Audio precision®

Testing for Optimal Results

ATS-1

Audio Precision Quality in a Low-Cost, Stand-Alone Test Set

Unmatched Value

(ES) Equipements Scientifiques SA - Département Tests Energie Mesures - 127 rue de Buzenval BP 26 - 92380 Garches
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ATS-1: Audio Precision Quality in a Stand-Alone Package

The ATS-1 family of audio test instruments—at home on the bench, or in a test rack under GPIB control.

With thousands of units sold, you'll find the ATS-1 family of audio analyzers in operation around the world in maintenance, engineering and production facilities. Whether in broadcast, communications, bench or production use, ATS-1 offers a complete easy-to-use audio test set ready for almost any environment. With twelve different measurement functions selectable at the push of a button, ATS-1 is comprehensive while remaining user-friendly. Its popularity is no less due to its outstanding performance specifications; yet ATS-1 is as affordable as lower-performing test sets.

Analog Only or full Dual Domain—Analog and Digital

The ATS-1 Access

ATS-1 *Access* includes comprehensive analog generation and measurement, with two outputs and two inputs. Easy-to-set-up sweep capability produces graphs of frequency response, distortion vs. frequency and even amplitude sweeps. Non-volatile storage of up to 30 tests allows easy one-button recall of your favorite test setup. Connect ATS-1 to a compatible printer and produce reports incorporating high-resolution graphs. If you work with digital audio, the ATS-1 Dual Domain® model adds AES3/SPDIF audio and interface measurement capabilities to the comprehensive analog capabilities of the ATS-1 family.

Analog+Digital+AES3/SPDIF: the ATS-1 Dual Domain

ATS-1 Dual Domain® is a comprehensive audio test set for both analog and digital audio, as well as for generation and measurement of AES3/SPDIF digital interface characteristics such as jitter. Like our 2700 Series family of instruments, ATS-1 Dual Domain features true dual domain architecture. Digital signals are generated and measured purely in the digital domain, resulting in the extremely low distortion and noise residuals necessary for making useful digital audio measurements.

System replacement for obsolete equipment:

HP8903B emulation mode
over HPIB (GPIB)

Unparalleled Precision

Low Distortion

Analog System THD+N 80 kHz BW **–92 dB**
Digital Distortion THD+N ≤**–140 dB**

High Analog Bandwidth

Signal Generation to **120 kHz**

Low Noise

22 Hz–22 kHz **< –114 dBu**
A-weighted **< –118 dBu**

Wide Input Voltage Range

Input Range 80 mV–250 V in 10 dB steps

Flat Response

20 Hz–20 kHz **±0.05 dB**

Low Crosstalk

Input **< –120 dB**
Output **< –110 dB**

Low Jitter

Generator **< 0.8 ns**
Analyzer **< 1.6 ns**

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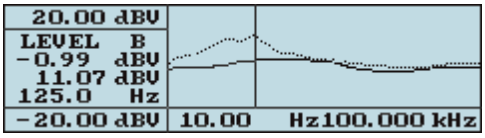
Performance, Measurement Power, and Ease-of-Use

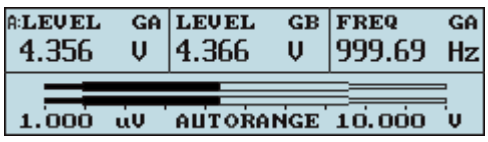
Easy to Use

Measurement functions are simply selected from the front panel. Just press a button

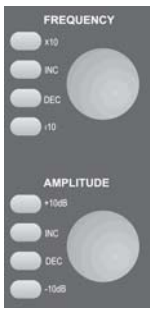
and make the measurement. Selection of analog and digital inputs is clearly indicated on the front panel with LED legends. ATS-1 makes *graphs* of *swept measurements* in real time on the high contrast back-lit LCD display, including both frequency and amplitude sweeps. Hard copy high-resolution graphs,



compact screen-sized graphs or tabular data listings can be made from your ATS-1 to laser or ink jet printers at the touch of a button. *Bargraphs* can display measurements ranging from AC mains power line distortion to digital interface error rate ...and nearly everything in between. Sepa-



rate buttons and knobs provide independent control of frequency and amplitude. The buttons provide large and medium steps (decade and 1/3 octave steps for frequency, 10 dB and 1 dB for amplitude), with knobs for finer resolution. When not otherwise



used, the setting knobs and buttons also provide a convenient human interface for scrolling display cursors and for entry of other settings and data.

Stereo:

ATS-1 Dual Domain is a true two channel instrument. Both analog and digital level functions measure both inputs simultaneously. Phase and level ratio measurements are also available.

