option	Option	Option
PDM 2 Channel I/O	No	Option	Option	Option
PDM 16 Channel Input Only	No	Option	Option	Option
PSIO (I^2S, TDM, DSP serial data) I/O	No	Option	Option	Option
Jitter Analysis, Clock Sync. I/O, & Trigger I/O	No	No	No	Option

APx COMPARISON (CONT'D)

FEATURE	APx526B	APx582B	APx585B	APx586B	APx555B
Analog Output Channels	2	2	8	8	2
Analog Input Channels	4	8	8	16	2
Microphone Power	No	No	No	No	No
Max Analog Output Level Sine, Balanced/Unbalanced	21.21 / 10.6 Vrms 26.66 / 13.33 Vrms (Option)	26.66 / 13.33 Vrms	14.4 / 7.2 Vrms	14.4 / 7.2 Vrms	26.66 / 13.33 Vrms
Max Input Level	230 Vpeak	160 Vpeak	160 Vpeak	160 Vpeak	230 Vpeak
Analog Generator Frequency Range	DC - > 80.1 kHz (192 kHz DAC)	DC - > 80.1 kHz (192 kHz DAC)	DC - > 80.1 kHz (192 kHz DAC)	DC - > 80.1 kHz (192 kHz DAC)	DC - > 80.1 kHz (192 kHz DAC) 5 Hz - 204.75 kHz (High Performance Sine Gen.)
Analog Analyzer Bandwidth	DC - > 90 kHz (192 kHz ADC) 1 MHz (2.5 MHz ADC) Option AC/DC Selectable Input Coupling	DC - > 90 kHz (192 kHz ADC) DC Coupled Input	DC - > 90 kHz (192 kHz ADC) DC Coupled Input	DC - > 90 kHz (192 kHz ADC) DC Coupled Input	DC - > 90 kHz (192 kHz ADC) 1 MHz (2.5 MHz ADC) AC/DC Selectable Input Coupling
Analog Residual THD+N (20 Hz - 20 kHz)	-105 dB -108 dB Typical -110 dB Option	-103 dB	-103 dB	-103 dB	-117 dB < -120 dB Typical
Analog Residual Noise (20 Hz - 20 kHz)	1.3 µVrms	1.3 µVrms	1.3 µVrms	1.3 µVrms	≤ 1.0 µVrms
Square Wave Function Generator	Option	Option	No	No	Yes
Sine Burst Function Generator	No	No	No	No	Yes
Digital Audio I/O Modules	2	4	4	2	4
AES3/SPDIF/TOSLINK I/O	Option	Option	Option	Option	Option
HDMI2, ARC, eARC I/O	Option	Option	Option	Option	Option
Bluetooth 5.4 I/O	Option	Option	Option	Option	Option
Bluetooth 4.2 I/O	Option	Option	Option	Option	Option
PDM 2 Channel I/O	Option	Option	Option	Option	Option
PDM 16 Channel Input Only	Option	Option	Option	Option	Option
PSIO (I^2S, TDM, DSP serial data) I/O	Option	Option	Option	Option	Option
Jitter Analysis, Clock Sync. I/O,	Option	Option	Option	Option	Yes

APx500 AUDIO TEST SOFTWARE

A VERSATILE, POWERFUL AUDIO TEST EXPERIENCE

As an expertly designed platform, APx500 audio measurement software provides market-leading flexibility, scalability and usability, whether paired with an APx B Series audio analyzer or with an ASIO- or Windows Audio (WASAPI)-capable audio interface and APx500 Flex. This high-performance software offers two easy-to-use modes, Sequence Mode and Bench Mode

CODE-FREE AUTOMATION & COMPLETE API

APx500 Measurement Software is the most advanced audio measurement interface available. Complex procedures that include user prompts, limits, and calls to external applications can be created directly in the GUI, saving time and money while ensuring painless updates over time, as no development is require

Create custom interfaces and application-to-application automation using the comprehensive APx API for integration in any .NET compatible language like Python, C#. Also compatible with MATLAB, and LabVIEW development environments. Projects and automation can be shared with other APx units anywhere in the world.

SHARING PROJECTS & REPORTING RESULTS

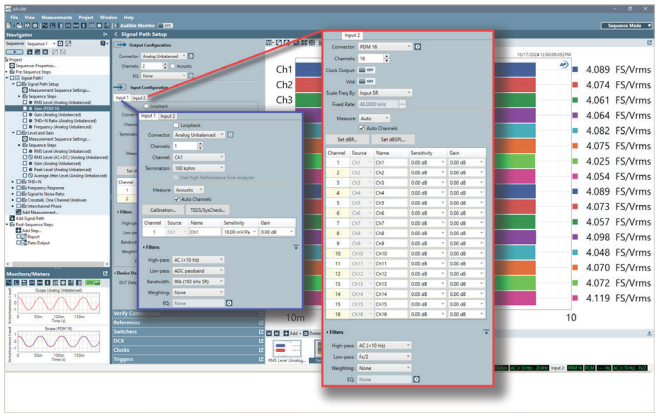
All settings for a test are saved in a single project file, making it easy to replicate test setups between R&D and production facilities anywhere in the world. Project files are compatible with all APx instruments and each project is self-contained, so there's never any worry about dependencies or broken links. Users can even embed waveform files and images within a project file.

