

6080A SERIES SYNTHESIZED RF SIGNAL GENERATORS

Uncompromising performance is the reason the 6080A and 6082A are preferred for critical receiver testing, RF design and ATE systems.

HIGH PERFORMANCE COMES STANDARD

The 6080A and 6082A give you exceptional spectral purity. Phase noise at 1 GHz is -131 dBc/Hz at 20 kHz offset. Non-harmonic spurious performance is -100 dBc at 1 GHz. And residual FM is a low 1.5 Hz, which is ideal for both high performance receiver test and LO substitution.

The output level of +19 dBm (+20 dBm with overranging) gives you all the power you need for receiver overload tests, LO substitution, and for driving high level mixers.

At -140 dBm (-147 dBm with underranging), the 6080A and 6082A are ideal for receiver sensitivity or noise figure measurements. And low RF IMD makes both instruments ideal for receiver selectivity or SSB two-tone testing.

GENERATE COMPLEX SIGNALS

AM, FM, phase and pulse modulation are all available, and can be combined for complex signal simulation. FM deviation to 8 MHz, plus rates from dc to 100 kHz, provide the versatility you need to test mobile, cellular and military communications, as well as pagers, surveillance receivers and more.

Pulse rise time is <15 ns (<7.5 ns typical). While the on/off ratio of the 6082A is 80 dB, making it well-suited

for a host of radar component testing applications. And the internal modulation oscillator makes it possible to produce pulse waveforms phase-locked with the RF carrier.

If you're involved in characterizing RF subassemblies, log amplifiers, mixers and other RF components, you'll appreciate the time you save using the frequency and amplitude sweep capability of the 6080A and 6082A.

When you can't afford to compromise on performance, Giga-tronics has the only Synthesized RF Signal Generators you can afford.



When it comes to the design and testing of sophisticated RF equipment, the Giga-tronics 6080A Series Signal Generators give you uncompromising performance.

SYSTEM SPECIFICATIONS

Specifications describe the instrument’s warranted performance and apply 20 minutes, or as noted, after the instrument has been connected to ac power and turned on.

FREQUENCY

Range: 6080A: 10 kHz to 1056 MHz.

6082A: 100 kHz to 2112 MHz.

Frequency Bands: The carrier frequency band endpoints are show below:

Approximate Carrier Frequency Band (MHz)	Specific Carrier Frequency Band (MHz)
1056 – 2112	1056 – 2112 ¹
512 – 1056	512 – 1055.999,999 ²
256 – 512	256 – 511.999,999
128 – 256	128 – 255.999,999
64 – 128	64 – 127.999,999
32 – 64	32 – 63.999,999
15 – 32	15 – 31.999,999
.01 – 15	.01 – 14.999,999 ³

Resolution: 1 Hz.

Stability: Same as reference oscillator.

Frequency Switching Time: <100 ms to within 100 Hz of final value.

Relative Phase Adjust: Adjustable in 1 or 10 degree increments.

INTERNAL REFERENCE OSCILLATOR

Characteristic	Standard TCXO	-132 Option Medium Stability Oven	-130 Option High Stability Oven
Frequency	10 MHz	10 MHz	10 MHz
Temperature (0 – 50° C)	< ± 1 ppm	< ± 1 x 10 ⁻⁷	< ± 2 x 10 ⁻¹⁰ /° C
Aging Rate	< ± 1 ppm/yr (typical)	< ± 1 x 10 ⁻⁷ /mo	< ± 5 x 10 ⁻¹⁰ /day ⁴ < ± 1.5 x 10 ⁻⁹ /mo

External Reference Input: Configurable for 1, 2, 5 or 10 MHz ±10 ppm, 0.2 to 2.0 Vrms into 50 Ω input impedance. 60 dB rejection of line related signals superimposed on reference signal.

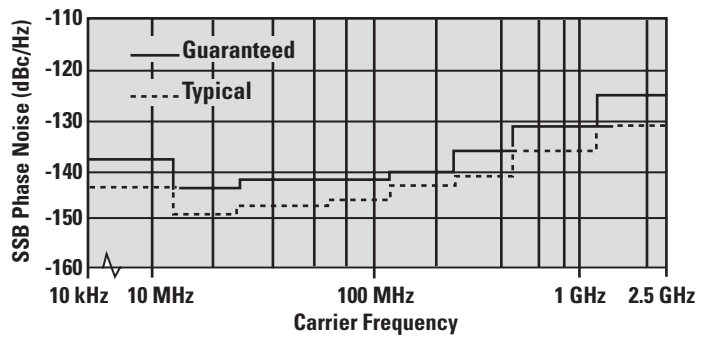
Reference Output: 10 MHz, >0 dBm into 50 Ω load, output impedance 50 Ω, nominal.