Full Range of Analog & Digital Testing Facilities:

ATS-1 Dual Domain provides complete and parallel measurement capabilities for both analog and digital audio signals. Measurements common to both domains include: Amplitude, Noise, Level (2 channels simultaneously), Frequency, Phase, THD+N, SMPTE/DIN, IMD, Crosstalk and Level Ratio. Standard A-weighting, CCIR 468, and LP/HP filters are included in both domains. RMS and quasi-peak (CCIR 468) detectors are available in both domains.

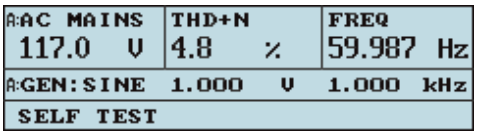
Analog Performance:

The low distortion transformer-coupled analog generator supplies a full +30.17 dBu (+29.5 dBm into 600 Ω) at selectable (50 Ω, 150 Ω or 600 Ω) source impedances. Extremely low analyzer noise and residual distortion support measurement of high performance digital devices.

Analog Convenience Functions:

In addition to the above measurements, the analog *GEN LOAD* function measures the input resistance of your device at any frequency you choose and makes swept impedance measurements (including loudspeakers).

AC MAINS CHECK measures the voltage, frequency and distortion of the power line without hazardous direct connections. BARGRAPH display in AC MAINS CHECK function provides a visible history of maximum and minimum mains voltage excursions.



The *dBg unit* (dB referred to the present analog generator amplitude) is useful for compression threshold measurements or rapid response sweeps at several different absolute levels, as well as for input to output gain/loss measurements.

600 Ω *Analog Input Terminations* are individually switchable for each channel of the analog analyzer.

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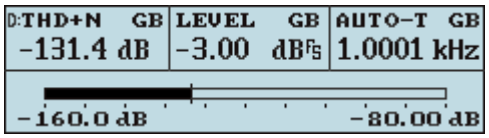
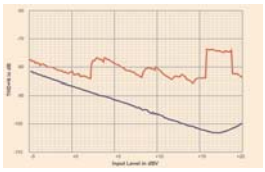
Comprehensive Analog and Digital Functions

Digital Performance:

ATS-1 Dual Domain uses a true DSP-implemented analyzer for digital measurements, which results in –130 dB residual THD+N, 0.01 dB flatness, and –140 dBFS residual noise. Other mixed-signal test sets in the



same price range have no digital analyzer, but use a D/A converter and an analog analyzer. These architectures "bottom out" at –70 dB to –84 dB residual THD+N (12–14 bit effective performance), and 0.1 dB flatness. With today's best A/D converters measuring –108 to –112 dB THD+N, their real performance is invisible to these mixed signal analyzers …buried under the analyzer's noise and distortion floor.



A competitive instrument lacking a DSP analyzer produces false THD+N readings (red trace) from a popular A/D converter; but both the ATS-1 Dual Domain and the Audio Precision 2700 Series graph the true performance of the converter (from 5 dB to 28 dB lower), as shown by the blue trace.

Separate & Independent Analog & Digital Generators:

Often necessary for dual domain testing. You may, for example, drive the inputs of an A/D converter with the low-distortion analog sine while simultaneously driving the converter's digital reference (house sync) input with the digital generator. Then, add jitter or vary the sample rate to see the effect on THD+N, IMD, or noise. Competitive units can drive only one domain at a time or use their analog generator to create the digital jitter, and thus can't make this measurement at all.

Separate Digital Inputs & Outputs:

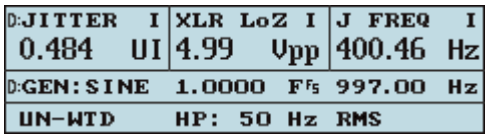
Three I/O formats: XLR, BNC, and optical (Toslink®). All are completely separate from the analog audio XLR connectors, permitting both digital and analog generators to operate simultaneously. No cable changes required to go from A/D to D/A to D/D to A/A testing of a digital tape machine, for example.

Digital & Analog Monitors:

Listen to all measurements in the digital and analog domains over the internal loudspeaker or a pair of headphones. In the analog domain, monitor signals or distortion. In the digital domain, the incoming signal, distortion, or jitter can all be monitored.

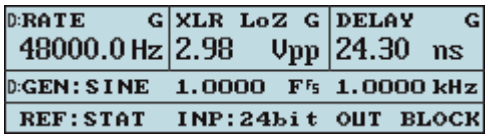
Jitter Meter:

ATS-1 Dual Domain includes jitter measurement in nanoseconds or in Unit Intervals. Two filter selections are provided for the jitter meter: a 700 Hz high-pass filter used for residual jitter measurements according to AES standards, and a 50 Hz high-pass filter for jitter response measurements.



