SIGNAL GENERATORS
Economy RF
HP 8656B, 8657A/B

HP 8656/57 Series Synthesized Signal Generators

The HP 8656/57 series is a collection of economical synthesized signal sources that support a variety of communications test requirements. Six models are included: 3 for general-purpose analog and 3 specialized for digital modulation. All 6 units offer capabilities ideal for research and development, manufacturing, and support applications.

The series offers high value in meeting your communications test needs. Ease-of-use features, such as store/recall memory and sequencing, help automate and speed tests. High-performance areas, such as good spectral purity and accurate output levels, ensure accurate test results. With the wide range of features and performance levels available, one of the HP 8656/57 series is sure to meet your requirements.

Economy Analog Signal Generators

HP 8656B
- 100 kHz to 990 MHz
- AM and FM modulation
- Lowest cost of family
- In-channel performance

HP 8657A
- 100 kHz to 1040 MHz
- AM and FM modulation
- Low SSB phase noise
- Electronic attenuator for ATE
- In- and out-of-channel performance

HP 8657B
- 100 kHz to 2060 MHz
- AM, FM and optional pulse modulation
- Low SSB phase noise
- In- and out-of-channel performance

Digital Modulation

HP 8657A Option 022
- 100 kHz to 1040 MHz
- 0.3 GMSK for GSM
- Low phase error

HP 8657B Option 022
- 100 kHz to 2060 MHz
- 0.3 GMSK for GSM and PCN
- Low phase error
- Optional pulse

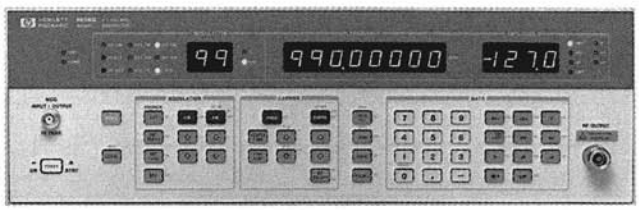
HP 8657D
- 100 kHz to 1030 MHz
- $\pi/4$ DQPSK modulation for NADC and JDC
- Low error vector magnitude
- Pulse modulation

HP 8657J
- 100 kHz to 1030 MHz
- $\pi/4$ DQPSK for PHP
- Low-error vector magnitude
- Pulse modulation

For more details on the 6 signal generators in the HP 8656/57 series, please see the catalog pages of this section. For full performance and specification information, see the documents listed below.

Available Literature	Reference No.
Economical Signal Generator Brochure	5091-1555
Economical Signal Generator Technical Data	5091-1556
Signal Generator Selection Guide	5951-3707

- 100 kHz to 990 MHz
- AM and FM modulation
- ±1 dB absolute level accuracy
- Amplitude offset and phase adjust



HP 8656B

Hewlett-Packard Instrument Drivers

DESIGNED FOR HP-IB SYSTEMS

HP 8656B Synthesized Signal Generator

The 8656B is a programmable synthesized signal generator that offers exceptional value through a powerful combination of performance, quality, and economy.

Communication Band Frequency Coverage

The HP 8656B provides frequency coverage from 0.1 to 990 MHz (with underrange to 10 kHz). This wide range covers the IF and LO frequencies, as well as the RF frequencies of most receivers. Frequency resolution of 10 Hz allows convenient setting of increments including narrow channel spacings, while characterization of phase-sensitive devices is made easier with the help of the phase increment/decrement feature.

Precise Output Control

The 8656B also features ±1.0 dB absolute level accuracy and 0.1 dB resolution for accurate receiver sensitivity tests, circuit characterization, and research and development applications. The output levels are calibrated from +13 dBm (overrange to +17 dBm) to −127 dBm and may be set and displayed in any one of 14 convenient units, including dBm, volts, dBμV or V_{emf}. The output level can also be offset to compensate for cable and/or other losses external to the generator, or turned on or off with a dedicated key. Shielding keeps leakage at <1.0 μV for testing RFI-susceptible devices, and standard resettable reverse power protection for up to 25 W guards against accidental damage from transmitters.

