

SIGNAL GENERATORS

High-Performance RF

HP 8660D

443

- 10 kHz to 2600 MHz
- Synthesizer stability and accuracy
- 1 Hz resolution (2 Hz above 1300 MHz)

- Ten-digit display
- Calibrated output over > 140 dB range
- AM, FM, Φ M, or pulse modulation



HP 8660D (with HP 86633B and HP 86603A plug-ins)

HP 8660D Synthesized Signal Generator

System Concept

The HP 8660 is a modular, solid-state, plug-in system. Each system includes: 1) A programmable, synthesized signal generator mainframe; 2) an RF section plug-in; and 3) a modulation section. Synthesized accuracy and stability, along with complete programmability, make the HP 8660 ideal for automated receiver, subsystem, and component testing.

Mainframes

The HP 8660D offers front-panel and HP-IB or BCD control of center frequency and frequency sweep. An external reference may be used to replace the internal high-stability reference oscillator.

Plug-In RF Sections

The HP 86601A (0.01 to 110 MHz), HP 86602B (1 to 1300 MHz), and HP 86603A (1 to 2600 MHz) are the three RF-section choices. The HP 11661B frequency extension module (mainframe Option 100) must be used with the HP 86602B and HP 86603A and is installed internally to an HP 8660 mainframe. (If you are using the HP 8660A mainframe, the HP 86603A plug-in must be ordered with Option 003.)

Plug-In Modulation

There are 5 modulation sections from which to choose. The HP 86631B auxiliary section provides external AM and pulse modulation. The HP 86632B offers AM and FM and utilizes a free-running VCO to provide high FM deviations and rates, while the HP 86633B provides AM and phase-locked FM. The HP 86634A offers high-performance phase modulation with rates to 10 MHz, while the HP 86635A provides both FM and phase modulation. (The HP 86634A and HP 86635A must be used with the Option 002 RF section.)

HP 8660D Mainframe Specifications

Frequency accuracy and stability: CW frequency accuracy and long-term stability are determined by an internal reference oscillator, or by an external reference.

Reference Oscillator

Internal: 10 MHz quartz oscillator. Aging rate less than ± 3 parts in 10^9 per 24 hours.

External: Rear panel switch allows operation from 5 MHz or 10 MHz frequency standard at a level between 0.5 and 2.5 V rms into 170 Ω .

Reference output: Rear-panel BNC connector provides output of the selected reference signal at a level of at least 0.75 V rms into 170 Ω .

Digital sweep: Auto, single, or manual. Selectable speeds of 0.1, 1, or 50 s

Remote Programming Functions

HP 8660D: CW frequency, frequency stepping (STEP \uparrow , STEP \downarrow), output level, and most modulation functions are programmable.

Programming Input

Connector type: 36-pin Cinch type 57 (mating connector supplied). 24-pin Cinch type 57 for HP-IB control. BCD and HP-IB control internal-jumper-selectable.

Logic: TTL-compatible (negative true).

Switching time: Less than 10 ms to be within 100 Hz of any new frequency selected. (Less than 175 ms to be within 10 Hz.)

General

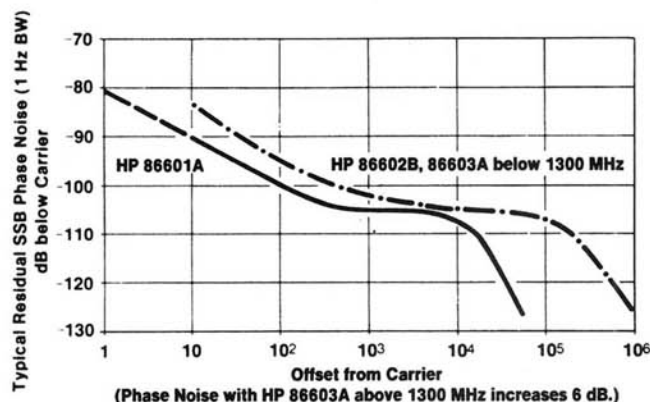
Operating temperature range: 0° to +55° C

Power: 100, 120 V (+5%, -10%), 48 to 400 Hz; 220, 240 V (+5%, -10%), 48 to 66 Hz; approximately 350 W

Weight (mainframe only): Net, 23.8 kg (53 lb); shipping, 29.6 kg (65 lb)

Supplemental Characteristics

Typical Single-Sideband Phase Noise



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High-Performance RF
HP 86601A, 86602B, 86603A

10 kHz to 110 MHz



HP 86601A

1 MHz to 1300 MHz



HP 86602B (HP 11661B required)

1 MHz to 2600 MHz



HP 86603A (HP 11661B required)

RF Section Specifications (installed in HP 8660D mainframe)

