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SIGNAL ANALYZERS
Distortion Measurement Set
Model 339A

- Ultra low distortion measurements
- Built-in low distortion oscillator
- Automatic
- True RMS detection



HP 339A

Description
Hewlett-Packard's Model 339A Distortion Measurement Set is an ultra low distortion measuring system complete with total harmonic distortion (THD) analyzer, true-rms voltmeter, and sinewave oscillator. This small, lightweight bench measurement set allows you to make THD distortion measurements as low as 0.0018% over a 10 Hz to 110 kHz frequency band including harmonics to 330 kHz.

For fast and easy THD measurements the built-in tracking oscillator in HP's 339A saves test time because you tune one instrument instead of two. Frequency and level measurements are easy to do with HP's 339A's voltmeter, which offers you a 1 mV to 300 V measurement range. The Relative Level mode has been included to further simplify frequency response measurements. Just set a 0 dBm reference at any frequency from 10 Hz to 110 kHz. Gain measurements can be read directly from the easy-to-read meter.

Operation Simplicity
Automatic frequency tuning and set-level features allow you to make rapid, error free THD measurements. The HP 339A's built-in tracking oscillator eliminates the need to find the fundamental frequency and tune the analyzer for a null. Just select your oscillator frequency and the rest is automatic. Automatic set-level saves time by automatically setting 0 dB (100%) reference in the distortion measuring mode. Front panel directional indicators light when the input range setting is improper insuring accurate and repeatable measurements. Automatic set-level also greatly simplifies measurements where distortion as a function of level (SINAD[1], for example) is desired. Without this feature, measurements are very time consuming and tedious.

When an external stimulus is used, analyzer tuning is simplified by directional indicator lights for reaching the fundamental null quickly and easily.

[1]SINAD is a sensitivity measurement computed from the ratio of signal plus noise and distortion to noise and distortion.

Specifications

Distortion
Fundamental frequency range: 10 Hz to 110 kHz continuous frequency coverage in 4 decade ranges with 2-digit resolution. Distortion analyzer and oscillator are simultaneously tuned.
Distortion measurement range: 0.01% full scale to 100% full scale (−80 dB to 0 dB) in 9 ranges.
Detection and meter indication: true rms detection for waveforms with crest factor ≤3. Meter reads dB and % THD (Total Harmonic Distortion). Meter response can be changed from NORMAL to VU ballistics with a front panel switch.
Distortion Measurement Accuracy

20 Hz to 20 kHz:	± 1 dB
10 Hz to 50 kHz:	+ 1, −2 dB
50 kHz to 110 kHz:	+ 1.5, −4 dB

Note: the above specifications apply for harmonics ≤330 kHz.
Fundamental Rejection (3 V scale or above)

10 Hz to 20 kHz:	> 100 dB
20 kHz to 50 kHz:	> 90 dB
50 kHz to 110 kHz:	> 83 dB

Distortion Introduced by Instrument (input > 1V rms)

10 Hz to 10 kHz:	< −95 dB (0.0018%) THD
10 kHz to 20 kHz:	< −92 dB (0.0035%) THD
20 kHz to 30 kHz:	< −90 dB (0.0056%) THD
30 kHz to 50 kHz:	< −85 dB (0.01%) THD
50 kHz to 110 kHz:	< −70 dB (0.032%) THD

Residual noise (fundamental frequency settings < 20 kHz, 80 kHz filter IN, source resistance ≤ 1 kΩ shielded): < −92 dB referenced to 1V.
Input level for distortion measurements: 30 mV to 300 V rms (100 mV range minimum).
Input impedance: 100 kΩ ± 1% shunted by < 100 pF input High to Low.
Monitor: provides scaled presentation of input signal after fundamental is removed for further analysis using oscilloscope or low frequency spectrum analyzer. Output voltage: 1V rms ± 5% open circuit for full scale meter indication, proportional to meter deflection. Output resistance: 1kΩ ± 5%.
Auto set level: no set level adjustment required. Distortion measurements are made directly over 10 dB range selected by input range switch. Two LED annunciators provide a fast visual indication to change input range for valid distortion measurement. Correct range is indicated when both annunciators are extinguished.
Automatic fine tuning: using internal oscillator: No separate analyzer tuning necessary when using internal oscillator as signal source. Oscillator frequency controls simultaneously tune the analyzer. Using external frequency source: Two LED annunciators provide a quick visual indication for the operator to increase or decrease the frequency. When the analyzer is rough tuned to within one least significant digit of the fundamental frequency, the indicator lights are extinguished and the HP 339A auto-null circuitry takes over to provide a fast, accurate null without tedious operator tuning.
Input filters (usable on all functions): low pass: 30 kHz −3 dB point at 30 kHz, + 2.6 kHz, −3 kHz with 60 dB/decade rolloff. Provides band limiting required by FCC for proof-of-performance broadcast testing. 80 kHz −3 dB point at 80 kHz, + 7 kHz, −7.9 kHz with 60 dB/decade rolloff. Normally used with fundamental frequencies < 20 kHz to reduce the effect of higher frequency noise present in the measured signal. High Pass: 400 Hz − 3 dB point at 400 Hz, + 35 Hz, −40 Hz with 60 dB/decade rolloff. Normally used with fundamental frequencies > 1 kHz to reduce the effect of hum components in the input signal.
DC isolation: input low may be connected to chassis ground or floated to 30 V to reduce the effects of ground loops on the measurement.

