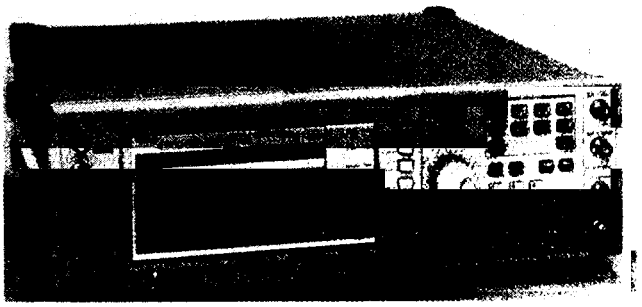
HP E4430B
HP E4431B
HP E4432B
HP E4433B

NEW

- 250 kHz up to 4 GHz
- Personalities for single and multichannel CDMA
- 20 MHz RF bandwidth for I and Q
- Superior level accuracy
- Step sweep (frequency, power and list)
- Wideband AM, FM and phase modulation
- Internal data generator and burst capabilites (Option UN8)
- Flexible creation of custom modulation (Option UN8, UND)
- Built-in TDMA formats for DECT, GSM, NADC, PDC, PHS and TETRA (Option UN8)
- Internal dual arbitrary waveform generator (Option UND)
- Internal bit-error-rate analyzer (Option UN7)
- 3 year warranty



HP ESG Series E4433B

HP ESG-D Series Digital and Analog Signal Generators

The HP ESG-D series of RF signal generators provide a wide range of digital modulation capabilities, in addition to a comprehensive feature set and excellent analog performance–all at an affordable price. They provide excellent modulation accuracy and stability, as well as unprecedented level accuracy. The HP ESG-D series is ideally suited to meet the demanding requirements of today's digital receiver test, component test and local oscillator applications.

Customized Modulations and DECT, GSM, NADC, PDC, PHS, TETRA Standards (Option UN8)

Internally generate signals for common standards to test receivers. Change modulation types, data, symbol rate, filter type and filter factor to generate customized signals for component and system margin testing. Create custom signals by mapping I/Q values and building a unique FIR filter. Easily configure timeslots to simulate different types of traffic, control or synchronization channels (or bursts). Generate mobile or base station transmissions with the internal burst capabilities. Also reduce the need for external equipment with comprehensive data generation capabilities.

Internal Dual Arbitrary Waveform Generator (Option UND)

Playback virtually any mathematically generated waveform. Download long or multiple waveforms (up to 1 Msample) to play or store in non-volatile RAM for later use. The 14 bits of DAC resolution enhance dynamic range and noise performance. Optimized for I/Q generation, the dual arbitrary option simplifies setup.

Single and Multichannel CDMA

The HP ESG-D series supports CDMA (Option UN5) and W-CDMA (Option H97, H98) personalities. Test CDMA mobile components and transmitters by generating forward and reverse single-channel. Fully characterized CDMA basestation amplifiers or perform transmitter test by simulating multiple coded channels with individually adjustable power, data and PN offsets.

Internal Bit Error Rate Analyzer (Option UN7)

Perform bit-error-rate analysis for sensitivity and selectivity measurements. Option UN7 provides analysis capabilities for PN9 and PN15 bit sequences and indicates pass or fail conditions for user-specified test limits.

Broadband I and Q Modulation

Use the analog I and Q inputs to generate complex modulation formats required for the development and testing of RF digital communications systems. A built-in quadrature modulator processes the I and Q input signals to provide superior modulation accuracy and stability over 10 MHz (1dB) baseband bandwidth.

Excellent Level Accuracy

Make sensitivity tests accurately and efficiently with the wide power range (+13 dBm to –136 dBm, +17 dBm to –136 dBm with Option UNB) and superior level accuracy of the HP ESG-D series RF signal generators. Level accuracies of better than +1.1 dB (+0.6 dB typical) for built-in modulation formats ensures precise measurement of even the most sensitive digital receivers.

Specifications

Frequency
HP E4430B: 250 kHz to 1000 MHz
HP E4431B: 250 kHz to 2000 MHz
HP E4432B: 250 kHz to 3000 MHz
HP E4433B: 250 kHz to 4000 MHz

For Analog Remote Programming and General Specifications, see ESG Series on page 208.

