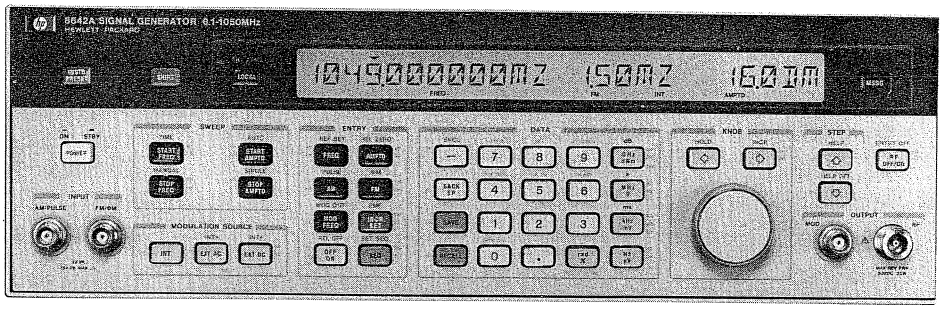
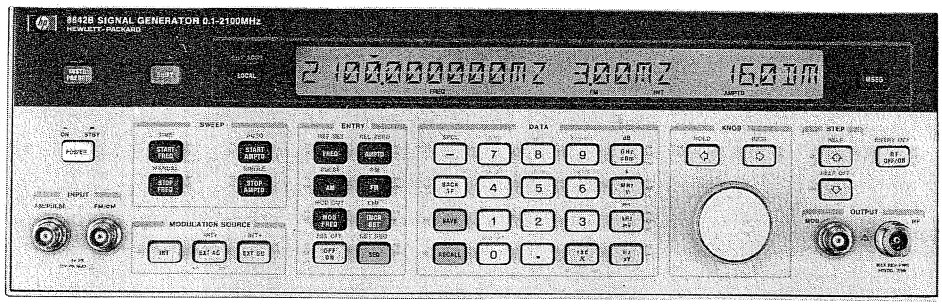
- 100 kHz to 2.115 GHz
- <−147 dBc/Hz SSB phase noise at 20 kHz offset
- −100 dBc nonharmonic spurious
- +20 dBm maximum output level
- AM, FM, ΦM and pulse modulation
- On-site repair and calibration



HP 8642A



HP 8642B

DESIGNED FOR HP-IB SYSTEMS

HP 8642A/B Synthesized Signal Generators

The HP 8642A and HP 8642B synthesized signal generators are high performance programmable signal generators intended for the most demanding out-of-channel RF receiver measurements and other stringent RF applications. The HP 8642A covers the frequency range from 100 kHz to 1057.5 MHz and the HP 8642B covers the frequency range from 100 kHz to 2115 MHz. The two generators are otherwise very similar.

Low SSB Phase Noise

The HP 8642A/B improve the state-of-the-art in SSB phase noise at typical receiver adjacent channel spacings over the cavity tuned HP 8640B signal generator. This improvement is made possible through the use of high-Q Surface Acoustic Wave resonator oscillators operating near 800 MHz. SSB phase noise at 20 kHz offset from a 1 GHz carrier is −134 dBc/Hz, approximately 6 dB lower than the HP 8640B. The HP 8642A/B are an ideal choice to characterize selectivity on high performance receivers up to 1 GHz or 2 GHz. Furthermore, their advanced control features simplify measurements on the bench and in ATE systems.

−100 dBc Spurious

Nonharmonic spurious are held to below −100 dBc on the HP 8642A/B up to 1 GHz and to below −94 dBc on the HP 8642B above 1 GHz. These two generators allow receiver spurious rejection tests to be fully automated with the utmost confidence in test results. In the HP 8642A/B design, high performance mixers reduce typical synthesizer spurious, and rigid die castings with resilient RF gasketing provide up to 140 dB of circuit isolation to ensure low spurious content on the output.

±1 dB Output Level Accuracy

Absolute output level accuracy is ±1 dB down to −127 dBm (0.1 μV). In R&D or on the production line, the HP 8642A/B will accurately measure receiver sensitivities. Excellent output level repeatability is obtained with a high reliability attenuator specifically designed for continuous ATE system use. At any output level setting, the attenuator can be fixed and level varied up or down 10 dB in a transient free manner.

Up to +20 dBm Output Level

Up to +20 dBm is available from the HP 8642A/B to perform a variety of high level measurements, often eliminating the need for external amplifiers.

In ATE system use, this extra power is available to overcome cabling losses. Using the relative amplitude feature, the display can be offset to show correct output level at the end of the cable.

In receiver design, there is sufficient output power to drive high level mixers and perform receiver blocking tests. Intermodulation measurements can be made with high confidence since intermodulation distortion products on the HP 8642A/B are specified.

