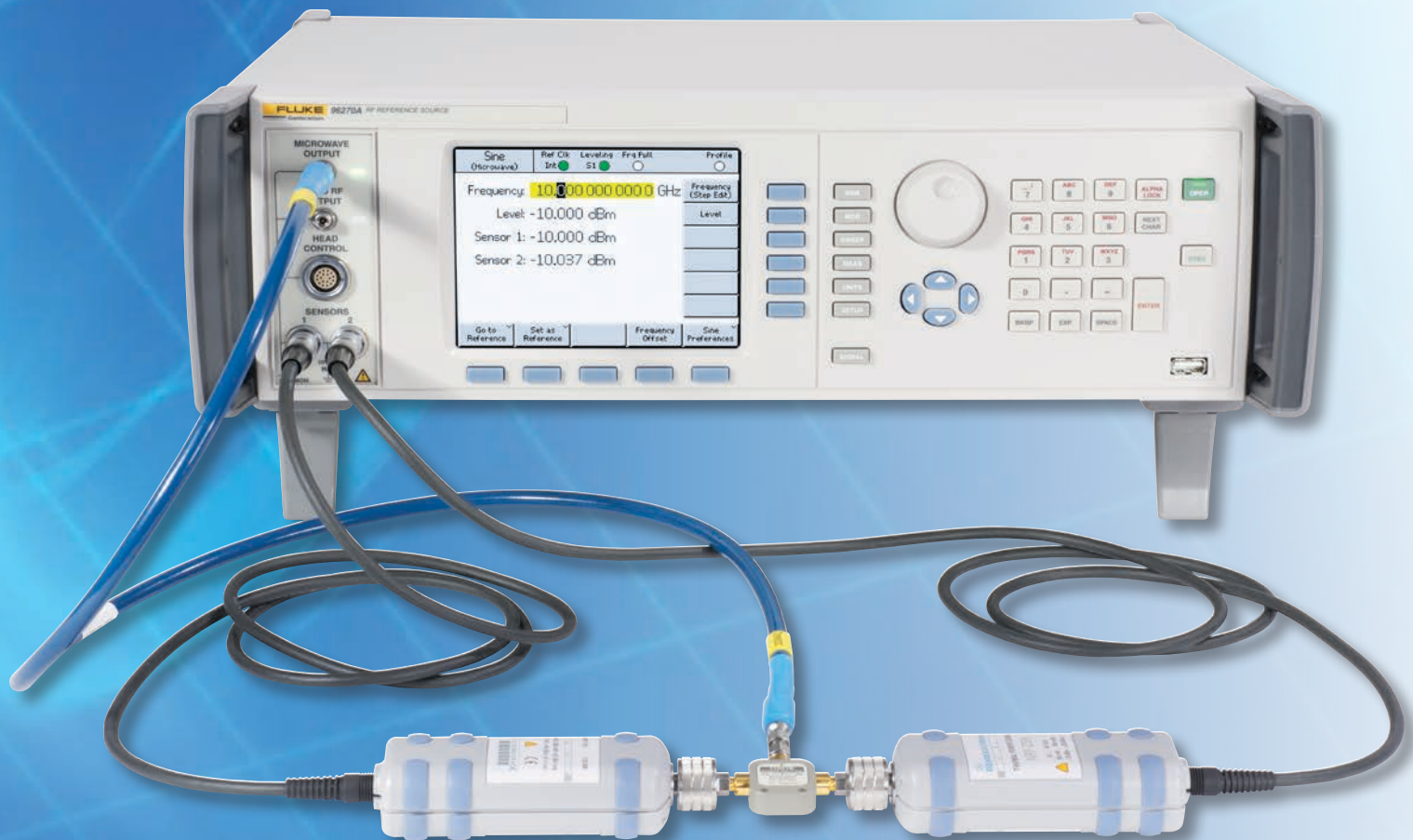


Cal Power

Via Acquanera, 29 22100 COMO
tel. 031.526.566 (r.a.) fax 031.507.984
info@calpower.it www.caltower.it

FLUKE®

Calibration

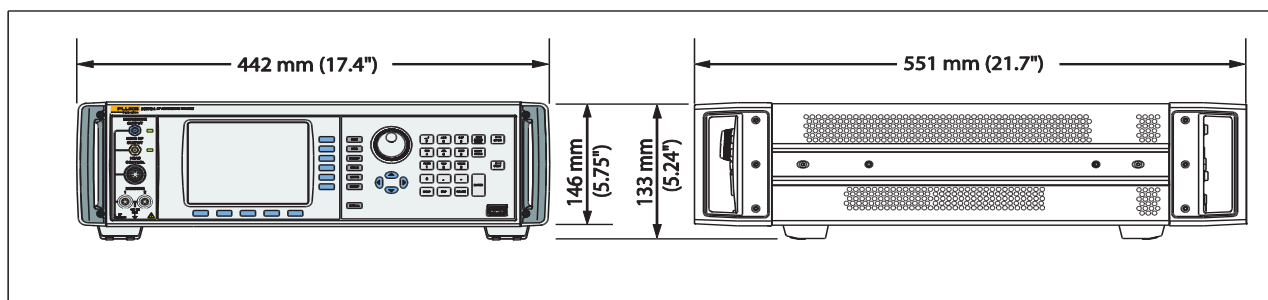


96000 Series RF Reference Sources

Extended specifications

General specifications (96040A and 96270A)

