

# Keysight Technologies

## NFA Noise Figure Analyzer

### Configuration Guide



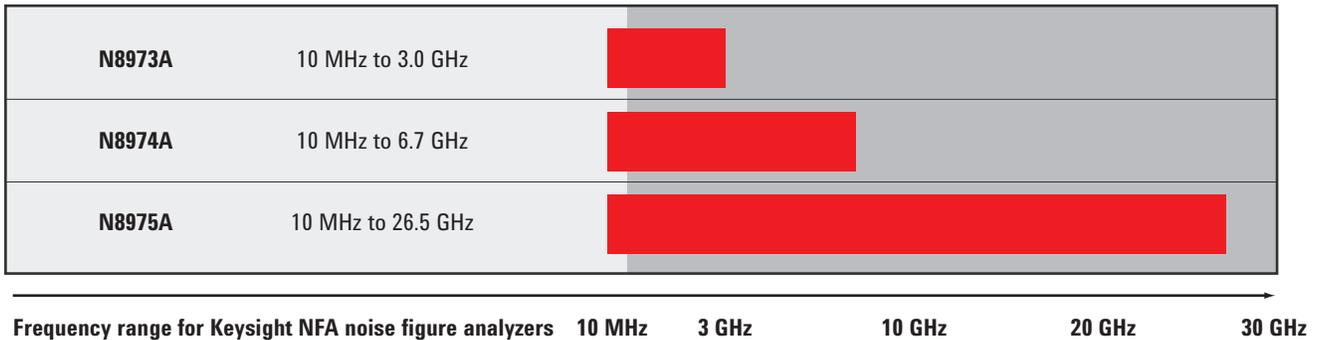
## Dedicated Noise Figure Analyzer

- Hard specifications to 26.5 GHz
- Works with N4000A SNS or 346 Series noise sources
- Noise figure measurements to 110 GHz with block downconverters

In order to make accurate noise figure measurements, engineers need proven equipment that give repeatable results. To help meet that need, Keysight Technologies, Inc. offers the only dedicated noise figure analyzer on the market. One of the advantages of a dedicated noise figure analyzer is the specified results, available up to 26.5 GHz, which outperform most traditional spectrum analyzer applications while costing less than a network analyzer solution.

The NFA Series offers results similar to the obsolete 8970 noise figure meter. Some of the new features the NFA delivers include a graphical view and compatibility with smart noise sources—for more details on the NFA, refer to the NFA Series Brochure, literature number 5989-0166E, available at [www.keysight.com/find/nfa](http://www.keysight.com/find/nfa).

The NFA Series standard configuration prepares engineers to make noise figure measurements immediately after instrument boot up as the preamplifier and noise figure software are both standard. There are three different frequency ranges to choose from:



For more information on Keysight’s full portfolio of noise figure solutions see the Noise Figure Selection Guide, literature number 5989-8056EN, available at [www.keysight.com/find/nf](http://www.keysight.com/find/nf).

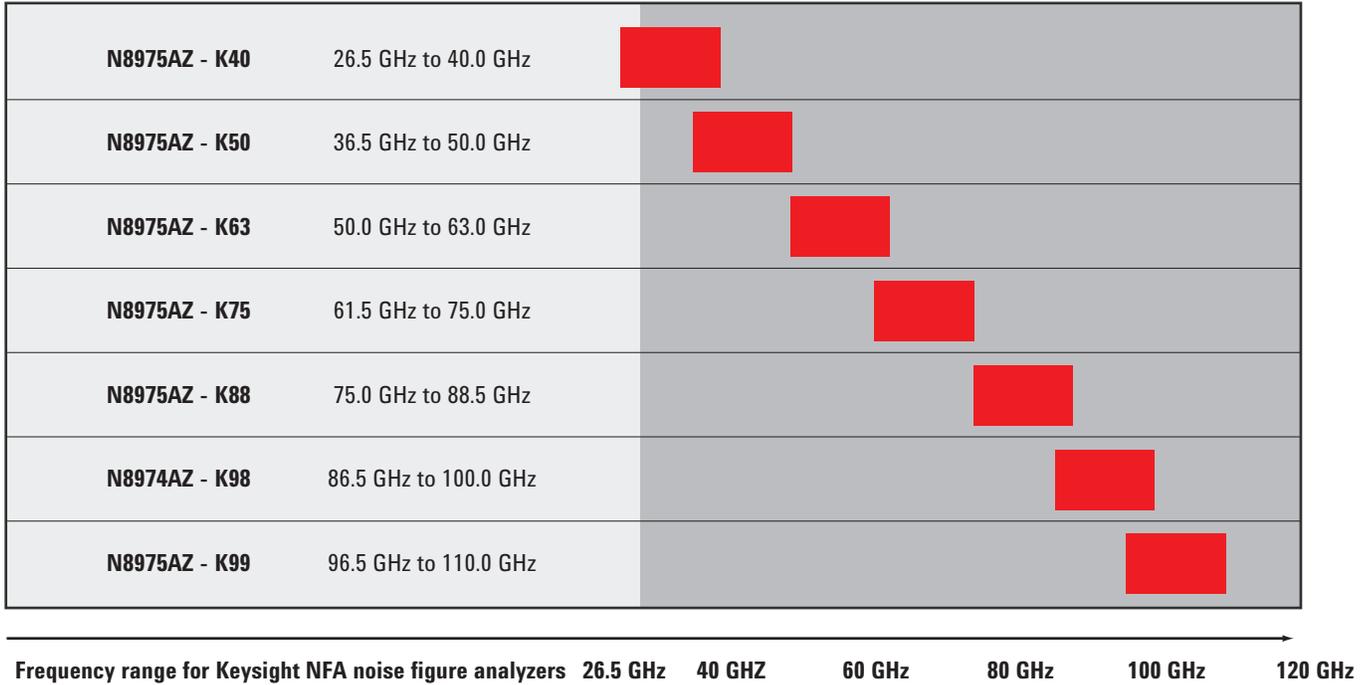
Following are the additional options available for any of the dedicated noise figure analyzers:

