Chapter 2
Specifications

Specifications describe the instrument's warranted performance and apply within ±5°C and 2 hours of last self-calibration. Specifications designated as "Typical" reflect supplemental, non-warranted characteristics.

Amplitude

Input Range: +27 dBV (31.7 Vpk) to -51 dBV (3.99 mVpk). Range is adjustable in 2 dB increments.

Dynamic Range: 70 dB
The following undesired responses will be < -70 dB relative to full scale input range:

Harmonic Distortion
Intermodulation Distortion
Alias Responses
Spurious or Residual Responses

Noise: **(-51 dBV range, Rs = 50Ω, 16 rms averages)**

160 Hz to 1.28 kHz < -130 dBV/$\sqrt{\text{Hz}}$ (.316 μV/$\sqrt{\text{Hz}}$)

1.28 kHz to 102.4 kHz < -140 dBV/$\sqrt{\text{Hz}}$ (.100 μV/$\sqrt{\text{Hz}}$)

NOTE: The following table shows the maximum span for each range at which noise will be < -70 dB relative to full scale for frequencies > 1.28 kHz. If you are using a span equal to or narrower than the spans shown below for each window/range combination, noise will not limit dynamic range.

Window Types

Ranges (dBV)	*Uniform*	*Hann*	*Flat Top*
+27 to -39	102.4 kHz	102.4 kHz	102.4 kHz
-41	102.4 kHz	102.4 kHz	51.2 kHz
-43	102.4 kHz	102.4 kHz	51.2 kHz
-45	102.4 kHz	51.2 kHz	25.6 kHz
-47	51.2 kHz	51.2 kHz	12.8 kHz
-49	25.6 kHz	25.6 kHz	12.8 kHz
-51	25.6 kHz	12.8 kHz	6.4 kHz

Common Mode Rejection: (Frequency ≤ 1 kHz)

-51 to -11 dBV Ranges > 80 dB (Typical)
(3.99 mVpk to 399 mVpk)

-9 to +9 dBV Ranges > 60 dB (Typical)
(502 mVpk to 3.99 Vpk)

+11 to +27 dBV Ranges > 40 dB (Typical)
(5.02 Vpk to 31.7 Vpk)

Crosstalk : < -130 dB relative to the transmitting signal, or < -70 dB relative to the receiving channel range, whichever is greater.
(Receiving channel Rs = 50Ω)

NOTE: This specification applies to both channel-to-channel and source-to-input crosstalk.

Residual DC Response:

Input Range (dBV)	*DC Level*
+27 to -35 (31.7 Vpk to 25.1 mVpk)	< -30 dB relative to full scale
-37 to -51 (20.0 mVpk to 3.99 mVpk)	< -20 dB relative to full scale

(Rs = 50Ω)

Absolute Amplitude Accuracy: ± 0.5 dB ± 0.03 % of input range
(488 μHz to 102.4 kHz, DC coupled)

Worst case absolute amplitude accuracy is the sum of full scale accuracy, linearity, and flatness at any of the 401 calculated frequency points. If the input signal is not at the center of a frequency bin, the accuracy of the measured signal will be the sum of absolute amplitude accuracy and the flatness specification for that particular window (see window shape parameters).

Full Scale Accuracy: ± 0.15 dB (at 1 kHz)

Linearity: ± 0.15 dB ± 0.03% of range (at 1 kHz)

Flatness: ± 0.2 dB (relative to 1 kHz, DC coupled)

Frequency

Measurement Range: *Channel 1:* **488 μHz to 102.4 kHz, single** channel mode
Channel 1 and 2: **244 μHz to 51.2 kHz,** dual channel mode.

Accuracy: ± 0.003% of frequency reading

Resolution: Span/400, both channels, single or dual channel operation.