Performance	All specifications apply to a 1-year calibration interval at an ambient temperature of $T_{cal} \pm 5\text{ }^{\circ}\text{C}$ Nominal factory T_{cal} calibration temperature $23\text{ }^{\circ}\text{C}$ Unless otherwise noted, specifications are stated at a 99 % confidence level
Standard interfaces	IEEE488.2 (GPIB) 96270A only: Compatible power sensor inputs ^[1] 96270A only: USB memory device
Warmup time	60 minutes
Temperature	Operating: $0\text{ }^{\circ}\text{C}$ to $50\text{ }^{\circ}\text{C}$ Specified operation: $5\text{ }^{\circ}\text{C}$ to $40\text{ }^{\circ}\text{C}$ Storage: $-20\text{ }^{\circ}\text{C}$ to $+70\text{ }^{\circ}\text{C}$
Relative humidity	Operating or storage: Non-condensing, $5\text{ }^{\circ}\text{C}$ to $30\text{ }^{\circ}\text{C}$ <90 %, < $40\text{ }^{\circ}\text{C}$ <75 %, < $70\text{ }^{\circ}\text{C}$ <45 %
Altitude	Operating: $\leq 2,000\text{ m}$ Non-operating: $\leq 12,000\text{ m}$
Safety	EN 61010-1: Pollution Degree 2, Installation Category II
Electromagnetic compatibility	EN 61326 -1: Controlled. Applies to use in Korea only, Class A Equipment (Industrial Broadcasting & Communication Equipment) ^[2]
Line power	Voltage: 100 V to 240 V rms with additional voltage fluctuations of $\pm 10\text{ }%$ Frequency: 50 Hz to 60 Hz with additional frequency variation of $\pm 3\text{ Hz}$
Power consumption	250 VA
Dimensions	442 mm (17.4 in) wide, 146 mm (5.76 in) high and 551 mm (21.7 in) deep, including handles. Mounts within industry-standard 483 mm (19 in) rack-mount frames when fitted with Y9600 rack mounting kit
Weight	18 kg (40 lb)
^[1] See Power Meter Readout specifications for compatible power sensor details. ^[2] This product meets requirements for industrial (Class A) electromagnetic wave equipment and the seller or user should take notice of it. This equipment is intended for use in business environments and is not to be used in homes.	



96040A and 96270A dimensions

Frequency reference input/output specifications (96040A and 96270A)

Frequency reference input	Rear-panel reference frequency input BNC connector
Frequency	1 MHz to 20 MHz in 1 MHz steps ± 0.3 ppm, typical
Level	1 V pk nominal into 50 Ω , ± 5 V pk max
Frequency reference output	Rear-panel reference frequency output BNC connector
Frequency	1 MHz or 10 MHz, user selectable
Level	1.5 V pk-pk into 50 Ω , 3 V pk-pk into 1 k Ω , TTL compatible
Accuracy ^{[1] [2]}	± 0.05 ppm
Ageing rate and stability ^[2]	After 24-hr warmup: $\leq \pm 5 \times 10^{-10}$ /day, typical Continuous operation: $\leq \pm 2 \times 10^{-8}$ /month typical, $\leq \pm 5 \times 10^{-8}$ over 1 year
^[1] Includes all stability effects for the 1-year calibration interval and Tcal ± 5 °C temperature range applicable to all specifications. ^[2] Specifications apply only if internal frequency reference operation is selected. With external frequency reference operation selected, the frequency of the frequency reference output is locked to the signal applied to the frequency reference input.	

Leveled Sine Specifications at Leveling Head Output (96040A and 96270A)

Frequency	
Range	1 MHz to 4 GHz
Resolution	Standard: <100 MHz: 0.001 Hz (1 mHz), ≥ 100 MHz: 11 digits Enhanced: 0.000 01 Hz (10 μ Hz)
Accuracy	Internal frequency reference: ± 0.05 ppm ± 5 μ Hz External frequency reference: Ext freq ref accuracy ± 5 μ Hz

Amplitude	50 Ω Output	75 Ω Output
Output connector	Precision 50 Ω N-Series male	Precision 75 Ω N-Series male
Range	-130 dBm to +24 dBm (0.2 μ V to 10 V pk-pk) > 125 MHz: +20 dBm > 1.4 GHz: +14 dBm	-130 dBm to +18 dBm (0.13 μ V to 6.3 V pk-pk) > 125 MHz: +14 dBm > 1.4 GHz: +8 dBm
Resolution	0.001 dB	0.001 dB
VSWR	≤ 100 MHz: ≤ 1.05 ≤ 2 GHz: ≤ 1.1 2 GHz to 4 GHz: $\leq 1.0 + 0.05 \times f$ (GHz)	≤ 100 MHz: ≤ 1.1 ≤ 1 GHz: ≤ 1.2 ≤ 2 GHz: ≤ 1.3

Attenuation	50 Ω Output	75 Ω Output
Attenuation 10 Hz ^[1] to 128 MHz	<p>Relative to +16 dBm output:</p> <p>0 to 55 dB ± 0.025 dB</p> <p>55 to 64 dB ± 0.03 dB</p> <p>64 to 74 dB ^[1] ± 0.05 dB</p> <p>74 to 100 dB ^[1] ± 0.07 dB</p> <p>100 to 116 dB ^[1] ± 0.15 dB</p> <p>Relative to +10 dBm output:</p> <p>0 to 49 dB ± 0.02 dB</p> <p>49 to 59 dB ± 0.03 dB</p> <p>59 to 69 dB ^[1] ± 0.05 dB</p> <p>69 to 94 dB ^[1] ± 0.07 dB</p> <p>94 to 110 dB ^[1] ± 0.15 dB</p>	<p>Relative to +10 dBm output</p> <p>0 to 33 dB ± 0.07 dB</p> <p>33 to 64 dB ± 0.1 dB</p> <p>64 to 100 dB ^[2] ± 0.2 dB</p> <p>100 to 110 dB ^[2] ± 0.4 dB</p>
Cumulative and incremental attenuation To determine the attenuation specification between any two output levels, apply an RSS ^[3] summation of the dB values listed for each output level	<p>Relative to any level between +10 dBm and -100 dBm, 10 Hz ^[1] to 128 MHz</p> <p>+16 to +10 dBm ± 0.025 dB</p> <p>+10 to -39 dBm ± 0.02 dB</p> <p>-39 to -48 dBm ± 0.03 dB</p> <p>-48 to -58 dBm ^[1] ± 0.05 dB</p> <p>-58 to -84 dBm ^[1] ± 0.07 dB</p> <p>-84 to -100 dBm ^[1] ± 0.15 dB</p>	<p>Relative to any level between +10 dBm and -100 dBm, 10 Hz ^[2] to 128 MHz</p> <p>+10 to -23 dBm ± 0.07 dB</p> <p>-23 to -54 dBm ± 0.1 dB</p> <p>-54 to -90 dBm ^[2] ± 0.2 dB</p> <p>-90 to -100 dBm ^[2] ± 0.4 dB</p>
^[1] 50 Ω Output attenuation specifications are typical at absolute levels of less than -48 dBm up to 20 kHz, at less than -74 dBm up to 100 kHz, and at less than -84 dBm at all frequencies. ^[2] 75 Ω Output attenuation specifications are typical at absolute levels of less than -54 dBm up to 20 kHz, at less than -80 dBm up to 100 kHz, and at less than -90 dBm at all frequencies. ^[3] Root Sum Square.		