Level Accuracy with Digital Modulation

(With ALC on; relative to CW; with PRBS-modulated data)[1]
π/4 DQPSK or QPSK Formats
± 0.15 dB (with raised cosine or root-raised cosine filter and $\alpha \geq 0.35$; with 10 kHz ≤ symbol rate ≤ 1 MHz; at RF freq. ≥ 25 MHz; power ≤ max. specified –3 dBm or –6 dBm with Option UNB.
Constant Amplitude Formats
(FSK, GMSK, etc.): No degradation in power level accuracy
Level Accuracy with ALC Off[2]
± 0.3 dB, typical (After power search is executed; relative to CW level accuracy with ALC on; if external I/Q is enabled: $\sqrt{I^2 + Q^2} = 0.5\ V_{rms}$)

I/Q Modulation

I&Q Inputs:
Input Impedance: 50 Ω
Full Scale Input: $\sqrt{I^2 + Q^2} = 0.5\ V_{rms}$
Adjustments/Impairments (nominal):
DC Offset: (I and Q independently adjustable) +100%
I/Q Gain Ratio: ± 4 dB
I/Q Quadrature: ± 10°

DC Vector Accuracy
Relative to full scale, power ≤ + 7 dBm (≤ +10 dBm for Option UNB)

Frequency (GHz)	< 0.6	0.6 to 2	2 to 3.7	≤ 4
Static EVM[1] (rms)	< 0.75%	< 0.5%	< 0.75%	< 1%
Magnitude Error[1] (rms)	< 0.5%	< 0.35%	< 0.5%	< 0.75%
Phase Error[1] (rms)	< 0.35°	< 0.25°	< 0.35°	< 0.5°
Origin Offset (dBc)	< –46	< –46	< –40	< –40

Burst Envelope

On/Off Ratio: V_{ac}: ≤ –1.05 V
≤ 3 GHz: > 75 dB
> 3 GHz: > 60 dB
Rise/Fall Time: < 2 μs, typical
Minimum Burst Rate:
ALC On: 10 Hz, typical
ALC Off: DC
External Input: Ext 1
Input Impedance: 50 Ω
Input Voltage
RF Off: –1.0 V
RF On: 0 V

Coherent Carrier Out[3]

Range: 250 MHz to maximum carrier frequency
Level: 0 dBm ± 5 dB, typical
Impedance: 50 Ω

For more information, visit our website: **http://www.hp.com/go/esg**

[1] Typically, level accuracy with ALC on will be maintained with drive levels between 0.25 and 1.0 V_{rms}.
[2] When applying external I/Q signals with ALC off, output level will vary directly with I/Q input level.
[3] Coherent carrier is modulated by FM or ΦM when enabled.

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Optional Real-Time I/Q Baseband Generator (Option UN8)

Modulation Formats
PSK: BPSK, QPSK, OQPSK, π/4DQPSK, 8PSK, 16PSK, D8PSK
MSK: User-defined phase offset
QAM: 4, 16, 32, 64, 256
FSK: Symmetric 2, 4, 8, 16
Custom FSK: User-defined asymmetric
Custom I/Q: Map of 16 unique values for I and Q
Filters: Nyquist, Root Nyquist, Gaussian, Custom FIR
Filter Rate: α: 0 to 1; BT 0.1 to 1
Symbol Rate: Adjustable up to 12 Msymbols/sec
Data Structure
Frames and timeslots may be configured as different types of traffic or control channels. The data field of a timeslot can accept user file, PRBS or external data with the appropriate clock.
Internal Data
Pseudo-Random Patterns: Continuous PN9, PN11, PN15, PN20 or PN23
Repeating Sequence: Any 4-bit sequence

Downdoadable Data
Maximum Size (Pattern RAM): 1 Mbits, 8 Mbits (Option UN9)
Maximum Size (User File): 128 kbytes
External Data
Inputs: Data, bit/symbol clocks (accepts rates ± 5% of specified data rate)
Reference Frequency: Internal or external 1, 2, 5, 10 MHz reference. Data clock can be locked to an external 13 MHz GSM reference
Frame Trigger Delay Control
Range: 0 to 65,535 bits
Resolution: 1 bit
Internal Burst Shape Control
Rise/Fall Time Range: Up to 30 bits
Rise/Fall Delay Range: 0 to 63.5 bits (varies w/standard)
I/Q Outputs
EVM (NADC, PDC, PHS, TETRA): 1% rms
Global Phase Error (GSM): 0.75° rms
Deviation Accuracy (DECT): 1 kHz

