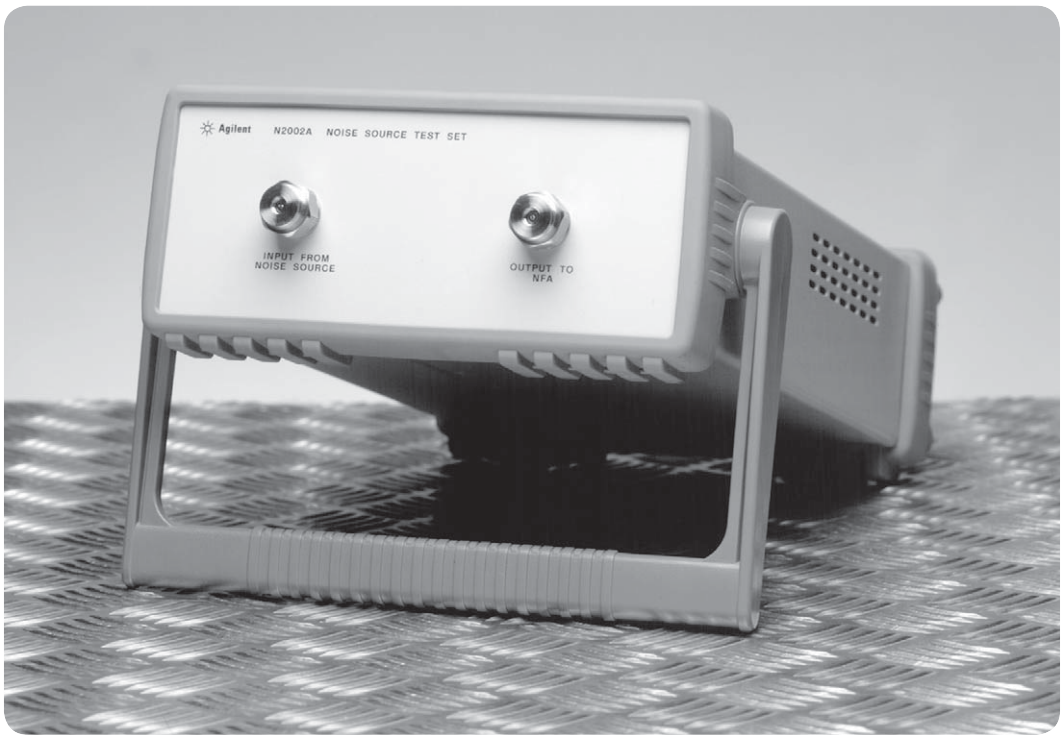
Agilent
N2002A Noise Source Test Set
10 MHz to 26.5 GHz

Technical Overview



Agilent Technologies

Noise Source Calibration

One of the key performance parameters for noise figure is the level of measurement uncertainty. A significant contributor to this is the uncertainty surrounding the noise source used when measuring noise figure on your device. Accurate noise source calibration is critical to minimizing noise source uncertainty, and thus a critical factor for obtaining quality noise figure measurements. The Agilent N2002A noise source test set is a stand-alone instrument that operates as an integral part of a noise source calibration system. The low cost, easy-to-use N2002A, as part of a calibration system, helps deliver fast, accurate, repeatable calibration results with minimal levels of uncertainty.

Agilent recommends using the N2002A noise source test set together with the Agilent N8975A noise figure analyzer (NFA)[1] as the core equipment to perform fast and accurate noise source calibrations. The N2002A provides isolation between the noise source and the NFA to minimize the reflection coefficient. This coefficient contributes to reflections between the DUT and the source, causing uncertainty in the noise power emerging from the source; the measured noise figure refers to the actual noise source impedance, rather than the desired 50-ohm value. Incorporating the N2002A into a calibration system will minimize the interaction between the DUT and the NFA, thus minimizing the reflection coefficient and thereby ensuring measurement results with reduced measurement uncertainty. The result is more accurate noise source calibrations. Measurements made with an accurate noise source allow for greater confidence and tighter specifications of the device being tested.

The N2002A will be of particular interest if

- you and your company would benefit from completing noise source calibration in-house, but previously found it too expensive or complex
- you already perform noise source calibration with the Agilent N8975A NFA but would benefit from the improved accuracy provided by the N2002A test set
- you already perform noise source calibration, without the N8975A, but would benefit from the improved speed and accuracy provided by the N2002A test set and N8975A NFA combination.