Absolute amplitude accuracy			50 Ω Output					
Amplitude								
dBm	10 Hz ^[1] to <100 kHz	100 kHz	>100 kHz to <10 MHz	10 MHz to 128 MHz	>128 MHz to 300 MHz	>300 MHz to 1.4 GHz	>1.4 GHz to 3 GHz	>3 GHz to 4 GHz
>+20 to +24	± 0.03 dB	± 0.03 dB	± 0.05 dB	± 0.05 dB	Output not available			
>+14 to +20	± 0.03 dB	± 0.03 dB	± 0.05 dB	± 0.05 dB	± 0.07 dB	± 0.2 dB		
-17 to +14	± 0.03 dB	± 0.03 dB	± 0.05 dB	± 0.05 dB	± 0.07 dB	± 0.2 dB	± 0.3 dB	± 0.3 dB
-48 to <-17	± 0.03 dB	± 0.03 dB	± 0.05 dB	± 0.05 dB	± 0.07 dB	± 0.2 dB	± 0.3 dB	± 0.5 dB
>-74 to <-48	Not specified	± 0.2 dB	± 0.2 dB	± 0.1 dB	± 0.1 dB	± 0.4 dB	± 0.5 dB	± 0.5 dB
>-84 to -74		± 0.5 dB	± 0.5 dB	± 0.1 dB	± 0.3 dB	± 0.5 dB	± 1.0 dB	± 1.0 dB
>-94 to -84		± 0.5 dB	± 0.5 dB	± 0.3 dB	± 0.5 dB	± 1.0 dB	± 1.0 dB	Not specified
-130 to -94					± 0.7 dB	± 1.5 dB	± 1.5 dB	
^[1] Also applies as typical accuracy at frequencies <10 Hz.								
^[2] Specification are typical.								

Amplitude flatness relative to 100 kHz			50 Ω Output					
Amplitude								
dBm	10 Hz ^[1] to <100 kHz	100 kHz	>100 kHz to <10 MHz	10 MHz to 128 MHz	>128 MHz to 300 MHz	>300 MHz to 1.4 GHz	>1.4 GHz to 3 GHz	>3 GHz to 4 GHz
>+20 to +24	± 0.03 dB	± 0.00 dB	± 0.04 dB	± 0.04 dB	Output not available			
>+14 to +20	± 0.03 dB	± 0.00 dB	± 0.04 dB	± 0.04 dB	± 0.06 dB	± 0.2 dB		
-17 to +14	± 0.03 dB	± 0.00 dB	± 0.04 dB	± 0.04 dB	± 0.06 dB	± 0.2 dB	± 0.3 dB	± 0.3 dB
-48 to <-17	± 0.03 dB	± 0.00 dB	± 0.04 dB	± 0.04 dB	± 0.06 dB	± 0.2 dB	± 0.3 dB	± 0.5 dB
>-74 to <-48		± 0.00 dB	± 0.2 dB	± 0.1 dB	± 0.1 dB	± 0.4 dB	± 0.5 dB	± 0.5 dB
>-84 to -74		± 0.00 dB	± 0.5 dB	± 0.1 dB	± 0.3 dB	± 0.5 dB	± 1.0 dB	± 1.0 dB
>-94 to -84		± 0.00 dB	± 0.5 dB	± 0.3 dB	± 0.5 dB	± 1.0 dB	± 1.0 dB	
-130 to -94		Not specified						
^[1] Also applies as typical accuracy at frequencies < 10 Hz.								

Absolute amplitude accuracy			75 Ω Output					
Amplitude								
dBm	10 Hz ^[1] to <20 kHz	>20 kHz to <100 kHz	>100 kHz to <10 MHz	10 MHz to 125 MHz	>125 MHz to 300 MHz	>300 MHz to 1.4 GHz	>1.4 GHz ^[2] to 3 GHz	>3 GHz ^[2] to 4 GHz
>+14 to +18	±0.12 dB	± 0.12 dB	± 0.12 dB	± 0.12 dB	Output not available			
>+8 to +14	±0.12 dB	± 0.12 dB	± 0.12 dB	± 0.12 dB	± 0.15 dB	± 0.25 dB		
-23 to +8	±0.12 dB	± 0.12 dB	± 0.12 dB	± 0.12 dB	± 0.15 dB	± 0.25 dB	± 0.3 dB	± 0.5 dB
-54 to <-23	±0.15 dB	± 0.15 dB	± 0.15 dB	± 0.15 dB	± 0.2 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB
>-80 to <-54	Not specified		± 0.2 dB	± 0.2 dB	± 0.2 dB	± 0.5 dB	± 0.5 dB	± 0.5 dB
>-90 to -80			± 0.7 dB	± 0.7 dB	± 0.7 dB	± 1.0 dB	± 1.0 dB	± 1.0 dB
>-100 to -90			± 0.7 dB	± 0.7 dB	± 0.7 dB	± 1.0 dB	± 1.0 dB	Not specified
-120 to -100					± 1.5 dB	± 1.5 dB	± 1.5 dB	
^[1] Also applies as typical accuracy at frequencies <10 Hz.								
^[2] Specifications are typical for frequencies >2 GHz.								