	NADC		PDC		PHS		TETRA[5]		DECT	GSM (DCS, PCS)
Error Vector Magnitude[4] (% rms)	**Cont.**	**Burst**	**Cont.**	**Burst**	**Cont.**	**Burst**	**Cont.**	**Burst**		
Low EVM Mode	0.7	1.4	0.9	1.3	0.9	0.9	0.8	1.7	N/A	N/A
Low EVM Mode (typical)	0.4	1.1	0.6	0.9	0.6	0.7	0.5	1.3	N/A	N/A
Low ACP Mode (typical)	1.0	1.4	0.8	1.0	0.9	0.9	0.9	1.5	N/A	N/A
Global Phase Error[4] (rms/pk)	N/A		N/A		N/A		N/A		N/A	0.6°/2.2° 0.3°/1.3°(typ.)
Deviation Accuracy[4] (kHz)	N/A		N/A		N/A		N/A		3 (2, typ)	N/A
Adjacent Channel Power[4] (ACP) (Low ACP Mode dBc, typical)	**Cont.**	**Burst**	**Cont.**	**Burst**	**Cont.**	**Burst**	**Cont.**	**Burst**	N/A	**Cont.** **Burst**
at Adjacent Channel[6]	–35	–34	—	—	—	—	–69[7]	–64	N/A	–37 –37
at 1st Alternate Channel[6]	–80	–78	–74	–72	–80	–78	–80	–78	N/A	–72 –71
at 2nd Alternate Channel[6]	–82	–81	—	—	–80	–79	–81	–80	N/A	–82 –80
at 3rd Alternate Channel[6]	–84	–83	–81	–79	—	—	–81	–80	N/A	–82 –81
Supported Burst Types	Custom, Up/Down TCH		Custom, Up/Down TCH, Up Vox		Custom, TCH, Sync		Custom, Up Control 1 & 2, Up Normal, Down Normal, Down Sync		Custom, Dummy B 1 & 2, Traffic B, Low Capacity	Custom, Normal, FCorr, Sync, Dummy, Access
Scramble Capabilities	—		—		Yes		Yes		—	—

[4] Specifications apply for the frequency range, symbol rates, root raised cosine filter, filter factors (α or B_bT) and default scaling factor specified for each standard, and at power levels ≤ + 7 dBm (≤ 4 dBm for TETRA), (≤ + 10 dBm for Option UNB).
[5] ACP for TETRA is measured over a 25 kHz bandwidth, with an 18 kHz root raised cosine filter applied at power levels ≤ 4 dBm (≤ +8 dBm for Option UNB).
[6] The "channel spacing" determines the offset size of the adjacent and alternate channels: Adjacent Chan. offset = 1 x channel spacing, 1st Alt. Chan. = 2 x channel spacing, 2nd Alt. Chan. = 3 x channel spacing, etc.
[7] TETRA ACP performance is typically –72 dBc with Option H99 in continuous modulation mode.

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Optional Dual Arbitrary Waveform Generator (Option UND)

Channels: 2
Resolution: 14 bits (1/6384)
Waveform Memory Length
Playback: 1 Msample/channel
Storage (non-volatile RAM): 1 Msample/channel
Waveform Segments
Length: 16 samples to 1 Msample
Number of Segments: 128
Sequencing: Continuously repeating
Sample Rate: 1 Hz to 40 MHz
Output Reconstruction Filters
Type: Elliptic
Fcutoff (nominal, 3 dB): 250 kHz, 2.5 MHz, 8 MHz and Through
Baseband Spectral Purity
(typical, full scale sinewave, >20x oversampling)
Harmonic distortion:
< 100 kHz: <-80 dBc
100 kHz to 2 MHz: <-65 dBc
Non-Harmonic spurious: <-80 dBc
Phase Noise: <-120 dBc/Hz
(baseband output of 1 MHz sinewave at 20kHz offset)
IM Performance: <-69 dB
(two sinewaves at 950 kHz and 1050 kHz at full scale)

Optional Bit-Error-Rate Analyzer (Option UN7)

