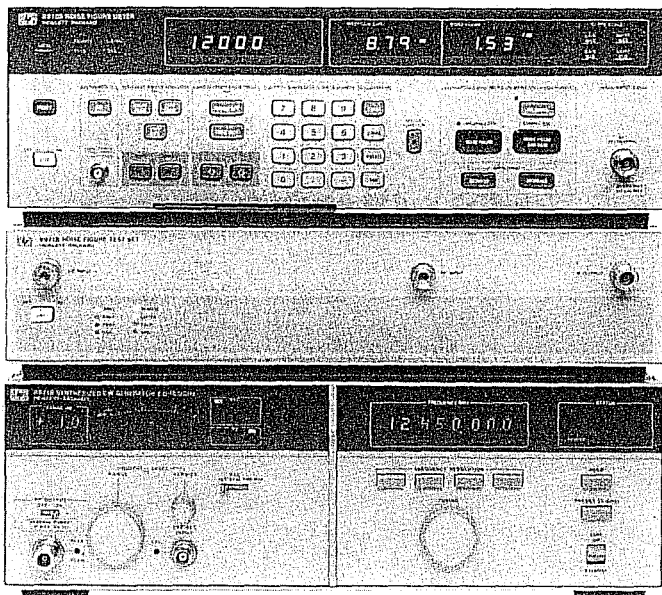


NOISE FIGURE METER

Noise Figure Measurement System

Models 8970S/T, 8971B



HP 8970 S/T

HP 8970S/T Microwave Noise Figure Measurement Systems

Until now, there was no standardized way to make a microwave noise figure measurement, users had to design and support their own microwave system, and measurements crossing from RF to microwave were difficult because they required multiple system configurations.

Hewlett Packard's answer to these problems is the HP 8970S and HP 8970T noise figure measurement systems. Each system consists of the HP 8970B Noise Figure Meter, the HP 8971B Noise Figure Test Set, and a synthesized local oscillator. (The recommended LOs for the 8970S are listed in the 8970S Partial Specifications; the HP 8970T uses the HP 8671B Synthesized CW Generator as its local oscillator.)

The HP 8970S/T system eliminates the tedious job of designing the measurement system and selecting components. The HP 8970B acts as the controller to the system so all system operation is transparent to you, the user. To insure specified performance, the HP 8970S/T systems are given specifications just like an RF noise figure meter (i.e HP 8970B).

HP 8970S/T Partial Specifications

(See 8970S technical data sheet for complete specifications)

Frequency range: 10 MHz to 18 GHz.

Noise figure measurement range: 0 to 30 dB.

Noise figure instrumentation uncertainty: ± 0.25 dB (for a 14 to 16 dB ENR noise source in a 0 to 55°C environment).

Gain instrumentation uncertainty: ± 0.45 dB.

Noise figure (max): 10 to 1600 MHz: 12 dB + .003 dB/MHz

1.6 to 2.4 GHz: 24 dB

2.4 to 12 GHz: 22 dB

12 to 15 GHz: 24 dB

15 to 18 GHz: 28 dB

Input SWR: 10 to 1600 MHz: 1.7

1.6 to 2.4 MHz: 2

2.4 to 18 GHz: 2

Gain/noise figure repeatability: .2 dB.

Recommended local oscillators: HP 8671B, 8672A, 8673B/C/E, 8340B, and 8341B.

- 10 MHz to 18GHz
- Fully specified system
- Removes double-sideband inaccuracies
- As easy to operate as the 8970A or B

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HP 8971B

HP 8971B Noise Figure Test Set

The HP 8971B Noise Figure Test Set brings the simplicity of double sideband measurements and the accuracy of single sideband measurements together in one package. Careful design and high performance components, including a stable YIG filter, allow broadband single-sideband measurements from 10 MHz to 18 GHz with a single calibration and sweep.

Measurement modes in the HP 8970B allow for double down-conversion using the HP 8971B as the second down-converter. These new modes can be used for millimeter-wave measurements of amplifiers and transistors and measurements of receivers and mixers with IFs above 1.6 GHz.

HP recommends using an isolator and preamplifier between the test device and measurement system. This reduces two of the largest sources of noise figure measurement uncertainty - mismatch uncertainty and second stage noise figure.

HP 8971B Partial Specifications

(See 8970S technical data sheet for complete specifications)

Frequency range: 10 MHz to 18 GHz.

Gain/noise figure repeatability: ± 0.2 dB.

Input SWR: 1.5 (10 MHz to 1.6 GHz)

2 (1.6 to 2.4 GHz)

2 (2.4 to 18 GHz)

Image and odd-harmonic rejection: 20 dB.

