HEWLETT PACKARD

HP 3566A and 3567A

Technical Specifications

Software Version A.03.03

	HP 3566A	HP 3567A
Initial Channel Count	8	2
Expand Channel Increment	8	1
Maximum Channel Count	48	48
Maximum Freq Span	12.8 kHz	102.4 kHz
Cross-Channel Amplitude Accuracy	± 0.1 dB	± 0.1 dB
Cross-Channel Phase Accuracy	± 0.5°	± 0.5°
Dynamic Range	72 dB	80 dB
Signal Conditioning		
ICP Current	2 mA with open circuit voltage of >20 volts [1]	4 mA with open circuit voltage of >20 volts
Charge Amp	No	Yes
Waterfall Display Update Rate [2]		
For 8 simultaneous displays	10/sec	10/sec
Real-time Bandwidth (single channel)		
Display OFF - any block size up to 4096 [3]	4 channels at 12.8 kHz	2 channels at 25.6 kHz
Display ON - 2048 block size	3.2 kHz	3.2 kHz
Measurement Capability [4]		
Time Domain	Yes	Yes
Time Domain Transient Capture	Yes	Yes
Linear Spectrum	Yes	Yes
Power Spectrum	Yes	Yes
RPM Spectral Map	Yes	Yes
Frequency Response Function (FRF)	Yes	Yes
Coherence	Yes	Yes
Auto/Cross Correlation	Yes	Yes
Histogram	Yes	Yes
1/3 and 1/1 Octave (synthesized)	Yes	Yes
Real-time Octave (HP 35638A)	No [5]	Yes
RPM Octave Map	Yes	Yes
Order Track (HP 35636A)	Yes	Yes
RPM Track (HP 35636A)	Yes	Yes
Order Ratio Spectrum (HP 35636A)	Yes	Yes
Order Ratio Map (HP 35636A)	Yes	Yes
Orbits	Yes	Yes
Filtered Orbits	Yes	Yes
Swept Sine (HP 35637A)	Yes	Yes

[1] The transducer cases must be electrically isolated from the structure-under-test, and input coupling cannot be "Float" to obtain an open circuit voltage of 20 volts.

[2] Based on a HP Vectra PC 486 MX (486DX2 - 66 MHz).

[3] Based on HP 35651C or HP 35645B. Real-time bandwidth is halved if HP 35651B is used.

[4] The HP 3566A and HP 3567A share the same software measurement feature set but differ in hardware specifications.

[5] The HP 3566A can make real-time octave measurements on data that is throughput to disk using Time Capture Mode.

Specifications

Amplitude

	HP 3566A	HP 3567A
Input Range	5 mVpk to 10 Vpk in 2 dB steps	1.26 mVpk to 39.8 Vpk in 2 dB steps
Dynamic Range	72 dB (75 dB typical)*	80 dB <51.2 kHz (85 dB typical)* 75 dB >51.2 kHz (80 dB typical)*
Noise (Rs=50 Ω, 16 RMS avgs., flat top window measured on most sensitive range)		
20 to 1000 Hz (frequency dependent)	$<2260/\sqrt{(f)}$ nVrms $\sqrt{(Hz)}$	
>1000 Hz (frequency independent)	<70 nVrms/ $\sqrt{(Hz)}$	
20 to 200 Hz (frequency dependent)		$<(565/\sqrt{(f)}$ nVrms/$\sqrt{(Hz)}$
Above 200 Hz (frequency independent)		<40 nVrms $\sqrt{(Hz)}$
Single Channel Amplitude Accuracy (0.1 Hz to 100 kHz)	± 0.15 dB	1.26 to 3.16 mVpk ± 0.25 dB
	± 0.15 dB	3.98 mVpk to 39.8 Vpk

Time Capture

Transient Capture Rates (Time Capture to Memory/DOS or HP 35659A with option AT3 internal disk)	HP 3566A	HP 3567A
Max Rate per Channel (samples/sec)	32,768	262,144
Max Aggregate Rate (samples/sec)	1.3 million	1.3 million
Max Time Samples to RAM	1.5 million 7.5 million (opt. 116)	1.5 million 7.5 million (opt. 116)
Max Time Samples To Disk (HP 35659A with option AT3 internal disk)	500 million	500 million

