FLUKE®
Calibration

96040A
Low Phase Noise Reference Source

Technical Data

Simplify your RF calibration system

The Fluke Calibration 96040A RF Reference Source enables you to simplify your RF calibration system by replacing many of the instruments and accessories that make up your current system. Its precision signal level and attenuation, high signal purity and precision low distortion modulation make this reference source superior to the general-purpose signal generators that are often used to calibrate spectrum analyzers, modulation meters, RF sensors, attenuators, and similar instruments. Its low phase noise provides superior phase noise performance.

Unlike many RF calibration solutions, the 96040A is designed specifically for RF calibration, with a calibration-oriented user interface that makes it easy to learn and use. The 96040A speeds up calibration procedures, reduces opportunities for operator errors, and greatly simplifies RF metrology. As the core of an RF and microwave calibration system, the 96040A covers the majority of test points required for calibrating spectrum analyzers of any frequency range.

Automated with MET/CAL® *Plus* Calibration Management Software, the 96040A reduces complexity and calibration times, dramatically improving efficiency and increasing capacity by 50 % or more over manual methods.

Key benefits

- Covers a broad range of RF calibration workload
- Reduces the number of instruments and interconnections required for your RF calibration system
- "What you set is what you get" accurate signal delivery direct to the UUT input
- Integrated 50 MHz frequency counter eliminates need for an additional instrument
- Calibration-specific interface simplifies technician tasks
- Simplifies uncertainty calculations by delivering known signals direct to the unit under test (UUT)
- Lowers RF system maintenance costs
- With automation, reduces spectrum analyzer calibration times by as much as 50% over manual methods

Broad, versatile workload coverage

The 96040A calibrates a broad workload of RF calibration devices, including:

- Spectrum analyzers
- Modulation meters and analyzers
- RF power meters and sensors
- Frequency counters
- Attenuators
- And more

The metrology associated with calibrating these items becomes simpler because you have fewer error sources and uncertainty contributions to consider.

FLUKE®
Calibration

More than just an RF calibrator

There are many applications in research and development, manufacturing test, and ATE needing better performance than a general purpose signal generator. If wide frequency coverage, frequency resolution, low harmonics, phase noise and spurious content, signal level and attenuation accuracy, or dynamic range are critical parameters the 96040A is an ideal solution.

Cut the cost of your RF calibration system in half

As the central instrument in a high capability RF spectrum analyzer calibration system, the 96040A can cut your costs in half. The 96040A replaces all of these parts of a "typical" RF calibration system:

- Up to four signal sources (from audio/ function generators to RF signal and low phase noise sources)
- Power meters and power sensors
- Step attenuators
- Filters
- Pads
- Couplers
- 50 MHz frequency counter

The 96040A not only reduces the initial need to purchase, install and configure RF system components, but it also reduces the maintenance and calibration costs associated with all of that equipment. The 96040A is also easier to transport than a heavy rack of equipment and accessories, making it a good solution for on-site calibration.

With its 4 GHz frequency range, the 96040A performs more than 80 % of all the tests required on high performance, high frequency spectrum analyzers. For workload items that require frequencies beyond 4 GHz, you can use an RF and microwave source that you probably already own alongside the 96040A to address the few remaining higher frequency test points.

For many spectrum analyzer models operating below 4 GHz, you only need a 96040A to perform the entire calibration. You can't simplify much more than that!

No need for additional function generators

The 9640A Reference Source's internal modulation capability makes it suitable for applications that require precision modulation to be applied to the output signal, such as modulation analyzer calibration and spectrum analyzer sweep time testing using an AM signal with more accurate modulation rates. You don't need additional function generators as a low frequency modulation source—the 96040A delivers it all.

Designed for RF calibration

The 96040A user interface is designed to simplify processes for calibrating typical items in your workload, such as spectrum analyzers, RF level meters and receivers. Parameter offset, stepping, relative and UUT/DUT error readout modes allow you to work accurately and efficiently, following familiar calibration procedures. You'll find it easier than ever to determine the performance and tolerances of units under test.

The 96040A front panel is equipped with dedicated function keys, context-sensitive softkeys, and a bright, easy-to-read color display that make it easy to learn and operate. You can set output levels in terms of power (watts or dBm), voltage (RMS or peak to peak) using familiar multipliers and exponent forms. You can move easily between voltage, power and dBm units without losing entered values or accuracy. In error readout mode to adjust the reading, simply rotate the spin wheel and the UUT error is displayed directly in dB, ppm or percent.