Option	Description	Upgrades
N897x-1D5	High-stability frequency reference	No
N897x-A6J	ANSI Z540 compliant calibration with test data	Service Center
N897x-1CP	Rack mount and handle kit	Yes
N897x-UK9	Additional front-panel cover	Yes
N897x-1FP	Calibration, performance verification, and adjustment software	Yes

**Helpful tip:** The most popular option for enhancing the dedicated noise figure analyzers is Option 1D5, the high-stability frequency reference. Option 1D5 can only be purchased at the initial sale and is not available as an upgrade.

## Block Down Conversion

Keysight offers the K-Series block downconverters, which extend the upper frequency limit of the N8975A from 26.5 GHz up to 110 GHz. The downconverter uses an internal LO to down convert the input signal to an IF that is within the measurement range of the NFA. The K-Series is offered in 13.5 GHz bands. For example, a customer that would like to make noise figure measurements to 52 GHz would order K40, K50, and K63 in order to bridge from the 26.5 GHz end frequency of the N8975A to the 52 GHz required.



**Note:** The K-Series block downconverters can only be used with the N8975A and N9020A MXA signal analyzers.

## Noise Source Selection

The other critical piece of equipment needed to make a noise figure measurement is a noise source. Noise sources contribute to your total measurement noise figure via ENR uncertainty and input mismatch.

The output of a noise source is defined in terms of its frequency range and excess noise ratio (ENR). Nominal ENR values of 6 dB and 15 dB are commonly available. A low ENR noise source will minimize error due to noise detector non-linearity. This error will be smaller if the measurement is made over a smaller, and therefore more linear, range of the instrument's detector. A 6 dB noise source uses a smaller detector range than a 15 dB noise source.

Use a 15 dB noise source for:

- General-purpose applications to measure noise figure up to 30 dB
- User-calibrating the fullest dynamic range of an instrument before measuring high-gain devices

Use a 6 dB noise source for:

- Measuring a device with gain that is especially sensitive to changes in the source impedance
- The device under test (DUT) has a very low noise figure
- The device noise figure does not exceed 15 dB

Keysight offers three different families of noise sources, and all may be used in conjunction with the NFA. The smart noise sources simplify measurement set-up and improve accuracy and reliability, automatically downloading electronically stored calibration data to the instrument to save valuable time. The 346 Series noise sources are the traditional and most cost-effective solution, offering the widest range of frequency coverage. Lastly, Keysight offers high-frequency noise sources for customers making measurements above 26.5 GHz. If one source does not include both frequency ranges, a second source will be required. A second noise source may also be necessary when measuring a non-frequency translating device with low noise figure and high gain.



	Noise source	ENR	Frequency range
<b>Smart Noise Sources</b>	N4000A	4.6 – 6.5 dB	10 MHz – 18 GHz
	N4001A	14 – 16 dB	10 MHz – 18 GHz
	N4002A	12 – 17 dB 1	10 MHz – 26 GHz
<b>Traditional Noise Sources</b>	346A	5 – 7 dB	10 MHz – 18 GHz
	346B	14 – 16 dB	10 MHz – 18 GHz
	346C	12 – 17 dB	10 MHz – 26 GHz
	346CK01	21 dB	1 GHz – 50 GHz
<b>High Frequency Noise Sources</b>	Q347B	6 – 13 dB	33 GHz – 50 GHz
	R347B	10 – 13 dB	26.5 GHz – 40 GHz

**Helpful tip:** Keysight's most popular noise sources are the N4000A smart noise sources and 346B traditional noise source.

