

DISTORTION ANALYZERS



AA 5001/ NEW AA 501A

Distortion Analyzers

**GPIB
IEEE-488**

The AA 5001 complies with IEEE Standard 488.1-1987 and with Tektronix Standard Codes and Formats.

- Fully Automatic: No Level Setting, Tuning, or Nulling
- Level, Total Harmonic Distortion, and dB Ratio Measurements
- Total System Harmonic Distortion plus Noise ((THD+N) < 0.0025% (with companion SG 5010/SG 505 Oscillators)
- Residual Noise $\leq 3.0 \mu\text{V}$
- Digital Readout plus Analog-Like Bar Graph for Peaking and Nulling
- IMD to SMPTE, DIN, and CCIF (Option 01)

The AA 5001/AA 501A Distortion Analyzers provide fully automated measurement of level, total harmonic distortion plus noise (THD+N), and intermodulation distortion (Option 01 for the AA 501A). The AA 5001 adds GPIB compatibility plus programmability.

Fully Automatic

Automatic measurement means that once the mode is selected and the test signal

is applied, the operator simply reads the accurate result on the 3-digit display. Functions such as level setting, tuning, and nulling are fully automatic.

The AA 501A Option 1 adds intermodulation distortion measurement capability conforming to SMPTE, DIN, and CCIF standards. Internal circuitry automatically identifies the signal being used and performs the measurement, making IMD measurements as automatic as harmonic distortion measurements. These capabilities are standard in the AA 501A.

Advanced Performance

The AA 5001/501A provides dB-ratio measurement referencing either to 774.6 mV (1 mW in 600 ohms) or to a selected applied signal. The 0 dB reference memory stores the selected level, and all subsequent measurements are referenced to it.

The user can choose true RMS or average response. While true RMS is generally more accurate, the averaging feature is convenient for comparison of new data with data taken on older instruments where averaging was the only mode available.

The fundamental frequency range is 10 Hz to 100 kHz, with harmonic measurements to 300 kHz. Any one of four

built-in frequency-weighting filters can be switched into the signal paths for input signal preconditioning. External filters can be simply connected for special applications such as stereo pilot tone rejection, rejection of continuous tone squelch signals in mobile radio systems, or for selection of individual harmonics instead of total harmonic distortion measurements.

An Input-Monitor connector and a Function-Output connector permit oscilloscope display of the input signal or the filtered signal input used in THD+N measurement.

TM 5000/TM 500 Compatibility and Configurability

As members of the TM 5000/500 series, the AA 5001/501A distortion analyzers are designed to be used together with the SG 5010/505 Oscillators respectively as the nuclei of state-of-the-art audio analysis systems. The AA 5001/SG 5010 setup provides the heart of a programmable automated audio testing system, while the AA 501A/SG 505 setup can be rack-mounted for ease of use at the plant for manual operations or can be easily removed and placed in a portable main-frame for use in the field.

CHARACTERISTICS

HARMONIC DISTORTION FUNCTION

Fundamental Frequency Range—10 Hz to 100 kHz, automatically tuned to input frequency.

Distortion Ranges—Auto (100%), 20%, 2%, 0.2%, and dB (autoranging).

Accuracy—20 Hz to 20 kHz is ± 1 dB. 10 Hz to 100 kHz is $\pm 1, -2$ dB. (Accuracy is limited by residual THD + N and filter selection.)

Typical Fundamental Rejection—At least 10 dB below specified residual THD + N or actual signal THD, whichever is greater.

Minimum Input Level—60 mV (-22 dBm).

LEVEL FUNCTION

Autoranging digital voltmeter displays input-signal level in volts, dBm, or dB ratios.

Modes—Volts, dBm (600 Ω), or dB ratio with push-to-set 0 dB reference.

Level Ranges—200 μ V full scale to 200 V full scale in ten steps, manual or autoranging.

Accuracy

Frequency	Volts	dBm or dB Ratio
20 Hz to 20 kHz	$\pm 2\%$ ± 1 count	± 0.3 dB* $\pm 0.5\%$ of reading
10 Hz to 100 kHz	$\pm 4\%$ ± 2 counts	± 0.5 dB* $\pm 0.5\%$ of reading

* $V_{in} \geq 100 \mu V$, level ranging indicators extinguished. ± 0.2 dB at 1 kHz only. Flatness is 0.1 dB, 20 Hz to 20 kHz, and ± 0.3 dB, 10 Hz to 100 kHz.

Bandwidth— ≥ 300 kHz.

Residual Noise—

$\leq 3 \mu V$ (-108 dBm) with 80-kHz and 400-Hz filters, RMS response.

