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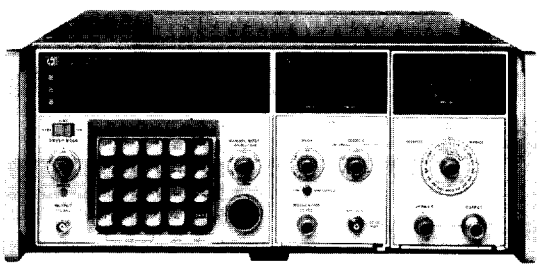
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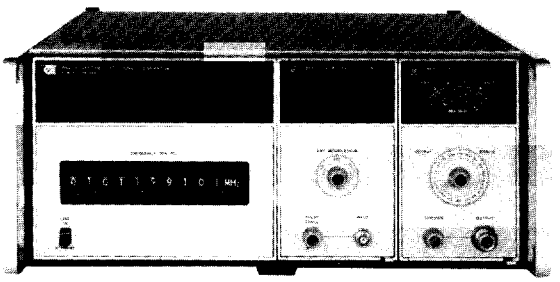
SIGNAL GENERATORS
Synthesized Signal Generators
Models 8660A and 8660C

- 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, ΦM, or pulse modulation

DESIGNED FOR HP-IB SYSTEMS



HP 8660C



HP 8660A

HP 8660A, 8660C Synthesized Signal Generators

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 most automated receiver and component testing situations.

Mainframes

There are two mainframes, the HP 8660A and HP 8660C which both offer a BCD or optional HP-IB interface and operation from an internal or external frequency reference. The HP 8660A mainframe uses thumbwheel switches to select CW output frequencies. The HP 8660C mainframe provides direct keyboard entry of CW frequencies. Added capabilities of the HP 8660C include digital sweep, frequency stepping, control of frequency with a tuning knob, and a ten-digit numerical display.

Plug-In RF Sections

The HP 86601A (0.01 – 110 MHz), HP 86602B (1 – 1300 MHz), and HP 86603A (1 – 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 internal to an HP 8660 mainframe. When using the HP 8660A mainframe, the HP 86603A plug-in must be ordered with option 003.

Plug-In Modulation

There are five modulation sections to choose from. 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 option 002 RF Section.)

HP 8660A, 8660C Mainframe Specifications

Frequency accuracy and stability: CW frequency accuracy and long term stability are determined by internal reference oscillator (3×10^{-8}/day), or by external reference.

Reference Oscillator

Internal: 10 MHz quartz oscillator. Aging rate less than ±3 parts in 10^8 per 24 hours after 72 hours warm-up (±3 parts in 10^9 per 24 hours, Option 001).

External: rear panel switch allows operation from 5 MHz or 10 MHz frequency standard at a level between 0.5 and 2.5 Vrms into 170 ohms.

Reference output: rear panel BNC connector provides output of reference signal selected at level of at least 0.5 Vrms into 170 ohms.

Digital sweep (HP 8660C): auto, single, or manual. Selectable speeds 0.1, 1, or 50 seconds.

Remote Programming

Functions

HP 8660A: all front panel frequency and output level (and most modulation functions) are programmable.

HP 8660C: CW frequency, frequency stepping (STEP↑, STEP ↓), output level, and most modulation functions are programmable. Note: digital sweep is NOT programmable.

Programming Input

Connector type: 36-pin Cinch type 57 (mating connector supplied). 24-pin Cinch type 57 for optional HP-IB interface (mating connector NOT supplied).

Logic: TTL compatible (negative true).

Switching time: less than 5 ms to be within 100 Hz of any new frequency selected. (Less than 100 ms to be within 10 Hz.)

General

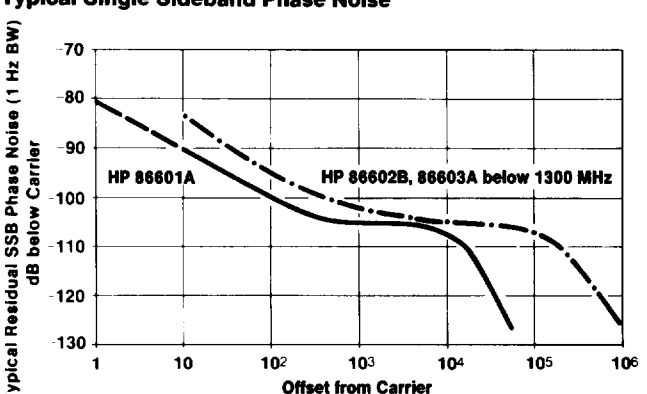
Operating temperature range: 0 to +55°C.