SPECTRAL PURITY

Phase Noise (CW, AM⁵, FM⁶, Phase Modulation⁶, Pulse Modulation):

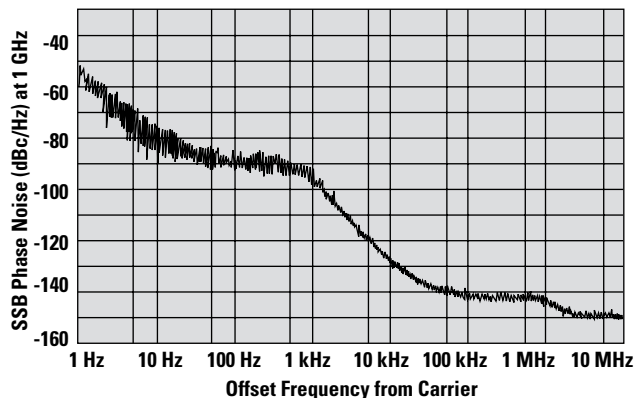
Approximate Carrier Frequency Band (MHz)	6080A			6082A		
	Offset Frequency			Offset Frequency		
	1 kHz (dbc/Hz)	20 kHz (dbc/Hz)	100 kHz (dbc/Hz)	1 kHz (dbc/Hz)	20 kHz (dbc/Hz)	100 kHz (dbc/Hz)
1056 – 2112	—	—	—	-88	-125	-132
512 – 1056	-94	-131	-138	-94	-131	-138
256 – 512	-100	-136	-142	-100	-136	-142
128 – 256	-106	-141	-144	-106	-140	-143
64 – 128	-112	-144	-145	-112	-143	-144
32 – 64	-118	-144	-146	-118	-143	-144
15 – 32	-124	-145	-146	-124	-144	-144
.01 – 15	-112	-138	-138	-112	-137	-137

SSB Phase Noise at 20 kHz offset from carrier⁶:



Typical SSB Phase Noise and Spurious at 1 GHz⁶

(with option -130 high stability reference oscillator):



Spurious Signals:

Harmonics⁷: <-30 dBc, output <+13 dBm.

Sub-harmonics: none, below 1056 MHz; -45 dBc from 1056 to 2112 MHz.

Non-harmonics: (for carrier offsets >10 kHz):

-100 dBc, <1056 MHz; -94 dBc, >1056 MHz.

Power Line Related: <-56 dBc, <1056 MHz;

<-50 dBc, >1056 MHz. Improves 6 dB per octave as frequency decreases to 15 MHz.

Residual FM (CW, AM⁶, FM⁶, Phase Modulation⁶, Pulse Modulation):

Approximate Carrier Frequency Band (MHz)	Post Detection Bandwidth	
	0.3 kHz to 3 kHz (CCITT) Hz rms	0.5 kHz to 15 kHz Hz rms
1056 – 2212	3.0	4.0
512 – 1056	1.5	2.0
256 – 512	0.7	1.0
128 – 256	0.4	0.5
.01 – 128	0.2	0.4

Residual AM: <0.01%, 0.05 to 15 kHz post detection bandwidth.

SSB AM Noise Floor (at 200 kHz offset, +13 dBm output):

Approximate Carrier Frequency Band (MHz)	SSB AM Noise floor dBc/Hz
1056 – 2212	< -153
15 – 1056	< -154
.01 – 15	< -146

OUTPUT

Maximum Output Level:

Approximate Carrier Frequency Band (MHz)	Maximum Level	
	6080A	6082A
1056 – 2212	NA	+13 dBm (1.00 V)
512 – 1056	+17 dBm (1.58 V)	+16 dBm (1.41 V)
.01 – 512	+19 dBm (2.00 V)	+16 dBm (1.41 V)

Minimum Output Level: -140 dBm (0.023 μV).

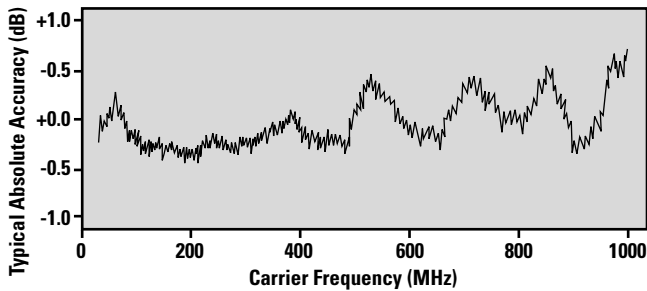
Output Level Over/Under Range: Typical overranging 1-3 dB more than maximum specified output. Underranging to -147.4 dBm.