Maximum Frequency Spans for Time Capture to HP 35659A SCSI Module Option AT3 Internal Disk (typical)*	***Number of Channels***	***Maximum Frequency Span (kHz)***[6]	***Aggregate Transfer Rate (Mbytes/sec)***
	5	*102.4 (80)*	*2.62*
	10	*51.2 (40)*	*2.62*
	20	*25.6 (20)*	*2.62*
	40	*12.8 (10)*	*2.62*
	48	*6.4 (5)*	*1.57*

[6] Value in parenthesis is for offline real-time 1/3-octave measurements. Online real-time 1/3-octave measurements require smaller frequency spans. See the Real-time Octave Analysis section for online performance.

* Specifications designated as "typical" reflect supplemental, non-warranted characteristics.

Frequency

	HP 3566A	HP 3567A
Measurement Range	64 µHz to 12.8 kHz	64 µHz to 102.4 kHz
Accuracy	± 8 ppm	± 8 ppm
Sample Rate	32,768 samples/sec	262,144 samples/sec
Resolution	25, 50, 100, 200, 400, 800, 1600, or 3200 lines	25, 50, 100, 200, 400, 800, 1600, or 3200 lines
Spans		
102.4 kHz	—	X [7]
51.2 kHz	—	X
25.6 kHz	—	X
12.8 kHz	X	X
6.4 kHz	X	X
3.2 kHz	X	X
1.6 kHz	X	X
800 Hz	X	X
400 Hz	X	X
200 Hz	X	X
100 Hz	X	X
50 Hz	X	X
25 Hz	X	X
12.5 Hz	X	X
6.25 Hz	X	X
3.125 Hz	X	X
1.562 Hz	X	X
781 mHz	X	X
390 mHz	X	X
195 mHz	X	X
Center Frequency Resolution	0.25 Hz	0.25 Hz
Real-time Bandwidth (Fast averaging, display off)	4 channels at 12.8 kHz [8]	2 channels at 25.6 kHz [8]

Frequency Response (Gain/Phase)

	HP 3566A	HP 3567A
Cross Channel Accuracy		
Gain	± 0.1 dB	± 0.1 dB (0.1 Hz to 100 kHz)
Phase	± 0.5°	± 0.5° (0.1 Hz to 100 kHz)
Charge Input Accuracy		
Gain (at 1 kHz)	n/a	± 0.3 dB
Flatness (to 51.2 kHz)	n/a	± 0.1 dB
Phase (to 51.2 kHz)	n/a	± 0.5°

[7] Extendible to 110 kHz by making a zoom measurement. (Specifications are not guaranteed >102.4 kHz).

[8] Based on HP 35651C or HP 35654B. Real-time bandwidth is halved if HP 35651B is used.

Swept Sine

	HP 3566A	HP 3667A
Cross Channel Accuracy		
Gain	± 0.1 dB	± 0.1 dB (0.1 Hz to 100 kHz)
Phase	± 0.5°	± 0.5° (0.1 Hz to 100 kHz)
Charge Input Accuracy		
Gain (at 1kHz)	n/a	± 0.3 dB
Flatness (to 51.2 kHz)	n/a	± 0.1 dB
Phase (to 51.2 kHz)	n/a	± 0.5°
Dynamic Range	132 dB	132 dB
Maximum Frequency	12.8 kHz	102.4 kHz
Maximum Number of Points:	32,767	32,767

Synthesized Octave Analysis

The octave measurement is made in synthesized 1/3 or full (1/1) octave bands. Filter bandwidth, center frequency, and bandshape meet ANSI Class III (Class II for full octave) specifications. A total-power and weighted-power band is given for all measurements which gives the total and weighted power in all displayed bands (unless peak hold average is applied, in which case a broadband peak value is given instead of the band-limited value).

