

374

## SIGNAL GENERATORS

### Economy RF

#### HP 8656B

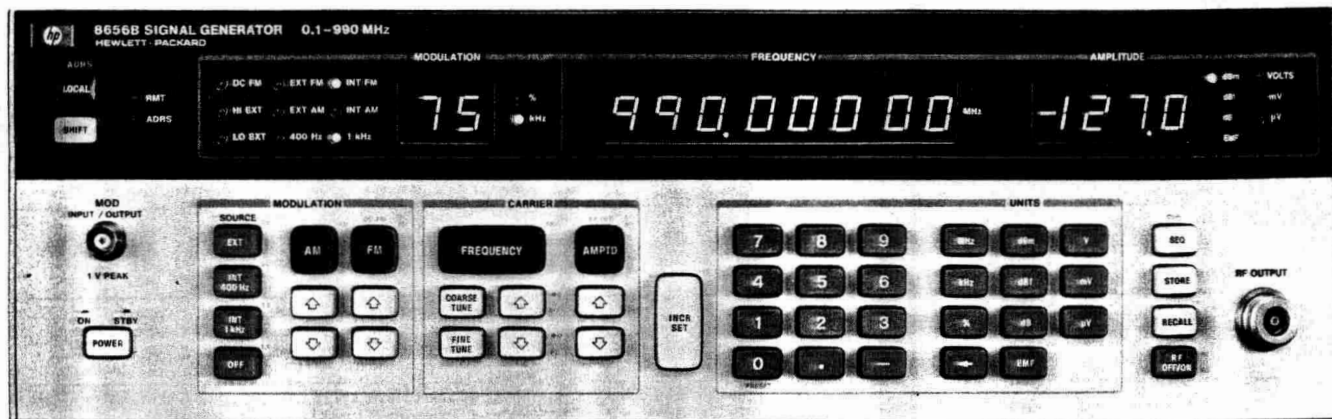


# METAF

Electronic Solutions – since 1993

- 100 kHz to 990 MHz
- $\pm 1.0$  dB absolute level accuracy
- Amplitude offset and phase adjustment capability

- 150 millisecond frequency switching speed
- Versatile simultaneous modulation including dc FM
- Fully HP-IB programmable



HP 8656B



Supported by  
**HP ITG**  
Software

### HP 8656B Synthesized Signal Generator

The HP 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 under-range to 10 kHz). This wide range covers the IF and LO frequencies as well as the RF frequencies of most receivers. It also allows testing in a variety of communication systems including the 800 MHz FM mobile band. 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. The standard internal reference has an aging rate of 2 ppm/year. Improved stability and accuracy can be achieved by adding the optional  $1.5 \times 10^{-7}$ /day high stability time base (Option 001) or using an external reference of 1, 5 or 10 MHz.

### Precise Output Control

The 8656B also features  $\pm 1.0$  dB absolute level accuracy and 0.1 dB resolution for accurate receiver sensitivity tests, circuit characterization and R&D 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, dB $\mu$ V or Vemf. 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  $< 1.0 \mu$ V for testing RFI susceptible devices, and standard resettable reverse power protection for up to 25 watts 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) and center frequency accuracy ( $\pm 500$  Hz) eliminating the need for retuning in the dc FM mode. For calibrated external modulation, a 1V peak signal is required, and HI/LO annunciators on the HP 8656B indicate when the external signal is within 5% of the correct amplitude. (For information on pulse modulation, refer to the HP 8657B Opt. H60.)

### Ease of Operation For Improved Productivity

The HP 8656B is designed for efficient operation in a bench environment. Features such as being able to change Frequency, Modulation and Level without having to access "hidden" displays or menus will streamline your testing. Additionally, the Frequency, Modulation and Level functions each have their own UP/DOWN arrow keys for rapid front-panel setup and tuning.

Up to ten 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.)