AM, FM, ΦM and Pulse Modulation

The HP 8642A/B offer AM, FM, ΦM and pulse modulation across their full frequency ranges with a unique dual output section to improve modulation characteristics at lower carrier frequencies.

The HP 8642A/B, like their predecessor the HP 8640B, use an RF divider output chain to obtain lower frequency coverage with improved spectral purity. However, the HP 8642A/B can, on demand, switch in a separate heterodyne (HET) output section below 132.2 MHz to obtain improved modulation performance over the divided output.

For testing FM mobile radios, the HP 8642A/B have built-in 750 μs preemphasis (FM PRE) to simplify receiver audio flatness tests. Simultaneous modulation capability allows two-tone modulation tests.

A low distortion internal modulation oscillator can be used to modulate the HP 8642A/B up to 100 kHz rates or as a stand-alone audio source. The output, available at the front panel, is programmable both in frequency and level providing an independent audio oscillator.

SIGNAL GENERATORS

Synthesized Signal Generators (cont'd)

Models 8642A and 8642B

Fit for ATE System Use

To improve instrument availability or "uptime", the HP 8642A/B have been designed to reduce failures and simplify the service procedure in the event of a failure. When used in ATE systems, the HP 8642A/B will improve overall system up-time, thus leading to increased productivity.

Extended Calibration Interval

The recommended calibration interval for the HP 8642A/B is two years, the result of a quality design, environmental-type testing and stringent production control. This means the HP 8642A/B will be more available for critical measurements, not out for calibration. When calibration is necessary, the HP 8952A Signal Generator Test System can automatically verify most warranted specifications for the HP 8642A/B in less than 20 minutes.

On-Site Repair and Calibration

The HP 8642A/B can be repaired and recalibrated on site in typically less than two hours. The fourteen internal modules that make up the HP 8642A/B all have rigid I/O specifications allowing a module-exchange repair strategy. Faulty modules can be quickly isolated using internal diagnostic hardware and software. A replacement module can be easily fitted and calibration data transferred to the instrument's main memory with a simple front-panel key sequence. Calibration and adjustments are primarily made electronically with ROM memory ICs and D/A converters.

A Unique Help Feature

Convenient control features help save time when putting the HP 8642A/B to work in systems. By using the "HELP" feature, special function codes and associated operational descriptions can be displayed by the alphanumeric back-lit liquid crystal display. It is easy to scroll through these descriptions with the knob or the UP/DOWN keys. The "HELP" feature eliminates the need to check manuals or pull-out cards by providing easy access to all special functions.

Through the LCD, messages in English clearly show instrument state and inform users of entry errors to help write programs that run smoothly from the start.

HP 8642A/B Specifications

Frequency

Range: 100 kHz to 1057.5 MHz, HP 8642A; 100 kHz to 2115 MHz, HP 8642B.

Bands: Both generators cover their ranges in one continuous span. However, many other specifications are dependent on carrier frequency. To simplify such specifications, the HP 8642A and 8642B carrier frequency ranges are divided into bands shown in the table below.

Band	Carrier Frequency (MHz)	Band	Carrier Frequency (MHz)
10	1057.500001-2115 (HP 8642B)	4	16.523438- 33.046875
9	528.750001-1057.5	3	8.261719- 16.523437
8	264.375001- 528.75	2	4.130860- 8.261718
7	132.187501- 264.375	1	0.1 - 4.130859
6	66.093751- 132.1875	HET	0.1 -132.1875
5	33.046876- 66.09375		

Resolution: 1 Hz, 0.1 Hz with special function.
Stability: same as reference oscillator.

Internal Reference Oscillator

Typical stability, standard: aging rate: ±2 ppm/year.
Stability, option 001: $<10^{-9}$/day aging rate after 8 days warm-up.

Spectral Purity

Residual FM; CW, AM or Angle Modulation ≤1/3 Maximum Peak Deviation:

Carrier Frequency	Post Detection Bandwidth, kHz	
	0.3 to 3 (Hz rms)	0.05 to 15 (Hz rms)
band 10 (HP 8642B)	<5	<9
band 9	<2	<5
band 8	<1.2	<2
bands 1 thru 7	<1	<1.2
band HET	<3.5	<5

SSB Phase Noise; CW, AM, or Angle Modulation <1/60 Maximum Peak Deviation:

Carrier Frequency Band	SSB Phase Noise 20 kHz Offset dBc/Hz	SSB Phase Noise Floor 200 kHz Offset dBc/Hz
10	–125	–134
9	–134	–143
8	–137	–144
7	–141	–144
6	–144	–145
5	–145	–145
4	–146	–147
3	–147	–148
2	–148	–149
1	–137	–138
HET	–125	–137