Clock Rate: 100 Hz to 10 MHz
Supported Data Patterns: PN9, PN15
Resolution: 10 digits
Minimum Synchronization Length: 9 bits (PN9 <2 MHz)
Bit Sequence Length: 100 bits to 4.294 Gbits after synchronization

Multichannel CDMA Personalities (Option UN5)

Spurious Emissions (typical dBc, with high crest factor on)

Reverse Channel (≤0 dBm)

	Offset 885 to 1.25 MHz			Offset 1.25 to 1.98 MHz			Offset 1.98 to 5 MHz		
	Std.	UNB	H99	Std.	UNB	H99	Std.	UNB	H99
30-200 MHz	-72	-75	-73	-76	-78	-74	-79	-79	-77
700- 1000 MHz	-73	-76	-79	-76	-79	-82	-79	-79	-79
1000-2000 MHz	-66	-74	-79	-70	-78	-82	-79	-79	-79

9/64 Channels (<-2 dBm)

	Offset 885 to 1.25 MHz			Offset 1.25 to 1.98 MHz			Offset 1.98 to 5 MHz		
	Std.	UNB	H99	Std.	UNB	H99	Std.	UNB	H99
30-200 MHz	-68	-71	-72	-73	-76	-72	-78	-78	-77
700- 1000 MHz	-70	-73	-75	-75	-77	-79	-79	-79	-79
1000-2000 MHz	-63	-71	-74	-68	-75	-78	-78	-78	-78

Chip (symbol) Rate: Adjustable from 1 Hz to 10 MHz with 4x oversampling
Predefined Channel Configurations: Pilot, 9, 32, 64, reverse
Rho: 0.9996
(<4 dBm, IS-95 filter, < 2 GHz, typical)
User-Defined Channels
Number of Channels: 1 to 256
Walsh Codes: 0 to 63
Channel Power: 0 to –40 dB
PN Offset: 0 to 511
Data: 00-FF (HEX) or random

Key Literature

HP ESG and ESG-D Series Brochure, p/n 5966-3696E
HP ESG Series Technical Specifications, p/n 5965-3096E
HP ESG Configuration Guide, p/n 5965-4973E
Source Selection Guide, p/n 5965-3094E
Using the HP ESG-D Series and the HP 8922 GSM Test Set for GSM Applications, p/n 5965-7158E
Generating and Downloading Data to the HP ESG-D Series for Digital Modulation, p/n 5966-101E
Controlling TDMA Timeslot Power Levels in the HP ESG-D Series, p/n 5966-4472E
Generate Digital Modulation with the HP ESG Series Internal Dual Arbitrary Waveform Generator, p/n 5966-4097E
Customize Digital Modulation with the HP ESG-D Series Real-time I/Q Baseband Generator, p/n 5966-4096E
Making Bit-Error-Rate Measurements with the HP ESG-D Series, p/n 5966-4098E

Ordering Information

	Price
HP E4430A	$14,600
HP E4431A	$16,100
HP E4432A	$17,600
HP E4433A	$19,100
Opt 1CM Rackmount kit, p/n 5063-9214	+$36
Opt 1CN Front handle kit, p/n 5063-9227	+$59
Opt 1CP Rackmount kit with handles, p/n 5063-9221	+$86
Opt 1E5 Add high stability time base	+$714
Opt 1EM Move all front panel connectors to rear panel	+$204
Opt UNA Alternate timeslot power level control option for UN8	+$500
Opt UNB High power with mechanical attenuator	+$1,000
Opt UND Internal dual arbitrary waveform generator	+$6,000
Opt UN5 Single and multichannel CDMA personality for UND	+$2,000
Opt H03 Single channel CDMA personality	Call HP
Opt UN7 Internal bit-error-rate analyzer	+$3,150
Opt UN8 Real-time I/Q baseband generator with TDMA standards	+$5,100
Opt UN9 Additional 7Mbits RAM memory for UN8	+$1,500
Opt H97 W-CDMA personality for UND	Call HP
Opt H98 W-CDMA receiver test baseband generator	Call HP
Opt H99 Improved ACP performance for W-CDMA, CDMA, TETRA	Call HP
Opt W50 Five-year warranty	+$950
Accessories	
Transit Case p/n 9211-1296	+$550
HP 83300A Remote Interface	+$342