For more information on these noise sources see the *Noise Figure Selection Guide*, literature number 5989-8056EN, or application note 57-3, "10 Hints for Making Successful Noise Figure Measurements," literature number 5980-0288E, both available at [www.keysight.com/find/nf](http://www.keysight.com/find/nf).

## Special Noise Source Options

In order to meet unique customer requirements, Keysight offers the following special noise source options:

**Helpful tip:** One of the most popular special noise source options is 346C-K01, which allows the 346C noise source to be used to 50 GHz.

Option	Description
346B-H01	APC 3.5 (m) connector with 21 dB nominal ENR
346C-H01	APC 3.5 (m) connector with 21 dB nominal ENR
346C-K01	10 MHz to 50 GHz 346 Series noise source nominal ENR 21 dB

## Noise Source Test Set

The Keysight N2002A noise source test set is a standalone instrument that, as part of a calibration system, enables fast, repeatable calibrations with minimal levels of uncertainty. This test set is needed when making ENR tests on a noise source. Low-cost and easy-to-use, the N2002A noise source test set ensures accurate calibration results, increasing measurement confidence and allowing the development of DUTs with tighter specifications. The N2002A noise source test set operates over a frequency range of 10.0 MHz to 26.5 GHz.



### Features:

- Reduces noise figure uncertainty to ensure accurate and repeatable results
- Delivers results traceable to national standard
- Performs full calibration of all Keysight SNS and 346 noise sources
- Provides manual control or remote operations using GPIB

For more information see [www.keysight.com/find/nsts](http://www.keysight.com/find/nsts)

## Documentation

A hard copy and CD version of the English language quick reference guide, user's guide, programmer's reference, and calibration and performance verification manual are included with the NFA. Selections can be made to change the localization of the manual set which will provide the quick reference guide and user's guide in the chosen language, and an English language version of the programmer's reference guide as well as calibration and performance verification manual.

Option	Description
N897XA-0B1	Additional NFA series manual set (English version)
N897XA-0B2	Additional NFA series user manual (English version)
N897XA-0BF	Additional NFA series programmer reference (English version)
N897XA-AB0	NFA series manual set for Taiwan -Chinese localization
N897XA-AB1	NFA series manual set - Korean localization
N897XA-AB2	NFA series manual set - Chinese localization
N897XA-ABE	NFA series manual set - Spanish localization
N897XA-ABF	NFA series manual set - French localization
N897XA-ABZ	NFA series manual set - Italian localization
N897XA-ABD	NFA series manual set - German localization
N897XA-ABJ	NFA series manual set - Japanese localization
N897XA-0B0	Delete hard copy manual set

## Additional Service Options

<b>Warranty</b>	<b>Standard warranty is 3 years</b>
R-51B	Occupied bandwidth
<b>Calibration</b>	<b>For 3 years, order 36 months of the appropriate calibration plan shown below</b>
R-50C-001	Standard calibration plan
R-50C-002	Standard compliant calibration plan

## Literature Resources

### Noise figure analyzer

*NFA Series Brochure,*

literature number 5980-0166E

*NFA Series Noise Figure Analyzers Configuration Guide,*

literature number 5980-0163E

*NFA Series Noise Figure Analyzers Data Sheet,*

literature number 5980-0164E

### Noise figure techniques

*Noise Figure Selection Guide,*

literature number 5989-8056EN

*Noise Figure Primer (AN 57),*

literature number 5989-6192EN

*Fundamentals of RF and Microwave Noise Figure Measurement (AN 57-1),*

literature number 5952-8255E

*Noise Figure Measurement Accuracy: The Y-Factor Method (AN 57-2),*

literature number 5952-3706E

*10 Hints for Making Successful Noise Figure Measurements (AN 57-3),*

literature number 5980-0288E

*Noise Figure Measurements of Frequency Converting Devices (AN 1487),*

literature number 5989-0400EN

*Non-Zero Noise Figure After Calibration (AN 1484),*

literature number 5989-0270EN

*Practical Noise Figure Measurement and Analysis for Low-Noise Amplifier Designs (AN 1354),* literature number 5980-1916E

### Noise sources

*SNS Product Overview,*

literature number 5988-0081EN

*Keysight 346A/B/C Noise Sources: 10 MHz to 26.5 GHz,*

literature number 5953-6452B

*Q347B Data Sheet,*

literature number EPSG084753

*R347B Data Sheet,*

literature number EPSG084754

### Noise source test

*N2002A Noise Source Test Set User's Guide,*

literature number N2002-90001

*Using the Keysight N8975A Noise Figure Analyzer and the N2002A Noise Source Test Set,* literature number 5988-7229EN

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