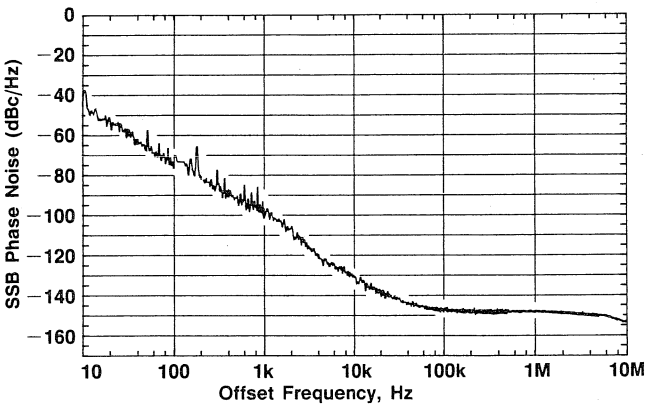
Residual AM: <0.01% AM rms, 0.3 to 3 kHz post-detection BW.

Spurious

Type of Spurious	HP 8642A/B Bands 1-9 and HET	HP 8642B Band 10
Harmonics		
Output Level ≤+10 dBm	–30 dBc	–25 dBc
Output Level ≤+16 dBm	–20 dBc	–20 dBc
Sub-harmonics	none	–45 dBc
Non-harmonics, >10 kHz from the carrier	–100 dBc[1]	–94 dBc

Supplemental Characteristics

Measured SSB Phase Noise at 1 GHz



Output

Level range: from maximum available to –140 dBm (0.023 μV).
Maximum Level Available:

	HP 8642A	HP 8642B
+20 dBm (2.24V)	bands 1 thru 7	bands 1 thru 7
+19 dBm (2.00V)	n/a	band 8
+18 dBm (1.78V)	bands 8 & HET	HET
+17 dBm (1.58V)	n/a	band 9
+16 dBm (1.41V)	band 9	band 10

Resolution: 0.1 dB.
Absolute accuracy: ±1 dB, output level ≥–127 dBm.
Flatness: ≤±0.75 dB, +10 dBm output level.
Impedance: 50 ohms nominal.
SWR: <1.5:1 for output levels <0 dBm;
<2.0:1 for output levels ≥0 dBm.
Reverse power protection: 50W, from a 50Ω source 25 Vdc, HP 8642A; 25W, 50 Vdc, HP 8642B.
Third order intermodulation: <–50 dBc at +10 dBm, two generators 25 kHz apart into a resistive combiner. Typically decreases 10 dB for every 5 dB of combined level decrease.
Available calibration units: V, mV, μV, dBm, and EMF. REL ZERO or REF SET can be used to obtain settings such as dBμV, dBEMFV, dBf, etc.

[1]Not specified in HET band.

Amplitude Modulation

AM depth: 0 to 99.9%, output level ≤+10 dBm.
AM resolution: 0.1%.
AM indicator accuracy at 1 kHz rate and up to 90% AM:
±(3.5% of setting +1% AM), HP 8642A/B bands 1-8 and HET, HP 8642B band 9.
±(5% of setting +1% AM), HP 8642B band 9, HP 8642B band 10.
AM distortion at 1 kHz rate:

Depth, %	Distortion	
	HP 8642A/B bands 1-8 HP 8642B band 9	HP 8642B band 9 HP8642B band 10 HP 8642A/B band HET
0 to 30	<1%	<2%
30 to 70	<2%	<4%
70 to 90	<4%	<6%

AM 3 dB bandwidth, depth ≤90%:
External dc/ac coupling: dc/20 Hz to 100 kHz, bands 1 and 5 thru 10; dc/20 Hz to 20 kHz, bands 2,3,4.
Internal: same as external ac.
Incidental phase modulation at 1 kHz rate and 30% AM: <0.2 radians peak.

Frequency Modulation

Maximum FM deviation:

Carrier Frequency Band	Maximum Deviation DC Coupled	Maximum Deviation AC Coupled or Internal (the smaller of)
10	3 MHz	3 MHz or f_{mod} X 2160
9	1.5 MHz	1.5 MHz or f_{mod} X 1080
8	750 kHz	750 kHz or f_{mod} X 540
7	375 kHz	375 kHz or f_{mod} X 270
6	187 kHz	187 kHz or f_{mod} X 135
5	93.8 kHz	93.8 kHz or f_{mod} X 67.5
4	46.9 kHz	46.9 kHz or f_{mod} X 33.75
3	23.4 kHz	23.4 kHz or f_{mod} X 16.88
2	11.7 kHz	11.7 kHz or f_{mod} X 8.44
1	93.8 kHz	93.8 kHz or f_{mod} X 67.5
HET	1.5 MHz	1.5 MHz or f_{mod} X 1080