Relative Input Level Mode
Provides a ratio measurement relative to an operator selected reference level with readout directly in dBV or dBm (600Ω). Voltage range, frequency range, accuracy specifications, and monitor are the same as in Voltmeter mode. (Accuracy is relative to 0 dB set level input.)

Oscillator
Frequency range: 10 Hz to 100 kHz in 4 overlapping decade ranges with 2 digit resolution. Frequency vernier provides continuous frequency tuning between 2nd digit switch settings.

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Output level: variable from < 1 mV to > 3 V rms into 600 Ω with 10 dB/step Level control and > 10 dB Vernier adjustment. OSC Level position on function switch allows a quick check of oscillator level without disconnecting leads to device under test. Off position on Oscillator Level control provides fast signal-to-noise measurement capability. Oscillator output terminals remain terminated in 600Ω.

Frequency accuracy: ± 2% of selected frequency (with Frequency Vernier in Cal position).

Level flatness: 20 Hz to 20 kHz: ≤ ± 0.1 dB
10 Hz to 110 kHz: ≤ ± 0.2 dB

Distortion (≥ 600Ω load, ≤ 3V output)
10 Hz to 20 kHz: < −93 dB (0.0022%) THD
20 kHz to 30 kHz: < −85 dB (0.0056%) THD
30 kHz to 50 kHz: < −80 dB (0.01%) THD
50 kHz to 80 kHz: < −70 dB (0.032%) THD
80 kHz to 110 kHz: < −65 dB (0.056%) THD

Output resistance: 600Ω ± 5%

Voltmeter

Voltage range: 1 mV rms full scale to 300 V rms full scale (−60 dB to + 50 dB full scale, meter calibrated in dBV and dBm into 600Ω).
Detection and meter indication: true rms detection for waveforms with crest factor ≤ 3. Meter reads true rms volts, dBm into 600Ω, and dBV.
Accuracy (% of range setting)
20 Hz to 20 kHz: ± 2%
10 Hz to 110 kHz: ± 4%
Frequency range: 10 Hz to 110 kHz.
Input impedance: 100 kΩ ± 1% shunted by < 100 pF between input High to Low.
Monitor: provides scaled presentation of input signal for further analysis using oscilloscope or low frequency spectrum analyzer. Output voltage: 1V rms ± 5% open circuit for full scale meter indication, proportional to meter deflection. Output resistance: 1 kΩ ± 5%.

Option 001

Voltage range: 0.1 mV rms full scale to 300 V rms full scale (−80 dBV to +50 dBV full scale); (.1 mV and .3 mV ranges—external source resistance must be <10 kΩ.)

Accuracy: 1 mV to 300 V Ranges
20 Hz to 20 kHz ±2%
10 Hz to 110 kHz

.1 mV and .3 mV Ranges
20 Hz to 20 kHz: ±2%
10 Hz to 30 kHz: ±4%
30 kHz to 80 kHz: +10/−30%

Noise Floor (600Ω source impedance)
30 kHz filter <6 μV
80 kHz filter <8 μV

AM Detector

Frequency range: carrier frequencies: 550 kHz to 1.6 MHz. Modulation frequencies: 20 Hz to 20 kHz.
Distortion introduced by AM detector (with 30 kHz filter switched IN): up to 85% Modulation: < −36 dB (1.6%) THD
85% to 95% Modulation: < −30 dB (3%) THD
Input level: maximum: 60V peak. Modulation signal level: 2V rms minimum; 10V rms maximum.

Monitor (with modulated RF carrier applied to AM detector input).

Distortion mode: provides scaled presentation of demodulated input signal after fundamental is removed.
Voltmeter and relative input mode: provides scaled presentation of demodulated input signal. Output voltage and output resistance are the same as in Distortion mode.

General

Power: 100/120/220/240 V + 5%, − 10% 48 Hz to 66 Hz line operation, 200 mA maximum.
Size: 146 mm H x 426 mm W x 375 mm D (5.75″ x 16.75″ x 14.75″).
Weight: net 8.2 kg (18 lb). Shipping 11.3 kg (25 lb).

HP 339A Distortion Measurement Set
Option 001

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