For customers, contract manufacturers or management, APx automatically generates rich graphic reports, with highlighted pass / fail limits and options to export as PDF, HTML, Excel, CSV, RTF or MATLAB files.

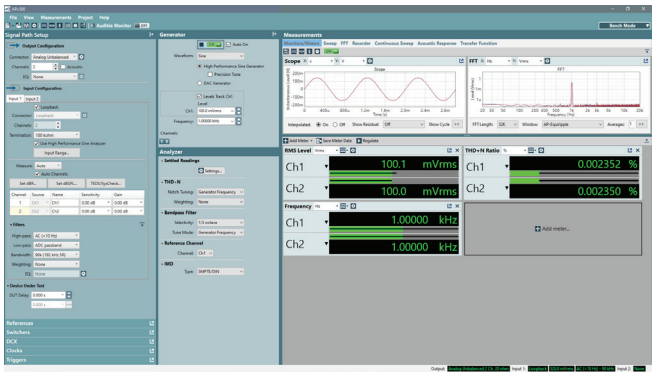
```python
import clr
# Import the APx500 API dlls
clr.AddReference(r"C:\Program Files\Audio Precision\APx500 9.2\API\AudioPrecision.API.dll")
clr.AddReference(r"C:\Program Files\Audio Precision\APx500 9.2\API\AudioPrecision.API2.dll")
from AudioPrecision.API import *

# Initialize APx500 reference
APx = APx500_Application()

# Load project and run the sequence
APx.OpenProject("example_project.approjx");
APx.Sequence.Run
```

```
Run
Run_MethodGroup
RunProductionTestSequence
```

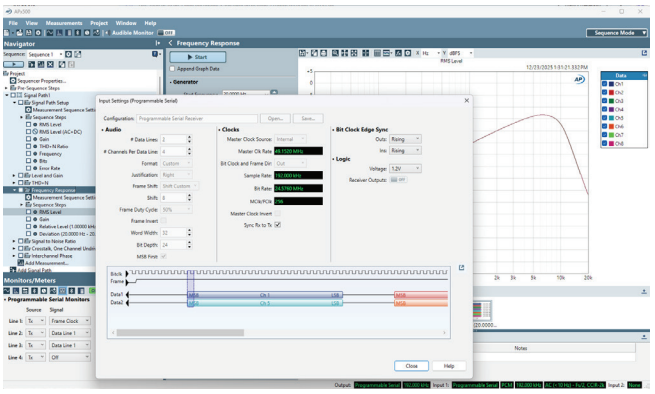
A simple example in Python loading a APx500 project and starting a measurement.



An illustration of the simultaneous multi-input capability of APx500 software, in this case an example application of 16 digital mics as the DUTs on Input 2 and an analog measurement mic as the reference on Input 1 (v6.0 or later).



APx500 software Bench Mode as an optional feature. For those power users eager to dive straight into their work upon launching the software, Relative to the standard Sequence Mode which mainly calculates in the frequency domain, Bench Mode tends to analyze in the time domain.



APx500 software generates and analyzes in both the analog and digital domain: I²S, TDM, PDM, BlueTooth and HDMI. The flexible digital serial setup screen shows detected clock rates and an "active timing diagram" for fast setup.

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APx500 SOFTWARE LICENSING OPTIONS

PERPETUAL LICENSING

All APx analyzers come standard with a perpetual, never expiring APx500 software license. See pages 10-11 for a table of which software options come standard and which are options.

New analyzers include a license for the major version of software available at the time of purchase.

New analyzers include a no cost update to the next, incremental major release of software available subsequently to the purchase of the analyzer.

A license to a major release of software includes the right to use all associated minor releases of software. Software options must be individually selected and purchased.

Software options purchased with an associated perpetual license are also perpetually licensed.

Future releases of software can be purchased via Upgrades or pre-purchased as Software Maintenance. Software Maintenance saves 30% or more versus Upgrades.

SUBSCRIPTION LICENSING

All APx analyzers are also available with a subscription license which grant a time limited right to use the APx500 software.

Subscriptions are available for terms of 1, 3, or 5 years.

Subscriptions grant access to all versions of software and all individual software options1.

Subscriptions are the most economical way to access the latest release and capabilities of APx500 software.

SOFTWARE UPGRADE OPTIONS		
	PERPETUAL LICENSE	**SUBSCRIPTION LICENSE**
Expiration	Never. A perpetual software license grants a permanent and non-expiring right to use the software	1, 3 or 5 year(s) A software subscription grants a time-limited license to access all software versions. 1-, 3- or 5-year subscriptions are available.
Additional Measurement Options	Does not include additional measurement options, which must be purchased separately. Purchased measurement options never expire.	Access to all optional APx measurements granted for duration of subscription (excluding POLQA) at no additional cost.
Software Upgrades	Will need to purchase each upgrade individually. If you skip an upgrade and decide you need one in the future, you may need to “catch up” by purchasing all the versions in between your current software version and the future one you are trying to receive.	You will receive a time-limited license to any/all APx software versions available, including future versions released during your subscription license period.

