

Table 1- 1 HP 8970B Noise Figure Meter Specifications (1 of 2)

Characteristics	Performance Limits	Conditions
NOISE FIGURE MEASUREMENT Range Resolution Instrumentation Uncertainty	0 to 30 dB 0.01 dB ¹ ± 0.1 dB	For a noise source in a 0 to 55°C environment with an ENR of 14 to 16 dB
GAIN MEASUREMENT Range Resolution Instrument Uncertainty	-20 to > + 40 dB 0.01 dB ¹ 0.1 dB ² ±0.15 dB	For total noise figures ≤30 dB Gain ≥ -9.99 dB Gain < -9.99 dB
INPUT Frequency Range Frequency Resolution Tuning Accuracy Noise Figure Input SWR (Reflection Coefficient) STD Option 020 ³ Maximum Operating Input Power Maximum Net External Gain Reducing System Noise Figure with Preamplification	Tunable from 10 to 1600 MHz (2047 MHz, opt 020) 1 MHz ±(1 MHz + 1% of frequency), ±6 MHz maximum <7 dB +0.003 dB/MHz (+0.002 dB, opt 020) <1.7(0.26) 10 to 1600 MHz <1.8(0.286) 10 to 1600 MHz <2.0(0.33) >1600 to 2047 MHz -10 dBm (wideband) >65 dB <1.8 dB + noise figure of the external system	From +10 to +40°C For input power levels below -60 dBm 50Ω reference impedance Between noise source and HP 8970B RF Input Low noise external preamplification with net gain >20 dB
ELECTROMAGNETIC COMPATABILITY Designed to meet MIL STD 461B-1980 Conducted and Radiated Emissions Conducted and Radiated Immunity		MIL STD 461B-1980 using method CE03 MIL STD 461B-1980 using method CS01, CS02 and RS03
¹ Resolution over the Hewlett-Packard Interface Bus is 0.001 dB ² Resolution over the Hewlett-Packard Interface Bus is 0.01 dB ³ For serial prefixes below 3811: <1.7(0.26) 10 to 1600 MHz		

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Characteristics	Performance Limits	Conditions
<p>Meets the requirements of the European Union EMC Directive 89/336/EMC plus amendments and is CE marked accordingly.</p> <p>Conducted and Radiated Emissions</p> <p>Conducted and Radiated Immunity</p>	<p>EN 55011, 1991 Group 1, Class A</p> <p>EN 50082-1, 1992</p>	<p>Electrostatic Discharge immunity according to IEC 1000-4-2, 1995 at 8 kV air discharge and 4 kV contact discharge.</p> <p>Radiated Immunity according to IEC 1000-4-3, 1995 at 3 V/m from 27 to 500 MHz.</p> <p>Electrical Fast Transients - bursts according to IEC 1000-4-4, 1995 at 1.0 kV mains and 0.5 kV ports.</p>
<p>GENERAL</p> <p>Noise Source Drive</p>  <p>Power Requirements</p> <p>Line Voltage:</p> <p>100, 120, 220, 230, or 240 V</p> <p>Operating Frequency Range</p> <p>Power Dissipation</p> <p>Temperature:</p> <p>Operating</p> <p>Storage</p> <p>Humidity</p> <p>Remote Operation (HP-IB)</p> <p>Dimensions:</p> <p>Height</p> <p>Width</p> <p>Depth</p> <p>Net Weight</p>	<p>28.0 \pm 0.1 V</p> <p><1 V</p> <p>\pm10%</p> <p>48 - 66 Hz</p> <p>150 VA maximum</p> <p>0 to 55°C</p> <p>-55 to 75°C</p> <p>Up to 95% Relative Humidity to 40°C</p> <p>IEEE STD 488-1978</p> <p>Compatibility Code:</p> <p>SH1, AH1, T5, TE0 L4, LE0, SR1, RL1, PP0, DC1, DT1, C0 and E1</p> <p>146 mm (5.75 in.)</p> <p>425 mm (16.8 in.)</p> <p>462 mm (18.2 in.)</p> <p>15.5 kg (34 lbs)</p>	<p>Noise source ON at up to 60 mA peak.</p> <p>Noise source OFF.</p> <p>The Hewlett-Packard Interface Bus (HP-IB) is Hewlett-Packard's implementation of IEEE Std 488-1978, "Digital Interface for Programmable Instrumentation". Most functions are remotely programmable.</p> <p>Note: For ordering cabinet accessories, the module sizes are 5¹/₄ H, 1 MW (Module width), and 17D.</p>

Table 1-2. HP 8970B Noise Figure Meter Supplemental Characteristics

Supplemental characteristics are intended to provide information useful in applying the instrument by giving typical, but non-warranted, performance parameters.

All parameters describe performance in automatic operation or properly set manual conditions.

Bandwidth: approximately 4 MHz.

Audible Noise Level: <5.5 bels at 1 metre.

Sensitivity: no external gain required; -100 dBm; able to measure its own noise figure.

Measurement Speed: about 6 to 9 measurements per second with minimum smoothing.

Sweep Speed at Minimum Smoothing (10 to 1600 MHz): 140 ms per frequency point.

Maximum Safe Input Level: ± 20 Vdc; +20 dBm peak (or average) at RF.

Jitter Peak-to-peak² Y-factor variation <0.15 dB At minimum smoothing
 Peak-to-peak² Y-factor variation <0.02 dB With increased smoothing (smoothing factor set to 64).