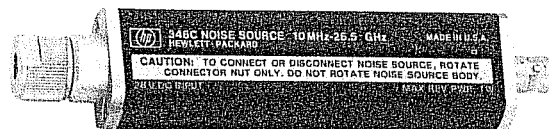
Accessories supplied:

1 LO-to-HP 8971B cable - SMA(f), 300 mm

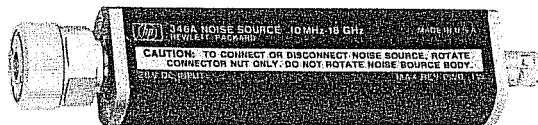
1 HP 8971B-to-HP 8970B cable - N(m), 190 mm

1 N(m)-to-SMA(m) adapter

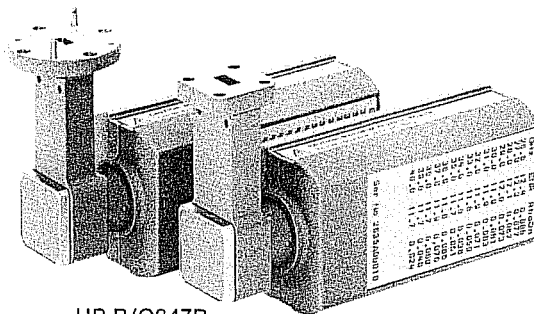
2 HP-IB cables - .5 m



HP 346C



HP 346A (option 002)



HP R/Q347B



HP 346A/B/C Broadband Noise Sources

The ideal companion to the HP's noise figure meter and systems is the HP 346 family of noise sources. Since they are broadband (10MHz to either 18 or 26.5 GHz), they eliminate the necessity for several sources at different frequency bands. Each source has individually calibrated ENR values at specific frequencies. The calibration is printed on its label (see illustration) for easy loading into the HP 8970B. The low SWR of each noise source reduces a major source of measurement uncertainty - re-reflections of test signals. In addition, the variety of connectors available reduces the need for degrading accuracy with connector adapters.

The HP 346 family of noise sources are designed for a broad range of measurement applications. The HP 346C covers the broadest frequency range, 10 MHz to 26.5 GHz. The HP 346B's high ENR, low SWR, and variety of connectors make it a general purpose noise source. The HP 346A is designed especially for accurate characterization of input-impedance-sensitive devices (like GaAsFETs and many UHF amplifiers). Its very small change in reflection coefficient (<0.01) from ON to OFF minimizes errors when measuring noise figure and gain as a function of input impedance.

FREQ GHz	ENR dB
0.01	15.18
0.10	15.49
1.0	15.26
2.0	15.17
3.0	14.93
4.0	14.86
5.0	14.91
6.0	14.83
7.0	14.90
8.0	15.05
9.0	15.26
10.0	15.39
11.0	15.43
12.0	15.50
13.0	15.41
14.0	14.93
15.0	15.51
16.0	15.95
17.0	15.62
18.0	15.66

SERIAL NO.
2037A00428

Example label of HP 346B Noise Source

HP 346 A/B/C Partial Specifications

(See technical data sheet for complete specifications.)

Frequency range: 10 MHz to 18 GHz for HP 346A/B; 10 MHz to 26.5 GHz for HP 346C.

Excess noise ratio (ENR) limits: HP 346A: 4.5 to 6.5 dB; HP 346B: 14 to 16 dB; HP 346C: 12 to 16 dB (10 MHz to 12 GHz) and 14 to 17 dB (12.0 to 26.5 GHz).

Maximum SWR (reflection coefficient) on and off:

HP 346A/B: 10 to 30 MHz — 1.3 (0.13); 30 to 5000 MHz — 1.15 (0.07); 5 to 18 GHz — 1.25 (0.11).

HP 346C: 10 MHz to 18 GHz — 1.25 (0.11); 18 to 26.5 GHz — 1.35 (0.15).

Power required: 28±1 Vdc.

Dimensions: 140 H x 21 W x 30 mm D (5.5" x 0.8 x 1.2").

Weight: net, 0.108 kg (3.5 oz). Shipping, 0.5 kg (1 lb).

Standard connector: APC - 3.5(m)

HP R & Q347B Solid-state Noise Sources

The performance and reliability you have come to expect from Hewlett-Packard RF and microwave solid-state noise sources, is now extended to millimeter-wave frequencies with the HP R347B (26.5 to 40 GHz) and HP Q347B (33 to 50 GHz) noise sources. A new GaAs avalanche diode specifically designed for high noise output and long term reliability was developed for the HP R/Q347B Noise Sources. This results in excellent ENR stability over time. In turn, this insures long recalibration cycles and very accurate noise figure measurements.

HP R & Q347B Noise Sources

(See technical data sheet for complete specifications)

Frequency Range: R347B - 26.5 to 40 GHz

Q347B - 33 to 50 GHz

Excess Noise Ratio (ENR) Range:

HP R347B: 10 to 13 dB

HP Q347B: 9.5 to 12.5 dB (33 to 44 GHz)

6.75 to 11.25 dB (44 to 50 GHz)

Max. SWR (reflection coefficient):

HP R347B: <1.42 (.17)

HP Q347B: <1.31 (.13)

Supplemental Characteristics

ENR Variation with temperature: <.006 dB/C

ENR Variation with time:

R 347B: .15 dB typ. (over 2000 hrs.)

Q 347B: .15 dB typ. (over 2000 hrs.)

Ordering Information

HP 8970B Noise Figure Meter

Option H18: Increases upper frequency from 1600 to 1800 MHz

Option 907: Front panel handle kit

Option 908: Rack mounting flange kit

Option 909: Both options 907 and 908

HP 8971B Noise Figure Test Set

HP 8970T Noise Figure Measurement System

HP 8970S Noise Figure Measurement System

HP 346A Noise Source

HP 346B Noise Source

HP 346C Noise Source

Option 001 (HP 346A/B only): Type N (m) connector

Option 002 (HP 346A/B only): APC-7 connector

Option 004 (HP 346A/B only): Type N (f) connector

HP R347B Noise Source

HP Q347B Noise Source