

APx585/586

multichannel audio analyzers

Specifications



APx585 and 586 multichannel audio analyzers

Specifications for APx500 version 2.1



**Audio
precision**

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Specifications

APx585 and 586 multichannel audio analyzers

with APx500 v2.1 measurement software

Characteristic	Specifications	Supplemental Information
<u>ANALOG GENERATOR</u>		
Number of Channels	8, independent amplitude control	<i>DAC sample rate = 192 ks/s.</i>
Waveforms	Sine, continuously swept-sine, IMD test signals (SMPTE, MOD, DFD)	
Sine Characteristics		
Frequency Range	5 Hz to 80.1 kHz	<i>Frequency setting resolution is typically $192 \text{ kHz} / (2^{32}) = 45 \text{ } \mu\text{Hz}$</i>
Flatness (1 kHz ref)		<i>Typically <0.003 dB.</i>
10 Hz to 20 kHz	$\pm 0.008 \text{ dB}$	
20 kHz to 50 kHz	$\pm 0.030 \text{ dB}$	
50 kHz to 80 kHz	$\pm 0.10 \text{ dB}$	
Residual THD+N ^{1,2}		
30 Hz–20 kHz	$\leq (-103 \text{ dB} + 1.4 \text{ } \mu\text{V})$	
20 Hz–30 Hz	$\leq (-102 \text{ dB} + 1.4 \text{ } \mu\text{V})$	
IMD Test Signals		
<u>SMPTE & MOD</u>		
LF Tone Range	40 Hz to 1 kHz	
HF Tone Range	2 kHz to 20 kHz	<i>HF tone must be $\geq 6 \cdot$ LF tone.</i>
Mix Ratio	10:1, 4:1 or 1:1 (LF:HF)	<i>4:1 maximum with SMPTE signal.</i>
Residual IMD ^{1,2,3}	$\leq 0.0025\% [-92 \text{ dB}]$	

Characteristic	Specifications	Supplemental Information
DFD		
Tone Pair Mean Range	2.5 kHz to 20 kHz	$F_{mean} = (F1 + F2)/2.$ $F_{diff} = F2-F1 ;$ F_{mean} must be $\geq 6 \cdot F_{diff}.$
Tone Pair Difference Range	80 Hz to 2.0 kHz	
Residual IMD ^{1,2,3}	$\leq 0.0010\%$ [-100 dB]	
Frequency Accuracy	$\pm 0.0003\%$ [3 PPM]	
Amplitude Range (all Waveforms)		
Balanced	< 1 μ Vrms to 14.40 Vrms [40.72 Vpp]	<i>Will drive 600 Ω load to +24.0 dBm.</i>
Unbalanced	< 1 μ Vrms to 7.20 Vrms [20.36 Vpp]	
Amplitude Accuracy (1 kHz)		
+15° C to +30° C	± 0.03 dB [$\pm 0.35\%$]	
0° C to +45° C	± 0.05 dB [$\pm 0.58\%$]	
Source Resistance (Rs)		
Balanced	100 Ω , ± 1 Ω	<i>Grounded, symmetrical</i> <i>Semi-floating ($Z_f \approx 50$ Ω 22 nF).</i>
Unbalanced	50 Ω , ± 1 Ω	
Max Output Current	Sum of all outputs must be ≤ 180 mA, typically >30 mA peak per channel.	
Crosstalk¹		
Balanced	$\leq (-100$ dB + 1 μ V) to 20 kHz	<i>With AP cable PN 4150.0001.</i>
Unbalanced	$\leq (-115$ dB + 1 μ V) to 20 kHz	
Residual DC Offset	$\pm(0.25\%$ of Vrms setting + 250 μ V)	

Characteristic	Specifications	Supplemental Information
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ANALOG ANALYZER

Number of Channels

APx585	8, independently auto-ranging
APx586	16, independently auto-ranging

*max ADC sample rate = 192 ks/s.
max ADC sample rate = 96 ks/s
when >8 channels are active;
192 ks/s if 8 or less are active.*

Input Ranges

0.32 Vrms to 100 Vrms, 10 dB steps; ≈10–15% over-range in each range	<i>Maximum rated input is 110 Vrms, or ±155 Vpk (dc to 20 kHz).</i>
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Input Impedance

Balanced	100 kΩ ≈230 pF, each side to gnd
Unbalanced	100 kΩ ≈230 pF, to BNC shield

Semi-floating ($Z_f \approx 500 \Omega \parallel 22 \text{ nF}$).