Leveled sine specifications at microwave output (96270A)

Frequency	
Range	1 MHz to 27 GHz
Resolution	Standard: <100 MHz: 0.001 Hz (1 mHz), ≥ 100 MHz: 11 digits, ≥ 10 GHz 12 digits Enhanced: <4 GHz: 0.000 01 Hz (10 μHz), ≥ 4 GHz: 0.000 1 Hz (100 μHz)
Accuracy	Internal frequency reference: ± 0.05 ppm ± 5 μHz External frequency reference: ± 5 μHz

Microwave Output direct	At the front panel Microwave Output connector. Amplitude set on instrument front panel and delivered at the front panel Microwave Output connector
Amplitude Range	-4 dBm to +24 dBm ^[1] > 1.4 GHz: +20 dBm ^[1] With low-level Microwave Output option ^[2] : -100 dBm to +24 dBm ^[1] > 1.4 GHz: +20 dBm ^[1] > 20 GHz: +18 dBm ^[1]
Amplitude resolution	0.001 dB
Amplitude accuracy (typical, into 50 Ω)	-4 dBm to +24 dBm up to 4 GHz: ± 0.5 dB 4 GHz to 26.5 GHz: ± 1.0 dB
VSWR	≤ 2.0 typical
Connector	PC2.92 mm female
^[1] Amplitude specifications apply into 1.0 VSWR match only.	
^[2] Internal step attenuator rated to 1.5 million operations.	

Microwave Splitter/Sensor Output ^[1]	At the leveling splitter output port connector. Amplitude set on instrument front panel and delivered at the splitter output port connector
Leveling frequency range	1 kHz minimum, to avoid leveling control tracking instantaneous signal level at lower frequencies
Amplitude range	-10 dBm to +18 dBm ^[2] (200 mV to 5 V pk-pk) > 1.4 GHz: +14 dBm ^[2] (3.17 V pk-pk) With Low-Level Microwave Output option ^[3] : -35 dBm ^[4] to +18 dBm ^[2] (11.2 mV to 5 V pk-pk) > 1.4 GHz: +14 dBm ^[2] (3.17 V pk-pk) > 20 GHz: +12 dBm ^[2] (2.52 V pk-pk)
Amplitude resolution	0.001 dB
VSWR	≤ 1.22 (HF Leveling Kit splitter device output port VSWR specification)
Connector	PC3.5 mm female (HF Leveling Kit splitter device output port connector)
^[1] Requires the HF Leveling Kit or compatible power sensor and splitter with splitter/sensor leveling enabled. Automatic feedback establishes and maintains the level set on the instrument user interface at the splitter output port connector. See Power meter readout specifications for compatible power sensor details.	
^[2] Amplitude range specifications are nominal, apply into 1.0 VSWR match only. Maximum output assumes a typical 6 dB splitter loss and is also influenced by loss in the front panel Microwave output to splitter input interconnection.	
^[3] Internal step attenuator rated to 1.5 million operations	
^[4] Leveling operational to -35 dBm minimum with supplied HF Leveling Kit power sensor. As level decreases additional sensor low level reading repeatability/speed considerations and noise floor contributions may be required.	

Microwave Splitter/Sensor Output: Cal factor uncertainty ^{[1] [2]}
 Calibration factor uncertainty, applicable to power sensor calibration

Figures in parenthesis ^[3] apply with alternative user traceability and correction of mismatch errors.	100 MHz	1 GHz	2.4 GHz	8 GHz	12 GHz	18 GHz	22 GHz	26.5 GHz
	± 1.06 % (± 0.37 %)	± 1.42 % (± 0.49 %)	± 1.42 % (± 0.60 %)	± 2.19 % (± 0.76 %)	± 2.33 % (± 0.89 %)	± 2.91 % (± 1.06 %)	± 3.52 % (± 1.36 %)	± 3.52 % (± 2.18 %)

^[1]Uncertainties are for 95 % confidence level (k = 2), and exclude UUT match contribution.

^[2]Unless otherwise stated, applies to performance with supplied HF Leveling Kit and sensors, factory calibration and self-characterization. Self-characterization requires second sensor option.

^[3]Calibration factor uncertainty applicable with reference sensor calibrated with typical state-of-the-art uncertainty, and vector corrections for mismatch errors at splitter output port.

Microwave Splitter/Sensor Output: Power flatness uncertainty ^{[1] [2]}

Power flatness uncertainty, applicable to spectrum analyzer and other measurement device flatness calibration

Power Flatness uncertainty into 50 Ω (1.0 VSWR match)	> 1 kHz to 100 MHz	> 100 MHz to 2.4 GHz	> 2.4 GHz to 8 GHz	> 8 GHz to 12.4 GHz	> 12.4 GHz to 18 GHz	> 18 GHz to 26.5 GHz
	± 0.05 dB	± 0.07 dB	± 0.10 dB	± 0.10 dB	± 0.13 dB	± 0.16 dB

^[1]Uncertainties are specified for 95 % confidence level (k = 2), and exclude UUT match contribution.

^[2]Applies to performance with supplied HF Leveling Kit and sensors, factory calibration and self-characterization. Self-characterization requires second sensor option.

Microwave Splitter/Sensor Output: Voltage flatness uncertainty ^{[1] [2]}

Voltage Flatness uncertainty, applicable to oscilloscope bandwidth calibration

Voltage flatness uncertainty into 50 Ω		> 1 kHz to 100 MHz	>100 MHz to 2.4 GHz	>2.4 GHz to 8 GHz	>8 GHz to 12.4 GHz	>12.4 GHz to 18 GHz	>18 GHz to 26.5 GHz
For stated UUT Input VSWR:	1.0	± 0.53 %	± 0.71 %	± 1.10 %	± 1.16 %	± 1.46 %	± 1.76 %
	1.2	± 1.4 %	± 1.49 %	± 1.71 %	± 1.75 %	± 1.96 %	± 2.20 %
	1.6	± 3.38 %	± 3.41 %	± 3.51 %	± 3.53 %	± 3.64 %	± 3.77 %

^[1]Uncertainties are specified for 95 % confidence level (k = 2), and include UUT match contribution for the stated UUT input VSWR values.

^[2]Applies to performance with supplied HF Leveling Kit and sensors, factory calibration and self-characterization. Self-characterization requires second sensor option.