APx500 SW OPTIONS COMPARISON

	MEASUREMENT OR FUNCTION	APx500 FLEX, APx516, APx517	APx511, APx52x, APx58x, APx555	APx500 SUBSCRIPTION
CORE MEASUREMENTS	Level and Gain Measurement	Included	Included	Included
	THD+N/THD Distortion Analyzer	Included	Included	Included
	Loudspeaker Production Test Measurement	Included	Option	Included
	Stepped Frequency Sweep Analyzer	Included	Included	Included
	Pass/Fail Measurement	Included	Included	Included
	Signal Acquisition Measurement	Included	Included	Included
EXPANDED MEASUREMENTS	Crosstalk Measurements	Flex Pack 2 or Individual Option	Included	Included
	DC Level Tests	Flex Pack 2 or Individual Option	Included	Included
	Delay Measurement	Flex Pack 2 or Individual Option	Included	Included
	Frequency Counter	Flex Pack 2 or Individual Option	Included	Included
	Dedicated, High Speed Frequency Response Measurement	Flex Pack 2 or Individual Option	Included	Included
	Interchannel Phase Measurement	Flex Pack 2 or Individual Option	Included	Included
	X/Y, Interchannel Level Ratio Measurement	Flex Pack 2 or Individual Option	Included	Included
	Stripchart Measurement Recorder	Flex Pack 2 or Individual Option	Included	Included
	Total Noise (RMS) Measurement	Flex Pack 2 or Individual Option	Included	Included
	Quasi Peak (Q-peak) Noise Measurement	Flex Pack 2 or Individual Option	Included	Included
	Total Noise (RMS) Stripchart Recorder	Flex Pack 2 or Individual Option	Included	Included
	Signal-to-Noise Ratio Measurement	Flex Pack 2 or Individual Option	Included	Included
	SINAD Measurement	Flex Pack 2 or Individual Option	Included	Included
	Stepped Level Sweep, Amplitude Linearity Analyzer	Flex Pack 2 or Individual Option	Included	Included
ADVANCED MEASUREMENTS	Continuous Sweep (Farina Log Chirp) Analyzer	Flex Pack 3 or Individual Option	Included	Included
	Digital Error Rate Measurement	Flex Pack 3 or Individual Option	Included	Included
	Dynamic Range, Signal-to-Noise according to AES17 Measurement	Flex Pack 3 or Individual Option	Included	Included
	Inter-Modulation Distortion Analysis, including SMPTE & MOD	Flex Pack 3 or Individual Option	Included	Included
	Input Sample Rate Counter	Flex Pack 3 or Individual Option	Included	Included
	Maximum Output Level Measurement (Continuous)	Flex Pack 3 or Individual Option	Included	Included
	Maximum Output Level Measurement (Burst, According to CEA-2006)	Flex Pack 3 or Individual Option	Included	Included
	Power Bandwidth Measurement, Regulated Frequency Sweep Analyzer	Flex Pack 3 or Individual Option	Included	Included
	Multitone Analyzer	Flex Pack 3 or Individual Option	Included	Included
	Signal/FFT Analyzer	Flex Pack 3 or Individual Option	Included	Included

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APx500 SW OPTIONS COMPARISON (CONT'D)

