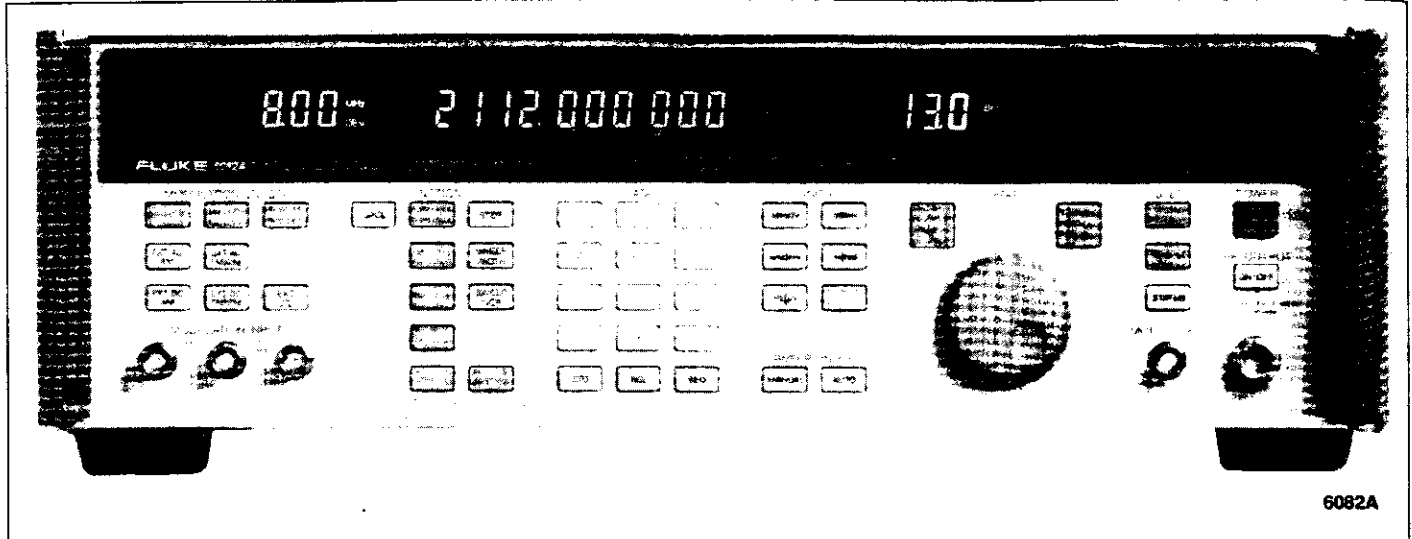


RF Signal Generators

6080A & 6082A



6080 Series High Performance RF Signal Generators

Frequency coverage 0.01 MHz to 1056 MHz (6080A)

or 0.1 MHz to 2112 MHz (6082A)

-131 dBc/Hz SSB phase noise at 1 GHz, 20 kHz offset

-100 dBc spurious

Output level range of +19 to -140 dBm in 0.1 dB steps

AM, FM, Phase, and Pulse Modulation

GPIB/IEEE-488.2 and emulation capability

High Performance is Standard Equipment

The 6080 Series of RF signal generators feature high performance modulation, wide output level range, and exceptionally high spectral purity. The 6080 Series is ideal for handling critical receiver test, RF design, and ATE systems applications. The 6080A covers frequencies to 1056 MHz, while the 6082A extends coverage to 2112 MHz.

Phase noise at 1 GHz is -131 dBc/Hz at 20 kHz offset. Non-harmonic spurious performance is -100 dBc at 1 GHz. Residual FM is a low 1.5 Hz, ideal for demanding FM distortion and SSB receiver testing.

Full modulation capability is also standard. AM, FM, pulse, and phase modulation can be combined for complex signal simulation. FM deviation to 8 MHz and rates from dc to 100 kHz provide the versatility you need to test FM mobile, cellular, military communications, pagers, and satellite receivers for example.

Low RF IMD is ideal for receiver selectivity and SSB two-tone testing. Amplitude and frequency sweep can be used to characterize RF subassemblies, log amplifiers, mixers, and other RF components.

A direct digital synthesis programmable modulation oscillator lets you simulate a wide variety of waveforms with reference oscillator precision. Waveforms include sine, square, triangle, and pulse. Use the triangle waveform to drive dc AM or dc FM to create an analog RF sweep. It's like having a function generator built-in.