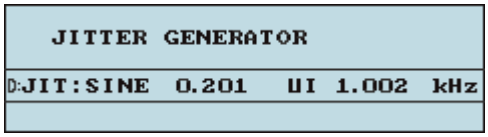
Other Interface Signal Measurements:

ATS-1 Dual Domain measures key digital I/O interface parameters in addition to jitter, including sample rate, AES signal voltage, frame delay through the device under test, and delay of the input signal relative to a house sync reference (frame or block).



Flexible Interface Impairment Simulation:

Flexible digital interface testing is vital for troubleshooting and verifying performance of digital audio at the systems level. ATS-1 Dual Domain allows simulation of real world transmission and interface problems.



Vary the digital output signal to test the acceptance range of your digital devices. Set sample rate anywhere from 28.8 kHz to 52.8 kHz, not just at the three standard frequencies. Inject jitter amplitude from 0 UI to 2.5 UI (415 ns at 48 kHz) in 0.01 UI (1.6 ns) steps, or 0 UI to 25.5 UI (4150 ns) in 0.1 UI (16 ns) steps.

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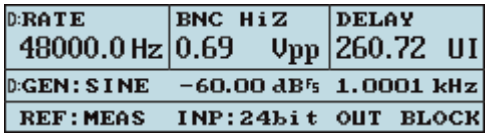
Injected jitter frequency can be set from 10 Hz to 38.8 kHz, not just to a fixed frequency. Adjust output signal amplitude continuously from zero to 5.12 Volts in 5 mV increments, not just at a few steps.

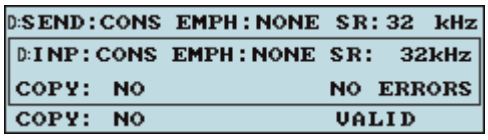
Independent Interface I/O Word Lengths:

Word length (resolution) of digital input and output are independently set from 16 to 24 bits. Output resolution is set to match the device under test to assure proper dither. Input resolution must be set to exclude signal in the AUX bits or other low-level bit activity meaningless to the desired measurement.



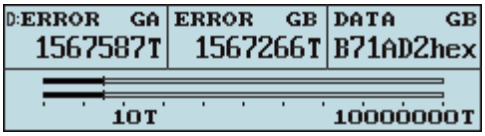
Independent Input & Output Sample Rates:

Lets you test sample rate converters. Measurement of the incoming embedded audio signal can be referred to the incoming sample rate, status byte indication of rate, or the outgoing generator rate.



Data✓ Error Testing Capability for Digital Audio Signals:

Stimulate the test device with random data and display current or totaled error measurements on both channels. The signal and



analysis techniques are compatible with the BITTEST feature of our System products, so you can test a transmission link end-to-end with an ATS-1 Dual Domain at one end and a System Two, Cascade or 2700 Series dual domain instrument at the other.

Other Digital Convenience Functions:

Digital Status bytes are displayed and set in high-level English.

Error flag displays for confidence, lock, coding, parity errors and the validity bit are included.
Additional active bit and actual bit displays on the panel help determine the word length of the incoming signal and detect stuck bits.

Digital Dither:

ATS-1 Dual Domain includes a full complement of dither selections—triangular and rectangular probability distribution functions; white or shaped spectrum.

Dither amplitude is automatically set to the proper value for the output word length and the selected probability function.

Sample & Frame Sync:

Synchronize ATS-1 Dual Domain sample and frame sync to the digital reference (house sync) input.

Digital Pass Mode:

Sends the input digital audio content to the output while modifying status bytes, validity bit, etc. ATS-1 Dual Domain can thus be used as a problem-solver between incompatible equipment.

Signal Monitoring Outputs:

A digital signal appropriate for syncing an external oscilloscope may be derived from the input sample rate, output sample rate, input block rate, output block rate, digital audio waveform, jitter signal, or the detected interface errors. A buffered version of the balanced AES3 signal from the XLR input is also available, which coupled with the high input impedance of the XLR in bridging mode allows non-intrusive digital line measurements with conventional ground-referenced oscilloscopes.

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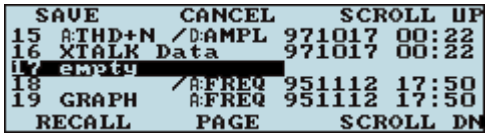
Versatile Connectivity

Choose among three different analog connector panels for your ATS-1. The connector panel can be mounted on the front of your instrument for convenience, or on the rear of the instrument if you'd prefer your ATS-1

hard-wired in a rack. All the panels come with extra dual banana and ground lugs. The XLR panel allows for either balanced or unbalanced measurements by using a simple dual banana-to-BNC (or to RCA phono) adapter.