In-house calibration

Many customers have long equated noise source calibration with the time consuming and expensive delays of sending equipment to external laboratories or test houses. The straightforward operation and low cost of Agilent's recommended noise source calibration equipment make the prospect of in-house calibration more appealing due to the drastic reduction in manufacturing downtime and the long-term financial advantages.

Incorporating the N2002A into an existing noise source calibration system

For engineers who currently run their own noise source calibration service, the N2002A noise source test set is an ideal addition to their test equipment. Incorporating this low-cost, self-contained unit into an existing noise source calibration system can significantly improve the quality of calibrations. With existing systems the noise source test set can be incorporated between the noise source and the noise figure measuring device to reduce reflections and therefore reduce the level of uncertainties.

N2002A key features and benefits

Features

- Reduces noise figure uncertainty thus ensuring accurate and repeatable results
- Operation over a frequency range of 10 MHz to 26.5 GHz
- Results traceable to a national standard
- Full calibration of Agilent SNS and 346 noise sources, as well as other manufacturers' noise sources
- Manual control or remote operation using GPIB

Benefits

- Ensures accuracy of noise source calibration systems, enabling greater confidence in and tighter specifications of the device under test
- Provides speed and accuracy when combined with the N8975 noise figure analyzer, resulting in increased throughput
- Cost-efficient solution for on-site calibration, which minimizes downtime

1. Agilent recommends that the N2002A noise source test set be used in conjunction with Agilent equipment, however test and measurement equipment from other manufacturers can also be used.

Noise Source Calibration System

Note: The N2002A noise source test set must be used within a noise source calibration system; the N2002 has no power supply and performs no measurements.



Figure 1. Noise source test system that includes the N2002A noise source test set, N8975A NFA and 11713A attenuator/switch unit

Configuring a noise source calibration system

Agilent can supply all the equipment necessary to configure a system that provides fast accurate noise figure calibration. For details on the required equipment and the recommended calibration process, see *Noise Source Calibration: Using the Agilent N8975A Noise Figure Analyzer and the N2002A Noise Source Test Set* (literature number 5988-7229EN).

The following Agilent equipment is required to configure a complete noise source calibration system[1]:

- N8975A NFA (10 MHz to 26.6 GHz) with option 1D5 (high stability frequency reference)
- N2002A noise source test set with option 001[2]
- 11713A attenuator/switch unit
- Gold standard noise source (See *Ordering information* for further details.)

Demonstration software

Demonstration software is supplied with the N2002A noise source test set to automate the noise source calibration process. You can also use the software as a basis for developing your own automation process.

The demonstration software is supplied free of charge on the accompanying CD and is written in Agilent VEE Pro. Although the source code may be manipulated to meet your requirements it is neither a supported product or covered under warranty. To make changes to the source code a licensed copy of Agilent VEE Pro is required.

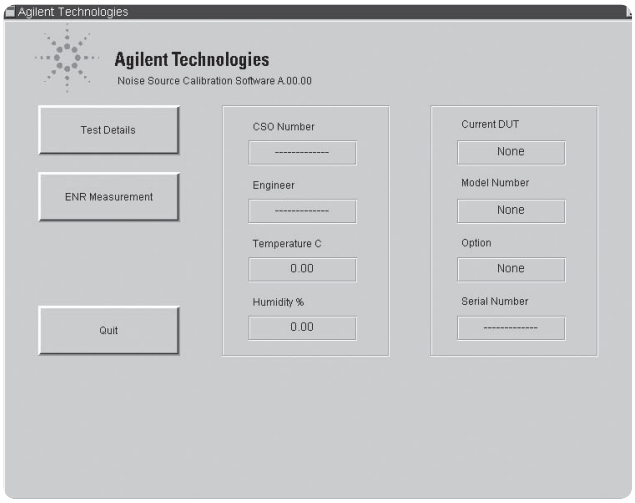


Figure 2. Demonstration software main window

2. Option N2002A-001 includes all the necessary cables and connectors to perform the standard calibration of noise sources with 3.5 mm and type-N connectors. See *Ordering information* for details.