Octave (synthesized)	**Bands Available**	**Bands Displayed** [9]
1/3	51	24
1/1	18	9

Frequency Range	***1/3 Octave Band Center Frequency Range***	***Data Collection Time***
400 - 80 kHz [10]	*26 - 49*	*31 msec*
200 - 40 kHz [10]	*23 - 46*	*63 msec*
100 - 20 kHz [10]	*20 - 43*	*125 msec*
50 - 10 kHz	*17 - 40*	*250 msec*
25 - 5 kHz	*14 - 37*	*500 msec*
12.5 - 2.5 kHz	*11 - 34*	*1 sec*
6.3 - 1.25 kHz	*8 - 31*	*2 sec*
3.15 - 630	*5 - 28*	*4 sec*
1.6 - 315	*2 - 25*	*8 sec*
0.8 - 160	*1 - 22*	*16 sec*

Frequency Range	***1/1 Octave Band Center Frequency Range***	***Data Collection Time Octave (synthesized)***
250 - 63 kHz [10]	*8 - 16*	*31 msec*
125 - 31.5kHz [10]	*7 - 15*	*63 msec*
63 - 16 kHz [10]	*6 - 14*	*125 msec*
31.5 - 8 kHz	*5 - 13*	*250 msec*
16 - 4 kHz	*4 - 12*	*500 msec*
8 - 2 kHz	*3 - 11*	*1 sec*
4 - 1 kHz	*2 - 10*	*2 sec*
2 - 500	*1 - 9*	*4 sec*
1 - 250	*0 - 8*	*8 sec*
0.5 - 125	*1- 7*	*16 sec*

[9] Refers to number of bands measurable at one time.

[10] HP 3567A only.

* Specification designated as "typical" reflects supplemental, non-warranted characteristics.

Real-time Octave Analysis (HP 3567A only)

The HP 35638A real-time octave option is made in real-time 1/12, 1/3 or 1/1- octave bands. Real-time octave measurements meet the requirements of ANSI IEC 225-1966, DIN 45651 and ANSI S1.11-1986. A total-power and weighted-power band is given for all measurements which gives the total and weighted power in all displayed bands (unless peak hold average is applied in which case a broadband peak value is given instead of the band-limited value).

Specification Compliance	IEC 651 SLM Accuracy Type 1 IEC225-199X Accuracy Class 1
Real-time Octave Measurement Performance	
1/3-octave Frequency	
(online measurement)	100 mHz - 20 kHz
(offline measurement using time capture)	100 mHz - 80 kHz
Frequency Resolution	1/1, 1/3, 1/12 octave
Dynamic Range (ANSI S1.11)	80 dB
Amplitude Accuracy	± 0.4 dB
Band to Band Flatness	± 0.4 dB
Frequency Accuracy	± 0.003%
Linear Average Range	31.25 msec - 64,000 sec
Exponential Average Time Constant Range	125 msec - 256,000 sec
Map Length (1/3 Octave)	32,767 traces
Maximum Number of Channels (For online Real-time 1/3 Octave Measurements)	4

Maximum Real-time Octave Frequency Span [11] For HP 3567A only	***Number of Channels***	*1/1 Octave*	*1/3 Octave*	*1/12 Octave*
	1	*8 kHz*	*20 kHz*	*6168 Hz*
	2	*8 kHz*	*20 kHz*	*6168 Hz*
	4	*4 kHz*	*10 kHz*	*3084 Hz*

Order Domain

	HP 3566A with 35658A (off-line)	**HP 3567A with 35658A** (off-line)
Max Pulses/Rev	35,536 [12]	35,536 [12]
Lines of Resolution	25 - 800	25 - 800
Max Number of Tach Channels	1 (48)	1 (48)
Max Number of Analysis Channels	48	48
RPM Range	0.5 - 40,000 (0.5 - 240,000)	0.5 - 120,000 (0.5 - 240,000)
Max Span	3.2 kHz (12.8 kHz)	25.6 kHz (102.4 kHz)
Max Order	200	200
Max Orders 1 Pulse/Rev		
120,000 RPM	—	6 (24) [13]
80,000 RPM	—	9 (35) [13]
40,000 RPM	3 (19)	19 (76)
20,000 RPM	9 (38)	38 (153)
10,000 RPM	19 (76)	76 (200)
9,000 RPM	21 (85)	85 (200)
8,000 RPM	24 (96)	96 (200)
7,000 RPM	27 (109)	109 (200)
6,000 RPM	32 (128)	128 (200)
5,000 RPM	38 (153)	153 (200)
4,000 RPM	48 (192)	192 (200)
3,000 RPM	64 (200)	200 (200)
2,000 RPM	96 (200)	200 (200)
1,000 RPM	100 (200)	200 (200)

[11] Applies to online real-time octave measurements using HP 35651C or HP 35654B. Performance is halved for 2 and 4 channel operation if HP 35651B is used. Higher frequency spans (up to 80 kHz) can be obtained for offline real-time octave measurements by performing a time capture on the data and then post-processing the data using a real-time octave measurement. See the specifications for transient capture rates on page two for more detail.