	MEASUREMENT OR FUNCTION	APx500 FLEX, APx516, APx517	APx511, APx52x, APx58x, APx555	APx500 SUBSCRIPTION
ELECTRO-ACOUSTIC MEASUREMENTS	Acoustic Response Analyzer	Flex Pack 4 or Individual Option	Included, Rub & Buzz req. Option	Included
	Bandpass Signal Analysis	Flex Pack 4 or Individual Option	Included	Included
	Cumulative Spectral Decay, Waterfall Plots, Time-Frequency Analysis	Flex Pack 4 or Individual Option	Option	Included
	Impedance / Thiele-Small Driver Analysis	Flex Pack 4 or Individual Option	Option	Included
	Modulated Noise Driver Air Leak Detector	Flex Pack 4 or Individual Option	Option	Included
	Loudspeaker Polar Plots with Turntable Control	Flex Pack 4 or Individual Option	Option	Included
	Transfer Function, Dual-Channel FFT Analysis	Flex Pack 4 or Individual Option	Included	Included
LAB USE	Bench Mode	Option	Included (except APx511 N/A)	Included
3RD PARTY DATA ACQ	Up to 16 Ch. Computer Audio Interface (ASIO and Windows Audio / WASAPI)	Included	Included	Included
SPECIFIC HARDWARE REQUIRED	Jitter Analysis	N/A	Included (Req. Advanced Master Clock)	Included (Req. Advanced Master Clock)
	DIM (Dynamic Inter-Modulation) Analysis	N/A	Included (Req. Analog Function Gen.)	Included (Req. Analog Function Gen.)
	Dolby & DTS Encoded Audio Bit Error Test	Included (Req. Digital Audio Interface)	Included (Req. Digital Audio Interface)	Included (Req. Digital Audio Interface)
	Digital Audio Metadata Logic Stripchart Recorder	Included (Req. Digital Audio Interface)	Included (Req. Digital Audio Interface)	Included (Req. Digital Audio Interface)
	Transducer Electronic Data Sheet (TEDS) Analysis	Included (Req. TEDS hardware)	Included (Req. TEDS hardware)	Included (Req. TEDS hardware)
	Common Mode Rejection Ratio (CMRR) Measurement	Included (APx516)	Included (APx52x, APx58x, APx555)	Included (APx52x, APx58x, APx555)
	Common Mode Rejection Ratio (CMRR) according to IEC 60268 Measurement	N/A	Included (APx52x, APx555)	Included (APx52x, APx555)
	ADC Test Mode (Common Mode DC Offset for ADC test)	N/A	APx555 Option Only	APx555 Option Only
	Digital MEMS Mic Power Supply Test, includes PSR & Voltage Ramp	Included (Req. 2 Ch. PDM module)	Included (Req. 2 Ch. PDM module)	Included (Req. 2 Ch. PDM module)
SPEECH QUALITY	Speech Transmission Index (STI)	Option	Option	Included
	Articulation Band Correlation Modified Rhyme Test (ABC-MRT)	Option	Option	Included
	POLQA v2 According to ITU-T P.863	Option	Option	Perpetual License Only

ANALOG & DIGITAL AUDIO TEST

From chip-level devices to complete systems, the range of products requiring some form of audio test, whether analog, digital or both, continues to expand in our technology-oriented world. Yet there are a few factors that make audio signals and their measurement unique.

WIDE FREQUENCY BANDWIDTH

A modern audio analyzer is asked to measure the DC offset of power amplifiers while observing the noise shaping and spurious out-of-band products emanating from Class-D chips and delta-sigma converters. Fortunately, Audio Precision analyzers offer industry leading performance and can resolve from DC to over 1 MHz with 1 Hz resolution.

LARGE AMPLITUDE RANGE

The total amplitude range of audio signals is also very large. A modern audio analyzer needs to observe the output of everything from state-of-the-art D/A converters with noise measured in single digit µV to power amplifiers with 200 V outputs. Additionally, while measuring a 200 Vrms sine wave, the system must still be able to resolve the amplitude of harmonic products that may be 60-100 dB lower in amplitude than the fundamental. The APx555B has a self-noise of less than 1 µV and a maximum input level of 300 Vrms, a range of 170 dB.

BRIDGING ANALOG AND DIGITAL AUDIO

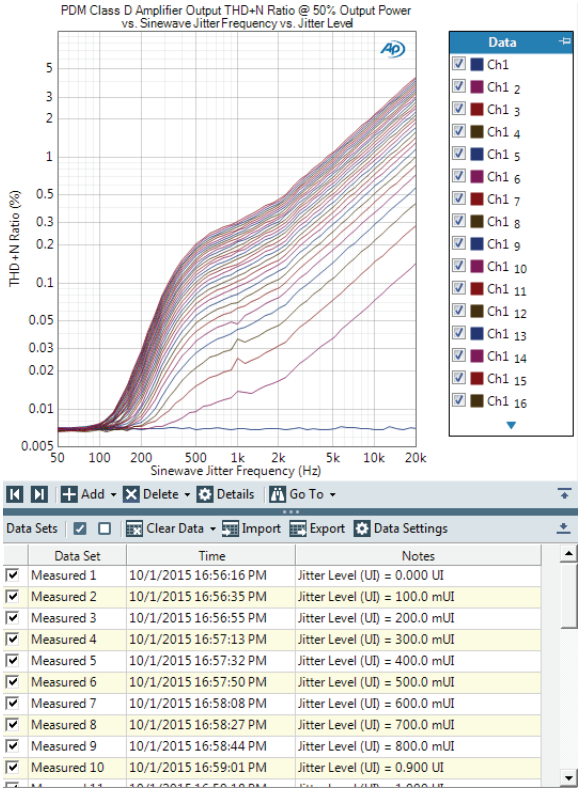
Adding to the capabilities of our APx analyzers is the widest array of digital interface options available. Every interface option is fully integrated into our software, eliminating uncertainty and enabling faster test setup. Our test software provides industry-standard measurement views and results that are trusted everywhere.

For specialized applications, APx offers jitter measurement, external triggering, and clock synchronization via the Advanced Master Clock (AMC) module (standard on the APx555B and optional for the APx52x and APx58x B Series analyzers).