Input Coupling

DC, all ranges

*Input bias current is typically 0.25 μA to
0.35 μA.*

Common Mode Rejection (Bal)

320 mV, 1 V, 3.2 V ranges	≥ 70 dB, 5 Hz to 20 kHz
10 V range	≥ 50 dB, 5 Hz to 20 kHz
32 V range	≥ 50 dB, 5 Hz to 20 kHz
100 V range	≥ 45 dB, 5 Hz to 20 kHz

*Maximum linear input signal range, each
side to ground:
±6 Vpk
±15.5 Vpk
±60 Vpk
±155 Vpk*

Input Related Crosstalk

Balanced	≤ (–100 dB + 1 μV) to 20 kHz
Unbalanced	≤ (–115 dB + 1 μV) to 20 kHz

With AP cable PN 4150.0001.

Level (Amplitude) Measurement

Range	< 1 μVrms to 110 Vrms
Accuracy (1 kHz)	
+15° C to +30° C	±0.03 dB [±0.35%]
0° C to +45° C	±0.05 dB [±0.58%]
Flatness (1 kHz ref)	
10 Hz to 20 kHz	±0.008 dB
20 kHz to 50 kHz	±0.030 dB
50 kHz to 80 kHz	±0.10 dB

Typically < 0.003 dB.

Residual Noise (inputs shorted)

≤ 1.3 μVrms, 20 kHz BW

Typically < 8.1 nV/root-Hz at 1 kHz.

Characteristic	Specifications	Supplemental Information
THD+N Measurement		
Fundamental Range	5 Hz to 80 kHz	
Measurement Range	0 to 100%	
Accuracy	±0.3 dB	
Residual THD+N ^{1,2}		
30 Hz–20 kHz	≤ (−103 dB + 1.4 μV)	
20 Hz–30 Hz	≤ (−102 dB + 1.4 μV)	
Level & THD+N Response		
Weighting	High-pass (None, 20, 30, 50, 70, 100, 200, 300 or 400 Hz), A-wtd, CCIR-2k, CCITT or C-message	
Bandwidth (BW)	3 kHz, 8 kHz, 15 kHz, 20 kHz, 22 kHz, 30 kHz, 40 kHz, 50 kHz, 80 kHz or None	<i>All selections except "None" exceed AES17 for roll-off characteristics.</i>
IMD Measurement		
Test Signal Compatibility		
SMPTE & MOD	Any combination of 40 Hz–1 kHz (LF) and 2 kHz–20 kHz (HF), mixed in any ratio from 1:1 to 10:1 (LF:HF)	<i>HF tone must be ≥ 6 • LF tone.</i>
DFD	Any two-tone combination with mean frequency of 2.5 kHz–50 kHz and a difference frequency of 80 Hz–2.0 kHz	<i>F_{mean} must be ≥ 6 • F_{diff}.</i>
IMD Measured		
SMPTE	Amplitude modulation of HF tone.	<i>Measurement BW is typ. 40–500 Hz. Use "d2+d3" for measurements per IEC60268.</i>
MOD & DFD	d2, d3, d2+d3, or d2+d3+d4+d5	
Measurement Range	0 to 20%	
Accuracy	±0.5 dB	
Residual IMD ^{1,2,3}		
SMPTE & MOD	≤ 0.0025% [−92 dB]	
DFD	≤ 0.0010% [−100 dB]	

Characteristic	Specifications	Supplemental Information
Frequency Measurement		
Range	< 5 Hz to 90 kHz	V_{in} must be ≥ 5 mV.
Accuracy	$\pm(0.0003\% + 100 \mu\text{Hz})$	
Resolution	6 digits	
Phase Measurement		
Range	± 180 deg	V_{in} must be ≥ 5 mV.
Accuracy	± 1 deg, 5 Hz to 5 kHz; ± 2 deg, 5 kHz to 20 kHz; ± 5 deg, 20 kHz to 50 kHz	
Resolution	0.001 deg	
DC Voltage Measurement		
Ranges	0.32 V to 100 V, 10 dB steps; ≈ 50 – 55% over-range in each range	Maximum rated input is ± 155 V.
Accuracy	$\pm(0.8\%$ reading + $600 \mu\text{V})$	Typically > 90 dB, 20 Hz to 20 kHz.
0.32 V range	$\pm(0.8\%$ reading + 0.1% range)	
1 V–100 V ranges		
Normal Mode Rejection		