Fixed Attenuator Vernier Range: 20 dB⁸ transient free.

Resolution: 0.1 dB.

Absolute Accuracy⁹: Maximum to -127 dBm: ±1 dB, 0.4 to 2112 MHz¹⁰; ±2 dB, 0.1 to 0.4 MHz¹¹.
-127 to -140 dBm: ±3 db¹².

Typical Absolute Accuracy at -127 dBm:



Attenuator Relay Life: 20 × 10⁶ cycles.

Flatness: ±0.75 dB for 6080A; ±1 dB for 6082A.

Applies at +10 dBm for carrier frequencies >0.1 MHz.

Reverse Power Protection: 6080A 50 W from a 50 Ω source, 50 Vdc; 6082A: 25 W from a 50 Ω source, 25 Vdc.

Third-Order Intermodulation: Applies with each signal level at +4 dBm into a resistive combiner. *Typical performance is 5 dB better than specifications.*

Approximate Carrier Frequency Band (MHz)	Signal Spacing	
	≤ 1 kHz	25 kHz
512 – 2112	-65 dBc	-70 dBc
128 – 512	-65 dBc	-75 dBc
.01 – 128	-60 dBc	-75 dBc

Source SWR: <1.5:1 for output levels <+6 dBm; <2.0:1 for output levels >+6 dBm.

Output Impedance: 50 Ω, nominal.

Output Level Switching Time: <100 ms within 0.1 dB of final value, typical.

AMPLITUDE MODULATION

AM Depth: 0 to 99.9%, for output level <+10 dBm, 6080A; <+ 7 dBm, 6082A.

AM Resolution: 0.1%.

AM Indicator Accuracy: ±(4% of setting +2%), up to 90% depth, 1 kHz rate.

AM Distortion at 1 kHz rate: <1.5%, 0-30% depth; <3%, 30-70% depth; <5%, 70-90% depth.

AM 3 dB Bandwidth:

External: 20 Hz to 50 kHz, ac coupled; dc to 50 kHz, dc coupled.

Internal: dc to 50 kHz. Minimum rate is determined by internal modulation source.

Incidental Phase Modulation: <0.2 radian at 30% AM and 1 kHz rate.

Input Impedance: 600 Ω, nominal.

FREQUENCY MODULATION

Maximum FM Deviation:

Approximate Carrier Frequency Band (MHz)	Maximum Deviation	
	dcFM	acFM ¹³ (the smaller of:)
1056 – 2112	8 MHz	8 MHz or fmod x 80,000
512 – 1056	4 MHz	4 MHz or fmod x 40,000
256 – 512	2 MHz	2 MHz or fmod x 20,000
128 – 256	1 MHz	1 MHz or fmod x 10,000
64 – 128	500 kHz	500 kHz or fmod x 5,000
32 – 64	250 kHz	250 kHz or fmod x 2,500
15 – 32	125 kHz	125 kHz or fmod x 1,250
.01 – 15	500 kHz	500 kHz or fmod x 5,000

FM Resolution: 3 digits.

FM Indicator Accuracy: ±(5% of setting +10 Hz) for rates from 50 Hz to 50 kHz.

FM Distortion:

Standard Mode: <2% for 0.5 to 1.0 times maximum deviation; <1% for <0.5 times maximum deviation.

Applies for rates of 50 Hz to 50 kHz.

Low Distortion Mode: <0.15% for ≤3.5 kHz peak deviation and rates 0.3 to 3 kHz. Typically <0.1%.

FM 3 dB Bandwidth:

Deviation	Coupling	
	Internal ac ¹⁴	External ac (dc)
0% to 25 % of Maximum	20 Hz to 175 kHz	20 Hz (dc) to 175 kHz
25% to 100% of Maximum	20 Hz to 100 kHz	20 Hz (dc) to 100 kHz

Incidental AM: <1% depth for deviation <100 kHz at 1 kHz rate and carrier frequency >0.5 MHz.

dcFM Carrier Frequency Offset¹⁵:

<(0.1% deviation + 500 Hz) at 1 GHz carrier frequency after internal dcFM calibration, typical.

dcFM Carrier Frequency Stability^{15,16}: 3 ppm/hr, <1/16 maximum deviation; 8 ppm/hr, >1/16 maximum deviation.

