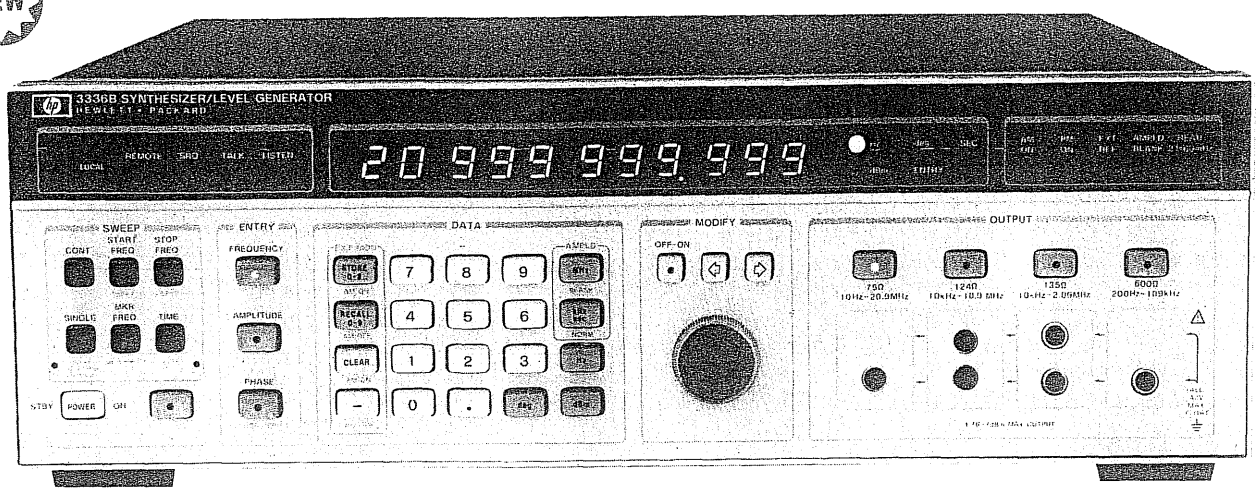
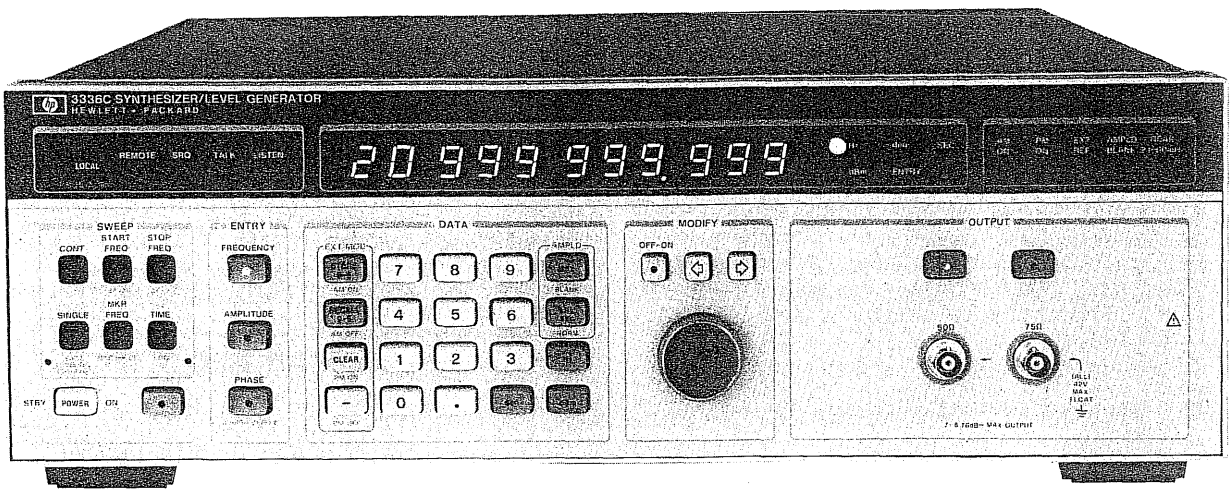
Synthesizer/Level Generator

Model 3336 A/B/C

NEW



3336B



3336C

HP-IB

Description

Covering a frequency range of 10 Hz to 20.999 MHz, the 3336A (CCITT) and 3336B (Bell) Synthesizer/Level Generators have performance characteristics that make them ideally suited for the telecommunications industry. The 3336C is designed for traditional synthesizer applications as well as R&D and production testing of systems or components. All three feature precision level control, high spectral purity, optional frequency stability of $\pm 5 \times 10^{-8}$/week, internal frequency sweep and numerous user conveniences. All models include HP-IB (IEEE Std. 488-1975) as a standard feature for use in automatic test systems.