FM resolution: 0.7% of setting or 0.0004% of maximum deviation, whichever is larger.
FM indicator accuracy:
±(5% of setting +10 Hz).
Rates dc to 100 kHz, external dc coupling.
Rates 20 Hz to 100 kHz, external ac and internal.
FM distortion: 4% for maximum dc coupled deviation, 2% for ½ maximum dc deviation, 0.4% for 1/15 maximum dc coupled deviation, rates 20 Hz to 100 kHz.
FM 3 dB bandwidth:
External dc/ac coupling: dc/20 Hz to 200 kHz.
Internal: dc/20 Hz to 200 kHz.
Incidental AM: 0.2%, 20 kHz peak deviation, 1 kHz rate, >400 kHz carrier frequency.
Carrier frequency offset when entering FM or phase modulation modes: AC and internal: none; DC: <500 Hz, HP 8642A/B; <1 kHz, HP 8642B band 10.

Phase Modulation

Maximum phase deviation:

Carrier Frequency Band	Maximum Deviation (Radians)
10	200
9	100
8	50
7	25
6	12.5
5	6.25
4	3.13
3	1.56
2	0.78
1	6.25
HET	100

Phase modulation accuracy: ±(5% of setting +0.09 radians), 1 kHz rate.
Phase modulation resolution: 0.7% of setting or 0.0004% of maximum deviation, whichever is greater.
Phase modulation distortion: <0.4%, 1 kHz rate.
Phase modulation 3 dB bandwidth: 20 Hz to 15 kHz, internal and external ac. DC to 15 kHz, external dc.

Pulse Modulation (for output levels ≤+15 dBm)

Pulse on/off ratio: >40 dB, HP 8642A/B; >80 dB, HP 8642B band 10.
Rise/fall time: <400 ns, 10% to 90%.
Maximum repetition frequency: 100 kHz.
Minimum pulse width: 2 μs.
Nominal peak input threshold level: 1.5V.

Internal Modulation Oscillator

Rates: 20 Hz to 100 kHz.
Frequency resolution: 1% of setting.
Frequency accuracy: 2% of setting.
Output level range: 0 to 3V peak into 600 ohms.
Output level resolution: 4 mV.
Distortion: >**0.5V peak:** <0.02%, 0.02 kHz to 15.8 kHz; <0.15%, >15.8 kHz.
Output level accuracy: ±(4% +15 mV) within 1 second.
Output impedance: 600 ohms ±10%.

Frequency Sweep

Digitally stepped sweep:
Start-stop sweep: sweeps between two selected endpoints in a linear step-wise manner. Endpoints can be anywhere within the frequency range of the instrument.
Phase continuous sweep:
Start-stop sweep: instrument sweeps between two selected endpoints in a linear, phase continuous manner.
Maximum span: up to 400 kHz, HP 8642A/B; up to 800 kHz, HP 8642B band 10.
X axis output: 0 to 10 Vdc, ±10%.
Z axis output: TTL positive true for crt display blanking during retrace.

Remote Programming

Interface: HP-IB (IEEE-488-1978).
Functions controlled: all functions controlled from the front panel or over HP-IB from 00 to 30 (5 bit decimal equivalent).
Interface function: listener, talker, and controller.
HP-IB interface functions: SH1, AH1, T5, TE0, L3, LE0, SR1, RL1, PP1, DC1, DT1, C1, C3, C28, E2.

General

Operating temperature range: 0° to 55° C.
Storage temperature: −55°C to +75° C.
Leakage: conducted and radiated interference is within the requirements of MIL STD 462B method CE03 and RE02. Interference is also within the standards set by FTZ 1115. Also, RF leakage of <0.5 μV is induced in a two turn loop 2.5 cm in diameter, held 2.5 cm away from any surface for output levels ≤0 dBm.
Power requirements: 100V, 120V, 220V, or 240V; +5%, −10%; 48 to 440 Hz; 300 VA max.
Size: 133H X 425W X 617D mm (5.25″ X 16.75″ X 24.3″).
HP System II module size: 5¼H X 1MW X 23D.
Weight: Net, 32.7 kg (71.5 lb); shipping, 43 kg (95 lb).

Ordering Information

HP 8642A Synthesized Signal Generator
HP 8642B Synthesized Signal Generator
Opt 001 High stability time base
Opt 002 RF connectors on rear panel only
Opt 710 On-site repair manual
Opt 907 Front handle kit
Opt 908 Rack flange kit
Opt 909 Front handle kit & rack flange kit
Opt 910 Additional operating and service manual
Opt W03 90 day on-site warranty conversion
Opt W30 Three-year extended hardware support:
HP 8642A
HP 8642B
HP 11801A On-site repair kit for HP 8642A
HP 11801B On-site repair kit for HP 8642B
HP 11801C On-site repair kit for HP 8642A and 8642B