Power: 100, 120, 220, or 240 volts +5%, −10%, 48-66 Hz; approximately 350 watts.

Weight (mainframe only): net 23.2 kg (51 lb). Shipping, 28.6 kg (63 lb).

Supplemental Characteristics

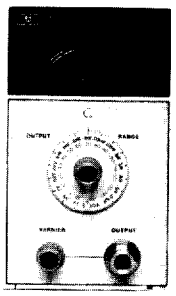
Typical Single Sideband Phase Noise



(Phase Noise with HP 86603A above 1300 MHz increases 6 dB.)

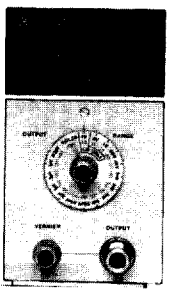
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10 kHz to 110 MHz



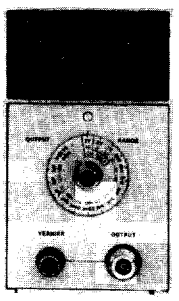
HP 86601A

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 8660A or HP 8660C mainframe)

			HP 86601A	HP 86602B (requires HP 11661B)	HP 86603A (requires HP 11661B)	
FREQUENCY CHARACTERISTICS	Frequency Range		0.01—110 MHz (109.999999 MHz)	1—1300 MHz (1299.999999 MHz)	1—2600 MHz (2599.999998 MHz)	
					CF <1300 MHz	CF ≥1300 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		≤–80 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		≤–74 dBc within 40 MHz of carrier[1] ≤–64 dBc >45 MHz from carrier
	Power Line Related (CW, AM, ϕM only)[2]		≤–70 dBc	≤–70 dBc		≤–64 dBc
	Signal To Phase Noise Ratio (CW, AM, ϕM only)[2]		>50 dB	>45 dB		>39 dB
OUTPUT CHARACTERISTICS	Output Level (into 50Ω)		+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)		<±0.75 dB	<±1.0 dB	<±2.0 dB (1–2600 MHz)	
	Impedance		50Ω			
MODULATION CHARACTERISTICS	AM Modulation Depth		0 to 95%	0 to 90%[4]		0 to 50%[4]
AM	3 dB Bandwidth:	0–30%	200 Hz, CF<0.4 MHz 10 kHz, 0.4≤CF <4 MHz 100 kHz, CF≥4 MHz	10 kHz, CF<10 MHz 100 kHz, CF≥10 MHz		10 kHz
		0–70%	125 Hz, CF<0.4 MHz 6 kHz, 0.4≤CF<4 MHz 60 kHz, CF≥4 MHz	6 kHz, CF<10 MHz 60 kHz, CF≥10 MHz		N/A
		0–90%	100 Hz, CF<0.4 MHz 5 kHz, 0.4≤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%, 0.4–110 MHz <3%, 0.4–110 MHz <5%, 0.4–110 MHz	<1% <3% <5%		<5% N/A N/A
FM	FM Rate		dc to 1 MHz with HP 86632B 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 100 kHz with HP 86633B	200 kHz with HP 86632B and HP 86635A 100 kHz with HP 86633B		400 kHz w/HP 86632B, 86635A 200 kHz w/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
ϕM[6]	ϕM 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 degrees		0 to 200 degrees
	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)		

[1]For output levels +3 dBm and below; slightly higher +3 to +7 dBm.
[2]Measured in a 30 kHz band centered on the carrier excluding a 1 Hz band centered on the carrier.
[3]For +3 to +7 dBm output levels, output accuracy and flatness will be slightly degraded (above 1300 MHz only)
[4]For RF output level meter readings from +3 dB to –6 dB and only at +3 dBm and below.
[5]Applies 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.
[6]Phase modulation is only possible with Option 002 RF Sections.

