1-40. Plotting

When used in conjunction with the sweep mode, any of the measurements vs. frequency can be plotted using the rear-panel X and Y AXIS outputs and an x-y recorder. The internal source is used as the stimulus. This simplifies traditionally time consuming measurements such as flatness, gain, distortion, and SINAD vs. frequency, and does not require the use of an external controller (although this too can be used via HP-IB).

Table 1-1. Specifications (1 of 4)

All parameters describe performance in automatic operation or with properly set manual controls.

Characteristic	Performance Limits	Conditions
SOURCE		
FREQUENCY		
Range	20 Hz to 100 kHz	
Resolution	0.3% increments	
Accuracy	0.3% of setting	
OUTPUT LEVEL		
Range	0.6 mV to 6V	Open circuit
Resolution	Better than 0.3%	
Accuracy	±2% of setting	60 mV to 6V; open circuit; 20 Hz to 50 kHz
	±3% of setting	6 mV to 60 mV; open circuit; 20 Hz to 100 kHz
	±5% of setting	0.6 mV to 6 mV; open circuit; 20 Hz to 100 kHz
Flatness	±0.7%	20 Hz to 20 kHz; 1 kHz reference
	±2.5%	20 Hz to 100 kHz; 1 kHz reference
Distortion and Noise (the higher of)	−80 dB or 30 μV	20 Hz to 20 kHz; 80 kHz BW
	−70 dB or 95 μV	20 Hz to 50 kHz; 500 kHz BW
	−65 dB or 169 μV	50 kHz to 100 kHz; 500 kHz BW
Impedance	600Ω ±1%	
MEASUREMENT		
SINAD		
Fundamental Frequency Range	20 Hz to 100 kHz	
Display Range	0 to 99.99 dB	Residual noise and distortion same as for distortion
Accuracy	±1 dB	20 Hz to 20 kHz
	±2 dB	20 kHz to 100 kHz
Input Voltage Range	50 mV to 300V	
SIG/NOISE		
Frequency Range	50 Hz to 100 kHz	
Display Range	0 to 99.99 dB	
Accuracy	±1 dB	
Input Voltage Range	50 mV to 300V	
Residual Noise (the higher of)	−80 dB or 30 μV	80 kHz BW
	−70 dB or 95 μV	500 kHz BW

Table 1-1. Specifications (2 of 4)

MEASUREMENT (Cont'd)		
Characteristic	**Performance Limits**	**Conditions**
DISTORTION		
Fundamental		
Frequency Range	20 Hz to 100 kHz	
Display Range	0.001% to 100% (−99.99 to 0 dB)	
Accuracy	±1 dB ±2 dB	20 Hz to 20 kHz 20 kHz to 100 kHz
Input Voltage		
Range	50 mV to 300V	
Residual Noise and Distortion (the higher of)	0.01% (−80 dB) or 30 μV 0.032% (−70 dB) or 95 μV 0.056% (−65 dB) or 169 μV	20 Hz to 20 kHz; 80 kHz BW 20 kHz to 50 kHz; 500 kHz BW 50 kHz to 100 kHz; 500 kHz BW
AC LEVEL		
Full Range Display	300.0V, 30.00V, 3.00V, .3000V, 30.00mV, 3.00mV, .3000 mV	
Overrange	33%	Except on the 300.0V range
Accuracy	±2% ±2% ±4%	30V to 300V; 20 Hz to 1 kHz 50 mV to 30V; 20 Hz to 20 kHz 0.3 mV to 30V; 20 Hz to 100 kHz
DC LEVEL		
Full Range Display	300.0V, 48.00V, 16.00V, 4.00V	
Overrange	33%	Except on the 300.0V range
Accuracy	±0.75% of reading ±3 mV	400 mV to 300V ≤400 mV
FREQUENCY		
Measurement Range	20 Hz to 150 kHz 20 Hz to 100 kHz	In ac level mode In distortion, SINAD, and signal-to-noise modes
Resolution	5 digits 0.01 Hz	Frequencies ≥100 Hz Frequencies <100 Hz
Accuracy	±0.004% ±1 digit	Distortion and SINAD modes only
Sensitivity	50 mV 5.0 mV	In ac level and signal-to-noise modes only

Table 1-1. Specifications (3 of 4)