[12] Requires HP 35658A

[13] One analysis channel only. At all the other RPMs, max number of analysis channels is 48.

Order Tracking

Amplitude Accuracy	± 1.0 dB			
Phase Accuracy	***RPM Range***	***1st Order***	***Orders 2-5***	***Orders >5***
	10 to 10,000	± 0.5°	± 1.0°	± 5°
	10,000 to 120,000	± 1.0°		

	HP 3566A	**HP 3567A**
Ramp Rates	3000 RPM/sec	3000 RPM/sec

(4 input channels 600-6000 RPM. Δ order = 0.1, 30 RPM step, pulses/revs = 4.0)

Inputs

	HP 3566A	**HP 3567A**
Connection	Grounded or Floating	Grounded or Floating
Input Impedance	1 MΩ ± 5%	1 MΩ ± 5%
Input Coupling	ac or dc ac roll-off is <3 dB at 1 Hz	ac or dc ac roll-off is <3 dB at 1 Hz
ICP Input		
Constant Current Source	2 mA [14]	4 mA
Open Circuit Voltage	>20 V	>20 V
Charging Amplifier	grounded and floating	grounded and floating

Source

Max Output Level	10 V
Max Current	50 mA
Max Capacitive Load	0.01 µF
Min Frequency Resolution	15.6 mHz
Max Frequency	102.4 kHz (HP 35653C) 51.2 kHz (HP 35653A)

DAC

Max Output Level	10 V
Max Current	50 mA
Max Capacitave Load	0.01µF
Max Frequency Clock	131,072 Hz, set in 2x steps
Anti-Alias Filter Setability	200 Hz - 51.2 kHz (200 Hz steps)
Amplitude Resolution	16 bits
Harmonics and Sub-Harmonies	-68 dBc (<2 kHz) -48 dBc (<10 kHz)
Max Buffer Length	1.5 M samples 7.5 M samples (with opt.116)

Trigger

Internal	Positive or negative slope
Trigger Level Resolution	± 0.031% of full scale range TTL, positive or negative slope
Max Trigger Delay [15]	Post-trigger: from 0 to 104,575 samples Pre-trigger: from 0 to 8,191 samples ΔT=1/(Fspan x 2.56)

Tachometer/Trigger Level (HP 35658A)

Range	-23V to +23V
Resolution	<5V: 40mV >5V: 200mV
Input Impedance	>20 kΩ (typical)

[14] Transducers must be isolated from the structure under test and the input coupling cannot be "Float" to obtain a 20 V open-circuit voltage.

[15] HP 3566A input channels share the same trigger delay settings. Trigger delay for HP 3567A input channels may be set independently.

General

Mainframe Power Supply	
Line	115 Vac range: 86 - 127 Vac
Voltage	230 Vac range: 195 - 253 Vac
Line Frequency	47.5 to 66 Hz
Line Current	115 Vac range: <6.0 Amps 230 Vac range: <3.0 Amps
Mainframe Dimensions	222 mm (8.75 in) high 432 mm (17.0 in) wide 584 mm (23.0 in) deep
Environmental:	
Ambient Temp	0 to 55° Celsius
Relative Humidity	Can be operated in environments with relative humidity of 95% at 40° C. Modules should be protected from temperature extremes, which may cause condensation.
HP-IB Implementation	SH1 AH1 T6 TE0 L4 LE0 SR1 RL0 PP0 DC1 DT1 C4,11 (IEEE Std 488-1978)

Abbreviations

dB	decibel
f	bin frequency in hertz
nV/√(Hz)	nano-volts rms per square root hertz
RPM	revolutions per minute
Rs	resistance of source or termination connected to an input