Save & Recall Tests:

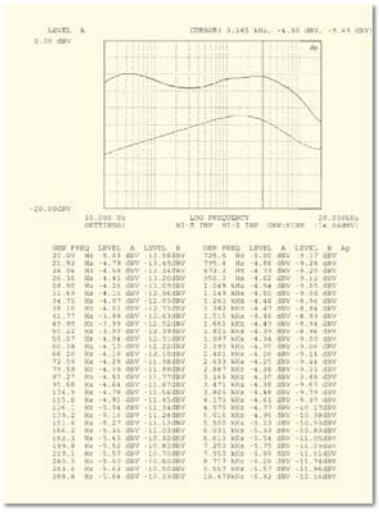
Save 30 instrument setups, including sweep results data, time-stamped from the internal clock calendar. Use for repeatable, easy bench and production testing or when in the field, for storing test



data to be printed or analyzed later. Each saved test includes all settings for the entire instrument, a default description or your own title for the test, the date and time, and the last test sweep result data.

Print Graphs And Test Results:

ATS-1 prints graphs, panel setups and measured data either to laser (PCL compatible) or inkjet printers. Front panel keys select two sizes of graph output (including cursor data), tabular sweep data, bargraphs and front panels for printing.



IEEE-488.2 GPIB Port:

An IEEE-488.2 GPIB interface port is included on the ATS-1. The commands closely model the front panel interface to make software development more productive. ATS-1 provides full query back of all manual settings and on-line help to speed up code development. Measurement sweep data is stored in the instrument for quick batch transfers without holding up GPIB bus traffic.

Settled GPIB Readings:

Reliable measurements are assured by algorithms inside the instrument which automatically compensate for varying device settling speeds. Settling can be disabled for measurements of jitter or other instantaneous values.

GPIB Software Drivers

Audio Precision supports the ATS-1 with a National Instruments LabView and LabWindows CVI driver for C and Basic programmers. The LabWindows driver runs with National Instruments GPIB interface cards for personal computers. The driver speeds development of test routines by eliminating the need to learn the ATS-1 programming mnemonics.

HP8903B GPIB Emulation Mode

GPIB ADDR 31	CMD MODE HPIB	FREQ STEP ISO
IDLE	ERRM PON	
LOC	*ESR CO h	AMPL STEP
	*STB OO h	1dB/ISO

ATS-1 also emulates the HP8903B audio analyzer HP command set for a simple replacement of slow and outdated equipment in existing systems. A front panel button selects between the Audio Precision 488.2 (GPIB) command mode and the HPIB command mode.

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specifications

ANALOG SIGNAL OUTPUTS

Low Distortion Sine Wave

Frequency Range	10 Hz to 120 kHz
Frequency Accuracy	±0.5 %
Amplitude Range	(20 Hz to 30 kHz)
Balanced	<0.25 mV to 26.25 Vrms [–70 dBu to +30.6 dBu]
Unbalanced	<0.25 mV to 13.12 Vrms [–70 dBu to +24.6 dBu]
Amplitude Accuracy	±0.2 dB [±2.3 %] at 1 kHz
Amplitude Resolution	0.01 dB
Flatness (1 kHz ref)	
10 Hz–20 kHz	±0.05 dB
Residual THD+N	
25 Hz–20 kHz	≤(0.0025% + 3 µV), 80 kHz BW [–92 dB]

Square Wave

Frequency Range	20 Hz–30 kHz
Amplitude Range	
Balanced	0.71 mVpp to 34.73 Vpp
Unbalanced	0.71 mVpp to 17.36 Vpp
Amplitude Accuracy	±0.3 dB [±3.5 %] at 400 Hz
Rise/fall time	Typically 2.5–3.0 µs

SMPTE (or DIN) Test Signals with option "ATS-IMD"

LF Tone	50, 60, 70, or 250; all ±1.0 %
HF Tone Range	7 kHz or 8 kHz (±1 %)
Mix Ratio	4:1 (LF:HF)
Residual IMD	0.0015 % [–96.5 dB], 60 Hz + 7 kHz or 250 Hz + 8 kHz

OUTPUT CHARACTERISTICS

Source Configuration	Selectable balanced or unbalanced
Source Impedances	
Balanced	50 Ω (±2 Ω), 150 Ω (±2 Ω), or 600 Ω (±6 Ω)
Unbalanced	50 Ω (±2 Ω)
Output Current Limit	75 mA peak
Max Output Power	
Balanced	+29.9 dBm into 600 Ω (Rs = 50 Ω)
Unbalanced	+23.8 dBm into 600 Ω (Rs = 50 Ω)
Output Related Crosstalk (10 Hz–20 kHz)	≤–110 dB or 10 µV, whichever is greater