Characteristic	Specifications	Supplemental Information
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DIGITAL I/O

DIGITAL OUTPUT RELATED:

Formats

Electrical, unbalanced	SPDIF-EIAJ per IEC60958, 0.5 Vpp or 1.00 Vpp ($\pm 10\%$) into 75 Ω	Output R is nominally 75 Ω .
Electrical, balanced	AES-EBU per AES3-1992, 5.00 Vpp ($\pm 10\%$) into 110 Ω	Output R is nominally 110 Ω .
Optical	Toslink®	TOTX-142L.

Sample Rate (SR) Range 22 kHz to 192 kHz

Sample Rate (SR) Accuracy $\pm 0.0003\%$ [3 PPM]

Channel Status Bits Full implementation per IEC60958, automatically set, common to all channels

User Bits & Validity Flag Set to 0, all channels

Residual Jitter

Electrical	Typically < 2 ns
Optical	Typically < 3 ns

EMBEDDED OUTPUT SIGNAL RELATED:

Waveforms Sine, continuously swept sine, IMD test signals (SMPTE, MOD, and DFD) 8–24 bit word width, triangular PDF dither.

Sine Characteristics

Frequency Range	5 Hz to $0.499 \cdot SR$
Flatness	Typically < 0.0005 dB
Harmonics & Spurious Products	Typically < -160 dB

IMD Test Signals

SMPTE & MOD

LF Tone Range	40 Hz to 1 kHz	
HF Tone Range	2 kHz to $(0.499 \cdot SR)$ or 20 kHz, whichever is lower	HF tone must be $\geq 6 \cdot LF$ tone.
Mix Ratio	10:1, 4:1 or 1:1 (LF:HF)	4:1 maximum with SMPTE signal
Residual IMD ¹	Typically < -136 dB, 4:1	

Characteristic

Specifications

Supplemental Information

DFD

Tone Pair Mean Range

2.5 kHz to $(0.499 \cdot SR - F_{\text{mean}} / 2)$ or
20 kHz, whichever is lower

$$F_{\text{mean}} = (F1 + F2)/2.$$

Tone Pair Difference Range

80 Hz to 2.0 kHz

$$F_{\text{diff}} = |F2 - F1|;$$

$$F_{\text{mean}} \text{ must be } \geq 6 \cdot F_{\text{diff}}.$$

Residual IMD¹

Typically < -148 dB

Characteristic	Specifications	Supplemental Information
<i>DIGITAL INPUT RELATED:</i>		
Formats		
Electrical	SPDIF-EIAJ per IEC60958 (unbal). Input R is selectable 75 Ω or \approx 23 k Ω AES-EBU per AES3-1992. Input R is selectable 110 Ω or \approx 2 k Ω .	
Optical	Toslink®	TORX-142L.
Sample Rate Range	22 kHz to 192 kHz	
<i>EMBEDDED INPUT SIGNAL RELATED:</i>		
Level (Amplitude) Measurement		
Measurement Range	< -120 dBFS to +3 dBFS	
Accuracy (1 kHz)	Typically < 0.001 dB	
Flatness	Typically < 0.001 dB	
Residual Noise	Typically < -140 dBFS, 20 kHz BW	
THD+N Measurement		
Fundamental Range	5 Hz to 0.49 • SR or 50 kHz, whichever is lower	<i>Tuning can be set to track counter reading or generator setting.</i>
Measurement Range	0 to 100%	
Accuracy	\pm 0.5 dB	<i>Exclude band from 0.70–1.40 F₀.</i>
Residual THD+N ¹	Typically < -140 dBFS	
Notch Tuning Modes	Auto for meters, gen-track for graphs	
Level & THD+N Filters		
Weighting	High-pass (None, 20, 30, 50, 70, 100, 200, 300 or 400 Hz), A-wtd, CCIR-2k, CCITT or C-message	
Bandwidth (BW)	3 kHz, 8 kHz, 15 kHz, 20 kHz, 22 kHz, 30 kHz, 40 kHz, 50 kHz, 80 kHz or None (typ >90k)	<i>Filter selection limited by sample rate. All selections except "None" exceed AES17 recommendations for roll-off and stop-band attenuation.</i>