Leveled sine specifications at Leveling Head Output (96040A and 96270A) and Microwave Output (96270A)

Signal purity	At maximum output level
Harmonics ^[1]	≤ 1 GHz: <-60 dBc, >1 GHz: <-55 dBc
Spurious ≥ 3 kHz offset	96040A and 96270A: ≤ 9 MHz: <-75 dBc, ≤ 500 MHz: <-84 dBc, ≤ 1 GHz: <-78 dBc, ≤ 2 GHz: <-72 dBc, ≤ 4 GHz: <-66 dBc 96270A: ≤ 8 GHz: <-60 dBc, ≤ 16 GHz: <-54 dBc, ≤ 27 GHz: <-48 dBc
Sub-harmonics	≤ 4 GHz, none > 4 GHz, <-60 dBc
SSB AM noise	10 MHz to 1.4 GHz, <0.015 % RMS, in 50 Hz to 3 kHz Bandwidth, typical
Typical for harmonic content above maximum output frequency for 96270A.	

Residual FM	Hz RMS in 50 Hz to 3 kHz bandwidth typical	Hz RMS in 50 Hz to 15 kHz bandwidth typical
125 MHz	0.004	0.03
250 MHz	0.006	0.035
500 MHz	0.01	0.055
1 GHz	0.02	0.11
2 GHz	0.04	0.22
3 GHz	0.06	0.33

RMS jitter	Typical, at +10 dBm output level, internal frequency reference		
Output frequency	Integration bandwidth	Phase (m° RMS)	Time (fs RMS)
155 MHz	100 Hz to 1.5 MHz	1.0	18
622 MHz	1 kHz to 5 MHz	4.0	18
2488 MHz	5 kHz to 20 MHz	14.4	16

SSB Phase Noise	dBc/Hz, at +13 dBm, internal frequency reference								
Carrier frequency	Offset from carrier								
	1 Hz spec (typical)	10 Hz spec (typical)	100 Hz spec (typical)	1 kHz spec (typical)	10 kHz spec (typical)	100 kHz spec (typical)	1 MHz spec (typical)	10 MHz spec (typical)	100 MHz spec (typical)
10 MHz	-96 (-106)	-116 (-123)	-132 (-139)	-143 (-149)	-150 (-155)	-153 (-157)	-154 (-157)	Not specified	
> 10 MHz to 15.625 MHz	-90 (-100)	-113 (-124)	-130 (-139)	-142 (-148)	-149 (-155)	-152 (-157)	-154 (-158)		
> 15.625 MHz to 31.25 MHz	-85 (-95)	-110 (-119)	-128 (-135)	-141 (-145)	-148 (-152)	-152 (-157)	-153 (-158)		
> 31.25 MHz to 62.5 MHz	-80 (-90)	-107 (-114)	-125 (-133)	-141 (-145)	-148 (-152)	-152 (-157)	-153 (-158)		
> 62.5 MHz to 125 MHz	-78 (-88)	-101 (-107)	-121 (-128)	-141 (-146)	-148 (-153)	-151 (-155)	-153 (-156)		
> 125 MHz to 250 MHz	-72 (-82)	-96 (-102)	-116 (-122)	-138 (-143)	-148 (-152)	-151 (-155)	-153 (-156)	-155 (-158)	(-162)
> 250 MHz to 500 MHz	-66 (-76)	-90 (-96)	-110 (-116)	-134 (-139)	-144 (-148)	-146 (-150)	-152 (-155)	-154 (-157)	(-163)
> 500 MHz to 1 GHz	-59 (-69)	-84 (-90)	-104 (-110)	-130 (-135)	-140 (-144)	-141 (-145)	-148 (-152)	-152 (-155)	(-156)
> 1 GHz to 2 GHz	-54 (-64)	-78 (-84)	-98 (-104)	-124 (-130)	-134 (-138)	-135 (-139)	-144 (-147)	-148 (-150)	(-150)
> 2 GHz to 3 GHz	-48 (-58)	-73 (-79)	-94 (-100)	-120 (-125)	-130 (-134)	-131 (-135)	-141 (-144)	-147 (-149)	(-149)
> 3 GHz to 4 GHz	-44 (-54)	-74 (-80)	-94 (-100)	-113 (-117)	-117 (-120)	-118 (-121)	-130 (-133)	-147 (-149)	(-149)
> 4 GHz to 8 GHz ^[1]	(-48)	(-74)	(-94)	(-111)	(-114)	(-115)	(-135)	(-155)	(-155)
> 8 GHz to 16 GHz ^[1]	(-42)	(-68)	(-88)	(-105)	(-108)	(-109)	(-129)	(-149)	(-149)
> 16 GHz to 26.5 GHz ^[1]	(-36)	(-62)	(-82)	(-99)	(-102)	(-103)	(-123)	(-143)	(-143)
SSB Phase Noise at 1 GHz with the 9600FLT ^[2] wide offset phase noise filter							(-152)	(-170)	(-174)

^[1]96270A Microwave Output only.

^[2]The 9600FLT Wide Offset Phase Noise Filter accessory is a narrow bandwidth 1 GHz bandpass filter for use with the 96000 Series models to reduce phase noise levels at high offset frequencies when operating at an output frequency of 1 GHz.

External leveling input ^[1]	Rear panel 50 MHz counter, modulation, leveling and frequency pull input BNC connector
For external power meter leveling ^[2]	User adjustable full scale voltage, 1 V to 5 V, positive polarity
Input impedance	10 k Ω nominal
Maximum Input	\pm 5 V

^[1]For 96270A, external leveling is not available when using splitter/sensor leveling.

^[2]With analog level control feedback from an external power meter readout instrument connected via the rear panel external leveling input.

