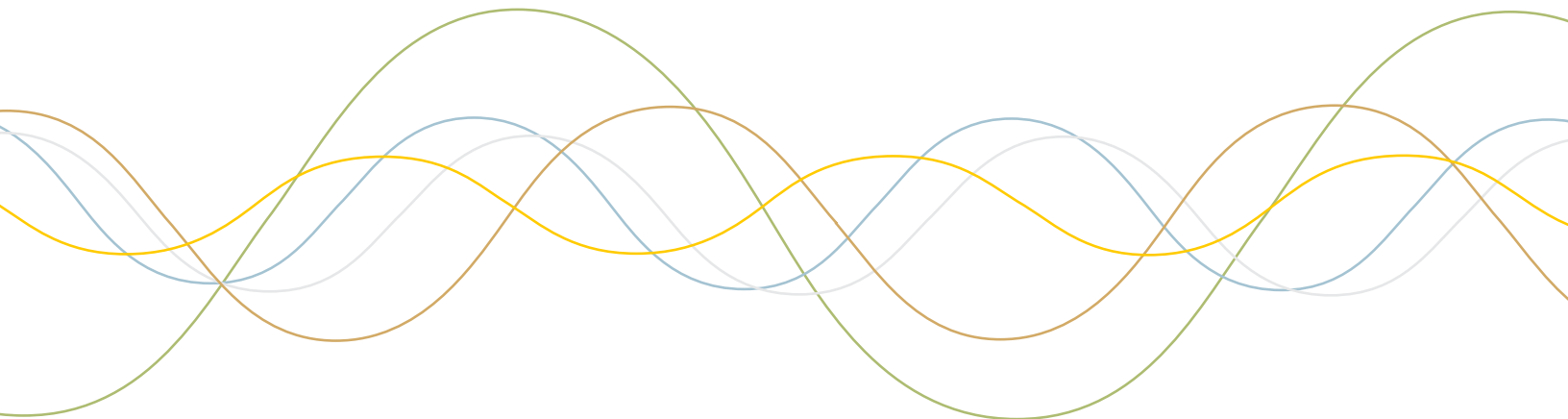


ATS-1

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

Unmatched Value



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**

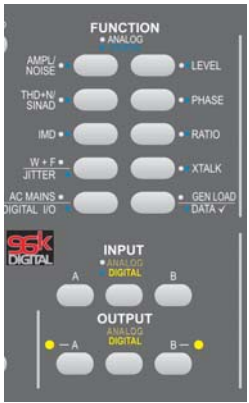
Analyzer **< 1.6 ns**



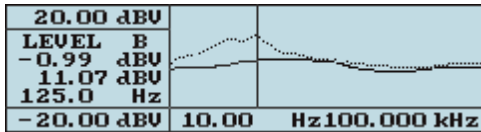
Performance, Measurement Power, and Ease-of-Use

Easy to Use

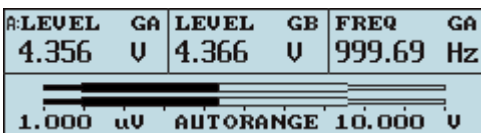
Measurement functions are simply selected from the front panel. Just press a button and make the measurement. Selection of analog and digital inputs is clearly indicated on the front panel with LED legends. ATS-1 makes *graphs* of *swept measurements* in real time



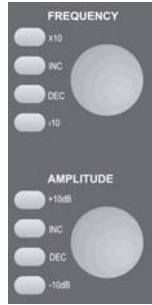
on the high contrast back-lit LCD display, including both frequency and amplitude sweeps. Hard copy high-resolution graphs,



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.

| | | |
|-------------|---------|-----------|
| A:AC MAINS | THD+N | FREQ |
| 117.0 V | 4.8 % | 59.987 Hz |
| A:GEN: SINE | 1.000 V | 1.000 kHz |
| SELF TEST | | |

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.

Turn on ATS-1: Audio Testing to Meet Your Challenges

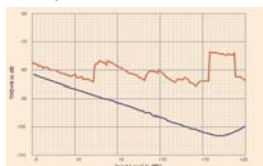
Comprehensive Analog and Digital Functions

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

| | | | | | |
|-----------|----|-------|-------------------|--------|-----|
| D:THD+N | GB | LEVEL | GB | AUTO-T | GB |
| -131.4 | dB | -3.00 | dB _{rms} | 1.0001 | kHz |
| | | | | | |
| -160.0 dB | | | | | |
| -80.00 dB | | | | | |