ANALOG ANALYZER

ANALOG INPUT CHARACTERISTICS

Input Ranges	80 mV to 250 V in 10 dB steps
Maximum Rated Input	350 Vpk, 140 Vrms (dc to 20 kHz); overload protected
Input Impedance	
Balanced (each side)	Nominally 100 kΩ // 150–200 pF
Unbalanced	Nominally 100 kΩ // 150–200 pF
Terminations	Selectable 600 Ω ±1 %
CMRR 80 mV–2.5 V range	≥70 dB, 50 Hz–20 kHz
Input Related Crosstalk 10 Hz–20 kHz	≤–120 dB or 1 µV, whichever is greater

Wideband Amplitude/Noise Function

Measurement Range	<1 µVrms to 140 Vrms [–118 dBu to +45 dBu]
Accuracy (1 kHz)	±0.2 dB [±2.37 %] unweighted
Flatness (1 kHz ref)	±0.05 dB (20 Hz–20 kHz)
Bandwidth Limiting Filters	
LF –3 dB	<10 Hz; 400 Hz ±5 % (3-pole)
HF –3 dB	22 kHz; 30 kHz; 80 kHz (3-pole), or 300 kHz
Weighting Filters	ANSI-IEC "A"; CCIR-QPK; CCIR-ARM; CCIR-RMS
Optional Filters	Up to 2 (Aux 1 and Aux 2)
Detection	RMS (=60 ms); AVG; QPK (CCIR Rec 468)
Residual Noise	
22 Hz–22 kHz BW	≤1.5 µV [–114 dBu]
A-weighted	≤1.0 µV [–118 dBu]
CCIR-QPK	≤5.0 µV [–104 dBu]

Frequency Meter Related (both channels)

Measurement Range	10 Hz–200 kHz
Accuracy	±0.01 % [±100 PPM]
Resolution	5 digits

Phase Measurement Related

Measurement Ranges	±180, +90/–270, or –90/+270 deg
Accuracy 20 Hz–20 kHz	±2.0 deg
Resolution	0.1 deg

Level Meter Related (both channels)

Measurement Range	10 mV to 140 V for specified accuracy and flatness, useable to <100 µV [–38 dBu to + 45 dBu]
Accuracy (1 kHz)	±0.1 dB + 100 µV
Flatness (1 kHz ref)	(Vin >10 mV) ±0.05 dB (20 Hz–20 kHz)

Bandpass Amplitude Function

Tuning Range (f_0)	20 Hz to 120 kHz
Bandpass Response	Q=5 (2-pole)
Accuracy (at f_0)	±0.3 dB, 20 Hz–120 kHz

THD+N / SINAD Function

Fundamental Range	10 Hz to 100 kHz, THD+N mode
Measurement Range	.001 %–100 %
SINAD Range	400 Hz–1 kHz
Accuracy	±1 dB, 20 Hz–120 kHz harmonics
Measurement Bandwidth	
LF –3 dB	<10 or 400 Hz
HF –3 dB	22k, 30k, 80k, or 300 kHz
Residual THD+N	
25 Hz–20 kHz	≤(0.0025% + 3.0 µV), 80 kHz BW [–92 dB]

Crosstalk Function

Frequency Range	10 Hz to 120 kHz
Measurement Range	–140 dB to 0 dB
Accuracy	±0.5 dB

SMPTE (DIN) IMD Function with option "ATS-IMD"

Test Signal Compatibility	40–250 Hz and 3 kHz–20 kHz in 0:1 to 8:1 ratio
IMD Measured	Amplitude modulation products of the HF tone.
Measurement Range	<0.0025 %–20 %
Accuracy	±1 dB per SMPTE RP-120-1983, DIN 45403
Residual IMD	≤0.0025% [–92 dB], 60 + 7 kHz or 250 + 8 kHz

Wow & Flutter Function

Test Signal Compatibility	2.80 kHz–3.35 kHz
Accuracy (4 Hz)	±(5 % of reading + 0.002 %)
Detection Modes	IEC/DIN; NAB; JIS
Residual W+F	≤0.005% Weighted; ≤0.01% Unweighted

DIGITAL SIGNAL GENERATOR

DIGITAL OUTPUT CHARACTERISTICS

Output Formats	AES/EBU (per AES3-1992); SPDIF-EIAJ; Optical
Sample Rates	28.8 kHz–52.8 kHz
Sample Rate Accuracy	±0.002% [±20 PPM] lockable to external reference
Word Length	16 to 24 bits (even values)

Sine Wave

Frequency Range	10 Hz to 47 % of sample rate (22.56 kHz at 48 ks/s)
Frequency Resolution	Sample Rate ÷ 2^{23} (typically 0.006 Hz at 48 ks/sec)
Flatness	±0.001 dB
Residual Distortion	±0.00001 % [–140 dB]