External frequency control input	Rear panel 50 MHz counter, modulation, leveling and frequency pull input BNC connector
Frequency pull range	\pm 5 ppm
Frequency pull sensitivity	User adjustable between 0.0001 ppm/V to 1.0000 ppm/V, positive or negative polarity
Input impedance	10 k Ω nominal
Maximum input	\pm 5 V

Modulation specifications at Leveling Head Output (96040A and 96270A) and Microwave Output (96270A)

Amplitude modulation	Microwave Output ^[1] (96270A only)	Leveling Head Output	
		50 Ω Output	75 Ω Output
Waveform	Sinusoidal, triangle, or external signal		
Carrier frequency	50 kHz to 4 GHz		
Carrier level	< 1.4 GHz: ≤ +14 dBm > 1.4GHz: ≤+ 8 dBm	< 1.4 GHz: ≤ +14 dBm > 1.4 GHz: ≤ +8 dBm	< 1.4 GHz: ≤ +8 dBm > 1.4 GHz: ≤ +2 dBm
Carrier level accuracy ^[2]	As leveled sine ± 0.5 dB, typical		
Carrier harmonics	≤ 50 dBc typical		
Rate	≤ 125.75 MHz, 1 Hz to 220 Hz, ≤ 1 % of carrier frequency > 127.75 MHz, 1 Hz to 100 kHz		
Rate resolution	0.1 Hz, 5 digits		
Rate accuracy	≥ 1 kHz: ± 1 digit, <1 kHz: ± 10 mHz		
Depth	0.1 % to 99 %		
Depth resolution	0.1 %		
Carrier frequency and level range for specified depth accuracy and distortion	≤ 1 GHz, -4 dBm to +14 dBm -56 dBm with Low Level Microwave O/P Option	≤ 1 GHz, -56 dBm to +14 dBm	≤ 1 GHz, -62 dBm to +8 dBm
AM sine depth accuracy ^[3]	± 3 % of setting ± 0.1 %, for >5 % depth Typically ± 0.75 % of setting ± 0.1 %, for 10 % to 90 % depth, ≤ 75 MHz carrier frequency		
AM sine distortion ^{[3] [4]}	≤ -40 dBc, 10 % to 80 % depth, for ≤ 20 kHz rate, or for >20 kHz rate at ≤ 75 MHz carrier frequency Typically ≤ -50 dBc, 10 % to 80 % depth, ≤ 75 MHz carrier frequency		

^[1]Modulation not available above 4 GHz. All signal level specifications apply at front panel Microwave Output connector. Splitter/Sensor leveling not available in Modulation functions.

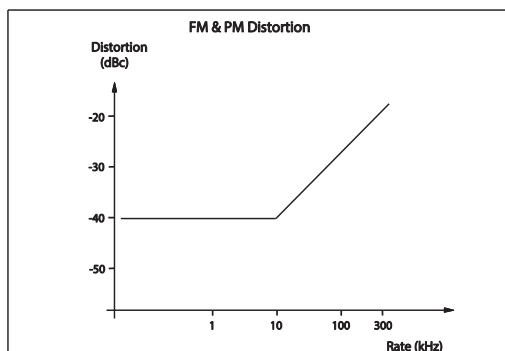
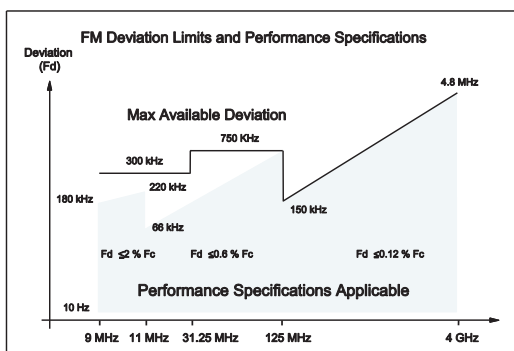
^[2]Signal content at carrier frequency only, excluding sidebands.

^[3]Applies to demodulated signal content at rate fundamental frequency. Specifications are typical for modulation rates < 20 Hz.

^[4]Includes harmonic distortion and noise up to 5 times rate frequency.

AM external	
Input	Rear-panel BNC connector (50 MHz counter, modulation, leveling and frequency pull input). 10 k Ω nominal input impedance
Bandwidth (-3 dB) ^[1]	DC coupled ^[2] : dc to 220 kHz, typical. AC coupled: 10 Hz to 220 kHz, typical
Depth sensitivity	User adjustable, 0.5 %/V to 400 %/V
Input level	± 2 V pk maximum operating, ± 5 V pk absolute maximum
Carrier level accuracy	As AM Internal Sine + 20 mV x depth/V setting, typical
Depth accuracy ^[3]	± 3 % of setting ± 0.1 %, for >5 % depth, 1 Vpk input, dc or 200 Hz to 20 kHz
Residual distortion ^[4]	As AM internal sine, for 1 Vpk input, ≤ 100 kHz
^[1] Maximum input frequency 100 kHz for carrier frequency >125 MHz. ^[2] DC coupled External Modulation permits dc control of carrier level or the offsetting of the modulation waveform. Note that at rates from 0.5 Hz to 10 Hz interaction with carrier leveling may occur, resulting in modulation distortion. ^[3] Applies to demodulated signal content at rate frequency fundamental. ^[4] Includes harmonic distortion and noise up to 5 times rate frequency.	

Frequency and phase modulation ^{[1] [2]}	
Waveform	FM: Sinusoidal, or external signal PM: Sinusoidal, or external signal
Carrier frequency (Fc)	9 MHz to 4 GHz
Carrier frequency accuracy	Internal frequency reference: ± 0.05 ppm ± 240 mHz External frequency reference: Ext freq ref accuracy ± 240 mHz
Rate (Fr)	1 Hz to 300 kHz
Rate resolution	0.1 Hz, 5 digits
Rate accuracy	≥ 1 kHz: ± 1 digit, < 1 kHz: ± 10 mHz
Deviation (Fd) ^[3]	Fc 9 MHz to 31.25 MHz FM: 10 Hz to 300 kHz PM: ≤ 1000 rad Fc 31.25 MHz to 125 MHz FM: 10 Hz to 750 kHz PM: ≤ 1000 rad Fc 125 MHz to 4 GHz FM: 10 Hz to 0.12 % Fc PM: ≤ 1000 rad or 0.12 % Fc/Fr
Deviation resolution	FM: 0.1 Hz, 5 digits. PM: 0.0001 rad, 5 digits
FM/PM sine deviation accuracy ^[2]	± 3 % of setting ± 240 mHz Typically ± 0.25 % of setting ± 240 mHz, for ≤ 50 kHz rate
FM/PM Sine Distortion ^{[3] [4]}	≤ -40 dBc (1 %) +20 dB/decade above 10 kHz (See chart) Typically ≤ -65 dBc +20 dB/decade above 1 kHz
^[1] 96270A: Modulation not available above 4 GHz. Splitter/Sensor leveling not available in Modulation functions. ^[2] Internal phase modulation is generated by applying sinusoidal frequency modulation with peak deviation derived from the phase deviation and rate settings ($Fd = \phi d \times Fr$). ^[3] See chart showing maximum available deviation, and maximum deviation for which deviation accuracy and distortion specifications apply. Applies to demodulated signal content at rate frequency fundamental. Specifications are typical for modulation rates <20 Hz. ^[4] Includes harmonic distortion and noise up to 5 times rate frequency.	