Characteristic	Performance Limits	Conditions
MEASUREMENT (Cont'd)		
AUDIO FILTERS		
400 Hz High-pass Filter		
3 dB Cutoff Frequency	400 ±40 Hz	
Rolloff	140 dB/decade	
Psophometric Filter		CCITT Recommendation P53
Deviation from Ideal Response	±0.2 dB	At 800 Hz
	±1 dB	300 Hz to 3 kHz
	±2 dB	50 Hz to 3.5 kHz
	±3 dB	3.5 kHz to 5 kHz
30 kHz Low-pass Filter		
3 dB Cutoff Frequency	30 ±2 kHz	
Rolloff	60 dB/decade	
80 kHz Low-pass Filter		
3 dB Cutoff Frequency	80 ±4 kHz	
Rolloff	60 dB/decade	
GENERAL		
TEMPERATURE		
Operating	0° to 55°C	
Storage	-55° to 75°C	
INPUT IMPEDANCE		
Resistance	100 kΩ ±1%	Except in dc level mode
	101 kΩ ±1%	In dc level mode only
Shunt Capacitance	<300 pF	Low terminal grounded; except Option 001
	<330 pF	Low terminal grounded; Option 001 only
COMMON MODE REJECTION RATIO (at 60 Hz)	60 dB	<2V differential input voltage
	36 dB	<48V differential input voltage
	30 dB	>48V differential input voltage
REMOTE OPERATION	IEEE STD 488-1978 Compatibility Code: SH1, AH1, T5, TE0, L3, LE0, SR1, RL1, PP0, DC1, DT1, C0	The Hewlett-Packard Interface Bus (HP-IB) is Hewlett-Packard Company's implementation of IEEE Std. 488-1978, "Digital Interface for Programmable Instrumentation". All functions except the line switch, the ×10 and ÷10 keys, and the low terminal float/ground switches are remotely controllable.

Table 1-1. Specifications (4 of 4)

GENERAL (Cont'd)		
Characteristic	**Performance Limits**	**Conditions**
POWER REQUIREMENTS		
Line Voltage		
100, 120, 220, 240 Vac	−5%, −10%	48 to 66 Hz
100, 120 Vac	−5%, −10%	48 to 440 Hz
POWER DISSIPATION	100 V·A maximum	
CONDUCTED AND RADIATED INTERFERENCE (EMI)	MIL STD 461A, VDE 0871, and CISPR publication 11	Conducted and radiated interference is within the requirements of methods CE03 and RE02 of MIL STD 461A, VDE 0871, and CISPR publication 11.
CONDUCTED AND RADIATED SUSCEPTIBILITY	MIL STD 461A-1968	Conducted and radiated susceptibility meets the requirements of methods CS01, CS02, and RS03 (1 volt/metre) of MIL STD 461A dated 1968.
NET WEIGHT	12.3 kg (27 lb)	
DIMENSIONS (Full Envelope)		
Height	146 mm (5.75 in.)	Note: For ordering cabinet accessories, the module sizes are 5¾H, 1MW, and 17D.
Width	425 mm (16.8 in.)	
Depth	462 mm (18.2 in.)	

Table 1-2. Supplemental Information (1 of 2)

All parameters describe performance in automatic operation or with properly set manual controls.	
SOURCE	
Frequency Switching Speed: <3 ms (does not include HP IB programming time).	**Sweep Mode:** Logarithmic sweep with up to 500 points/decade or 255 points total between entered start and stop frequencies.
Output Level Switching Speed: 20 ms (does not include HP-IB programming time).	
MEASUREMENT	
SINAD	
Detection: true rms (average detection selectable by internal modification).	<25 dB, the display is rounded to the nearest half dB to reduce digit flickering with noisy signals. (Full resolution is available by defeating this feature using Special Function 16.1.)
Resolution: 0.01 dB for ratios >25 dB. For ratios	

Table 1-2. Supplemental Information (2 of 2)

MEASUREMENT (Cont'd)

SINAD

Analog Meter: active in SINAD only and for SINAD ratios <18 dB (or 24 dB using Special Function 7.1).
Accuracy: 1 dB typical.
Tuning: notch filter is tuned to analyzer source frequency.
Time to Return First Measurement: 1.5s typical.
Measurement Rate: 2.0 readings/s typical.

SIG/NOISE

Resolution: same as SINAD.
Detection: true rms (average detection selectable by internal modification).
Time to Return First Measurement: <2.5s typical.
Measurement Rate: 1 reading/s typical.
Operation: The Audio Analyzer displays the ratio of the input voltages as the internal source is switched on and off.

DISTORTION

Measurement Bandwidth: 10 Hz to 500 kHz.
Detection: true rms (average detection selectable by internal modification).
Displayed Resolution:
0.0001% (<0.1% distortion)
0.001% (0.1% to 3% distortion)
0.01% (3% to 30% distortion)
0.1% (>30% distortion)
Time to Return First Measurement: 1.5s typical.
Measurement Rate: 2 readings/s typical.

AC LEVEL

High Level Accuracy: ±2%; 30 to 300V; 20 Hz to 20 kHz.
AC Converter: true rms responding for signals with crest factor of <3 and harmonics up to 80 kHz.
3 dB Measurement Bandwidth: >500 kHz.
Time to Return First Measurement: <1.5s typical.
Measurement Rate: 2.5 readings/s.

DC LEVEL:

Time to Return First Measurement: <1.5s typical.
Measurement Rate: 3 reading/s.

FREQUENCY MEASUREMENT

Measurement Rate: same as measurement mode selected.
Counting Technique: reciprocal with 2 MHz time base.