The standard pulse modulation rise-time is <math><15\text{ ns}</math> (<math><7.5\text{ ns}</math> typical). The 6082A's on/off ratio is 80 dB, making it particularly well-suited to a host of radar component testing applications. The internal modulation oscillator is coherent with the RF carrier, making it possible to produce pulse waveforms coherent with the RF carrier.

Wide output level range and high accuracy gives you the measurement margin you need to meet your workload requirements quickly and with confidence. Output level accuracy is specified at $\pm 1\text{ dB}$ and the special user-defined level correction registers can be used to compensate for cabling or systems loss and frequency response. Output level of up to +19 dBm (+20 dBm with overranging) provides the power you need for receiver overload tests, local oscillator substitution, and for driving high level mixers.

Output levels down to -140 dBm (-147 dBm with underranging) are ideal for receiver sensitivity or amplifier noise figure measurements. Low RF

leakage lets you perform EMI, pager, and unshielded receiver tests with the accuracy you need.

Fluke Technology Makes Superior Signal Generators

The capability of the 6080 Series is due in large part to a balance between what they can do and how they do it. Good specifications are useless unless they can be applied with ease to the working environment.

The 6080A and 6082A emulate the programming language of the Fluke 6060 and 6070 Series RF Signal Generators and the Hewlett-Packard 8642A and 8642B. This means you don't have to invest in expensive new software when it's time to update with new signal generators.

Both the 6080A and 6082A are designed to fit standard 5.25 inch (13.3 cm) rack spacing.

Fluke has applied the latest technology to maximize measurement power and convenience while maintaining simplicity of operation. The bright crisp vacuum fluorescent display is easy to read from all angles. Bright digit editing lets you highlight and individually change the value of any parameter using the edit knob. Step keys allow you to change parameters up and down in predetermined increments. Or you can use the keyboard to enter frequency, amplitude, and modulation parameters directly. Amplitude entries are easily changed between dBm and volts with a simple keystroke.

A full self-test is performed on power-up. In the event of component failure, internal diagnostics automatically help isolate the problem to the module level. Modules can then be quickly removed and replaced through the Fluke Module Exchange Program.

Versatility is also increased by the ability to store up to 50 complete instrument states in non-volatile memory. This allows you to recall front

panel set-ups for simplified retrieval during repetitive tests or to semi-automate your test routines. The sequence function allows you to step quickly through each set-up with a single key-stroke or via remote contact closure.

Special functions such as relative frequency and amplitude, modulation waveforms, or fixed attenuator for smooth amplitude changes all add to measurement power and convenience.

Select a Reference Oscillator Matched to Your Application

A choice of three reference oscillators is available to suit almost any application. The standard signal generator operates on an internal 10 MHz Temperature Compensated Crystal Oscillator (TCXO). The frequency variation is $\leq \pm 1$ ppm peak to peak over the temperature range of 0 to $+50^\circ\text{C}$. Two additional reference oscillators are available as options. The -132 Medium Stability Oven has an aging rate of $\leq \pm 1 \times 10^{-7}$ per month. The -130 High Stability Oven aging rate is $\leq \pm 1.5 \times 10^{-8}$ per month. The external reference input can be configured to accept frequencies of 1, 2, 5, or 10 MHz. The level required is 0.5 to 2.0V rms into a 50 Ω termination.

Fluke Reliability and Support

Solid construction, low parts count, and extensive operating thermal shock and random vibration testing assure high reliability for both the 6080A and 6082A. To achieve low RF leakage and high spectral purity, the instruments are partitioned into functional modules housed in RF-tight cavities with RFI-gasketed covers. The attenuator is designed for high accuracy and repeatability; the use of high-reliability sealed relays and has been field-proven for high reliability.

Reverse power protection of 50 watts on the 6080A and 25 watts 6082A is standard. Numerous special functions aid calibration, troubleshooting, and maintenance. Closed-case calibration via the GPIB/IEEE-488* bus or the front panel simplifies calibration and minimizes downtime.

Every 6080 Series is fully backed by comprehensive service and support. Technical centers are worldwide for applications support and other technical assistance.

Specifications

Technical Specifications

Frequency

Range: 6080A: 10 kHz to 1056 MHz; 6082A: 100 kHz to 2112 MHz. See also Internal Modulation Oscillator for coverage from 0.1 Hz to 200 kHz.

*The terms GPIB and IEEE-488 may be used interchangeably throughout this catalog.