Characteristic	Specifications	Supplemental Information
IMD Measurement		
Test Signal Compatibility SMPTE & MOD	Any combination of 40 Hz–1 kHz (LF) and 2 kHz–20 kHz (HF), mixed in any ratio from 1:1 to 10:1 (LF:HF)	<i>HF tone must be $\geq 6 \cdot$ LF tone.</i>
DFD	Any two-tone combination with mean frequency of 2.5 kHz–50 kHz and a difference frequency of 80 Hz–2.0 kHz	<i>F_{mean} must be $\geq 6 \cdot F_{diff}$.</i>
IMD Measured SMPTE MOD & DFD	Amplitude modulation of HF tone. d2, d3, d2+d3, or d2+d3+d4+d5	<i>Measurement BW is typ. 40–500 Hz. Use “d2+d3” for measurements per IEC-60268.</i>
Measurement Range	0 to 20%	
Accuracy	± 0.5 dB	
Residual IMD ¹ SMPTE & MOD DFD	Typically < -136 dBFS, 4:1 Typically < -148 dBFS	
Frequency Measurement		
Range	< 5 Hz to $0.499 \cdot$ SR	
Accuracy	$\pm(0.0003\% + 100 \mu\text{Hz})$	
Resolution	6 digits	
Phase Measurement		
Measurement Range	± 180 deg, 5 Hz to $0.499 \cdot$ SR	
Accuracy	Typically < 0.001 deg	
Resolution	0.001 deg	

Characteristic	Specifications	Supplemental Information
<u>GENERAL/ENVIRONMENTAL</u>		
Power Requirements	100–240 Vac \pm 10% (90–264 Vac), 50–60 Hz, with safety ground via approved power cord, 160 VA max.	
Temperature Range		
Operating	0° C to +45° C	
Storage	–40° C to +75° C	
Humidity	90% to +40° C (non-condensing)	
Max Operating Altitude	3000 m	
Stabilization Time	20 minutes	<i>Allow 60 minutes if unit has been exposed to significantly different environmental conditions before being turned on, or if unit is to be calibrated or adjusted.</i>
EMC	Complies with 89/336/EEC, IEC 61326-1: ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL AND LABORATORY USE -EMC REQUIREMENTS - PART 1: GENERAL REQUIREMENTS, CISPR 11/22 (class B), and FCC 15 sub J (class B).	<i>Emission and immunity levels are influenced by the shielding performance of interface and signal cables attached to the instrument. EMC compliance was demonstrated using Audio Precision cables.</i>

Characteristic	Specifications	Supplemental Information
Dimensions		
Width	432 mm (17.0 inches)	
Height	129 mm (5.08 inches)	
Depth	467 mm (18.4 inches)	
Weight	11.3 kg [24.8 lbs] for APx585 11.5 kg [25.3 lbs] for APx586	
Safety	Complies with: 73/23/EEC, 93/68/EEC, and EN61010-1 2001, Equipment Class I, Installation Category II, Pollution Degree 2, Measurement Category I. CAN/CSA-C22.2 No 1010.1-04, Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements (with Amendment 1). UL Std No 3111-1, Equipment for Measurement Use; Part I: General Requirements.	

Notes to Specifications

1. System specification including contributions from both generator and analyzer. Generator-only and analyzer-only contributions are typically less.
2. Generator load must be $\geq 600 \Omega$ balanced or $\geq 300 \Omega$ unbalanced for specified performance.
3. Analyzer input must be ≥ 100 mV for specified performance. Analyzer set to measure "d2+d3" IMD products for MOD and DFD modes.
4. Sample rate (SR) must be ≥ 27 kHz for specified performance. Jitter analyzer set for 700 Hz highpass response per AES3-1992.



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