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 ef-

fect 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

| | | | | | |
|---|----|---------|-----------------|--------|----|
| D:JITTER | I | XLR LoZ | I | J FREQ | I |
| 0.484 | UI | 4.99 | V _{pp} | 400.46 | Hz |
| D:GEN: SINE 1.0000 F _{rms} 997.00 Hz | | | | | |
| UN-WTD HP: 50 Hz RMS | | | | | |

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).

| | | | | | |
|--|----|---------|-----------------|-------|----|
| D:RATE | G | XLR LoZ | G | DELAY | G |
| 48000.0 | Hz | 2.98 | V _{pp} | 24.30 | ns |
| D:GEN: SINE 1.0000 F _{rms} 1.0000 kHz | | | | | |
| REF: STAT INP: 24bit OUT 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.

| | | | | | |
|-------------------------|-------|----|-------|-----|--|
| JITTER GENERATOR | | | | | |
| D:JIT: SINE | 0.201 | UI | 1.002 | kHz | |

Vary the digital output signal to test the acceptance range of your digital devices. Set sample rate anywhere from 28.8 kHz to 99.999 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.

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.

| | | |
|-------------|------------------------|------------|
| D:RATE | BNC HiZ | DELAY |
| 48000.0 Hz | 0.69 V _{pp} | 260.72 UI |
| D:GEN: SINE | -60.00 dB _s | 1.0001 kHz |
| REF: MEAS | INP: 24bit | OUT BLOCK |

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.

| |
|------------------------------------|
| D:SEND: CONS EMPH: NONE SR: 32 kHz |
| D:INP: CONS EMPH: NONE SR: 32kHz |
| COPY: NO NO ERRORS |
| COPY: NO VALID |

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

| | | |
|------------|----------|-----------|
| D:ERROR GA | ERROR GB | DATA GB |
| 1567587T | 1567266T | B71AD2hex |
| 10T | | 10000000T |

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.

| | | |
|------------|----------|-------------|
| D:ERROR GA | ERROR GB | DATA GA |
| 0 | 0 | 6FEA40hex |
| 24 | 16 | 8 ACTIVEBIT |

| | | |
|------------|----------|-------------|
| D:ERROR GA | ERROR GB | DATA GA |
| 0 | 0 | 5A0D60hex |
| 24 | 16 | 8 ACTUALBIT |

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.

Connectivity, Test Results and GPIB or HPIB Automation

Versatile Connectivity

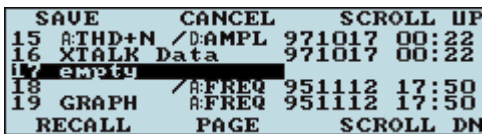
Choose among three different analog connector panels for your ATS-1. The connector panel can be mounted on the front of your instrument for convenience, or on the rear of the instrument if you'd prefer your ATS-1



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

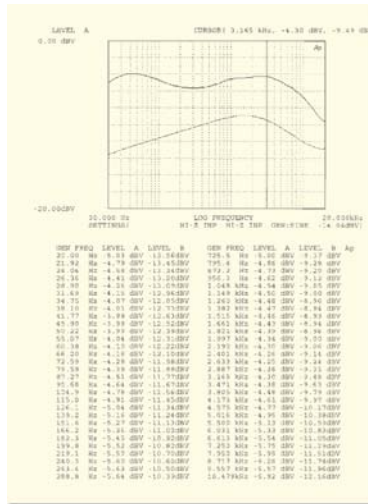


data to be printed or analyzed later. Each saved test includes all settings for the entire instrument, a default description or your own title for the test, the date and time, and the last test sweep result data.



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.



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 $-0.25\text{ mV to }26.25\text{ Vrms}$ [-70 dBu to +30.6 dBu] Unbalanced $-0.25\text{ mV to }13.12\text{ Vrms}$ [-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) | ±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 |

SMPTTE (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 | $-1\text{ μVrms to }140\text{ Vrms}$ [-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 <math><10\text{ Hz}</math>; 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 (τ=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 <math><100\text{ μV}</math> [-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 _c) | 20 Hz to 120 kHz |
| Bandpass Response | Q=5 (2-pole) |
| Accuracy (at f _c) | ±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 <math><10\text{ Hz}</math> 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 |

SMPTTE (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 | <math><0.0025\text{ %}</math>–20 % |
| Accuracy | ±1 dB per SMPTTE 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–99.9999 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 _c ÷ 4096 to f _c ÷ 6, in even integer divisors |

SMPTTE/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 ≤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–99.9999 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–99.9999 kHz |
| Word Length | 16 to 24 bits |