Ordering Information

Noise source test set

N2002A	Noise source test set, 10 MHz to 26.5 GHz
N2002A-001	Accessory cable and adapters Cable (x1): 11500E 3.5 mm female to female adapter (x3): 1250-1749 3.5 mm female to type-N female adapter (x1): 1250-1745

Noise sources

N4000 SNS series noise source

N4000A	SNS noise source, nominal ENR 6 dB, 10 MHz to 18 GHz
N4001A	SNS noise source, nominal ENR 15 dB, 10 MHz to 18 GHz
N4002A	SNS noise source, nominal ENR 15 dB, 10 MHz to 26.5 GHz
N400xA-001[3]	Type-N (male) connector
N400xA-H10	Gold standards calibration

346 series noise source

346A	346 series noise source, nominal ENR 5 dB, 10 MHz to 18 GHz
346B	346 series noise source, nominal ENR 15 dB, 10 MHz to 18 GHz
346C	346 series noise source, nominal ENR 15 dB, 10 MHz to 26.5 GHz
346x-001	Type-N (male) connector
346x-002[4]	APC-7 connector
346x-004[4]	Type-N (female) connector
346x-H10	Gold standards calibration

Optional noise source calibration equipment[5]

11713A	Attenuator/switch unit
N8975A	Noise figure analyzer, 10 MHz to 26.5 GHz (option N8975A-1D5, high stability frequency reference)

Additional Literature

Noise Source Calibration: Using the Agilent N8975A Noise Figure Analyzer and the N2002A Noise Source Test Set, product note, literature number 5988-7229EN

NFA Series Noise Figure Analyzers, brochure, literature number 5980-0166E

SNS Series Noise Sources, product overview, literature number 5988-0081EN

Fundamentals of RF and Microwave Noise Figure Measurements, application note 57-1, literature number 5952-8255

Noise Figure Measurement Accuracy, application note 57-2, literature number 5952-3706

10 Hints for Making Successful Noise Figure Measurements, application note 57-3, literature number 5980-0288E

For more information on noise figure visit: **www.agilent.com/find/nf**
For more information on N2002A noise source test set visit: **www.agilent.com/find/nsts**

3. Options only available with the N4000A and the N4001A.
4. Options only available with the 346A and the 346B.
5. Full system is not supplied - all necessary equipment must be purchased separately.

Remove all doubt

Our repair and calibration services will get your equipment back to you, performing like new, when promised. You will get full value out of your Agilent equipment throughout its lifetime. Your equipment will be serviced by Agilent-trained technicians using the latest factory calibration procedures, automated repair diagnostics and genuine parts. You will always have the utmost confidence in your measurements.

Agilent offers a wide range of additional expert test and measurement services for your equipment, including initial start-up assistance onsite education and training, as well as design, system integration, and project management.

For more information on repair and calibration services, go to:

www.agilent.com/find/removealldoubt



Agilent Email Updates

www.agilent.com/find/emailupdates
Get the latest information on the products and applications you select.



Agilent Direct

www.agilent.com/find/agilentdirect
Quickly choose and use your test equipment solutions with confidence.

Agilent Open 

www.agilent.com/find/open
Agilent Open simplifies the process of connecting and programming **test systems** to help engineers design, validate and manufacture electronic products. Agilent offers open connectivity for a broad range of system-ready instruments, open industry software, PC-standard I/O and global support, which are combined to more easily integrate test system development.



www.lxistandard.org
LXI is the LAN-based successor to GPIB, providing faster, more efficient connectivity. Agilent is a founding member of the LXI consortium.

www.agilent.com

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:

www.agilent.com/find/contactus

Americas

Canada	(877) 894-4414
Latin America	305 269 7500
United States	(800) 829-4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Thailand	1 800 226 008

Europe & Middle East

Austria	0820 87 44 11
Belgium	32 (0) 2 404 93 40
Denmark	45 70 13 15 15
Finland	358 (0) 10 855 2100
France	0825 010 700*
	*0.125 € fixed network rates
Germany	01805 24 6333**
	**0.14€/minute
Ireland	1890 924 204
Israel	972-3-9288-504/544
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200-88 22 55
Switzerland (French)	41 (21) 8113811(Opt 2)
Switzerland (German)	0800 80 53 53 (Opt 1)
United Kingdom	44 (0) 118 9276201

Other European Countries:
www.agilent.com/find/contactus

Revised: October 24, 2007

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2002, 2003, 2007
Printed in USA, November 29, 2007
5988-7228EN



Agilent Technologies