AUDIO FILTERS

400 Hz High-Pass Filter Rejection: >40 dB at 240 Hz; >65 dB at 60 Hz.

REAR-PANEL INPUTS AND OUTPUTS

Recorder Outputs:
X Axis: 0 to 10 Vdc corresponding to the log of the oscillator frequency.
Output Resistance: 1 kΩ.
Y Axis: 0 to 10 Vdc corresponding to the displayed value and entered plot limits.
Output Resistance: 1 kΩ.
Pen Lift: TTL output.

Monitor Output
Output Impedance: 600Ω.
In ac level mode, provides scaled output of measured input signal.
In SINAD, distortion, and distortion level modes, provides scaled output of input signal with the fundamental removed.

Table 1-3. Recommended Test Equipment (1 of 2)

Instrument Type	Critical Specifications	Suggested Model	Use*
AC Calibrator and High Voltage Amplifier	Accuracy: 0.1%, 30 to 300V, 20 Hz to 1 kHz; 0.25%, 30 mV to 300V, 20 Hz to 100 kHz Flatness: ±0.1%, 20 Hz to 100 kHz, <6V Output Current: 50 mA Frequency Accuracy: ±5%	HP 745A and HP 746A	P, A
Audio Oscillator	Frequency Range: 20 Hz to 500 kHz Frequency Accuracy: ±5% Output Range: 3V into 600Ω Output Attenuation Accuracy: ±0.075 dB, to 0.3 mV range	HP 651B	P, A
Attenuator	Attenuation Range: 0 to 40 dB Frequency Range: 20 Hz to 100 kHz Accuracy: ±1 dB Impedance: 600Ω Maximum Power Dissipation: 100 mW	HP 4437A	P
Computing Controller	HP-IB compatibility as defined by IEEE Std. 488 and the identical ANSI Std. MC1.1: SH1, AH1, T2, TE0, L2, LE0, SR0 PP0, DC0, DT0, and C1, 2, 3, 4, 5.	HP 9825A/ 98034A/98213A or HP 9835A/ 98034A/98332A (see Table 1-4)	C, T
Counter	Frequency Range: 20 Hz to 100 kHz Level Sensitivity: 25 mV Input Impedance: >1 MΩ Maximum Resolution: 0.001 Hz	HP 5300B/ 5307A	P
DC Standard	Output Range: 3 mV to 300V Accuracy: ±0.1% ±0.3 mV	HP 740B or Fluke 893AR (see Table 1-4)	P
Digital Voltmeter	AC Accuracy: ±0.2% at 6 Vrms and 1 kHz DC Accuracy: ±0.2% at 1V	HP 3455A	A, T
Feedthrough Termination	Impedance: 600Ω Impedance Accuracy: ±1% Maximum Dissipation: 100 mW	HP 11095A	P, A
Frequency Standard	Frequency: 0.1, 1, 2, 5, or 10 MHz Accuracy: ±1 ppm	House Standard	A
Oscilloscope	Bandwidth: less than 3 dB down 0 to 10 MHz Sensitivity: 5 mV per division minimum Input Impedance: 1 MΩ Triggering: Internal and External	HP 1740A	C,A,T
Resistor 100Ω	Accuracy: ±0.1%	HP 0698 7497	P

*C = Operator's Checks; P = Performance Tests; A = Adjustments; T = Troubleshooting

Table 1-3. Recommended Test Equipment (2 of 2)

Instrument Type	Critical Specifications	Suggested Model	Use*
Signature Analyzer	Because the signatures documented are unique to a given signature analyzer, no substitution is recommended.	HP 5004A	T
Test Oscillator	Frequency: 1 kHz Output: 30 Vpp	HP 3310A	T
True RMS Voltmeter	Type: true rms responding Level Range: 100 mV to 10V Frequency Range: 20 Hz to 500 kHz Accuracy: ± 0.2% of range ±0.2% of reading Coupling: ac	HP 3403C	P
* = Operator's Checks; P = Performance Tests; A = Adjustments; T = Troubleshooting			

Table 1-4. Recommended Alternate Test Equipment

Instrument Type	Suggested Alternate	Instrument Replaced	Advantages of Alternate
Computing Controller	HP 9835A/98034A/98332A	HP 9825A/98034A/98213A	CRT Display ANSI BASIC Larger Memory
DC Standard	Fluke 893AR	HP 740B	Availability

Table 1-5. Service Accessories*

Accessory*	Specifications	Suggested Model
Digital Test Extender Board	No substitution recommended	HP 08903-60018
Extender Board	44 contacts (2 × 22)	HP 08901-60084
Extender Board	30 contacts (2 × 15)	HP 08901-60085
Foam Pad	Conductive polyurethane foam, 12 × 12 × 0.25 inches (nonmagnetic)	HP 4208-0094
*Refer to Section VIII, paragraph 8-21, of this manual for application.		

NOTE

The performance tests, adjustments, and troubleshooting procedures are based on the assumption that the recommended test equipment is used. Substituting alternate test equipment may require modification of some procedures.