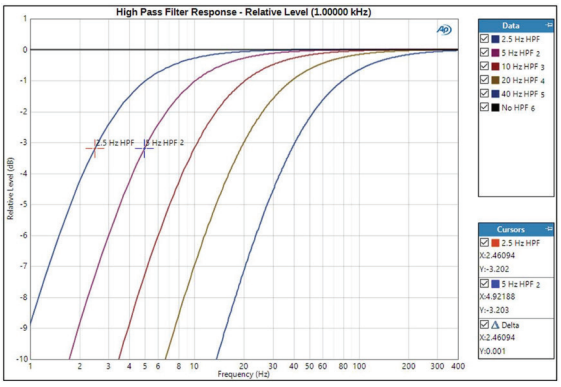
EXPANDING THE OPTIONS

The APx Computer Audio Interface (ASIO and Windows Audio / WASAPI) supports the use of APx500 audio measurement software with third-party audio interfaces, both analog and digital. Either stand-alone in production testing or mixed with AP hardware for R&D. These channels can be compared to other data streams (e.g transfer functions).

LTV-1 Light to voltage converter is an analyzer accessory that enables precise audio-to-video delay (A/V sync) measurements. It is useful for Dolby and DTS licensee compliance testing.



Quantify the interaction between digital and analog audio for a Class D amplifier. Pulse Density Modulation (PDM) Class D Amplifier Output THD+N Ratio as a function of sinewave jitter frequency and jitter level (from 0 to 1.5 UI (Unit Intervals).



Verify the performance of high pass filters typically used to remove low frequencies or in audio crossovers.

SPEECH QUALITY MEASUREMENT

APx500 MEASUREMENT SOFTWARE supports several innovative and popular perceptual audio tests used for evaluating speech quality or intelligibility. From testing mobile phones to VoIP networks to hands free devices, software options, POLQA, STI and ABC-MRT support designers' needs for perceptional audio analysis.

POLQA

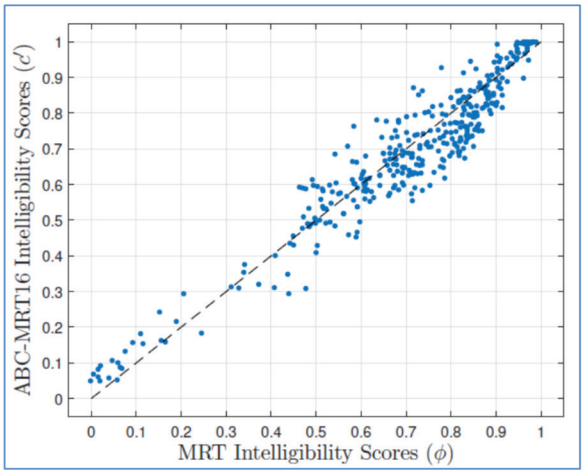
Wide Band Speech Quality

Perceptual Objective Listening Quality Analysis (POLQA) is licensed from OPTICOM as a successor to Perceptual Evaluation of Speech Quality (PESQ), supporting newer technologies like HD Voice, 3G, 4G/LTE and VoIP. Like PESQ, POLQA delivers perceptual audio measurement results which correlate to evaluations based on human subjects. Unlike PESQ, POLQA handles variations including wide band audio, acoustic transducers, DSP and level.

SPEECH TRANSMISSION INDEX (STI)

Speech Intelligibility (Noise-Based)

Using the APx STI measurement enables developers to verify the STI performance of their designs with AP's industry-leading instrumentation. Once the option is installed, the STIPA measurement can be easily incorporated into any measurement sequence. Additionally, the option includes a Speech Level measurement that conforms to Annex J of IEC 60268-16, for proper adjustment of the STIPA signal level.



ABC-MRT compared with standard Modified Rhyme Test (MRT) on 367 conditions (NB, WB, SWB and FB)

ARTICULATION-BAND CORRELATION MODIFIED RHYME TEST (ABC-MRT)

Speech Intelligibility (Voice-Based)

The Articulation-Band Correlation Modified Rhyme Test, ABC-MRT, option provides a convenient, automated method for measuring speech intelligibility that is proven to be highly correlated with subjective Modified Rhyme Test (MRT). As an objective estimate of speech intelligibility, it is fully integrated with APx B Series analyzers, including the test sequencer, limits and reporting, up to 16 acquisition channels and access to a wide variety of audio interfaces.

NFPA 1981 testing of self-contained breathing apparatus, SCBA, mounted on a G.R.A.S. KEMAR manikin in an anechoic chamber.
[Photo courtesy of Scott Safety, used by permission; for illustration only, not to scale.]

ACOUSTIC TEST

APx audio analyzers and software are the preferred choice for designing and testing soundbars, pro-audio powered speakers, smartphones, hands-free devices, and other products that integrate electronics, loudspeakers, and microphones.

FROM DESIGN TO PRODUCTION

As a software platform, APx500 audio measurement software provides a comprehensive solution for acoustic testing, allowing designers, manufacturing test technicians, and QA engineers to test electro-acoustic products end-to-end. Key capabilities such as Transfer Function (using speech, music, or noise signals to assess the complex frequency response, coherence, and impulse response of a device) and Multi-Input (providing simultaneous measurement on analog and digital signals) are complemented by a variety of electro-acoustic software options.