EMBEDDED AUDIO MEASUREMENTS

Wideband Level/Amplitude

| | |
|-------------------|--|
| Range | 0 dBFS to -140 dBFS |
| Frequency Range | <math><10\text{ Hz}</math>–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 _c) |

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 |

SMPTTE (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 | <math><0.0001\text{ %}</math>–10 % |
| Accuracy | ±1 dB per SMPTTE 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 | Measures status propagation from the AES/EBU output to the input. |
| Input to Input Delay | 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

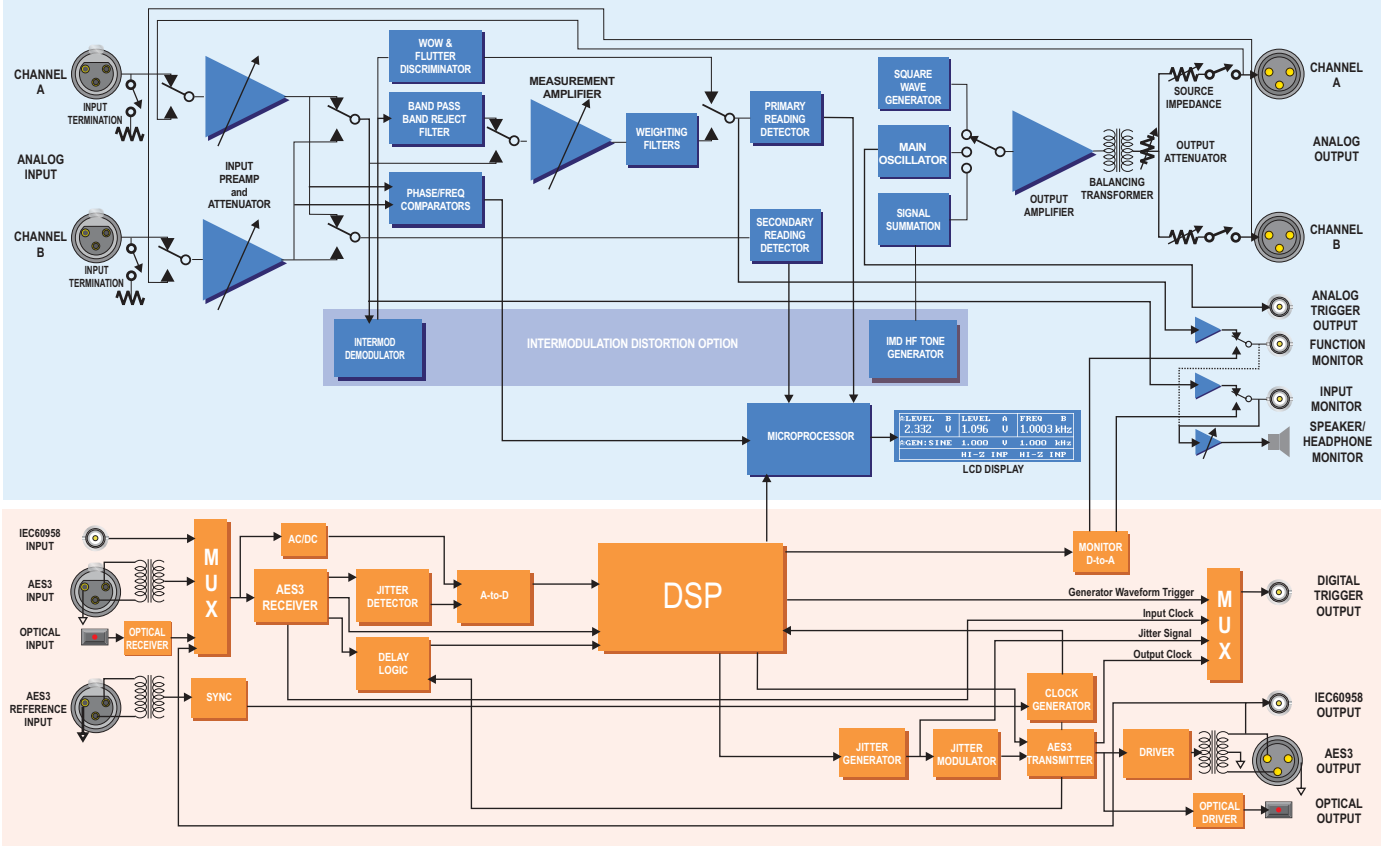
| | |
|--------------|------------------|
| Power Output | Typically 1 watt |
|--------------|------------------|

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) |

Complete ATS-1 specifications are downloadable from the Products area of the Audio Precision Web site at audioprecision.com.

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-ATSD | 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.

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.

Audio precision

Testing for Optimal Results

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