Precision Frequency Measurements

Major advances in HP technology have provided a single loop, fractional-N synthesis technique which allows synthesizer accuracy with 11 digits of resolution, plus. . . completely phase continuous frequency sweep over any of the instrument's frequency ranges. Microhertz resolution below 100 kHz allows precise frequency measurements over a range of 10 Hz to 20.999 999 999 MHz. Harmonics are below 60 dB over the range from 50 Hz to 1 MHz (50 dB to 20 MHz), with spurious signals below 70 dBc or −100 dBm in the standard instrument, −115 dBm with an option.

±0.05 dB Amplitude Accuracy

New HP attenuator technology coupled with custom designs in leveling loops and thermal converters produce amplitude accuracies seen only in instruments at much greater cost. The fast leveling loop makes extremely flat sweeps possible at fast sweep speeds. External leveling is also available for those custom applications where a control loop is desired.

HP-IB

The 3336A, B and C come standard with HP-IB. Remote programming of major front panel controls makes these instruments a versatile and powerful addition to automatic test systems. The isolated interface combined with floating inputs and outputs contributes to ease of use in systems applications.

Other Features

Both the 3336 A & B have true balanced outputs which can be floated. All three models (the 3336A, B & C) have 10 storage registers; amplitude blanking capability during frequency switching; linear or logarithmic phase continuous sweep capabilities; RPG (rotary pulse generator) to simplify modification of any digit in the display; phase offset capability; output connector and impedance flexibility; AM and PM modulation, and many other features. Refer to the data sheet for complete information.

Abbreviated Specifications

Frequency

Signal Output	3336A	3336B	3336C
50 Ω Unbalanced			10 Hz to 20.999 999 999 MHz
75 Ω Unbalanced	10 Hz to 20.999 999 999 MHz		
124 Ω Balanced		10 kHz to 10.999 999 999 MHz	
135 Ω Balanced		10 kHz to 2.099 999 999 MHz	
150 Ω Balanced	10 kHz to 2.099 999 999 MHz		
600 Ω Balanced	200 Hz to 109.999 999 kHz		

Resolution: 1 μHz for frequencies < 100 kHz, 1 mHz for frequencies ≥ 100 kHz
Accuracy: ±5 x 10^{-6} of programmed frequency
Aging rate: ±5 x 10^{-6}/year (20° to 30°C)
Warm-up time: 30 minutes to within specified accuracy

Amplitude

Range: 50 Ω: −71.23 to +8.76 dBm; 75 Ω and 600 Ω: −72.99 to +7.00 dBm; 124 Ω, 135 Ω, 150 Ω: −78.23 to +1.76 dBm
Absolute accuracy: ±.05 dB, 20° to 30°C (for the top 9.99 dB of amplitude range at 10 kHz, 50 kHz for 124 Ω, 135 Ω, 150 Ω); ±.08 dB, 0° to 55°C
Flatness: 50/75 Ω, ±.1 dB (±.07 dB with option 005) referenced to 10 kHz, 124, 135, 150 Ω, ≤ ± .15 dB referenced to 50 kHz.
Attenuator accuracy: (Instruments without Option 005)

	10 Hz	1 MHz	10 MHz	20.9 MHz
10 to 19.99 dB	±.1 dB	±.15	±.2dB	
20 to 39.99 dB	±.15 dB	±.2 dB	±.25 dB	
40 to 79.99 dB	±.2 dB	±.25 dB	±.3dB	

Note: Amplitude Accuracy is the sum of the Absolute Accuracy and, as necessary, Flatness and Attenuator Accuracy. See page 592 (3336 A/B) for overall amplitude. Accuracy specification expressed versus output level.

Amplitude blanking: output drops to less than −85 dBm during frequency switching

Main Signal Outputs

Return loss (on carrier), balance

Output	Return Loss	Balance
50 Ω (3336C)	>30 dB, 10 Hz to 10 MHz, >25 dB, 10 MHz to 20 MHz	Unbalanced
75 (3336 A/B/C)	>30 dB, 10 Hz to 20 MHz	Unbalanced
124 Ω (3336B)	>20 dB, 10 kHz to 30 kHz >30 dB, 30 kHz to 10 MHz	>30 dB 10 kHz to 10 MHz
135 Ω (3336B)	>20 dB, 10 kHz to 30 kHz >30 dB, 30 kHz to 2 MHz	>36 dB 10 kHz to 2 MHz
150 Ω (3336A)	>20 dB, 10 kHz to 30 kHz >30 dB, 30 kHz to 2 MHz	>36 dB 10 kHz to 2 MHz
600 Ω (3336 A/B)	Not specified	>38 dB 300 Hz to 50 kHz