Note: Jitter in noise figure is equivalent to jitter in Y factor to within 10% for ENR > 14 dB and F < 4 dB. At minimum smoothing, jitter can limit accuracy; the small jitter at high smoothing does not.

FUNCTIONAL PROPERTIES

Noise Figure Display Units: noise figure in dB or as a ratio, or uncorrected Y-Factor in dB or as a ratio, or effective input noise temperature in kelvins.

Displayed Measurement Frequency Range: 10 to 99999 MHz.

Number of Calibration Points in One Sweep: 181

System LO Control: frequency control over the System Interface Bus from 10 to 99999 MHz.

Noise Figure Display Jitter: <0.01 dB with appropriate smoothing.

Cold Noise Source Data Range: 0 to 9999K.

Hot Noise Source Data Range: stored table — ENR from -7 to +50 dB; spot frequency — from 0 to 14824K.

Storage Capacity of Hot Noise Source Tables: Four stored ENR tables with 35 frequencies each (plus one working ENR table).

Smoothing: exponential averaging of gain and noise figure before display according to $D = P(F-1) + M/F$ where D is the display result, prior to conversion to logarithmic form, P is the previous result, M is the latest measurement, and F is the averaging factor (1, 2, 4, 8, 16, 32, 64, 128, 256, or 512). Arithmetic averaging is used during swept operation.

Table 1-2. HP 8970B Noise Figure Meter Supplemental Characteristics (2 of 2)

Rear Panel Outputs: X-Axis and Y-Axis from 0 to 6V. Z-Axis is TTL for pen lift (on an X-Y recorder) and blanking (on an oscilloscope).

Plotter Capability: Noise figure and gain versus frequency plot with grid, title and noise figure, gain and frequency axis annotation.

Compatible Digital Plotters: HP 7470A, 7475A, 7550A, 7440A and 9872B.

Table 1-3. Noise Figure System Specifications (HP 8970B with HP 8971B and LO) (1 of 2)

Specifications for the Noise Figure Measurement System are the same as the Noise Figure Meter, with the following exceptions. These specifications are valid when any of the recommended system local oscillators (HP 8671B, HP 8672A, HP 8673B [standard], HP 8673C, HP 8340A/B or HP 8341A/B) is used in the Noise Figure Measurement System.

Characteristics	Performance Limits	Conditions
NOISE FIGURE MEASUREMENT Range Instrumentation Uncertainty ^{1,2}	0 to 30 dB $<\pm 0.25$ dB	All specifications certified for temperature range of +10 to +40° C For a noise source with an ENR of 14 to 16 dB. For $NF1 + G1 > 5$ dB where NF1 is the noise figure of the device under test and G1 is the gain of the device under test.
GAIN MEASUREMENT Instrumentation Uncertainty ^{1,2}	$<\pm 0.45$ dB	For $NF1 + G1 > 10$ dB where NF1 is the noise figure of the device under test and G1 is the gain of the device under test.
INPUT Frequency Range Reducing System Noise Figure with Preamplification Noise Figure (maximum) SSB1 SSB2 SSB3 Input SWR SSB1 SSB2 SSB3	Tunable from 10 to 18000 MHz < 2 dB + noise figure of the external system ≤ 12 dB + 0.003 dB/MHz (+0.002 dB, opt 020) ≤ 21 dB ≤ 22 dB ≤ 24 dB ≤ 28 dB 1.7:1 (1.5:1, opt 020) 2:1 2:1	Low noise external preamplification with net gain 30 dB 10 MHz to 1.6 GHz 1.6 to 2.4 GHz 2.4 to 12 GHz 12 to 15 GHz 15 to 18 GHz 10 MHz to 1.6 GHz 1.6 to 2.4 GHz 2.4 to 18 GHz

Table 1-3. Noise Figure System Specifications (HP 8970B with HP 8971B and LO) (2 of 2)

GENERAL Power, net weight and dimensions	Sum of HP 8970B, HP 8971B and local oscillator.	
¹ Noise figure accuracy and gain accuracy are dependent on the device under test. Refer to the Preamplifier Selection detailed operating instruction in Section III for more information on computing accuracy for your application. ² When making a measurement, the Noise Figure Measurement System must be tuned in the same direction and to the same frequency points used during calibration without skipping any frequency points.		

Table 1-4. Supplemental Characteristics (HP 8970B with HP 8971B)

Supplemental characteristics are intended to provide information useful in applying the instrument by giving typical, but non-warranted, performance parameters.	
Maximum Safe Input Level Maximum Operating Input Power Maximum Net External Gain Sensitivity Double Sideband (DSB) Noise Figure SWR (DSB) Measurement Speed Sweep Speed at Minimum Smoothing (for each Noise Figure Test Set Band) SSB1 140 ms per frequency point SSB2 150 ms per frequency point SSB3 435 ms per frequency point DSB 150 ms per frequency point System Local Oscillator Control Displayed Measurement Frequency Range	+20 dBm (+16 dBm, opt 020), 0 Vdc -20 dBm >60 dB -90 dB (no external gain required, but recommended to lower measurement uncertainty; able to measure its own noise figure with HP 346B/C). 18 dB, 2.4 – 26.5 GHz 2.5:1 6 to 9 measurements per second with minimum smoothing. 10 to 1600 MHz 1.6 to 2.4 GHz 2.4 to 18 GHz 2.4 to 18 GHz The Noise Figure Meter will control the system local oscillator used in the Noise Figure Measurement System. The Noise Figure Meter will not control a local oscillator that is external to the Noise Figure Measurement System. 10 to 99999 MHz