Square Wave

Frequency Range	10 Hz to 1/6 sample rate
Frequencies available	f_s ÷ 4096 to f_s ÷ 6, in even integer divisors

SMPTE/DIN IMD Waveform with option "ATS-IMD"

Upper Tone Range	Choice of 7 kHz or 8 kHz
Lower Tone Range	Choice of 50 Hz, 60 Hz, 70 Hz, or 250 Hz
Amplitude Ratio	4:1 (LF:HF)
Residual Distortion	≤0.00001 % [–140 dB] at 4:1 ratio

Random Generator Waveform

Waveform	Compatible with Audio Precision BITTEST

Dither (all waveforms)

Probability Distribution	Triangular or rectangular; independent for each channel
Spectral Distribution	Flat (white) or Shaped (+6 dB/oct, triangular only)
Amplitude	Automatically tracks word length or off

AES/EBU INTERFACE GENERATION

Interface Signal

Amplitude Range	
Balanced (XLR)	0–5.11 Vpp, into 110 Ω in 5 mV steps
Unbalanced (BNC)	0–1.62 Vpp, into 75 Ω in 1.6 mV steps
Channel Status Bits	English language decoded, Professional/Consumer
Validity Flag	Selectable, set or cleared

AES/EBU Impairments

Induced Jitter	Sine wave
Jitter Freq Range	10 Hz to 38.8 kHz
Jitter Amplitude	0–1.28 UI (pk), in steps of 0.005 UI or better 1.3–12.75 UI, in steps of 0.05 UI or better
Residual Jitter	(total generator/analyzer) peak calibrated
RMS response	≤0.005 UI (700 Hz–30 kHz BW)
Peak response	≤0.015 UI (700 Hz–30 kHz BW)
Spurious Jitter Products	
Jitter & Ref Delay Off	≤0.0005 UI
Jitter On	≤–30 dB below jitter signal

REFERENCE INPUT CHARACTERISTICS

Input Formats	AES/EBU (per AES3-1992)
Input Sample Rates	28.8 kHz–52.8 kHz
Lock Range	±0.0025% [±25 PPM]

DIGITAL ANALYZER

DIGITAL INPUT CHARACTERISTICS

Input Formats	AES/EBU (per AES3-1992); SPDIF-EIAJ; Optical
Sample Rates	28.8 kHz–52.8 kHz
Word Length	16 to 24 bits

EMBEDDED AUDIO MEASUREMENTS

Wideband Level/Amplitude

Range	0 dBFS to –140 dBFS
Frequency Range	<10 Hz–22.0 kHz at 48 ks/sec
Accuracy	±0.01 dB, ≥–90 dBFS
Flatness	±0.01 dB, 15 Hz–22 kHz
High pass Filters	22 Hz, 400 Hz, 2-pole Butterworth
Low pass Filters	15 kHz, 20 kHz 6-pole elliptic low-pass
Weighting Filters	ANSI-IEC "A" weighting; CCIR QPK; CCIR RMS
Residual Noise	–140 dBFS unweighted; –142 dBFS A-weighted

Narrow Band Amplitude

Frequency Range	0.04% to 40% of sample rate (10 Hz–19.2 kHz at 48.0 ks/sec)
Filter Shape	10-pole, Q=19 (BW = 5.3% of f_0)

THD+N Measurements

Fundamental Range	0.02% to 45% of sample rate (10 Hz–22.0 kHz at 48.0 ks/sec
Residual THD+N	≤–138 dBFS
High pass Filters	22 Hz, 400 Hz 2-pole Butterworth
Low pass Filters	15 kHz, 20 kHz 6-pole elliptic low-pass
Weighting Filters	ANSI-IEC "A" weighting; CCIR QPK; CCIR RMS

SMPTE (DIN) IMD Function with option "ATS-IMD"

Test Signal Compatibility	40–250 Hz and 3 kHz–20 kHz in 1:1 to 4:1 ratio
IMD Measured	Amplitude modulation products of the HF tone.
Measurement Range	<0.0001%–10%
Accuracy	±1 dB per SMPTE RP-120-1983, DIN 45403
Residual IMD (0 dBFS)	≤0.0001% [–120 dB], 60 + 7 kHz or 250 + 8 kHz

Frequency Measurements

Range	5 Hz to 47% of sample rate

Phase Measurement Related

Measurement Ranges	±180, +90/–270, or –90/+270 deg
Accuracy	±2.0 deg (20 Hz–20 kHz)
Resolution	0.1 deg