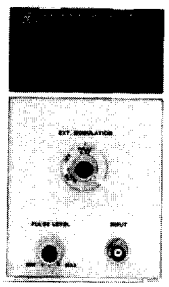
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SIGNAL GENERATORS

Synthesized Signal Generators

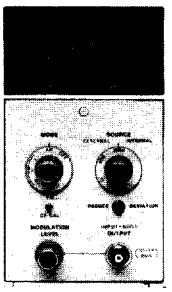
Models 8660A & 8660C (cont.)

Pulse/AM



HP 86631B

AM/High Deviation FM



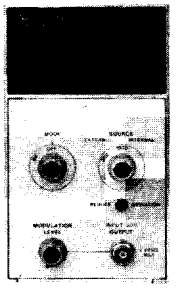
HP 86632B

AM/ϕ Locked FM



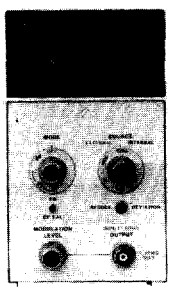
HP 86633B

High rate ϕM



HP 86634A

ϕM/FM



HP 86635A

Modulation Section Specifications

		HP 86631B	HP 86632B	HP 86633B	HP 86634A	HP 86635A
	Functions	Ext. Only	Int. and Ext.	Int. and Ext.	–	–
AM	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 200 Hz/hr	Same as in CW Mode (3 x 10^{-8}/day)	–	Typically less than 200 Hz/hr
	Indicated Accuracy (up to 20 kHz rates)	–	±5% of full scale		–	±5% of full scale
Pulse	Functions	Ext. Only	–	–	–	–
ϕM	Functions	–	–	–	Int. and Ext.	Int. and Ext.
	Indicated Accuracy (15°C 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		–	0–100% AM 0–10, 100, 1000 kHz FM Pk. Dev. (0–20, 200, 2000 kHz FM for CF ≥1300 MHz)	0–100% AM 0–10, 100 kHz FM Pk. dev. (0–20, 200 kHz FM for CF ≥1300 MHz)	0–100° Peak ϕM (0–200° for CF≥ 1300 MHz)	0–10, 100, 1000 kHz FM, 0–100° Pk ϕM (0–20, 200, 2000 kHz FM, 0–200° Pk. ϕM for CF ≥1300 MHz)
Internal Modulation Source Output		None –	400 Hz and 1 kHz ±5% 200 mV minimum into 10 kΩ. Available at front panel BNC connector			
Input Impedance		50Ω Pulse 600Ω AM	600Ω	600Ω	50Ω	600Ω
Weight		Net, 1.4 kg (3 lb) Shipping, 2.3 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

	Price
HP 8660A Synthesized Signal Generator Mainframe	$10,500
HP 8660C Synthesized Signal generator Mainframe	$12,500
Options for HP 8660A, 8660C	
Option 001: ±3 × 10^{-9}/day internal reference oscillator	add $210
Option 002: no internal reference oscillator	less $300
Option 003: operation from 50 to 400 Hz line	add $155
Option 004: 100 Hz frequency resolution (200 Hz above 1300 MHz)	less $350
Option 005: HP-IB programming interface	$250
Note: HP-IB cables not supplied, see page 742.	
Option 009: (HP 8660A only) LED display indicates selected frequency in 1-2-4-8 BCD code	add $210
Option 100: HP 11661B factory installed inside main frame	add $5,100
Option 908: Rack Flange Kit	$40
HP 86601A 0.01–110 MHz RF Section	$6,500
HP 86602B 1–1300 MHz RF Section	$7,000
HP 86603A 1–2600 MHz RF Section	$9,500
Note: HP 86602B and 86603A RF sections require an HP 11661B for operation.	
Option 001: no RF output attenuator (all RF Sections)	less $600
Option 002: adds phase modulation capability (HP 86602B, 86603A only)	add $2,250
Option 003: allows operation of HP 86603A with HP 8660A mainframe	add $250
HP 11661B Frequency Extension Module	$5,100
HP 86631B Auxiliary Section	$550
HP 86632B AM/FM Modulation Section	$3,000
HP 86633B AM/FM Modulation Section	$3,200
HP 86634A ϕM Modulation Section	$2,400
HP 86635A ϕM/FM Modulation Section	$3,500
HP 11672A Service Accessory Kit	$1,005
HP 11707A Test Plug-in	$2,200

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