FM external	
Input	Rear-panel BNC connector (50 MHz counter, modulation, leveling and frequency pull input). 10 k Ω nominal input impedance
Bandwidth (-3 dB)	DC coupled: dc to 1 MHz, typical. AC coupled: 10 Hz to 1 MHz, typical
Deviation sensitivity	User adjustable, 500 Hz/V to 19 MHz/V, carrier frequency dependent
Input level	± 2 V pk maximum operating, ± 5 V pk absolute maximum
Carrier frequency accuracy	As FM internal sine ± 20 mV x deviation/V setting, typical
Deviation accuracy ^[1]	$\pm 3\%$ of setting ± 240 mHz, for 1 Vpk input, dc or 200 Hz to 20 kHz rate, deviation $>0.01\% F_c$
Residual distortion ^{[1] [2]}	As FM internal sine, for 1 Vpk input, deviation $>0.01\% F_c$ Typically ≤ -55 dBc +20 dB/decade above 10 kHz, for 1 Vpk input, deviation $>0.01\% F_c$
^[1] See chart showing maximum available deviation, and maximum deviation for which deviation accuracy and residual distortion specifications apply. Applies to demodulated signal content at rate fundamental frequency. ^[2] Includes harmonic distortion and noise up to 5 times rate frequency.	

PM external ^[1]	
Input	Rear-panel BNC connector (50 MHz counter, modulation, leveling and frequency pull input). 10 k Ω nominal input impedance
Bandwidth (-3 dB)	DC coupled: dc to 1 MHz, typical. AC coupled: 10 Hz to 1 MHz, typical
Deviation sensitivity	User adjustable, 0.001 rad/V to 96 rad/V, carrier frequency dependent
Input level	± 2 V pk maximum operating, ± 5 V pk absolute maximum
Carrier frequency accuracy	As FM internal sine, typical
Deviation accuracy ^[2]	$\pm 3\%$ of setting ± 240 mHz/Fr rad, for 1 Vpk input, dc or 200 Hz to 20 kHz rate, deviation $>0.01\% F_d/F_r$ rad. typical
^[1] External phase modulation deviates the phase of the carrier, applying the set deviation sensitivity to the modulation input signal. ^[2] See chart showing maximum available equivalent frequency deviation and equivalent maximum frequency deviation for which phase deviation accuracy specifications apply for sinusoidal inputs ($\phi_d = F_d / F_r$). Applies to demodulated signal content at rate frequency fundamental.	

Modulation trigger output	Rear panel trigger I/O BNC connector
Level	TTL compatible logic output, selectable as rising or falling edge
Timing alignment	± 500 ns typical, from modulation waveform zero crossing for sinusoidal or positive peak for triangle

Frequency sweep specifications at Leveling Head Output (96040A and 96270A) and Microwave Output (96270A)

Sweep frequency range	96040A and 96270A Leveling Head output: 1 mHz to 4 GHz 96270A Microwave Output: 1 mHz to 27 GHz Sweeps are generated as a sequence of discrete synthesized frequencies
Sweep modes	Stop - Start and Center - Span Linear or Logarithmic Sawtooth or Triangular Repetitive, Single Shot, Triggered and Manual Sweep Squelch or Non-Squelch at frequency transitions Narrow range-locked sweep ^[1]
Start, stop and step frequency setting resolution	< 100 MHz: 0.1 Hz , > 100 MHz: 11 digits
Frequency steps	5 million maximum
Step size	96040A and 96270A Leveling Head output: 1 mHz to 4 GHz 96270A Microwave Output: 1 mHz to 27 GHz
Step dwell time	20 ms (40 ms for 96270A Microwave Output) to 10 s 2 ms to 10 s for narrow range-locked sweep ^[1]
Sweep duration	100 hrs maximum, calculated from step dwell x number of steps
Squelch duration ^[2]	96040A and 96270A Leveling Head output: <20 ms 96270A Microwave Output: <40 ms
Trigger input/sync output	Rear-panel Trigger I/O BNC connector, selectable as sweep trigger input or sweep sync output
Trigger input	TTL compatible logic input, selectable as rising or falling trigger to start sweep Typically ≤ 1 ms delay from trigger to sweep start
Sync output	TTL compatible logic output, selectable as rising or falling sync pulse coincident with sweep start Typical pulse duration 250 μs. Typical time alignment +15 ms to +18 ms from sweep start when dwell time ≥ 20 ms, +1 ms when dwell time <20 ms (delay ensures settled signal at the trigger point)
^[1] Narrow range-locked sweep provides phase continuous constant amplitude frequency sweep without hardware boundaries when sweep range setting <0.03 % of center frequency and center frequency >15.625 MHz. ^[2] When selected, squelch is active between all frequency transitions. When deselected, squelch is active only at hardware range boundaries. squelch is not active in narrow range-locked sweep.	

Frequency counter specifications

Input	96270A	Rear-panel BNC connector (300 MHz Counter) Input impedance selectable 50 Ω (dc coupled) or 10 kΩ ^[1] (ac coupled), nominal AC coupled into 0 V threshold		
	96040A	Rear-panel BNC connector (50 MHz Counter, Modulation, Leveling and Frequency Pull Input) Input impedance 10 kΩ ^[1] (ac coupled), nominal AC coupled into 0 V threshold		
Frequency range	96270A	0.9 MHz to 310 MHz for specified accuracy. Functional to 10 Hz, typical		
	96040A	0.9 MHz to 50.1 MHz for specified accuracy. Functional to 10 Hz, typical		
Frequency bands	96270A Only	0.9 MHz to 50.5 MHz, >50.5 MHz to 310 MHz with 50 Ω selected 0.9 MHz to 50.5 MHz with 10 kΩ ^[1] selected		
Input level		0.5 V pk-pk minimum operating, ± 5 V pk absolute maximum		
Gate times and resolutions ^[2] (in displayed digits)		0.2 s: 7/8 digits, 2 s: 8/9 digits, 20 s: 9/10 digits, 80 s: 10/11 digits		
Accuracy	Gate Time		Internal frequency reference	External frequency reference
	0.2 s, 2 s, 20 s		± 0.05 ppm ± 0.5 count	Ext Freq Ref Accuracy ± 0.5 count
	80 s		± 0.05 ppm ± 1.25 counts	Ext Freq Ref Accuracy ± 1.25 counts

^[1]Higher frequencies into 10 kΩ impedance may require an external 50 Ω termination fitted to the 96040A frequency counter BNC, depending on signal matching, or for 96270A, the 50 Ω input impedance setting may be required.