BITTEST Measurement

Measurement	Compatible with random mode of Audio Precision BITTEST

DIGITAL INTERFACE MEASUREMENTS

AES/EBU Impairments, Real Time Displays

Input Sample Rate	±0.002% [±20 PPM] internal ref, ±0.0001% [*1 PPM] external ref
Output to Input or Reference Input to Input Delay	Measures status propagation from the AES/EBU output to the input. Range is 0–192 (frames), resolution ±60 ns.
AES/EBU Input Voltage	
Balanced	400 mV to 10.24 Vpp, ±(10% + 50 mV)
Unbalanced	100 mV to 2.56 Vpp, ±(10% + 30 mV)
Jitter Amplitude (500 Hz)	(peak-peak sine wave calibrated) 0–10 UI,
Jitter Flatness	±1.5 dB, 100 Hz–22 kHz (50 Hz HP selection, RMS detection, 48 kHz sample rate)
Residual Jitter, peak calibrated	(analyzer only) (700 Hz–30 kHz BW)≤0.01 UI RMS; ≤0.03 UI Peak
Spurious Jitter Products	≤0.002 UI (1.2 kHz) or 0 dB below jitter signal
Channel Status Bits	English language decoded (Professional/Consumer)
Validity Flag	Displayed for selected channel
Parity; Signal Confidence; Receiver Lock; Coding Error	Displayed for total signal (both channels combined)

AUXILIARY SIGNALS

Generator Analog Sync Output; Digital Sync Output; Analyzer Input Monitor; Analyzer Reading