INSIGHTS FOR DEVELOPMENT

AP's waterfall and polar plots provide powerful visualization tools for understanding electro-acoustic behavior. The APx Waterfall Plot Utility creates three-dimensional graphs that display multiple curves of data that can represent changes over time or frequency. Spectrum or Cumulative Spectral Decay (CSD) views are available, with variable FFT length, number of slices and samples per shift.

PRODUCTION TESTING

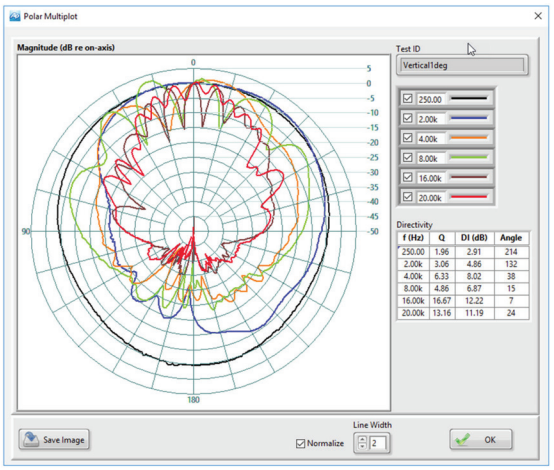
For the production test of speaker drivers—as well as finished loudspeakers, headphones, headsets, and microphones—manufacturers need look no further than the APx517B acoustic analyzer or APx500 Flex audio analyzer. These systems are purpose-built for manufacturing line test of acoustic products, whether using analog interfaces only (APx500 Flex) or both digital and analog (APx517B).

APx software offers the broadest set of methodologies available for detecting rub and buzz defects: Rub & Buzz, SoneTrac, High-Order Harmonic Distortion (HOHD), and Rub & Buzz Loudness.

ONE TOOL ACROSS THE ORGANIZATION

Finally, measurements, results, reports and automation can be easily shared across APx analyzers, allowing designers and production engineers (or OEMs and their contract manufacturers) to collaborate and ensure quality, even when separated by great distances.

IMP1 Impedance fixture measures the current through a driver's voice coil. Popular with production line testers using APx500 Flex, a computer audio interface (ASIO and Windows Audio/WASAPI), and an external amplifier.

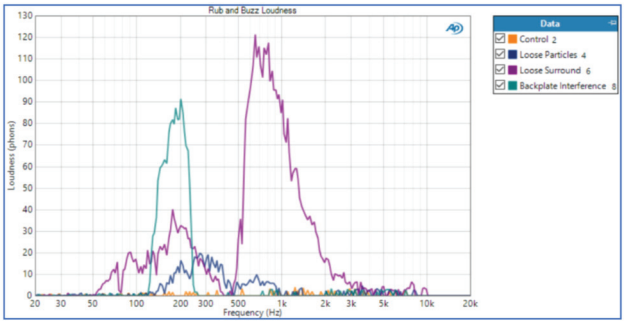


APx Polar Plot displays the response of loudspeakers and microphones relative to position in a plane, and supports popular turntables to produce full circle, semi-circle, quarter-circle and custom plots. No anechoic chamber required.

The **APx1701** Transducer Test Interface integrates:

- Instrument-grade amplifiers, 1 or 2 channels
- Current sensor for speaker impedance measurement
- Microphone power supplies with TEDS

It turns any APx hardware into a complete solution for speaker testing.



APx500 software (v6.1 or later) offers the broadest set of rub & buzz defect detection methodologies available to speaker designers and manufacturers: Rub & Buzz, SoneTrac, High-Order Harmonic Distortion (HOHD) and Rub & Buzz Loudness (shown above).

HEARING AID TESTING

Hearing aids are challenging from an audio test perspective. They are one of the few audio devices that have both acoustic input and acoustic output.

HEARING AID COMPLIANCE TESTING

In many countries, performance testing and reporting is required to sell hearing aids. In the US, the Food and Drug Administration (FDA) requires testing to ANSI S3.22. In Europe the applicable standard is IEC 60118.

The APx500 software features library of functions that automate the tests described in IEC 60118-7 and ANSI S3.22:

- Peak OSPL90
- EIN (Equivalent Input Noise)
- Frequency Response with limits
- Attack & Release

HEARING AID DEVELOPMENT TESTING

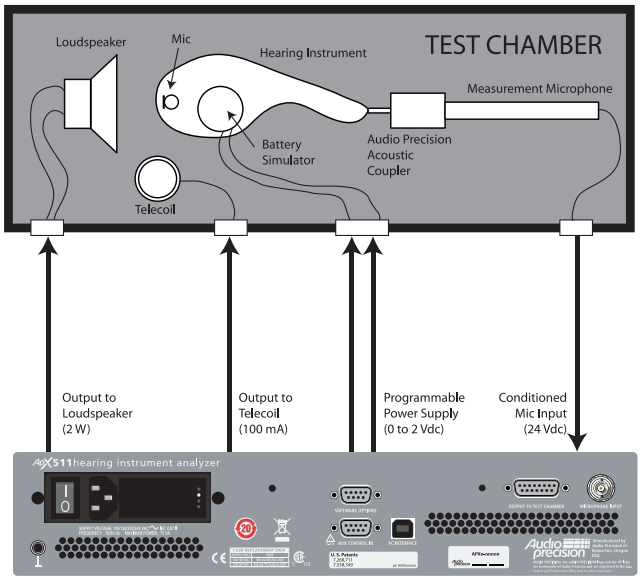
Premium hearing aids include extra features:

- noise reduction
- microphone arrays/beamforming
- wireless connectivity
- synchronization between left and right sides

Analyzers like the APx517, APx52x and APx555 can be expanded with digital audio I/O modules.

Hearing aid designers can evaluate the performance of components at the “chip level” like MEMS microphones, amplifiers and speakers using the PDM, PDM16 and Digital Serial modules.

Wireless connectivity can be tested with the Bluetooth 5 module.



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.

Even the simplest hearing aid has: one or more microphones, a computer doing DSP processing, a power amplifier, a loudspeaker, user controls powered, and battery power.

MICROPHONES

GRAS makes measurement microphones that can be used to measure levels from -2dBA and up to 193 dB, and frequencies from 0.09 Hz and up to 140 kHz.

On this page you can see only a handful of microphones from the GRAS range.

GRAS 42AG

SOUND CALIBRATOR, CLASS 1

The GRAS 42AG Multifunction Sound Calibrator is a portable, battery-operated sound source for calibration and check of microphones and sound level meters.

PRODUCT	DESCRIPTION	SENSITIVITY DYN RANGE	FREQ RANGE
46AE 	1/2" Free-field CCP measurement microphone set.Our most popular microphone for general acoustic measurements.	50 mV/Pa 17 dB(A) - 138 dB	3.15 Hz to 20 kHz
46A0 	1/2" Pressure-field CCP measurement microphone set. Optimized for measurements in near-field, flush-mounted and cavities.	12 mV/Pa 25 dB(A) - 150 dB	3.15 Hz to 20 kHz
46BE 	1/4" Free-field CCP measurement microphone set. For high frequency and/or high sound pressure level (SPL) measurements.	3.6 mV/Pa 35 dB(A) - 160 dB	4 Hz to 70 kHz
46BD 	1/4" Pressure-field CCP measurement microphone set. For high frequency and/or high sound pressure level (SPL) measurements.	1.45 mV/Pa 44 dB(A) - 168 dB	5 Hz to 80 kHz
40PK 	Cost-effective 1/4" Free-field CCP production line microphone.	18 mV/Pa 26 dB(A) - 145 dB	10 Hz to 20 kHz
40PM-1 	Cost-effective 1/4" Pressure CCP production line microphone with the revolutionary EQset technology that uses an internal DSP to fix the sensitivity and flatten the frequency response of the microphone.	20 mV/Pa 30 dB(A) - 125 dB	20 Hz to 20 kHz
47HC 	1/2" CCP Low-noise free-field microphone. Extra high-sensitivity to be able to measure the lowest sound pressure levels.	400 mV/Pa 6.5 dB(A) - 100 dB	10 Hz to 20 kHz

MICROPHONE POWER SUPPLIES AND AMPLIFIERS FOR SPEAKER TESTING

PRODUCT	DESCRIPTION	MIC POWER	TEDS	APx FLEX, SOUNDCARD COMPATIBLE
APx1701 	Two-channel microphone power supply with two-channel power amplifier with current-sense resistor for speaker testing. Includes 19" rack mount.	2-ch CCP 2-ch 48 V Phantom	Yes	No
GRAS 12Bx series 	Cost-effective microphone power supplies. Reads sensitivity from TEDS.	6 models: 1-, 2- or 4-ch CCP or LEMO	Yes	Yes
GRAS AG0003 	Inline adapter powers CCP microphones from a soundcard's 48 V Phantom Power.	1-ch CCP	No	Yes

TEST FIXTURES

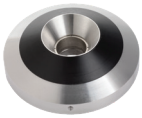
GRAS has a vast range of standalone ear simulators, test fixtures, and HATS (Head & Torso Simulators) that can be used for a wide range of applications such as testing earphones, headphones, headsets, hearing aids, loudspeakers, smart-speakers, telephones, speakerphones, and hearing protectors.

HEAD & TORSO SIMULATORS

The KEMAR manikin is the recognized industry standard for in-situ anthropomorphic testing of devices. It comes in many different configurations including different types of pinnae and ear canals, ear simulators, and a mouth simulator option.