Spectral Purity:

Harmonic distortion: harmonically related signals will be less than the following levels relative to the fundamental (normal leveling):

Frequency Range*	Harmonic Level
50 Hz to 1 MHz	−60 dB
1 MHz to 5 MHz	−55 dB
5 MHz to 20 MHz	−50 dB

Integrated phase noise: (3336C) −54 dB, over a 30 kHz band, centered on a 20 MHz carrier, excluding 1 Hz about the carrier; (3336A & B) −64 dB for a 3 kHz band, 2 kHz either side of carrier.
Spurious: all non-harmonically related signals will be more than 70 dB below the fundamental or −100 dBm (−115 dBm with Option 005)
*Refer to data sheet for specifications below 50 Hz.

Phase Offset

Range: ±719.9° with respect to arbitrary reference phase.
Resolution: 0.1°
Accuracy: ±0.2°

Frequency Sweep

Sweep time: linear; 0.01 s to 99.99 s. Single Log; 2 s to 99.99 s. Continuous Log; 0.1 s to 99.99 s.
Maximum sweep width: specified frequency range of selected output
Minimum sweep width: log; 1 decade. Linear; minimum BW (Hz) = .1 (Hz/s) x Sweep Time (s)
Phase continuity: phase is continuous over full frequency range.
Sweep flatness: fast leveling; ±.15 dB, 10 kHz to 20 MHz, .03 s
Sweep time: normal leveling; ±.15 dB, 50 Hz to 1 MHz, .5s sweep time.

Amplitude Modulation

Modulation depth: 0 to 100%
Modulation frequency range: 50 Hz to 50 kHz
Envelope distortion: <−30 db to 80% modulation (1 kHz modulating frequency)

Phase Modulation

Range: 0° to ±850°
Linearity: ±0.5% from best fit straight line
Modulation frequency range: dc to 5 kHz
Input sensitivity: ±5 V peak for 850° phase shift (170°/volt)

Auxiliary Outputs

AUX O dBm: frequency range is 21 MHz to 60.999 999 999 MHz
SYNC OUT: TTL square wave with V_{high} >1.2 V into 50 ohms.
REF OUT: 0 dBm (50 Ω), 1 MHz signal for phase locking.
10 MHz OVEN OUT: Instruments with Opt 004 only. 0 dBm (50 Ω). 10 MHz temperature stabilized, crystal oscillator.
X DRIVE: 0 to >+10 Vdc linear ramp.
Z BLANK: sweep related TTL compatible voltage levels.
MARKER: TTL compatible high to low level transition at the programmed Marker Frequency.

Auxiliary Inputs

EXT REF IN: For phase-locking the Model 3336 to an external frequency reference. Signal from 0 dBm to +20 dBm (50 Ω).
AMPTD MOD: See Amplitude Modulation specifications.
PHASE MOD: See Phase Modulation specifications.
EXTERNAL LEVELING: Input from an External Leveling voltage source to regulate the signal amplitude at a remote point.
Option 004: High Stability Frequency Reference (all models)
Accuracy: ±5 x 10^{-8}
Aging rate: ±5 x 10^{-8}/week after 72 hours continuous operation
±5 x 10^{-7}/month after 15 days continuous operation
Ambient stability: ±5 x 10^{-8} maximum, 0° to 55°C.
Option 005: High Accuracy Attenuator (Models 3336 A/B/C)

Accuracy: attenuation

10 to 19.99 dB	±.035 dB
20 to 29.99 dB	±.06 dB
40 to 79.99 dB	±.1 dB

General

Operating environment:
Temperature: 0° to 55°C
Relative humidity: ≤85%, 0° to 40°C
Altitude: 15,000 ft, ≤4600 meters
Storage temperatures: −50° to +65°C
Storage altitude: ≤50,000 ft, 15,240 meters
Power requirements: 100/120/220/240 V, +5%, −10%, 48 to 66 Hz, 60 VA, (100 VA with all options), 10 VA standby
Size: 132.6 high x 425.5 wide x 497.8 deep or 5¼" x 16¾" x 19⅝"
Weight: net, 10 kg. (22 lbs.); shipping, 15.5 kg. (34 lbs.)

Ordering Information*

	Price
3336A Synthesizer/Level Generator (CCITT)	$4100
3336B Synthesizer/Level Generator (N. American)	$4100
3336C Synthesizer/Level Generator (General Purpose)	$3800
Opt 004 High Stability Frequency Reference	add $550
Opt 005 High Accuracy Attenuator	add $550
Opt 907 Front Handle Kit	add $20
Opt 908 Rack Flange Kit	add $15
Opt. 909 Rack Flange and Handle Kit	add $30

*HP-IB cables not furnished. See page 28.