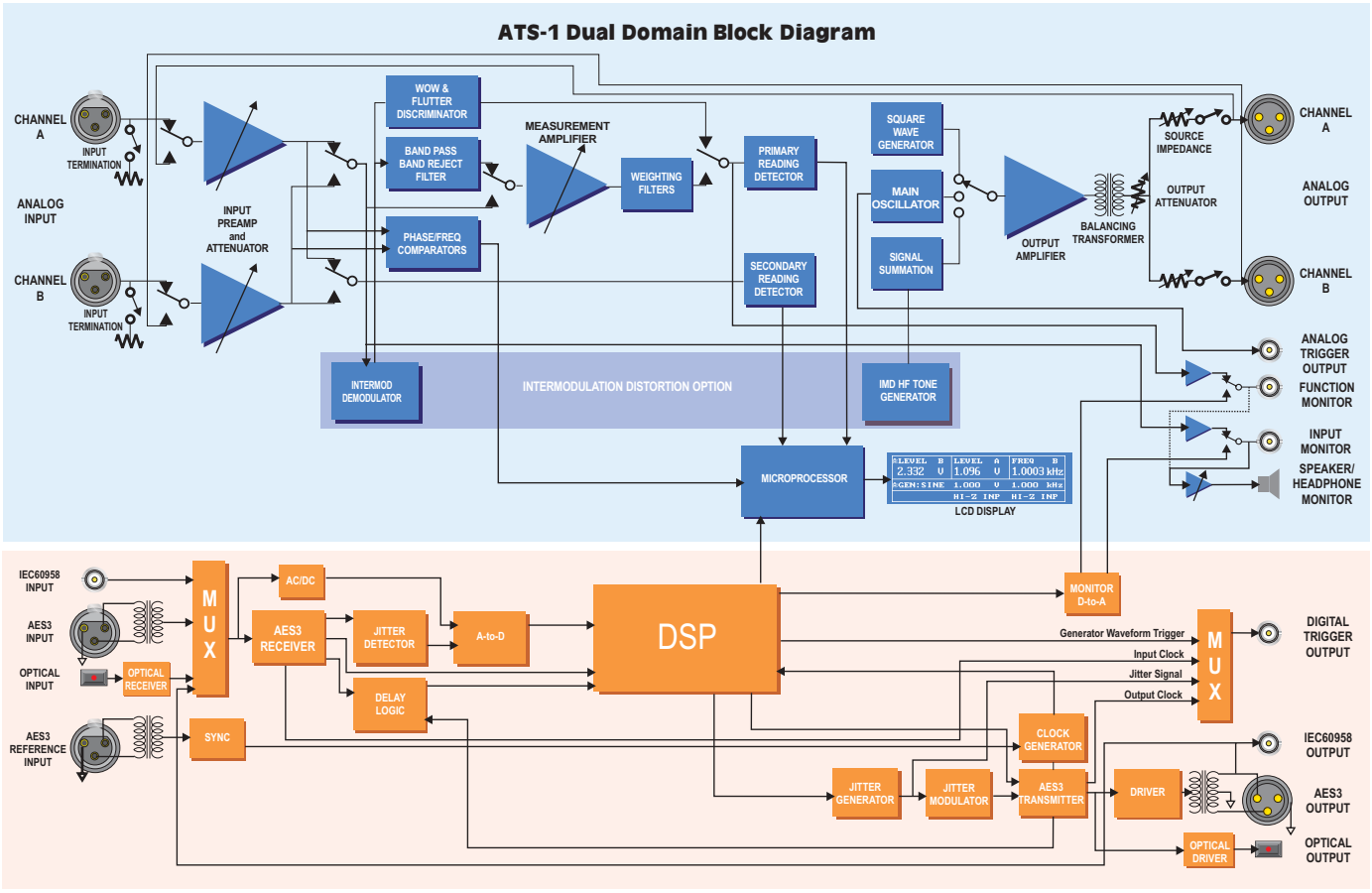
AUDIO MONITOR

Power Output	Typically 1 watt

GENERAL / ENVIRONMENTAL

Power Requirements	100/120/230/240 Vac (–10%/+6%), 50–60 Hz, 50 VA max
Temperature Range	0° C to +50° C Operating; –20° C to +60° C Storage
Humidity	90% RH to at least +40° C (non-condensing)
EMC	Complies with 89/336/EEC, CISPR 22 (class B), and FCC 15 subpart J (class B)
Dimensions	16.5 x 6.0 x 13.6 inches [41.9 x 15.2 x 34.5 cm]
Weight	Approximately 20 lbs [9.1 kg]
Safety	Complies with 73/23/EEC, 93/68/EEC, EN61010, and IEC 1010 (including Amendments 1 and 2)

ATS-1 Dual Domain Block Diagram



Ordering Information

ATS-1A	ATS-1 Access Audio Test System with GPIB interface
ATS-1DD	ATS-1 Dual Domain (digital and analog) Audio Test System with GPIB interface
	Select panel type and front or rear connections at time of order:
	ATS-BNC: BNC and banana jack connector panel ATS-XLR: XLR and banana jack connector panel ATS-PHJ: ¼-inch phone and banana jack connector panel
	ATS-R: Rear mount (front mount connector panel is default)

Options and Accessories for ATS-1 Instruments

ATS-IMD	SMPTE/DIN intermodulation distortion measurement and generation (analog and digital)
RAK-ATS	Rack mount shelf for ATS-1 Access or ATS-1 Dual Domain
MAN-ATSA	Additional ATS-1 Access operator's manual (one included with instrument)
MAN-ATSDD	Additional ATS-1 Dual Domain operator's manual (one included with instrument)
MAN-ATS488	Additional GPIB manual for ATS-1 Access or ATS-1 Dual Domain (one included with instrument)
SVC-ATS	Service manual for ATS-1 Access or ATS-1 Dual Domain
CAB-XMF	Set of four XLR male to XLR female cables
CAB-XBR	Set of four XLR male/female to RCA/BNC cables
CAB-AES	Set of two AES3 digital cables, 1 meter
CAB-AES2	Set of two AES3 digital cables, 2 meters
CAB-AES4	Set of two AES3 digital cables, 4 meters

ATS-1 includes a removable carrying handle.
Portable and self-contained, take your ATS-1 with you on the road.

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BUYING AN ATS-1 ANALYZER FOR ANALOG AND DIGITAL AUDIO:

What to look for when evaluating competitive instruments

Digital Architecture and Features: Not all analyzers that accept a digital input signal are actually digital analyzers. Does the instrument have a real (DSP-implemented) digital domain analyzer, or just a D/A converter from the digital input connector to an analog hardware analyzer? This latter approach in a competitive unit yields distortion performance in the 12–14 bit range (–70 to –85 dB THD+N, for example). There's just not that much 12-bit digital audio around to measure anymore. ATS-1 Dual Domain's digital analyzer guarantees –130 dB residual distortion (nearly 22 bit performance), far in excess of the –108 to –112 dB actual linearity of today's best A/D converters.

Analog Performance: Does the instrument have an analog hardware generator and an analog hardware analyzer? Some competitive units (at twice the price of ATS-1 Dual Domain) use DSP techniques for all generation and analysis, so analog signals pass through converters inside the instrument. The result is THD+N as high as –79 dB, flatness as poor as –0.2 dB —inadequate for most modern audio devices.

Interface Testing: Does the instrument have independent analog, digital, and jitter generators? If it can only provide analog or digital output at any one time, you can't test a house-synchronized A/D converter for jitter rejection. Without independent, flexible digital audio and jitter generators, you can't measure jitter sensitivity of a D/A converter at various audio and jitter frequency combinations.

True Dual Domain: True Dual Domain hardware by definition guarantees a full range of analysis capabilities in both analog and digital domains. Everyone measures level and some measure THD+N (although implemented with extremely limited performance, as noted above). Be sure that other useful measurements such as IMD (Intermodulation Distortion), Phase, and Crosstalk are available for both analog and digital signals, not just analog.

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