Versatile Modulation

The HP 8656B's modulation capabilities include simultaneous and mixed modulation modes (AM/AM, FM/FM, and AM/FM) from internal (1 kHz and 400 Hz) and external sources. AM is ac-coupled, while FM can be either ac- or dc-coupled. The patented dc-coupling technique used in the HP 8656B provides exceptional long-term stability (<10 Hz/hour drift) and center frequency accuracy (±500 Hz), eliminating the need for retuning in the dc FM mode. For calibrated external modulation, a 1 V peak signal is required, and HI/LO annunciators on the HP 8656B indicate when the external signal is within 5% of the correct amplitude.

Ease of Operation for Improved Productivity

Up to 100 complete front-panel setups can be stored in the HP 8656B's memory for recall during testing. These setups can be accessed sequentially by pushing one front-panel key or by using the rear-panel SEQ port. The SEQ port can be connected to a foot switch or other operator-controlled device.

- 100 kHz to 1040 MHz
- AM and FM modulation
- Electronic attenuator for ATE
- ±1.0 dB level accuracy (typically ±0.5 dB)
- 50 W reverse power protection

HP 8657A

Hewlett-Packard Instrument Drivers

DESIGNED FOR HP-IB SYSTEMS

HP 8657A Synthesized Signal Generator

The 8657A is a 100 kHz to 1040 MHz synthesized signal generator that offers truly outstanding performance at an affordable price. The HP 8657A gives enhanced performance above the HP 8656B signal generator to form a complementary set of low-cost/high-performance RF signal generators from Hewlett-Packard.

Spectral Purity for Demanding Applications

The HP 8657A provides excellent phase noise performance across its full 100 kHz to 1040 MHz range. When characterizing an RF receiver, the SSB phase noise of the HP 8657A (−130 dBc/Hz at 500 MHz) provides the performance for almost all measurements requiring test signals at adjacent or out-of-channel offsets.

RF Output with Electronic Attenuator

The HP 8657A's patented, solid-state attenuator provides accurate output levels to ±1 dB (typically ±0.5 dB). Highly reliable PIN diodes replace mechanical relays to provide an extended switching lifetime. The HP 8657A is backed with a 5-year warranty against attenuator failure, providing you with the highest level of insurance for trouble-free performance.

The HP 8657A provides high RF output power (+13 dBm with over-range to +17 dBm) for driving mixers and overcoming cable losses without the use of external amplifiers. The unique RF leveling loop design also lowers intermodulation distortion to typically better than −50 dBc. Reverse power protection is provided standard for protection up to 50 W and 50 Vdc.

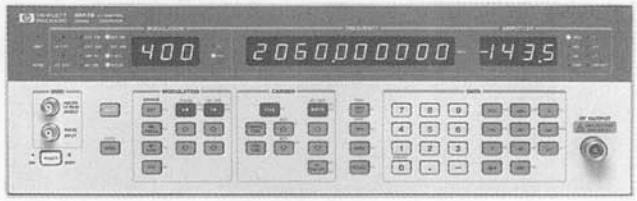
Versatile Modulation

The HP 8657A can combine modulation modes for AM/AM, FM/FM, and AM/FM from both internal and external modulation sources. Like the HP 8656B, the HP 8657A has ac-coupled AM and ac/dc coupling for FM.

The patented dc-coupling technique provides excellent long-term stability (<10 Hz/hour drift) as well as center frequency accuracy (±500 Hz worst-case). When dcFM is enabled, SSB phase noise and residual FM performance are not degraded as with other generators. dcFM allows the HP 8657A to be used as an ideal VCO in a design application, or to be used to faithfully reproduce digital squelch tones when modulating the carrier signal.

Pulse modulation for this frequency range is available, and can be ordered as HP 8657B Option H60.

- 100 kHz to 2060 MHz
- AM, FM, and optional pulse modulation
- ±1 dB absolute level accuracy (typically ±0.5 dB)
- 1 Hz frequency resolution
- 50 W reverse power protection



HP 8657B

Hewlett-Packard Instrument Drivers

DESIGNED FOR HP-IB SYSTEMS

HP 8657B Synthesized Signal Generator

The 8657B is an L-Band synthesized signal generator offering excellent performance at an affordable price. The HP 8657B is ideal for radio-receiver and radar system and subsystem design and testing.