The simple, calibration-oriented user interface also makes troubleshooting easier if you encounter an unexpected result or an out-of-tolerance condition while following a manual or automated calibration procedure.

"What you set is what you get" accuracy and signal purity

A rugged, precise leveling head delivers 96040A signal levels directly to the unit under test (UUT) input just the way you set them on the front panel. This unique "What you set is what you get" feature helps you avoid problems like losses, noise, interference, and mismatch errors, which can be caused by using intermediate connectors and cables. This approach also maintains the integrity of low-level signals. The head maintains signal precision and noise immunity throughout a 154 dB dynamic range, down to the very lowest levels at –130 dBm.

The leveling head reduces lead changes from 25 to just 5 during a typical calibration, allowing you to "connect once and test many," extending unattended times in an automated system, and reducing connector wear.

Calibrated as a system to assure system performance

The 96040A is supplied with a 50 ohm leveling head. The /75 model has both 50 ohm and 75 ohm leveling heads. Each mainframe and head are calibrated together as a complete system. System calibration helps assure overall system performance. Each 96040A instrument is supplied with a comprehensive ISO 17025 compliant certificate of calibration with data for all key parameters, including level and attenuation, output VSWR, and phase noise. You can be assured that your 96040A is traceable, plus RF metrology and uncertainty analysis become much simpler and faster. Accredited certification is available for the 96040A and both 50 ohm and 75 ohm heads.

State-of-the-art phase noise performance

With reduced low phase noise optimized for low and high offset frequencies and specifications from 1 Hz to 10 MHz offsets, the 96040A offers exceptional phase noise performance beyond that required for today's high performance workloads.

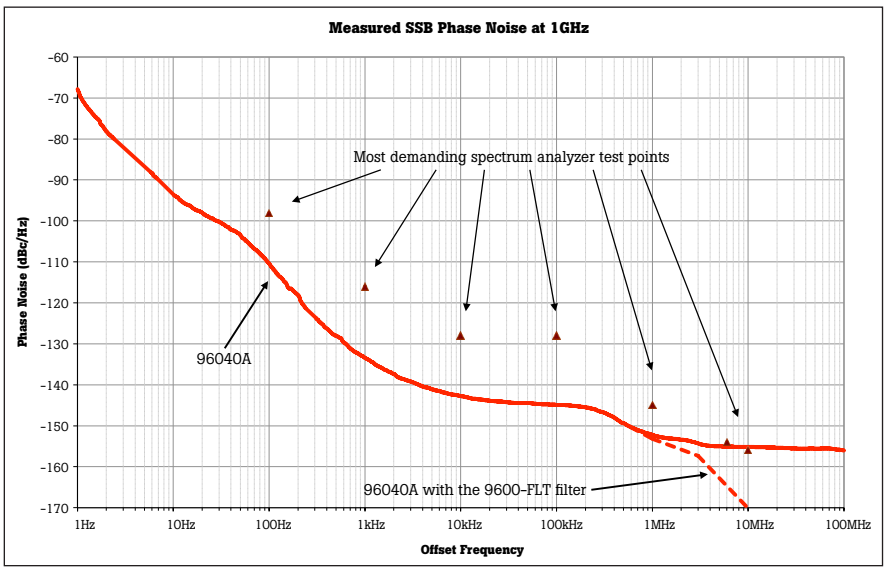
Phase noise data is included in the 96040A certificate of calibration. Instead of relying only on the more conservative guaranteed specifications, users have actual performance data for their unit. Even with the best low phase noise signal generators, filters are commonly used during spectrum analyzer phase noise calibration tests, reducing noise levels at wide (high) offset frequencies to improve test margins. The 9600FLT 1 GHz bandpass filter accessory is designed specifically for high performance spectrum analyzer wide-offset phase noise testing and connects easily to 96040A models in either benchtop or rack-mounted applications.

Selectable frequency reference input/output expands functionality

Selectable external frequency reference input is available as a standard feature on the rear panel of the 96040A. The input allows you to lock the frequency output to an external reference, such as the Fluke Calibration 910R Rubidium Standard, for applications where high clock accuracy or use of a common reference frequency is important. The frequency reference output allows a UUT to be frequency locked to the 96040A internal reference clock. This configuration is often required to reduce frequency offset errors that may occur between the reference source and the UUT.

Simplify frequency response tests with 96040A sweep functions

RF applications often require a frequency sweep. The 96040A's sweep functions simplify the application of manual legacy spectrum analyzer frequency response testing, as well as filter response measurements.