### Programmability for High Volume Testing

Full HP-IB programmability is standard with the HP 8656B. Each programming command has an easy-to-remember, two-character, alpha-numeric HP-IB code. All functions are quickly and easily programmed using the same function/data/units format used on the front panel.

Additionally, the HP 8656B program codes are 100% upwards compatible with the new HP 8657A Synthesized Signal Generator. This provides you with even more flexibility in system configuration without having to modify any program code.

## HP 8656B Specifications

### Frequency

**Range:** 100 kHz to 990 MHz (8 digit LED display).

**Frequency underrange:** 10 kHz with uncalibrated output.

**Resolution:** 10 Hz.

**Accuracy and stability:** same as internal time base.

### Typical Time Base Characteristics

Typical Characteristics	Standard Time Base	Option 001 Time Base
Aging Rate	±2 ppm/year	1.0x10 <sup>-9</sup> /day after 45 days
Frequency	50 MHz	10 MHz
External Reference Input (rear panel)	Accepts any 1, 5, or 10 MHz (±0.002%) frequency standard at a level >0.15 Vrms into 50 ohms.	

**Frequency switching speed (to be within 100 Hz of final frequency):** <150 ms.

**Phase Offset:** adjustable via HP-IB or from the front panel in nominal 1 degree increments.

### Spectral Purity

**Spurious Signals (≤ +7 dBm output levels)**

**Harmonics:** < -30 dBc.

**Non-harmonic spurious (greater than 5 kHz from carrier in CW mode):** < -60 dBc.

**Sub-harmonics:** none.

### Residual FM

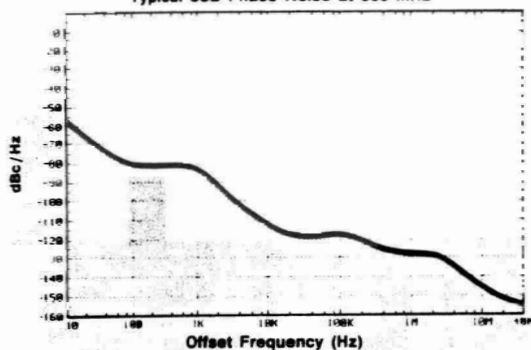
Post Detection Noise Bandwidth	Frequency Range (MHz)			
	0.1 to 123.5	123.5 to 247	237 to 494	494 to 990
0.3 to 3 kHz	<7 Hz rms	<2 Hz rms	<4 Hz rms	<7 Hz rms
0.05 to 15 kHz	<15 Hz rms	<4 Hz rms	<8 Hz rms	<15 Hz rms

**Residual AM (0.05 to 15 kHz post detection noise bandwidth):** 0.025%.

### SSB Phase Noise (CW only)

Offset from Carrier	0.1 to 123.5 MHz (dBc/Hz)	123.5 to 247 MHz (dBc/Hz)	247 to 494 MHz (dBc/Hz)	494 to 990 MHz (dBc/Hz)
20 kHz	<-114	<-126	<-120	<-114

Typical SSB Phase Noise at 500 MHz



### Output

**Level range (into 50 ohms):** +13 dBm to -127 dBm (3 1/2 digit LED display; uncalibrated output to +17 dBm).

**Resolution:** 0.1 dB.

**Absolute level accuracy:** <±1.0 dB; 123.5 to 990 MHz <±1.5 dB; f<sub>c</sub> < 123.5 MHz, levels > +7 dBm and < -124 dBm.

**Level flatness (100 kHz to 990 MHz):** ±1.0 dB at an output level setting of 0.0 dBm.

**Reverse power protection:** protects signal generator from application of up to 25 watts (from a 50Ω source) of RF power to 990 MHz into generator output; dc voltage cannot exceed 25V.