Spectral Purity for Radar and Satellite

The low residual FM and low SSB phase noise make the HP 8657B excellent as a local oscillator, low-noise VCO, or test source with AM, FM, and pulse modulation. In addition to great noise performance, features such as carrier phase adjust allow you to characterize phase-sensitive devices such as phase detectors or phase interferometers, using precise 1-degree phase offsets with respect to another signal source. Display blanking and nonvolatile memory-clear are also available for operation in secure environments.

Advanced Performance

The 8657B offers wide dynamic output range, from +13 to −143.5 dBm, with unparalleled accuracy of ±1 dB. The HP 8657B also has extremely low radiated emissions for making sensitivity measurements on your receiver or for design work on extremely sensitive circuitry. High-stability dcFM keeps center frequency drift below 10 Hz/hour, which allows accurate VCO simulation or low-rate FM modulation.

High-Performance Pulse Modulation

The HP 8657B has a GaAs FET pulse modulator (Option 003) for fast rise time and high isolation pulse. The HP 8657B has 35 to 50 ns rise times (typically 10 to 18 ns) and 70 to 90 dB on/off ratios. For pulse modulation coverage to 1040 MHz only, order the HP 8657B Option H60.

Ease of Operation for Improved Productivity

Up to 100 complete front-panel setups can be stored in the HP 8657B's memory for recall during testing. These setups can be accessed sequentially by pushing one front-panel key or by using the rear-panel SEQ port. The SEQ port can be connected to a foot switch or other operator-controlled device.

SIGNAL GENERATORS

Economy RF (cont'd)

HP 8656B, 8657A/B

Specifications	HP 8656B	HP 8657A	HP 8657B
Frequency			
Range:	100 kHz to 990 MHz	100 kHz to 1040 MHz	100 kHz to 2060 MHz
Resolution:	10 Hz	10 Hz	1 Hz
Timebase aging rate:	±2 ppm/year	±2 ppm/year	±2 ppm/year
Option 001:	1×10^{-9} parts/day after 45 days	1×10^{-9} parts/day after 45 days	1×10^{-9} parts/day after 45 days
Switching Speed (w/in 100 Hz of carrier):	<35 ms (25 ms typ. at 25° C)	<35 ms (30 ms typ. at 25° C)	<35 ms (30 ms typ. at 25° C)
Spectral Purity f_c = 500 MHz			
SSB Phase Noise (20 kHz offset):	< −114 dBc/Hz	< −130 dBc/Hz	< −130 dBc/Hz
Nonharmonics (>5 kHz offset, CW mode):	< −60 dBc	< −60 dBc	< −60 dBc, <1030 MHz, < −54 dBc, ≥1030 MHz
Harmonics:	< −30 dBc, output ≤ +7 dBm	< −30 dBc, output ≤ +10 dBm	< −30 dBc, output ≤ +7 dBm, <1030 MHz; < −25 dBc, output ≤ +7 dBm, >1030 MHz
Subharmonics:	None	None	None, 100 kHz to 1030 MHz < −25 dBc, 1030 to 2060 MHz
Residual FM (0.3 to 3 kHz, CW mode):	<7 Hz rms	<4 Hz rms	<3 Hz rms
Output Level			
Range:	+13 to −127 dBm into 50 Ω	+13 to −143.5 dBm into 50 Ω, +10 dBm, 100 kHz to 1 MHz	+13 to −143.5 dBm into 50 Ω, +10 dBm, <1030 MHz
Resolution:	0.1 dB	0.1 dB	0.1 dB
Absolute Accuracy:	< ±1 dB, 123 to 990 MHz, +7 to −124 dBm; < ±1.5 dB, 0.1 to 123.5 MHz, and < −124 dBm or < +7 dBm at 0.1 to 990 MHz	< ±1 dB, output ≥ −127 dBm < ±1.5 dB, > +7 dBm	< ±1 dB, output +3.5 to −127 dBm < ±1.5 dB, output ≥ +3.5 dBm
Reverse Power Protection:	25 W	50 W	50 W
Amplitude Modulation			
Depth:	0 to 99%, output < +7 dBm, 0.1 to 990 MHz	0 to 99%, output ≤ +7 dBm, f_c ≥400 kHz	0 to 100%, output ≤ +7 dBm
Resolution:	1%	1%	1%
Bandwidth (1 dB):	20 Hz to 40 kHz	20 Hz to 40 kHz	20 Hz to 40 kHz
Accuracy: (internal rates)	< ±(2% + 4% of setting), <90% AM	< ±(2% + 6% of setting), <90% AM, levels < +7 dBm	< ±(2% + 6% of setting), <90% depth, internal rates
Distortion: (0 to 30% AM, internal rates, level < +7 dBm)	<1.5%	<1.5%	<1.5%, <1030 MHz <4%, >1030 MHz
Frequency Modulation			
Maximum Peak Deviation[1]:	99 kHz, f_c <123.5 and >247 MHz 50 kHz, f_c 123.5 to 247 MHz	99 kHz, f_c <130 and >260 MHz 50 kHz, f_c 130 to 260 MHz	50 kHz, f_c 130 to 260 MHz 400 kHz, f_c 1040 to 2060 MHz
Resolution:	100 Hz, deviations <10 kHz, 1 kHz, deviations ≥10 kHz	100 Hz, deviations <10 kHz, 1 kHz, deviations ≥10 kHz	100 Hz, <1040 MHz, dev <100 kHz 200 Hz, >1040 MHz, dev <100 kHz
Bandwidth (1 dB):	dc to 50 kHz	dc to 50 kHz	dc to 50 kHz
Indicator Accuracy:	< ±5% of setting	< ±5% of setting	< ±5% of setting
Distortion: (internal rates, ≥3 kHz peak deviation)	<0.5% THD + noise	<0.5% THD + noise	<0.5% THD + noise, ≥6 kHz peak deviation for f_c ≥1040 MHz