Frequency Bands: The carrier frequency band endpoints are shown in the following table

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

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

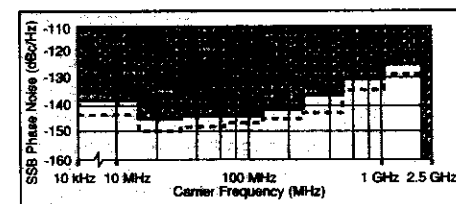
Typical Relative Phase Adjust: Adjustable in 1 or 10 degree increments

Spectral Purity

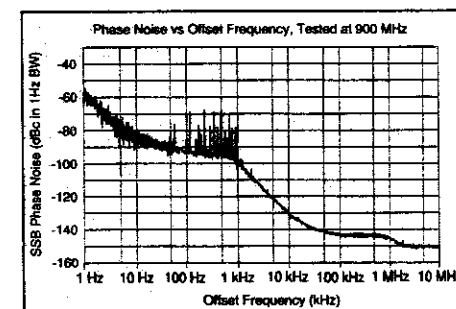
Phase Noise (CW, AM⁵, FM⁶, Phase Modulation⁶, Pulse Modulation):

Approx Carrier Freq Band (MHz)	6080A			6082A		
	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):



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)	$\leq \pm 1$ ppm	$\leq 1 \times 10^{-7}$	$\leq 2 \times 10^{-10}/^\circ\text{C}$
Aging Rate	≤ 1 ppm/yr typical	$\leq 1 \times 10^{-7}$ /mo	$\leq 5 \times 10^{-10}$ /day ⁴ $\leq 1.5 \times 10^{-9}$ /mo

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

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

Spurious Signals

Harmonics⁷: <-30 dBc, output <+13 dBm

Subharmonics: 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.

¹ Model 6082A only

² Specified endpoints are 512 - 1056 MHz for model 6080A

³ Specified endpoints are 0.1 - 14,999,999 MHz for model 6082A

⁴ Applies after 21 days continuous operation

⁵ With AM on, performance degrades approximately 2 dB at 100 kHz offset for carrier frequencies below 256 MHz

⁶ Peak deviation less than 1.5% of maximum for frequency band

⁷ Applies from 1 to 2112 MHz for model 6082A

RF Signal Generators

6080A & 6082A

Residual FM (CW, AM, FM⁶, Phase Modulation⁹, Pulse Modulation):

Approximate Carrier Freq Band (MHz)	Post Deflection Bandwidth	
	0.3 kHz to 3 kHz (CCITT) Hz rms	0.05 kHz to 15 kHz Hz rms
1056 - 2112	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

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

Approximate Carrier Frequency Band (MHz)	SSB AM Noise Floor dBc/Hz
1056 - 2112	<-153
15 - 1056	<-154
0.01 - 15	<-146

Output

Maximum Output Level:

Approximate Carrier Freq Band (MHz)	Maximum Level	
	6080A	6082A
1056 - 2112	NA	+13 dBm (1.00V)
512 - 1056	+17 dBm (1.58V)	+16 dBm (1.41V)
0.01 - 512	+19 dBm (2.00V)	+16 dBm (1.41V)

Minimum Output Level: -140 dBm (0.023 μ V)

Output Level Over/Under Range: Overranging 1-3 dB more than maximum specified output; underranging to -147.4 dBm

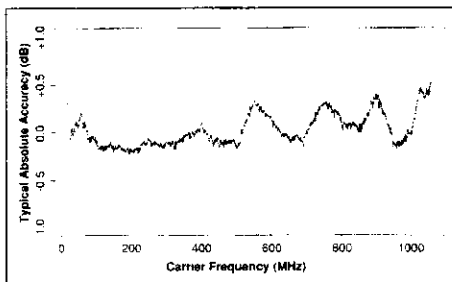
Fixed Attenuator Vernier Range: 20 dB⁸ transient free

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

Typical Attenuator Relay Life: 20 x 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 watts from a 50 Ω source, 50V dc; 6082A: 25 watts from a 50 Ω source, 25V dc

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 Freq 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: 6080A: <1.5:1 for output levels <+6 dBm; <2.0:1 for output levels >+6 dBm
6082A: <1.5:1 for output levels <+2 dBm; <2.0:1 for output levels >+2 dBm

Output Impedance: 50 Ω , nominal
Typical Output Level Switching Time: ≤ 100 ms within 0.1 dB of final value

Amplitude Modulation

AM Depth: 0 to 99%, for output level <+10 dBm, 6080A; <+7 dBm, 6082A

AM Resolution: 0.1%

AM Indicator Accuracy: $\pm(4\%$ 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 Freq Band (MHz)	Maximum Deviation	
	dc FM	ac FM 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: $\pm(5\%$ 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: <0.3% for 3.5 kHz peak deviation and rates 0.3 to 3 kHz