Applies at 1 GHz carrier frequency, typical.

Low Rate External acFM: Extends external acFM lower bandwidth to 0.5 Hz. Useful for digital applications where squarewave droop is undesired.

Input Impedance: 600 Ω, nominal.

PHASE MODULATION

Maximum Phase Deviation:

Approximate Carrier Frequency Band (MHz)	Maximum Deviation	
	Standard Mode	High Rate Mode
1056 – 2112	800 radians	80 radians
512 – 1056	400 radians	40 radians
256 – 512	200 radians	20 radians
128 – 256	100 radians	10 radians
64 – 128	50 radians	5 radians
32 – 64	25 radians	2.5 radians
15 – 32	12.5 radians	1.25 radians
.01 – 15	50 radians	5 radians

Phase Modulation Indicator Accuracy: $\pm(5\%$ of setting + 0.1 radian) at 1 kHz rate.

Phase Modulation Resolution: 3 digits.

Phase Modulation Distortion: <2% for 0.5 to 1.0 times maximum deviation; <1% for <0.5 times maximum deviation. Applies for 1 kHz rate in standard mode, and from 50 Hz to 50 kHz in high mode.

Phase Modulation 3 dB Bandwidth:

External: Standard mode: 20 Hz to 15 kHz, ac coupled; dc to 15 kHz, dc coupled. High rate mode: 20 Hz to 100 kHz, ac coupled; dc to 100 kHz, dc coupled.

Internal: Same as external dc coupled. Minimum rate is determined by internal modulation source.

Incidental AM: <1% depth for peak deviation <10 radians at 1 kHz rate and carrier frequency >0.5 MHz.

Input Impedance: 600 Ω , nominal.

PULSE MODULATION

On/Off Ratio:

Model	Carrier Frequency	
	<100 MHz	>100 MHz
6080A	60 dB	40 dB
6082A	80 dB	80 dB

Rise/Fall Time¹⁷: <15 ns, 10% to 90%. Typically 7.5 ns.

Minimum pulse width determined by rise/fall time.

Pulse Delay: 80 ns, typical.

Maximum Pulse Repetition Frequency: 10 MHz.

Output Level Accuracy¹⁸: Within ± 0.7 dB of CW accuracy for pulse widths >50 ns.

External Input: ≥ 2 V peak, On; ≤ 0.5 V peak, Off. Damage level $\geq \pm 10$ V peak. TTL compatible.

Input Impedance: 50 Ω , nominal.

INTERNAL MODULATION SOURCE

Waveforms: Sinusoidal, Square, Triangular, Pulse.

	Sine, Square, Triangle	Pulse
Rates	0.1 Hz to 200 ¹⁹ kHz	10 Hz to 200 kHz
Frequency Accuracy	Ref Osc ± 7 mHz	Reference Oscillator
Frequency Resolution	3 Digits	3 Digits
Pulse Width Resolution	NA	100 ns
Output Level Range	0 – 4 Vpk	TTL
Output Level Resolution	3 digits	NA
Output Impedance	600 Ω	TTL

Output Level Accuracy: $\pm(4\% + 15$ mV) for rates <100 kHz, sinusoidal waveform.

Sinusoidal Distortion: <0.15% for rates <20 kHz and level >0.2 Vpk.

MODULATION

Simultaneous Modulation: Any combination of AM, FM (or phase modulation), and pulse modulation. Any modulation type may be driven from any combination of internal or external sources.

External Input Level: 1 Vpk for specified accuracy for AM, FM and phase modulation. Front panel annunciators indicate application of 1 Vpk $\pm 2\%$ input signal level. When greater accuracy is required, modulation voltages should be monitored externally.

External Coupling: Coupling is ac or dc for AM, FM or phase modulation. Pulse modulation is dc coupled.

FREQUENCY SWEEP

Sweep Type: Linear, frequency stepped.

Parameter Entry: Center Frequency/Width, Start Frequency/Width, Sweep Frequency Increment and Time per Increment.

Sweep Time: 40 ms +(0 ms or 20 ms to 10 s) per frequency increment in 1, 2, 5 sequence. Total sweep time is time per frequency increment x number of frequency increments over sweep width.

Sweep Modes: Auto, single, manual.

X-axis Output: 0 to +10 V $\pm 10\%$, 4096 max steps.

Z-axis Output: TTL level, high during sweep retrace.

AMPLITUDE SWEEP

Sweep Type: Linear (volts) or Log (dB), amplitude stepped.

Parameter Entry: Center Amplitude/Width, Start Amplitude/Width, Sweep Amplitude Increment and Time per Increment.