HP 3566A and 3567A Measurement Features

Measurements/results
Auto-correlation
Cross-correlation
Coherence
Cross-spectrum
Frequency response
Histogram
Probability density funct. (PDF)
Cumulative density funct. (CDF)
Overall power order tracking [1]
Peak order tracking [1]
Power spectrum order tracking [1]
Phase order tracking [1]
Composite power order tracking [1]
Order ratio map [1]
Order ratio spectrum [1]
Synthesized 1/3 octave (24 bands) [2]
Synthesized 1/1 octave (9 bands) [2]
Real-time 1/12 octave (144 bands) [3]
Real-time 1/3 octave (36 bands) [3]
Real-time 1/1 octave (12 bands) [3]
A, B, and C weights
Orbits
Filtered orbits
Power spectrum
Power spectral density
RPM spectral map
Instantaneous linear spectrum
Swept sine [4]
1/1, 1/3 octave RPM map
Instantaneous time record

X-axis coordinates
Linear, log, octave, Hz, rad/sec, RPM, CPM, order, sec, minute, user

Y-axis coordinates
Log magnitude, log dB, linear magnitude, phase, real data, imaginary data, Nyquist, Nichols, polar, EU, EU^2, EU^2/Hz (PSD), EU/√Hz

Engineering units (EUs) are displayed as peak, peak to peak, or RMS.

[1] Requires HP 35636A rotating machinery software.

[2] Conforms to 1976 ANSI specification.

[3] Conforms to ANSI S1.11-1986, order 3, type 1-D specification.

[4] Requires HP 35637A.

HEWLETT PACKARD

Display scaling
Single autoscale
Continuous autoscale
Default scale
Fixed scale
Linear, log, or octave x-axis (freq. domain only)

Programming capabilities
Programming of host PC via SCPI command port in: Microsoft® C, Microsoft BASIC 6.0, QuickBASIC, QuickC

Windows programming (via DDE): HP I-BASIC for Windows, Microsoft Visual Basic

Keystroke Capture
Auto-Math

Marker functions
Move to defined X value, move to peak, peak tracking, move to valley, relative marker, x marker to scale, span to marker, center frequency to marker, marker coupling for multiple traces, EU at marker (calibration), gain margin, phase margin, total harmonic distortion, harmonic power, band power

Signal averaging
From 1 to 32,767 average/meas
Stable
Exponential
Peak hold
Peak continuous
Fast averaging
Overlap
Overload reject
Manual preview

Hardcopy output
HP DeskJet
HP LaserJet
HP PaintJet
HP-GL Plotters (Centronics and RS-232 interface only)

Instrument Control
Initialize, start, pause/continue, preset, abort

Tachometer Input
Tachometer input from input channel
Tachometer input from HP 35658A[5]
Tachometer input from HP 35658A with simultaneous key phasor input from external trigger[5]

Triggering
Continuous (freerun)
Synchronized to source module
Synchronized to DAC module
Synchronized to input module
Synchronized to external trigger[5]
Selectable level, slope, delay
Manual arm

Display formats
One, two or three traces
Digital scope mode (16 traces)
Overlay - two and three traces
Filtered orbit
Waterfall
Spectrogram
Map

Input channels
Voltage, charge[6], ICP input modes
AC/DC coupling
Autorange
Floating or grounded
Engineering units
On screen overload indicators

Frequency
Block size (resolution) 64(25);128(50); 256(100); 512(200); 1024(400); 2048(800); 4096(1600); 8192(3200)
Zoom on all channels
Start frequency
Center frequency
Time record length

Windows
Hann, flat top, uniform, force, exponential

Math functions
Add, chirp, clear, comment, compare, complex conjugate, copy, convolution, DAC output, module, differentiate, display, divide, divide by jw, FFT, filters, imaginary, integrate, inverse FFT, inverse LN, LN, multiply, multiply by jw, name, normalize, negate, random, real part, reciprocate, rotate, set, sine, slope, smooth, square root, subtract, window

Saving and recalling
Measurement results
Instrument state
Display state
Math results
Save to PC disk drive
Save as binary data in MS-DOS® files

Interfaces
HP-IB (IEEE-488.1 and 488.2)

Calibration
Internal calibration signals automatically generate gain and phase adjustments to meet the accuracy specifications.

Source output
Continuous random, burst random, continuous sine, burst sine, negative pulse, positive pulse

DAC Editor functions
Sine, square, triangle, random, exponential, constant, reverse, rotate

Online HELP
Context sensitive help
Indexed by topic

[5] Requires HP 35658A Tachometer/Trigger Module

[6] For the HP 3567A only

8/94
5963-2343E