

# HP 3566A and 3567A

## Technical Specifications

Software Version A.03.03

	HP 3566A	HP 3567A
<b>Initial Channel Count</b>	8	2
<b>Expand Channel Increment</b>	8	1
<b>Maximum Channel Count</b>	48	48
<b>Maximum Freq Span</b>	12.8 kHz	102.4 kHz
<b>Cross-Channel Amplitude Accuracy</b>	± 0.1 dB	± 0.1 dB
<b>Cross-Channel Phase Accuracy</b>	± 0.5°	± 0.5°
<b>Dynamic Range</b>	72 dB	80 dB
<b>Signal Conditioning</b>		
Constant Current Supply	2 mA with open circuit voltage of >20 volts <sup>1</sup>	4 mA with open circuit voltage of >20 volts
Charge Amp	No	Yes
<b>Waterfall Display Update Rate</b> <sup>2</sup>		
For 8 simultaneous displays	10/sec	10/sec
<b>Real-time Bandwidth</b> (single channel)		
Display OFF - any block size up to 4096 <sup>3</sup>	4 channels at 12.8 kHz	2 channels at 25.6 kHz
Display ON - 2048 block size	3.2 kHz	3.2 kHz
<b>Measurement Capability</b> <sup>4</sup>		
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 <sup>5</sup>	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

<sup>1</sup> 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.

<sup>2</sup> Based on a HP Vectra PC 486 MX (486DX2 - 66 MHz).

<sup>3</sup> Based on HP 35651C or HP 35645B. Real-time bandwidth is halved if HP 35651B is used.

<sup>4</sup> The HP 3566A and HP 3567A share the same software measurement feature set but differ in hardware specifications.

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

## Time Capture

<b>Transient Capture Rates</b> (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

<b>Maximum Frequency Spans for Time Capture to HP 35659A SCSI Module Option AT3 Internal Disk (typical)*</b>	<b>Number of Channels</b>	<b>Maximum Frequency Span (kHz)<sup>6</sup></b>	<b>Aggregate Transfer Rate (Mbytes/sec)</b>
	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

<sup>6</sup> 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
<b>Measurement Range</b>	64 $\mu$ Hz to 12.8 kHz	64 $\mu$ Hz to 102.4 kHz
<b>Accuracy</b>	$\pm$ 8 ppm	$\pm$ 8 ppm
<b>Sample Rate</b>	32,768 samples/sec	262,144 samples/sec
<b>Resolution</b>	25, 50, 100, 200, 400, 800, 1600, or 3200 lines	25, 50, 100, 200, 400, 800, 1600, or 3200 lines
<b>Spans</b>		
102.4 kHz	—	X <sup>7</sup>
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
<b>Real-time Bandwidth</b> (Fast averaging, display off)	4 channels at 12.8 kHz <sup>8</sup>	2 channels at 25.6 kHz <sup>8</sup>

**Frequency Response (Gain/Phase)**

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

<sup>7</sup> Extendible to 110 kHz by making a zoom measurement. (Specifications are not guaranteed >102.4 kHz).

<sup>8</sup> Based on HP 35651C or HP 35654B. Real-time bandwidth is halved if HP 35651B is used.

## Swept Sine

	HP 3566A	HP 3667A
<b>Cross Channel Accuracy</b>		
Gain	± 0.1 dB	± 0.1 dB (0.1 Hz to 100 kHz)
Phase	± 0.5°	± 0.5° (0.1 Hz to 100 kHz)
<b>Charge Input Accuracy</b>		
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°
<b>Dynamic Range</b>	132 dB	132 dB
<b>Maximum Frequency</b>	12.8 kHz	102.4 kHz
<b>Maximum Number of Points:</b>	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 <sup>9</sup>
1/3	51	24
1/1	18	9

Frequency Range	1/3 Octave Band Center Frequency Range	Data Collection Time
400 - 80 kHz <sup>10</sup>	26 - 49	31 msec
200 - 40 kHz <sup>10</sup>	23 - 46	63 msec
100 - 20 kHz <sup>10</sup>	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 <sup>10</sup>	8 - 16	31 msec
125 - 31.5kHz <sup>10</sup>	7 - 15	63 msec
63 - 16 kHz <sup>10</sup>	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

<sup>9</sup> Refers to number of bands measurable at one time.

<sup>10</sup> 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).

<b>Specification Compliance</b>	IEC 651 SLM Accuracy Type 1 IEC225-199X Accuracy Class 1
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### 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 <sup>11</sup> 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 <sup>12</sup>	35,536 <sup>12</sup>
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) <sup>13</sup>
80,000 RPM	—	9 (35) <sup>13</sup>
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)

<sup>11</sup> 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.

<sup>12</sup> Requires HP 35658A

<sup>13</sup> One analysis channel only. At all the other RPMs, max number of analysis channels is 48.

## Order Tracking

<b>Amplitude Accuracy</b>	± 1.0 dB			
<b>Phase Accuracy</b>	<b>RPM Range</b>	<b>1st Order</b>	<b>Orders 2-5</b>	<b>Orders &gt;5</b>
	10 to 10,000	± 0.5°	± 1.0°	± 5°
	10,000 to 120,000	± 1.0°		
	<b>HP 3566A</b>	<b>HP 3567A</b>		
<b>Ramp Rates</b>	3000 RPM/sec	3000 RPM/sec		
(4 input channels 600-6000 RPM. Δ order = 0.1, 30 RPM step, pulses/revs = 4.0)				

## Inputs

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

## Source

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

## DAC

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

## Trigger

<b>Internal</b>	Positive or negative slope
<b>Trigger Level Resolution</b>	± 0.031% of full scale range TTL, positive or negative slope
<b>Max Trigger Delay</b> <sup>15</sup>	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)

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

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

<sup>15</sup> HP 3566A input channels share the same trigger delay settings. Trigger delay for HP 3567A input channels may be set independently.

## HP 3566A and 3567A Measurement Features

### 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 TEO L4 LEO SR1 RLO PP0 DC1 DT1 C4,11 (IEEE Std 488-1978)
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### Abbreviations

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

### Measurements/results

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

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

<sup>1</sup> Requires HP 35636A rotating machinery software.

<sup>2</sup> Conforms to 1976 ANSI specification.

<sup>3</sup> Conforms to ANSI S1.11-1986, order 3, type 1-D specification.

<sup>4</sup> Requires HP 35637A.

**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<sup>5</sup>  
Tachometer input from HP 35658A with simultaneous key phasor input from external trigger<sup>5</sup>

**Triggering**

Continuous (freerun)  
Synchronized to source module  
Synchronized to DAC module  
Synchronized to input module  
Synchronized to external trigger<sup>5</sup>  
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<sup>6</sup>,  
IEPE constant current 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

<sup>5</sup> Requires HP 35658A Tachometer/Trigger Module

<sup>6</sup> For the HP 3567A only

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