45BB

RA0045 (711)



RA0039 (IEC60318-1)

RA0038 (2cc)

RA0252 (0.4cc)

EAR SIMULATORS

Ear simulators can be acquired standalone, as spare parts for ear simulator kits, test fixtures, and HATS, or to be used with microphones and preamplifiers you already own. GRAS has the largest range of ear simulators. They include the classics like:

- RA0039 for supra-aural earphones to IEC 60318-1
- RA0038 for hearing aids to IEC 60318-5 and ANSI S3.7
- RA0252 for high frequency testing of hearing aid
- Multiple versions of the legendary “711 coupler“

Among the special versions of the 711 coupler, we have a High-Frequency version and a Hi-Res version for reliable measurements up to 20 and 50 kHz respectively.

45CC

45CA

TEST FIXTURES

Each test fixture can be configured in multiple ways using different microphones, ear simulators, and even pinnae.

The 45CC is the most flexible platform as all its dimensions can be adjusted to accommodate devices and headphones of different types, sizes, and shapes. A mouth simulator can be added for headset testing.

The 45CA was originally designed for hearing protector test and therefore has a massive construction with high self-insertion loss which makes it a great solution for ANC testing of headphones.

43AG

43AC

43AA

EAR SIMULATOR KITS

These are ready-to-use tabletop test fixtures that are equipped with different types of ear simulators, microphones, preamplifiers, and even versions with realistic pinna and ear canals.

The GRAS 43AG Ear and Cheek Simulator, sometimes referred as the table-top KEMAR, offers you much of the KEMAR capability in a convenient and portable package.

The GRAS 43AC can be equipped with multiple versions of the 711 ear simulator for testing in-ear devices and the 43AA is perfect for testing on-ear and around-the-ear headphones.

ACCESSORIES

SWITCHING AMPLIFIER MEASUREMENT FILTERS

Audio Precision switching amplifier measurement filters are designed to be inserted between the device under test, typically a Class-D amplifier, and analyzer input, to reduce out-of-band switching signal components before measurement.

AUX-0100

Eight-channel passive low-pass filter, 20 Hz to 20 kHz passband.

AUX-0025

Two-channel passive filter, 20 Hz to 20 kHz passband.

AUX-0040

Two-channel passive filter, 20 Hz to 40 kHz passband.

AUDIO SWITCHERS

SWR-2755B

Audio Precision offers three models of the SWR-2755B audio switchers, which expand the input and output capabilities of Audio Precision two-channel audio analyzers.

WARRANTY AND CALIBRATION

Warranty Information

Audio Precision is proud to offer a limited three-year warranty on its new products. Upgrades, used equipment, and cables have a one-year warranty. Service is warranted for 90 days.

When purchasing a new analyzer, the EWP2 option extends the hardware warranty an additional two years, for a total warranty period of five years.Any instrument covered under a valid Audio Precision new product warranty—where the damage is not caused by owner misuse or abuse—is repaired free of charge. If the repair is made within a year of purchase, the unit will also receive an Accredited Calibration (Service B). If the unit is more than one year old, calibration is not included automatically, though it can be ordered at an extra charge.

Accredited Calibration Lab

Ensuring documented and traceable verification of instrument performance

Audio Precision is accredited by the American Association for Laboratory Accreditation under ISO/IEC 17025:2017 for equipment calibration at our main factory in the USA. Calibration has been requested by many of our customers who need to use calibrated audio test instruments to meet their own Quality System Requirements.

Calibration provides documented and traceable verification that instruments meet or exceed performance as detailed in the calibration report. Accredited calibration adds a further degree of rigor to the calibration process, incorporating review and On-Site Assessment by recognized independent experts. With its 17025 accreditation, AP meets the highest standard of calibration performance.

- All new audio analyzers sold by AP include an Accredited Calibration when shipped from the Factory.
- AP offers Accredited Calibration of existing AP audio analyzers as part of our Service Offerings (Service B).

A2LA ACCREDITED
Certificate # 2527.01

AP LOCATIONS

Audio Precision Locations

- AP Headquarters & Factory
- Regional Offices
- Local Representatives and Partners

Audio Precision operates globally, with partners, offices, and support teams ready to assist you. Whether you're interested in discussing our products, scheduling a demo, or asking technical questions, we're here to help. Please visit us at **www.audioprecision.com**.

Axiometrix Solutions
9290 SW Nimbus Avenue
Beaverton, OR 97008 USA

UNITED STATES

9290 SW Nimbus Ave
Beaverton OR, USA 97008

525 Avis Drive, Suite 10
Ann Arbor, MI 48108

DENMARK

Skovlytoften 33, 2840 Holte, Denmark

GERMANY

Voltastraße 5, 13355 Berlin, Germany

CHINA

Room 502, Building T1
No.1398 Ali Center Shenchang Road
Minhang District
Shanghai, China, 201107

An Axiometrix Solutions Brand

ES France - Département Tests & Mesures
127 rue de Buzenval BP 26 - 92380 Garches

Tél. 01 47 95 99 45

e-mail : tem@es-france.com
Site Web : www.es-france.com

An Axiometrix Solutions Brand

ES France - Département Tests & Mesures
127 rue de Buzenval BP 26 - 92380 Garches

Tél. 01 47 95 99 45

e-mail : tem@es-france.com
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