Automate with MET/CAL® software for "walk-away" efficiency

In a typical automated RF calibration process, the operator must frequently intervene to change test setups, thus limiting the benefits that can be realized by the automation. Walk-away automation can increase calibration system capacity by up to 25 percent using procedures you develop in MET/CAL *Plus* Calibration Management Software. For example, the manufacturer's calibration procedure for calibrating the Agilent E4407B 26.5 GHz spectrum analyzer requires 27 different and complex test setups. On the other hand, the 96040A, used with MET/CAL *Plus* Calibration Management Software, can perform the major core of required tests with a single setup. Only six additional setups would be needed using a MET/CAL procedure.

MET/CAL procedures created by Fluke Calibration for the 9640A models can be used by the 96040A in 9640A emulation mode. Optimized automated procedures can save time for the operators by allowing them to leave the system running while attending to other work. For example, the E4407B MET/CAL procedure for the legacy 9640A, running in emulation mode on the 96040A, allows for a total 90 minutes of "walk-away" time within the total two-hour calibration runtime.

Using the 96040A with other automation solutions

The 96040A is also integrated easily into existing automated systems and software. The time savings and efficiency gains offered by the 96040A can be realized by structuring test sequences to take full advantage of its "connect once measure many" capabilities.

The 96040A is designed to match or exceed the performance and functionality of the HP3335A and HP8662/3A in calibration systems. With HP3335A and HP8662/3A GPIB command emulation as standard, replacing these popular but obsolete and difficult-to-maintain products becomes just a plug-and-play substitution.

96040A summary specifications

Key specifications summary. Refer to the extended specifications for full and detailed specifications.

	Frequency specifications	**Level specifications (50 Ω output, see extended specifications for 75 Ω)**
Range	1 mHz to 4 GHz	–130 to +24 dBm to 125 MHz, 14 dBm at 4 GHz (leveled)
Resolution	10 µHz	0.001 dB
Accuracy	± 0.05 ppm ± 5 µHz	Down to –48 dBm: ± 0.03 dB to 100 kHz, ± 0.05 dB to 128 MHz, ± 0.3 dB at 4 GHz 10 MHz to 128 MHz: ± 0.05 dB to –48 dBm, ± 0.1 dB to –84 dBm , ± 0.7 dB at –130 dBm
Attenuation		± 0.02 dB to 49 dB, ± 0.15 dB at 110 dB Relative to +10 dBm, 10 Hz to 128 MHz
VSWR	≤ 100 MHz: ≤ 1.05, ≤ 2 GHz: ≤ 1.1, 2 GHz to 4 GHz: ≤ 1.0 + 0.05 xf (GHz)	
Harmonics and spurious	–60 dBc harmonics, –78 dBc spurious to 1 GHz	
Phase noise at 1 GHz	–144 dBc/Hz, typical, at 10 kHz to 100 kHz offset	
Modulation	AM, FM, PM, internal and external. Frequency pull and external leveling	
Frequency sweep	1 mHz to 4 GHz. Linear or Logarithmic. Stop-Start or Center-Span	
Frequency counter	Internal 50 MHz frequency counter	
Temperature	Operating: 0 °C to 50 °C, 23 °C ± 5 °C for specified performance; Storage: -20 °C to +70 °C.	
Standard interfaces	IEEE-488.2 (GPIB)	
GPIB command emulation	9640A, 9640A-LPN, 9640A-LPNX, HP3335, HP8662A, HP8663A.	
Dimensions (HxWxD)	146 mm x 442 mm x 551 mm (5.8 in x 17.4 in x 21.7 in) including handles Industry-standard 19 in (483 mm) rack mounting when fitted with Y9600 rack mounting kit	
Weight	18 kg (40 lb)	

FLUKE®
Calibration

Ordering information

Models
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

Accessories
9600FLT 1 GHz Wide Offset Phase Noise Filter; mounts directly to 9640A or 96040A mainframe
9600CONN Adapter/Torque Kit
Y9600 Rack Mount Kit (slides)
96000CASE Rugged Transit Case

Upgrades
75 Ohm Leveling Head upgrades are available on all models.

Hardware and Calibration CarePlans
Gold CarePlans are available for the 96040A 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**.

For information about the 96270A 27 GHz Low Phase Noise Reference Source, visit **www.flukecal.com** or contact your local Fluke Calibration sales representative.

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.eu

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

©2014,2020 Fluke Calibration. Specifications subject to change without notice.
Printed in U.S.A. 3/2020 6002253B_EN

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