		HP 86601A	HP 86602B (requires HP 11661B)	HP 86603A (requires HP 11661B)
FREQUENCY CHARACTERISTICS	Frequency Range	0.01 to 110 MHz (109.999999 MHz)	1 to 1300 MHz (1299.999999 MHz)	1 to 2600 MHz (2599.999998 MHz)
	Frequency Resolution	1 Hz	1 Hz	2 Hz
	Harmonics	≤ -40 dBc	≤ -30 dBc (< -25 dBc above $+3$ dBm)	≤ -20 dBc ¹
	Spurious Non-Harmonically Related (greater than 10 kHz offsets) Power-Line Related (CW, AM, \emptyset M only) ²	≤ -76 dBc ≤ -60 dBc	≤ -80 dBc below 700 MHz ≤ -80 dBc above 700 MHz within 45 MHz of carrier ≤ -70 dBc above 700 MHz > 45 MHz from carrier ≤ -50 dBc on $+10$ dBm range ≤ -60 dBc	≤ -74 dBc within 45 MHz of carrier ¹ ≤ -64 dBc > 45 MHz from carrier ≤ -60 dBc
	Signal-to-Phase-Noise Ratio (CW, AM, \emptyset M only, offsets > 300 Hz)	> 50 dB	> 45 dB	> 39 dB
OUTPUT CHARACTERISTICS	Output Level (into 50 Ω)	± 13 dBm to -146 dBm	$+10$ to -146 dBm	$+10$ to -136 dBm $+7$ to -136 dBm ³
	Output Accuracy (local and remote)	± 1 dB, $+13$ to -66 dBm ± 2 dB, -66 to -146 dBm	± 1.5 to -76 dBm ± 2.0 to -146 dBm	± 2.5 dB to -76 dBm ³ ± 3.5 dB to -136 dBm
	Flatness (output-level variation with frequency)	$< \pm 0.75$ dB	$< \pm 1.0$ dB	$< \pm 2.0$ dB
	Impedance	50 Ω		
MODULATION CHARACTERISTICS	AM	AM Modulation Depth 0 to 95%	0 to 90% ⁴	0 to 50% ⁴
	3 dB Bandwidth: 0 to 30%	200 Hz, CF < 0.4 MHz 10 kHz, $0.4 \leq CF < 4$ MHz 100 kHz, CF ≥ 4 MHz	10 kHz, CF < 10 MHz 100 kHz, CF ≥ 10 MHz	5 kHz
	0 to 70%	125 Hz, CF < 0.4 MHz 6 kHz, $0.4 \leq CF < 4$ MHz 60 kHz, CF ≥ 4 MHz	6 kHz, CF < 10 MHz 60 kHz, CF ≥ 10 MHz	N/A
	0 to 90%	100 Hz, CF < 0.4 MHz 5 kHz, $0.4 \leq CF < 4$ MHz 50 kHz, CF ≥ 4 MHz	5 kHz, CF < 10 MHz 50 kHz, CF ≥ 10 MHz	N/A
	Distortion, ⁵ THD at 30% AM at 70% AM at 90% AM	$< 1\%$, 0.4 to 110 MHz $< 3\%$, 0.4 to 110 MHz $< 5\%$, 0.4 to 110 MHz	$< 1\%$ $< 3\%$ $< 5\%$	$< 5\%$ N/A N/A
	FM	FM Rate dc to 1 MHz with HP 86632B and HP 86635A 20 Hz to 100 kHz with HP 86633B	dc to 200 kHz with HP 86632B and HP 86635A 20 Hz to 100 kHz with HP 86633B	
	Maximum Deviation (peak)	1 MHz with HP 86632B and HP 86635A 100 kHz with HP 86633B	200 kHz with HP 86632B and HP 86635A 100 kHz with HP 86633B	400 kHz with HP 86632B, 86635A 200 kHz with HP 86633B
	Distortion, THD (at rates up to 20 kHz)	$< 1\%$ up to 200 kHz dev. $< 3\%$ up to 1 MHz dev.	$< 1\%$ up to 200 kHz dev.	$< 1\%$ up to 400 kHz dev.
	PULSE	Pulse Rise/Fall Time 200 ns	50 ns	
	On/Off Ratio (with pulse level control at max.)	> 50 dB	> 40 dB	> 60 dB
\emptyset M ⁶	\emptyset M Rate	N/A	dc to 1 MHz with HP 86635A dc to 1 MHz for CF < 100 MHz dc to 10 MHz for CF ≥ 100 MHz with HP 86634A	
	Maximum Peak Deviation	N/A	0 to 100° C	0 to 200° C
	Distortion, THD	N/A	$< 5\%$ up to 1 MHz rates $< 7\%$ up to 5 MHz rates $< 15\%$ up to 10 MHz rates	
GENERAL	Weight	Net, 5 kg (11 lb) Shipping, 6.8 kg (15 lb)	Net, 4.1 kg (9 lb) Shipping, 5.5 kg (12 lb)	Net, 5 kg (11 lb) Shipping, 6.4 kg (14 lb)
		HP 11661B: Net, 2.3 kg (5 lb); shipping, 2.7 kg (6 lb)		

¹For output levels $+3$ dBm and below; slightly higher $+3$ to $+7$ dBm.

²Measured in a 30 kHz band centered on the carrier excluding a 1 Hz band centered on the carrier.

³For $+3$ to $+7$ dBm output levels, output accuracy and flatness will be slightly degraded (above 1300 MHz only).

⁴For RF output level meter readings from $+3$ dB to -6 dB and only at $+3$ dBm and below.

