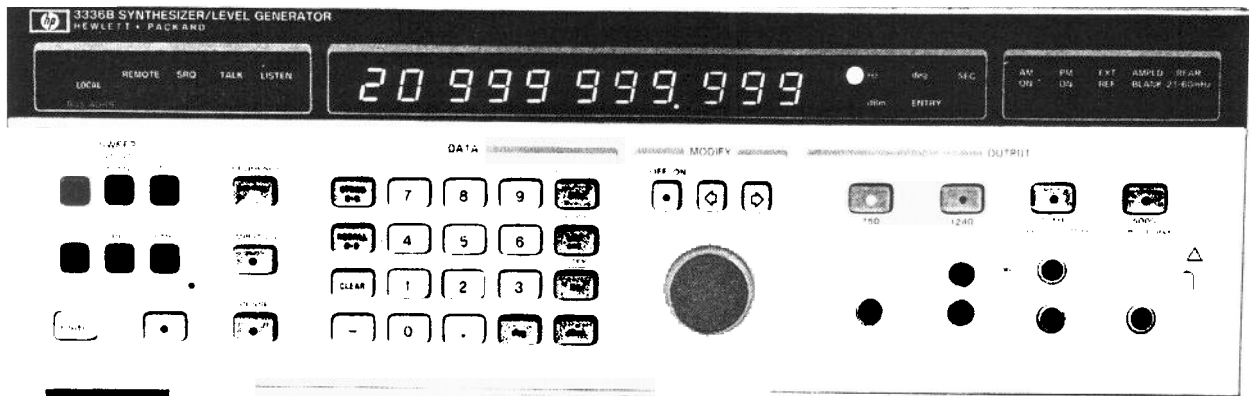




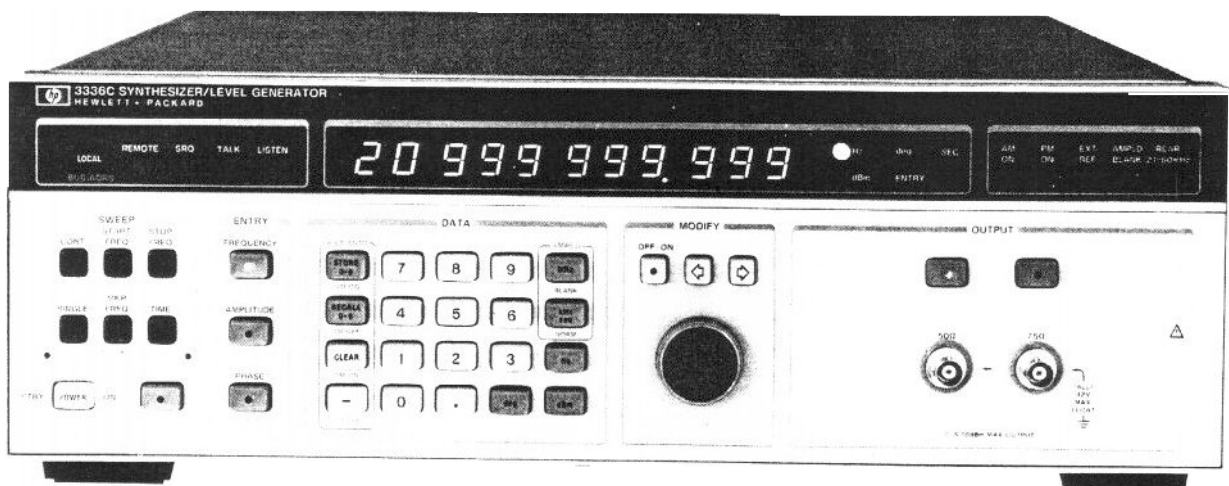
FUNCTION GENERATORS & FREQUENCY SYNTHESIZERS

Synthesizer/Level Generator

Model 3336 A/B/C



3336B



3336C



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 $\pm 5 \times 10^{-7}$ /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 μ Hz for frequencies < 100 kHz, 1 mHz for frequencies \geq 100 kHz

Accuracy: $\pm 5 \times 10^{-6}$ of programmed frequency

Aging rate: $\pm 5 \times 10^{-7}$ /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: $\pm .05$ 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); $\pm .08$ dB, 0° to 55°C

Flatness: 50/75 Ω , $\pm .1$ dB ($\pm .07$ dB with option 005) referenced to 10 kHz, 124, 135, 150 Ω , $\pm .15$ 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 | $\pm .1$ dB | $\pm .15$ | $\pm .2$ dB | $\pm .2$ dB |
| 20 to 39.99 dB | $\pm .15$ dB | $\pm .2$ dB | $\pm .25$ dB | $\pm .25$ dB |
| 40 to 79.99 dB | $\pm .2$ dB | $\pm .25$ dB | $\pm .3$ dB | $\pm .3$ dB |

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: $\pm 719.9^\circ$ with respect to arbitrary reference phase.

Resolution: 0.1°

Accuracy: $\pm 0.2^\circ$

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: $\pm .15$ dB, 10 kHz to 20 MHz, .03 s

Sweep time: normal leveling: $\pm .15$ 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 $\pm 850^\circ$

Linearity: $\pm 0.5\%$ 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 0 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: $\pm 5 \times 10^{-7}$

Aging rate: $\pm 5 \times 10^{-7}$ /week after 72 hours continuous operation

$\pm 5 \times 10^{-7}$ /month after 15 days continuous operation

Ambient stability: $\pm 5 \times 10^{-7}$ maximum, 0° to 55°C.

Option 005: High Accuracy Attenuator (Models 3336 A/B/C)

Accuracy: attenuation

| | |
|----------------|---------------|
| 10 to 19.99 dB | $\pm .035$ dB |
| 20 to 29.99 dB | $\pm .06$ dB |
| 40 to 79.99 dB | $\pm .1$ dB |

General

Operating environment:

Temperature: 0° to 55°C

Relative humidity: $\leq 85\%$, 0° to 40°C

Altitude: 15,000 ft, ≤ 4600 meters

Storage temperatures: -50° to +65°C

Storage altitude: $\leq 50,000$ 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 5 $\frac{1}{4}$ " x 16 $\frac{1}{4}$ " x 19 $\frac{3}{4}$ "

Weight: net, 10 kg. (22 lbs.); shipping, 15.5 kg. (34 lbs.)

Ordering Information*

3336A Synthesizer/Level Generator (CCITT)

3336B Synthesizer/Level Generator (N. American)

3336C Synthesizer/Level Generator (General Purpose)

Opt 004 High Stability Frequency Reference

Opt 005 High Accuracy Attenuator

Opt 907 Front Handle Kit

Opt 908 Rack Flange Kit

Opt. 909 Rack Flange and Handle Kit

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