^[2]Frequencies are automatically displayed in units of Hz, kHz or MHz. Number of digits depends on gate time selected and display auto-ranging points, arranged in decades at 1 099 999 9(99 9) / 1 100 000 (000).

Power meter readout specifications (96270A only)

Supported sensors	Rhode & Schwarz NRP-Z series thermal sensor models 51, 52, 55.03, 55.04, 56, 57 and 58
Sensor channels	Two front panel mounted mini-ODU connectors, compatible with supported sensor models User selectable as power meter readout or leveling control sensor feedback ^[1]
Readout/measurement functionality	Single or Dual readout, user selectable as power or equivalent voltage into 50 Ω , with linear or logarithmic units Source/Measure mode allows simultaneous signal output and single/dual power meter readout operation Relative ratio or difference mode ^[2]
Readout display	Absolute: In W, Vrms, Vpk-pk, dBm, dBuV Relative: ratio in dB or Δ %, difference in W or V Resolution: 0.001 dBm/dB; W/V/%, 5 digits with autoranging unit multiplier
User-selectable settings/actions	Reading averaging, single/continuous triggering, sensor zeroing
^[1] When used as the leveling control sensor for the Microwave Output with the HF Leveling kit or compatible splitter and sensor, the measured power is displayed. Settings are automatically configured for optimal performance. ^[2] Absolute/Relative mode independently selectable for each readout channel. Relative measurements between channels is not available.	

GPIO command emulation mode specifications

96270A ^[1] ^[2]	HP3335A, HP8662A, HP8663A, HP8340A, HP8360 B-Series, Agilent E8257 Series, 9640A
96040A ^[1]	HP3335A, HP8662A, HP8663A, 9640A
^[1] Only one instrument emulation mode may be selected at any one time. ^[2] Emulation includes models with frequency ranges above 27 GHz. These models are emulated within the frequency capabilities of the 96270A.	

Ordering information

Model

96040A	4 GHz RF Reference Source including 50 Ω Leveling Head
96040A/75	4 GHz RF Reference Source including 50 Ω and 75 Ω Leveling Head
96270A	96270A 27 GHz RF Reference including 50 Ω 4 GHz Leveling Head
96270A/75	96270A 27 GHz RF Reference including 50 Ω and 75 Ω 4 GHz Leveling Heads
96270A/LL	96270A 27 GHz RF Reference with Low Level Microwave O/P
96270A/HF	96270A 27 GHz RF Reference with HF Leveling Kit
96270A/LL/HF	96270A 27 GHz RF Reference, LL Microwave O/P, HF Leveling Kit

The 75 Ohm Leveling Head is available for all versions.

Options and accessories

96000SNS	Additional Power Sensor
96270A/HFKIT	Power Sensor, Splitter, Metrology-Grade Microwave Cable and APC-3.5 mm Adapter
Y9600	Rack Mount Slide Kit
96000CASE	Rugged Transit Case
96000CONN	RF Interconnect Kit, Sacrificial RF Adapters, Connector Torque Wrenches
9600FLT	1 GHz Wide Offset Phase Noise Filter, including Instrument Mounting Kit

Upgrades

96040A > 96270A	Upgrade 96040A to 96270A
96040A > 96270A/HF	Upgrade 96040A to 96270A/HF
96040A > 96270A/LL	Upgrade 96040A to 96270A/LL
96040A > 96270A/LL/HF	Upgrade 96040A to 96270A/LL/HF
96270A > 96270A/LL	Upgrade 96270A to 96270A/LL
96270A > 96270A/HF	Upgrade 96270A to 96270A/HF
96270A > 96270A/LL/HF	Upgrade 96270A to 96270A/LL/HF
96270A/LL > 96270A/LL/HF	Upgrade 96270A/LL to 96270A/LL/HF
96270A/HF > 96270A/LL/HF	Upgrade 96270A/HF to 96270A/LL/HF

75 Ohm Leveling Head upgrades are available on all models. Upgrades from the 9640A and 9640A/LPN or 9640A/LPNX are also available. Contact your Fluke Calibration sales representative for information.

Hardware and Calibration CarePlans

Gold CarePlans are available for the 96040A and 96270A in one-year, three-year or five-year plans with accredited or standard calibration. Contact your local Fluke Calibration sales office for details or visit www.flukecal.com.

Fluke Calibration. *Precision, performance, confidence.™*

Electrical	RF	Temperature	Pressure	Flow	Software
------------	----	-------------	----------	------	----------

Fluke Calibration
PO Box 9090,
Everett, WA 98206 U.S.A.

Fluke Europe B.V.
PO Box 1186, 5602 BD
Eindhoven, The Netherlands
Web access: <http://www.flukecal.com>

For more information call:

In the U.S.A. (877) 355-3225 or Fax (425) 446-5116
In Europe/M-East/Africa +31 (0) 40 2675 200 or Fax +31 (0) 40 2675 222
In Canada (800)-36-FLUKE or Fax (905) 890-6866
From other countries +1 (425) 446-5500 or Fax +1 (425) 446-5116
Web access: <http://www.flukecal.com>

©2013-2014 Fluke Calibration. Specifications subject to change without notice.
Printed in U.S.A. 6/2014 6002255A_EN
Pub-ID: XXXXX-eng

Modification of this document is not permitted without written permission from Fluke Calibration.

Cal Power

Via Acquarana, 29 22100 COMO
tel. 031.526.566 (r.a.) fax 031.507.984
info@calpower.it www.calspower.it