¹Model 6082A only. ²Specified endpoints are 512 – 1056 MHz for Model 6080A. ³Specified endpoints are 0.1 – 14,999,999 MHz for Model 6082A. ⁴Applies after 21 days continuous operation. ⁵With AM on, performance degrades approximately 2 dB at 100 kHz offset for carrier frequencies below 256 MHz. ⁶Peak deviation less than 1.5% of maximum for frequency band. ⁷Applies from 1 to 2112 MHz for Model 6082A. ⁸Accuracy specifications do not apply over entire vernier range while attenuator is fixed. ⁹Absolute accuracy allows for detector linearity, temperature, flatness and attenuator accuracy. ¹⁰Applies 0 – 50° C for 6080A and 25° C ± 5 ° C for 6082A; ± 1.5 dB, 0 – 50° C for 6082A. ¹¹Add ± 1 dB below 100 kHz for model 6080A. ¹²Accuracy typically degrades linearly from -127 dBm to -140 dBm. ¹³Applies from 1/64 to maximum deviation. For <1/64 maximum deviation, divide acFM maximum deviation by 64. ¹⁴dcFM may be used with internal FM to extend lower bandwidth limit and allow higher FM deviation at lower rates. Minimum rate is determined by internal modulation oscillator. ¹⁵Scales with carrier frequency bands from 15 to 2112 MHz. Performance for 0.01 – 15 MHz band is the same as for 64 – 128 MHz band. ¹⁶After two hour warmup at constant temperature. ¹⁷Below 10 MHz, rise/fall time = 2 x period of carrier frequency. ¹⁸Below 10 MHz, applies for pulse width >10 x period of carrier frequency. ¹⁹Square and triangular waveforms degrade above 20 kHz.

Sweep Time: 30 ms +(0 ms or 10 ms to 10 s) per amplitude increment in 1, 2, 5 sequence. Total sweep time is time per amplitude increment x number of amplitude increments over sweep width.

Sweep Modes: Auto, single, manual.

X-axis Output: 0 to +10V \pm 10%, 4096 max steps.

Z-axis Output: TTL level, high during sweep retrace.

REMOTE PROGRAMMING

Interface: IEEE-488.

Control Language: IEEE-488.2. Special emulation modes allow compatibility with Giga-tronics 6060 Series, Fluke 6060/6070 Series, or Hewlett-Packard 8642A/B.

Select Code Range: 00-30.

Interface Functions: SHI, AHI, T5, TE0, L3, LE0, SRI, RLI, PPO, DCI, DTI, C0, E2.

Functions Controlled: All functions except internal/external reference and power switch.

GENERAL

Temperature Range: Operating: 0 to 50° C;
Non-Operating: -40 to + 75° C.

Operating Humidity: 0-95%, 0-30° C; 0-75%, 30-40° C;
0-45%, 40-50° C.

RF Leakage: Complies with MIL-Std-461B method CEO3 and REO2; VDE 0871B; CISPR 22; FCC Part 15, class B. Also <0.5 μ V into a two-turn loop 2.5 cm in diameter, at 2.5 cm from any surface, terminated in 50 Ω load, at RF carrier frequency.

Internal Diagnostics: The instrument monitors internal operations and alerts the user of most malfunctions which then can be traced to faulty modules and repaired.

Calibration Interval: 2 years.

Store/Recall memory: 50 non-volatile registers for storing, recalling and sequencing through complete front panel setup states.

Secure Mode: Provides protection against unauthorized access to user-defined instrument state, instrument state registers and user compensation data. Includes optional display blanking and complete memory purging.

Rear Panel Input/Output: Reference input and output BNC's; 7-pin auxiliary connector for sweep x-axis drive and z-blank/penlift signal, and memory sequencing; IEEE-488 standard interface. Specify option 830 for rear panel RF output, AM input, FM and phase modulation input, pulse modulation input and modulation oscillator output.

Power: 100, 120, 220, 240 V \pm 10%; 48-63 Hz; 200 VA.

Weight: 6080A: 27 kg (60 lbs) net; 39 kg (85 lbs) shipping.
6082A: Add 11 kg (5 lbs).

Dimensions: 133 mm H x 430 mm W x 597 mm D
(5.25 in x 17 in x 23.5 in).

ORDERING INFORMATION

6080A (.01 – 1056 MHz); 6082A (0.1 – 2112 MHz)

Options:

130 High Stability Reference

132 Medium Stability Reference

830 Rear Output/Modulation Input. RF output reduced up to 1.5 dB.



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