$\leq 1.5 \mu V$ (-114 dBm) with "A" weighting filter, RMS response (standard instrument only).

$\leq 5 \mu V$ (-104 dBm) with CCIR weighting filter, quasi-peak response (Option 02 instrument only).

INTERMODULATION DISTORTION FUNCTION

Fully automatic SMPTE, DIN, and CCIF difference tone measurements. Minimum input level 60 mV (-22 dBm). Accuracy ± 1 dB.

SMPTE and DIN Tests—Lower Frequency Range: 50 to 500 Hz. Upper Frequency Range: Usable from 3 to 163.8 kHz. Level Ratio Range: 1:1 to 4:1 (lower:upper). Residual IMD: See System Specifications.

CCIF Difference Frequency Test—

Frequency Range: Usable from 4 to 163.8 kHz. Difference Frequency Range: 80 Hz to 1 kHz. Residual IMD: See System Specifications.

ALL FUNCTIONS

Display— $3\frac{1}{2}$ -digits resolution at ≈ 3 readings/s.

Detection—Average or true RMS for waveforms with crest factors ≤ 3 . Option 02 replaces average detector with quasi-peak detector complying with CCIR recommendation 468-2 and DIN 45405.

Filters—

400 Hz High Pass: -3 dB at 400 Hz $\pm 5\%$; 18 dB/octave slope, at least 40 dB rejection at 60 Hz.

80 kHz Low Pass: -3 dB at 80 kHz $\pm 5\%$; 18 dB/octave slope.

Audio Bandpass: -3 dB at 22.4 Hz and 22.4 kHz, both $\pm 5\%$. Complies with CCIR Recommendation 468-2 and DIN 45405.

"A" Weighting: Meets specifications for Type one sound-level meters (ANSI S1.4, IEC Recommendation 179). Option 02 replaces "A" weighting filter with CCIR weighting filter complying with CCIR Recommendation 468-2 and DIN 45405.

Ext: Allows connection of external filters.

Input Type—Balanced (full differential).

Input Impedance—100 k Ω $\pm 2\%$, each side to ground.

Maximum Input—300 V peak, 200 V RMS either side to ground or differentially. Fully protected on all ranges.

Common-Mode Rejection— ≥ 50 dB at 50 or 60 Hz. Typically ≥ 40 dB to 300 kHz.

PROGRAMMABILITY (AA 5001 ONLY)

Function (Level or THD or IMD). Level Mode (Volts or dBm). Input Level and Distortion Ranges (Auto-range or default to range selected by front-panel switches).

Detector Type (RMS or AVG; or RMS or Q-PK on Option 02).

Filter Selection (400-Hz Hi Pass, 80-kHz Low Pass, 22.4 Hz to 22.4 kHz Band-Pass, "A" Weight (or CCIR WTG on Option 02, Ext Filter).

GPIB Interface Function Subsets Implemented—SH1, AH1, T6, L4, SR1, RLL, PP0, DC1, DT0, C0.

FRONT-PANEL SIGNALS

Input Monitor—Provides constant-amplitude version of signal applied to input. Output Voltage: 1 V RMS $\pm 10\%$ for input signals > 50 mV. Source Impedance: 1 k Ω $\pm 5\%$.

Function Output—Provides a scaled sample of selected function signal. Output Voltage: 1 V RMS $\pm 3\%$ for 1000 count display. Source Impedance: 1 k Ω $\pm 5\%$.

Auxiliary Input—Provides input to detector circuit when Ext Filter button is depressed. Sensitivity: 1 V RMS $\pm 3\%$ = 1000 count display. Impedance: 100 k Ω $\pm 5\%$, ac coupled.

REAR-INTERFACE SIGNALS

Duplicates of all front-panel inputs and outputs are provided to allow external filter connections or oscilloscope monitoring within same mainframe without exposed cables. Detector outputs with specified scale factor also available to drive analog chart recorders, storage oscilloscopes, or similar devices.

ORDERING INFORMATION

AA 5001 Programmable
Distortion Analyzer **\$3,550**

Includes: Instruction manual (070-4598-01); instrument interface guide (070-4788-00); reference guide (070-4597-00).

AA 501A Distortion Analyzer **\$2,600**
Includes: Instruction Manual (070-2958-00).

OPTIONS

Option 01—(AA 501A only)
Intermodulation Distortion. **+\$750**

Option 02—CCIR/DIN
Includes Option 01.

(AA5001) **+\$410**
(AA501A) **+\$1,150**

SOFTWARE

See Test and Measurement Software section.