Spans:	*Single Channel*	*Dual Channel*
# of spans available	20 (x2 sequence)	20 (x2 sequence)
min. span	195.3 mHz	97.6 mHz
max. span	102.4 kHz	51.2 kHz
time record length	400/span	400/span

Window Functions: Flat Top, Hann, Uniform, Force, Exponential

Window Shape Parameters:

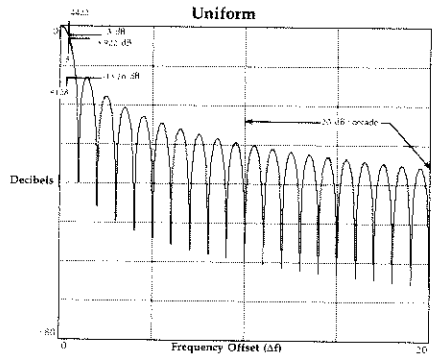
	Noise Equiv. BW (% of span)	*-3dB BW (% of span)*	*Shape Factor (-60dB BW/ -3 dB BW)*	*Window Flatness (dB)**
Uniform	0.25	0.25	716	+0, -4.0
Hann	0.375	0.37	9.1	+0, -1.5
Flat Top	0.955	0.9	2.6	± 0.005

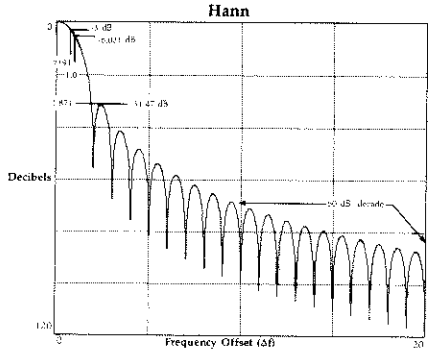
* relative to analyzer's 401 calculated frequency points (spectral lines)

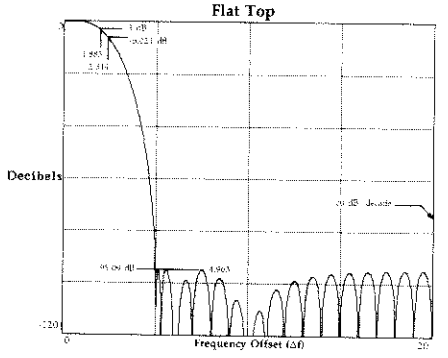
The HP 35660A functions as if the input signal were applied to a bank of 401 narrow-band filters in parallel. The drawings at right show the response of a single filter in the frequency domain when using Uniform, Hann or Flat Top windows. The left side of each drawing represents the center of the filter. The horizontal axis shows frequency offset (in unit of Δf) from the center of the filter. The units of Δf represent the spacing between adjacent bin centers. Only positive offsets are shown, as each filter is symmetrical. NOTE: HP 35660A marker frequencies fall at the center of each filter.

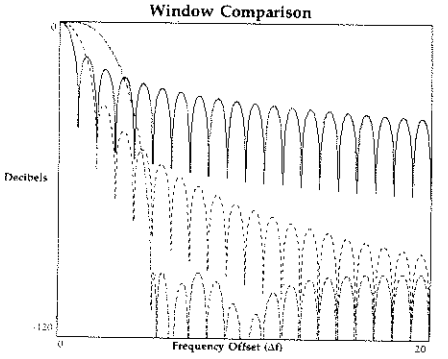
Typical Realtime Bandwidth: (random noise source off)

	Single Channel	*Dual Channel*
Averaging Off	800 Hz	400 Hz
Fast Averaging	3.2 kHz	1.6 kHz









Phase

Single Channel Phase Accuracy: 488 uHz to 10.24 kHz ± 4.0° (relative to external trigger, 16 vector averages, amplitude ≥ -50 dB relative to full scale, DC coupled)

NOTE: For Hann or Flat Top windows, phase is relative to the center of the time record. For the Uniform, Force, and Exponential windows, phase is relative to the beginning of the time record.