Specifications	HP 8656B	HP 8657A	HP 8657B
Pulse Modulation	Not applicable	Not applicable	Opt 003
On/Off Ratio:			>70 dB, $f_c \geq 130$ MHz, >95 dB, $f_c \geq 1030$ MHz
Rise/Fall Time, 10% to 90%:			<35 ns, $f_c \geq 130$ MHz, <50 ns, $f_c \geq 1030$ MHz
Repetition Rate:			dc to 30 MHz, typical
Duty cycle:			0% to 100%
Remote Programming			
Interface:	HP-IB (HP's implementation of IEEE-488)		
IEEE-488 Functions:	SH0, AH1, T0, L2, SR0, RL1, PP0, DC1, DT0, C0, E1		
General			
Save/Recall/Sequence Registers:	100 nonvolatile registers to save front-panel settings		
Operating Temperature:	0° to 55° C		
Power Requirements:	100 V, 120 V, 220 V or 240 V (+5, −10%); 48 to 440 Hz HP 8656B: 125 VA maximum HP 8657A: 175 VA maximum HP 8657B: 200 VA maximum		
Dimensions:	HP 8656B, 8657A: 133 mm H × 425 mm W × 520 mm D (5.25 in × 16.75 in × 20.5 in) HP 8657B: 133 mm H × 425 mm W × 574 mm D (5.25 in × 16.57 in × 22.6 in)		
Weight:	HP 8656B: 18.1 kg (40 lb) HP 8657A: 18.2 kg (40 lb) HP 8657B: 20.5 kg (45 lb)		

[1]Deviations reduced for low-rate modulation; not specified for $f_c - (f_m) < 100$ kHz.

Ordering Information

Base Price		HP 8656B	$6,720	HP 8657A	$9,425	HP 8657B	$13,660
Options							
001	High-Stability Timebase		+$1,040		+$1,040		+$1,040
002	RF Connectors on Rear Panel Only		+$270		+$270		+$270
003	Pulse Modulation		N/A		N/A		+$890
H60	Pulse Modulation, Frequencies to 1040 MHz		N/A		N/A		−$2,000
907	Front Handle Kit (5061-9689)		$57 ☎		$57 ☎		$57 ☎
908	Rack Flange Kit (5061-9677)		$33 ☎		$34 ☎		$34 ☎
909	Combined Front/Rack Flange Kit (5061-9683)		$82 ☎		$82 ☎		$82 ☎
910	Extra Operation/Calibration and Two Service Manuals		$360 ☎		$360 ☎		$360 ☎
915	Add Service Manual	(08656-90205)	$154 ☎	(08657-90004)	$154 ☎	(08657-90007)	$154 ☎
+W30	3-year Repair Service		$155		$190		$310
+W32	3-year Calibration Service		$405		$450		$500

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