### Amplitude Modulation (2 digit LED display)

**AM depth<sup>1</sup>:** 0 to 99% to +7 dBm and 0 to 30% to +10 dBm.

**Resolution:** 1%.

**AM rate:** internal 400 Hz and 1 kHz, ±3%; external (1 dB bandwidth), 20 Hz to 40 kHz.

**AM distortion (at internal rates):** <1.5%, 0-30% AM; <3%, 31-70% AM; <4%, 71-90% AM.

**Indicator accuracy (for depths <90% internal rates and levels < +7 dBm)<sup>1</sup>:** ≤ ±(2% + 4% of reading).

**Incidental phase modulation (at 30% AM depth and internal rates):** <0.3 radian peak.

### Frequency Modulation (2 digit LED display)

#### FM Peak Deviation

Center Frequency	Maximum Peak Deviation	
	AC Mode	DC Mode
0.1 to 123.5 MHz	The lesser of 99 kHz or 4000 x rate (Hz)	99 kHz
123.5 to 247 MHz	50 kHz or 1000 x rate (Hz)	50 kHz
247 to 494 MHz	99 kHz or 2000 x rate (Hz)	99 kHz
494 to 990 MHz	99 kHz or 4000 x rate (Hz)	99 kHz

FM not specified for f<sub>c</sub> - (Δf<sub>pk</sub>) < 100 kHz

**Resolution:** 100 Hz for deviations less than 10 kHz; 1 kHz for deviations greater than 10 kHz.

**FM rate:** internal 400 Hz and 1 kHz, ±3%; external (1 dB BW), dc coupled, dc to 50 kHz; ac coupled, 20 Hz to 50 kHz.

**Center frequency accuracy in dc FM mode:** <±500 Hz.

**Center frequency stability in dc FM mode:** <10 Hz/hour.

**FM distortion (internal rates and ≥3 kHz peak deviations):** <0.5%.

**Indicator accuracy<sup>1</sup>:** ±5% of reading at internal rates.

**Incidental AM (for center frequency ≥500 kHz, peak deviation <20 kHz and internal rates):** <0.1%.

### Remote Programming

**Interface:** HP-IB (Hewlett-Packard's implementation of IEEE - 488).

**HP-IB interface functions:** SH0, AH1, T0, L2, SR0, RL1, PP0, DC1, DT0, C0 and E1. (For more on these codes, refer to the HP-IB section of this catalog.)

### General

**Operating temperature range:** 0° to +55° C.

**Leakage:** conducted and radiated interference is within the requirements of methods RE02 of MIL STD 461B, FTZ 1115. Furthermore, RF leakage of less than 1.0 μV is induced in a two-turn loop, 2.5 cm in diameter, held 2.5 cm away from the front surface.

**Power requirements:** 100, 120, 220, or 240 Vac; +5%, -10%; 48 to 440 Hz, 125 VA maximum.

**Weight:** net, 18.2 kg (40 lb); shipping, 23.6 kg (52 lb).

**Size:** 133 H x 425 W x 520 mm D (5.25" x 16.75" x 20.5"). HP System II module size: 5 1/4 H x 1 MW x 17 D. For cabinet accessories, see page 714.

**Rack slides and transit case:** HP part numbers are: slide kit, 1494-0018; tilt slide kit, 08656-82001; full module transit case, 9211-2655.

### Ordering Information

HP 8656B Signal Generator <sup>2</sup>	Price
Opt 001 High stability time base	\$6,300
Opt 002 RF connectors on rear panel only	+ \$950
Opt 907 Front handle kit (5061-9689)	+ \$250
Opt 908 Rack flange kit (5061-9677)	+ \$57
Opt 909 Rack flange kit with front handles (5061-9683)	+ \$33
Opt 910 Provides an additional operation and calibration manual (08656-90204) and two service manuals (08656-90205)	+ \$82
Opt 915 Add service manual (08656-90205)	+ \$360
Opt W30 Extended repair service. See page 723.	+ \$154
Opt W32 Calibration service. See page 723.	+ \$155
	+ \$655

<sup>1</sup>AM depth and FM deviation are further limited by Indicator Accuracy specifications.

<sup>2</sup>HP-IB cables not included. For description and price, see page 579.

☎ For same-day shipment, call HP DIRECT at 800-538-8787