FM 3 dB Bandwidth:

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

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

⁶ Peak deviation less than 1.5% of maximum for frequency band

⁷ Applies from 1 to 2112 MHz for model 6082A

⁸ Accuracy specifications do not apply over entire vernier range while attenuator is fixed

⁹ Absolute accuracy allows for detector linearity, temperature, flatness and attenuator accuracy

¹⁰ Applies 0-50°C for 6080A and 25°C $\pm 5^\circ$ C for 6082A; ± 1.5 dB, 0-50°C for 6082A

¹¹ Add ± 1 dB below 100 kHz for model 6080A

¹² Accuracy typically degrades linearly from -127 dBm to -140 dBm

¹³ Applies from 1/64 to maximum deviation. For <1/64 maximum deviation, divide acFM maximum deviation by 64.

¹⁴ dcFM 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.

¹⁵ Scales 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.

¹⁶ After two hour warm-up at constant temperature

Phase Modulation

Maximum Phase Deviation:

Approximate Carrier Freq 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 rate 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

Typical Pulse Delay: 65 ns, off to on; 80 ns, on to off

Minimum Pulse Width: Determined by rise/fall time

Maximum Pulse Repetition Frequency: 10 MHz

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

Input Impedance: 50 Ω , nominal

Internal Modulation Source

Waveforms: Sinusoidal, Square, Triangular, Pulse

	Triangular Sine, Square,	Pulse
Rates:	0.1 Hz to 200 ¹⁹ kHz	10 Hz to 200 kHz
Frequency Accuracy:	Ref Osc ± 7 mHz	Reference Osc
Frequency Resolution:	3 digits	3 digits
Pulse Width Resolution:	NA	100 ns
Output Level Range:	0-4V pk	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 V pk

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: 1V pk for specified accuracy for AM, FM, and Phase modulation. Front panel annunciators indicate application of 1V pk $\pm 2\%$ 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 10s) 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 $+10V \pm 10\%$, 4096 max steps

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

¹⁷ Below 10 MHz, rise/fall time = 2 x period of carrier frequency

¹⁸ Below 10 MHz, applies for pulse width >10 x period of carrier frequency

¹⁹ Square and triangular waveforms degrade above 20 kHz

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

Sweep Time: 30 ms + (0 ms or 20 ms to 10s) 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 Fluke 6060/6070 Series, or Hewlett-Packard 8642A/B.

Select Code Range: 00 - 30

Interface Functions: SH1, AH1, T5, TE0, L3, LE0, SR1, RL1, PP0, DC1, DT1, C0, E2

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

General Specifications

Temperature Range:

Operating: 0°C to 50°C

Non-Operating: -40°C to +75°C

RF Leakage: Complies with MIL-STD-461B method CE03 and RE02; 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 a 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

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, 240V $\pm 10\%$; 48-63 Hz; 200V A

Size: 133 mm H x 430 mm W x 597 mm L (5.25 in H x 17 in W x 23.5 in L)

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

RF Signal Generators

6080A & 6082A

Ordering Information

Models January 1992 prices

6080A Signal Generator	\$15,950
6082A Signal Generator	21,950

Included with Instrument

One-year product warranty, line cord, Operator & Service Manuals, Reference Guides, and Certificate of Calibration Practices.

Options

-130 High Stability Reference	\$1500
-132 Medium Stability Reference	795
-830 Rear Output/Modulation Input	300
Y6080-01 Rack Mount Kit, incl. 22" slides	395

Manuals

6080A/82A Operator Manual* (PN 861034)	\$ 33
6080A/82A Operator Reference Guide* (PN 882154)	3
6080A/82A Remote Programming Ref. Guide (PN 882147)	3
6080A Service Manual* (PN 868914)	57
6082A Service Manual* (PN 881888)	57

**No charge with purchase of unit*

Customer Support Services

Also see Section 17.

Factory Warranty

One-year product warranty.

Extended Warranty (2 years)

SC1-6080A Repair w/Recalibration	\$ 696
SC2-6080A Calibration	445
SC3-6080A Full Service	1065
SC1-6082A Repair w/Recalibration	716
SC2-6082A Calibration	465
SC3-6082A Full Service	1100

Service Parts

Module Exchange and Product Update Microfiche Subscription Service are available. Contact Service Parts Center at (800) 526-4731 in most of U.S.A., (206) 356-5774 from WA, for more details.

Note: The above configurations meet North American power requirements. For other power options, see Section 19.