Frequency Response

Gain Accuracy: ± 0.4 dB

Phase Accuracy: 488 uHz to 10.24 kHz ± 1°
10.24 kHz to 102.4 kHz ± 1.8°

(DC coupled, 16 **rms** averages, **488 μHz** to 51.2 kHz, Ch1 range = Ch2 range, full scale periodic chirp input, Uniform window)

Inputs

Connection: Grounded or Floating

Input Impedance: 1 MΩ ± 10% shunted by < 100 pF

Low to chassis in floating mode:
1 MΩ shunted by **< 0.01 μF (Typical)**

Low to chassis in grounded mode: 50Ω (Typical)

Input Coupling: AC or DC coupling;
AC roll-off is < 3 dB at 1 Hz

Common Mode Range: ± 4V peak
(floating mode)

Source

Random, periodic chirp, fixed sine outputs are available from the front panel SOURCE output.

Output Impedance: < 5Ω

Max. Output Level: ± 5 Vpk

Max. Current: ± 20 mA

Max. Capacitive Load: 1000 pF

Sine:

Frequency range:
15.63 mHz to 102.4 kHz

Amplitude Accuracy:
± 4% Vpk (at 1 kHz, Vpk = .1V to 5V)

Flatness: ± 1.0 dB
(relative to 1 kHz, Vpk= .1V to 5V)

Harmonic, subharmonic, and other spurious responses:

488 μHz to 10 kHz:
< -60 dB relative to fundamental

10 kHz to 102.4kHz:
< -40 dB relative to fundamental

(Vpk= 0.1V to 5V)

Residual DC offset:
± 8.0 mV, ± 6.0% Vpk

Random:

Flatness: < 5.0 dB (Typical)
(passband,relative to minimum amplitude in the frequency domain, Vpk = .1V to 5V, full span)

Crest factor (Vpk/Vrms): 2.5 (Typical)
(center frequency > 0.7 * span frequency)

Trigger

Internal:

Positive or negative slope
Level range: ± 100% of input range

External:

TTL, positive or negative slope

Delay:

Pre-trigger: from 0 to 6 samples less than 8 time records. Resolution is 1 sample.

Post-trigger: from 0 to 8191 seconds. Resolution is 1 sample.

(1 sample = time record (secs)/1024)

NOTE: the relative trigger delay between channel 1 and 2 can be no more than ± 7 time records. As you set delay on one channel, the analyzer will automatically adjust delay on the other channel, so that the difference in their delay does not exceed 7 time records.

General

Environmental Specifications:

Standard Instrument:

	Operating	*Storage (no disc in drive)*
Temperature	5 to 50 C	-20 to 60 C
Humidity	min. 8% max. 80% at 30 C non-condensing	5 to 95% non-condensing
Altitude	2150 m (7000 ft)	15,200 m (50,000 ft)

Delete Disc Option:

	Operating	*Storage*
Temperature	0 to 55 C	-40 to 70 C
Humidity	min. 5% max. 95% at 40 C	min. 5% max. 95% at 40 C
Altitude	4570 m (15,000 ft)	15,200 m (50,000 ft)

Power:

90 - 132 VAC, 48 to 440 Hz
198 - 264 VAC, 48 to 66 Hz
280 VA maximum

Weight:

22 kg (47 lbs) net
24 kg (52 lbs) shipping

Dimensions:

222 mm (8.75 in) high
425.5 mm (16.75 in) wide
538 mm (21.19 in) deep

HP-IB:

Implementation of IEEE Std 488.1 & 488.2
SH1 AH1 T6 TE0 L4 LE0 SR1 RL1 PP0
DC1 DT1 C1,C2,C3,C12 E2

Peripherals:

Disc Drives: SS/80 Protocol Disc Drives

Plotters: Hewlett-Packard Graphics Language (HP-GL) digital plotters

Printers: HP-IB printers, alpha and raster dumps.

(See ordering guide for a list of peripherals and accessories.)

Abbreviations:

dBV = dB relative to 1 volt rms.
Rs = Resistance of source or termination connected to input.