⁵Applies only at 400 Hz and 1 kHz rates with output meter set between 0 and $+3$ dB. At -6 dB meter setting the distortion approximately doubles.

⁶Phase modulation is only possible with Option 002 RF Sections.

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High-Performance RF

HP 86631B, 86632B, 86633B, 86634A, 86635A

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Modulation Section Specifications

		HP 86631B	HP 86632B	HP 86633B	HP 86634A	HP 86635A
AM	Functions	Ext. Only	Int. and Ext.	Int. and Ext.	—	—
	Indicated Accuracy (at 400 and 1000 Hz rates)	—	± 5% of full scale With HP 86601A RF Section: ± 7% center frequency ≥ 100 MHz. With HP 86603A RF Section: ± 10%, center frequency ≥ 1300 MHz.		—	—
FM	Functions	—	Int. and Ext., FM CF CAL	Int. and Ext.	—	Int. and Ext., FM CF CAL
	Center Frequency Long-Term Stability	—	Typically less than 1 kHz/hr	Same as in CW Mode (3 x 10 ⁻⁶ /day)	—	Typically less than 1 kHz/hr
	Indicated Accuracy (up to 20 kHz rates)	—	± 5% of full scale		—	± 5% of full scale
Pulse	Functions	Ext. Only	—	—	—	—
ØM	Functions	—	—	—	Int. and Ext.	Int. and Ext.
	Indicated Accuracy (15° to 35° C)	—	—	—	± 5% of full scale up to 100 kHz rates ± 8% of full scale up to 2 MHz rates ± 15% of full scale up to 10 MHz rates	
Meter		—	0 to 100% AM 0 to 10, 100, 1000 kHz FM Pk. Dev. (0 to 20, 200, 2000 kHz FM for CF ≥ 1300 MHz)	0 to 100% AM 0 to 10, 100 kHz FM Pk. dev. (0 to 20, 200 kHz FM for CF ≥ 1300 MHz)	0 to 100° Peak ØM (0 to 200° for CF ≥ 1300 MHz)	0 to 10, 100, 1000 kHz FM, 0 to 100° Pk. ØM (0 to 20, 200, 2000 kHz FM, 0 to 200° Pk. ØM for CF ≥ 1300 MHz)
Internal Modulation Source:		None	400 Hz and 1 kHz ± 5%			
Output:		—	200 mV minimum into 10 k Ω. Available at front panel BNC connector			
Input Impedance		500 Ω Pulse 600 Ω AM	600 Ω	600 Ω	50 Ω	600 Ω
Weight		Net, 1.4 kg (3 lb); shipping, 23 kg (5 lb)	Net, 2.7 kg (6 lb); shipping, 4.1 kg (9 lb)	Net, 2.7 kg (6 lb); shipping, 4.1 kg (9 lb)	Net 1.8 kg (4 lb); shipping, 3.2 kg (7 lb)	Net, 2.7 kg (6 lb); shipping, 4.1 kg (9 lb)

Ordering Information

HP 8660D Synthesized Signal Generator mainframe¹

Opt 001 ± 3 × 10⁻⁹/Day Internal Reference Oscillator \$0

Opt 002 No Internal Reference Oscillator — \$300

Opt 003 Operation from 48 to 440 Hz Line \$0

Opt 005 Factory-Configured for HP-IB Programming Operation \$0

Opt 100 HP 11661B Factory Installed Inside Mainframe + \$7,550

Opt 908 Rack Flange Kit (08660-60347) \$113

Opt 910 Additional Operation and Calibration Manual (08660-90103) and Two Service Manuals (08660-90104) + \$255

Opt 915 Add Service Manual (08660-90104) + \$103

Opt W30 Extended Repair Service (see page 671) + \$355

HP 86601A 0.01 to 110 MHz RF Section + \$9,250

¹HP-IB cables not supplied. For description and price, see page 615.

☎ For off-the-shelf shipment, call 800-452-4844.

Price

\$17,860

\$0

— \$300

\$0

\$0

+ \$7,550

\$113

+ \$255

+ \$103

+ \$355

\$9,250

HP 86602B 1 to 1300 MHz RF Section² \$10,465

HP 86603A 1 to 2600 MHz RF Section² \$12,960

Opt 002 Add Phase Modulation Capability + \$2,865

(HP 86602B, 86603A only)

Opt 003 Allows Operation of HP 86603A with HP 8660A Mainframe + \$281

HP 86607A Field Retrofit for HP 8660A/C to HP 8660D \$5,400

HP 86631B AM/Pulse Auxiliary Section \$910

HP 86632B AM/FM Modulation Section \$4,360

HP 86633B AM/FM Modulation Section \$4,360

HP 86634A ØM Modulation Section \$3,475

HP 86635A ØM/FM Modulation Section \$4,800

Note: Opt 910, 2 sets of operation and service manuals, is available for each plug-in section. Contact your HP sales representative for part numbers and prices.

HP 11661B Frequency Extension Module \$7,550

HP 11672A Service Accessory Kit \$1,650

HP 11707A Test Plug-In \$3,210

²HP 86602B and HP 86603A RF sections require an HP 11661B for operation.