

**FLUKE**®

# 9640A RF Reference Source

Calibration made simpler



# The Fluke 9640A Reference Source



## Broad workload coverage

The Fluke 9640A and 9640A-LPN Reference Sources can help you calibrate a broad range of RF test equipment:

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

## Reference sources designed for RF calibration

The Fluke 9640A and 9640A-LPN RF Reference Sources feature a unique combination of level accuracy, signal purity, dynamic range and metrology-specific user interfaces to calibrate the broadest range of RF measurement workload.

Perhaps the first RF signal sources to be designed for metrologists, they bring a unique package of features, performance and user benefits to these demanding applications.

The 9640A replaces many of the instruments commonly used in an RF calibration system. The 9640A-LPN adds low phase noise capability for even broader, more demanding workload coverage, including the Agilent PSA series and Rohde & Schwarz FSU Series of spectrum analyzers. Each accurate, dependable source gives you the signal range, purity and precision you need in a single, easy-to-use instrument.



## Replace multiple instruments in your RF calibration system

Both 9640A models replace multiple signal generators, attenuators, power meters, power heads, filters and impedance converters, for a streamlined system. Fewer pieces of equipment means reduced lead changes, reduced attendance of automated processes, simpler test setup and operation and, ultimately, fewer errors, better uncertainties and greater convenience.

In support of automation, the 9640A and 9640A-LPN feature HP 3335A or 8662/3A emulation to make replacing those old workhorses as easy as plug-and-play. You no longer have to worry that one of your obsolete but valuable instruments will suddenly fail, putting your system out of business. A 9640A keeps you up and running and gives you peace of mind.

## Assemble a new, high performance system—quickly, easily and economically

Although you need more than just a 9640A calibrator to build a complete RF calibration system, a 9640A-based system is more straightforward to assemble,

operate and maintain than other systems. In most cases, adding one or two basically configured microwave sources, and perhaps a power meter and a splitter, will complete a 9640A-based RF calibration system.

A 9640A system also represents a much smaller investment than other solutions. It costs basically half the price you would normally pay for an RF solution to address workload to 50 GHz or higher.

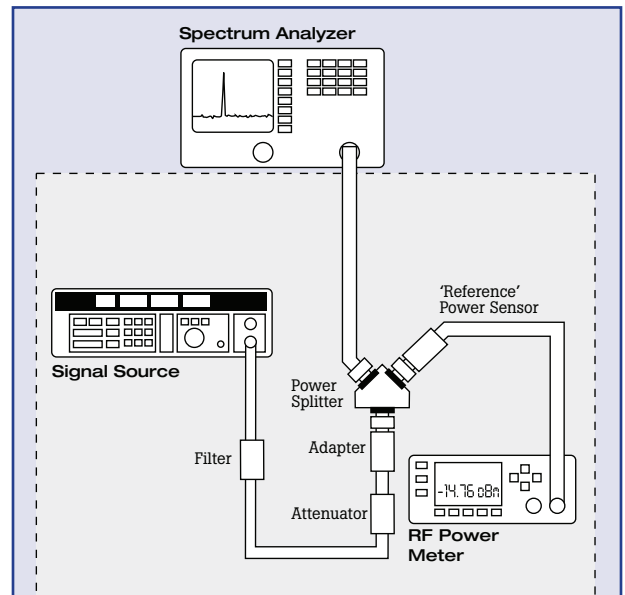
What's more, a streamlined, 9640A system is portable, which is useful if your customers are asking for on-site calibration.

## Automate for fast, repeatable calibrations

The 9640A and 9640A-LPN can be automated with MET/CAL® *Plus* Calibration Management software, cutting total calibration time significantly and simplifying the process.

A comprehensive and growing range of MET/CAL procedures is available for popular spectrum analyzers, modulation analyzers, measurement receivers, power meters and RF millivoltmeters. Custom procedure development is also available.

For users of SureCAL software, a Fluke 9640A and 9640A-LPN driver is available for true plug-and-play ease of use.



The instruments in the grey area are typically used to deliver precision level when testing spectrum analyzer frequency response and attenuation. The Fluke 9640A and 9640A-LPN Reference Sources have the level and attenuation precision without the need for external characterization, to help simplify RF workload calibration.

Besides improving test efficiency, the multi-functional capabilities and precision leveling head attenuation of the 9640A make it easier to use manually or automate your RF calibration system.

# Capability and performance, in a single, cost-effective solution



## Level accuracy and broad frequency coverage in one instrument

Calibration often involves use of several signal sources spanning a wide range of frequencies. Some of the most popular signal sources are now obsolete. You would normally need three signal generators, plus a power meter and sensors, to cover the frequency range of today's workload with the required accuracy.

Whether your RF calibration workload has a frequency bandwidth of 4 GHz or 40 GHz, the Fluke 9640A handles 70 % of the test points for a typical 40 GHz spectrum analyzer.

## Precision leveling head minimizes mismatch errors

A rugged, precision leveling head delivers the 9640A signals directly to the unit under test, minimizing losses, noise and mismatch errors, and maintaining 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, extending unattended times in an automated system and reducing connector wear.

By integrating signal leveling and attenuation within the leveling head, the 9640A eliminates the need for separate step attenuators, simplifying automation and reducing cost of ownership. It also eliminates the need to use an external power meter and sensors to characterize the output at different frequencies and levels.

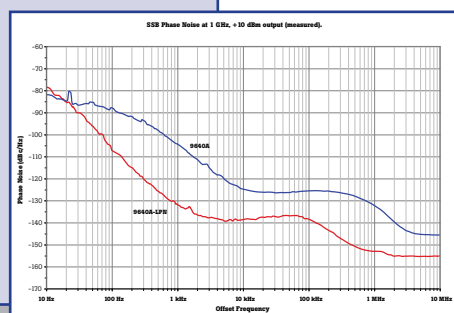
VSWR and mismatch errors are often the dominant source of measurement uncertainty in RF applications. Connecting the leveling head output directly to the load minimizes transmission line length and VSWR degradation due to cabling, allowing the full potential of its accuracy specifications to be realized at the load across the entire frequency range.

The standard 9640A and 9640A-LPN models are supplied with a 50 Ohm leveling head and the /75 models have an additional 75 Ohm leveling head. Mainframe and heads are calibrated together as a system.

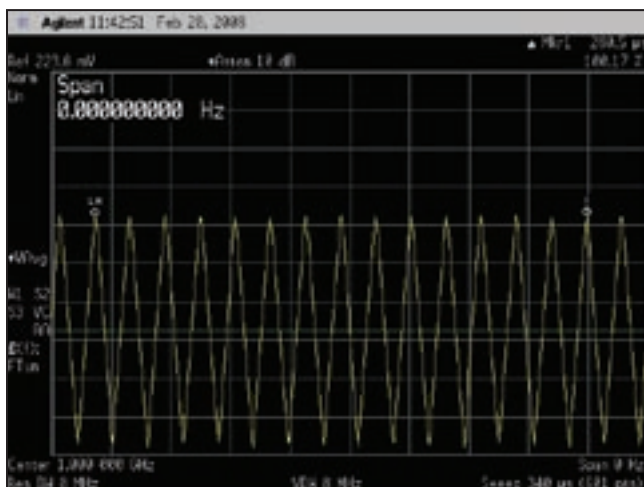
## High signal purity and low phase noise

The 9640A generates a high purity sinusoidal signal with low harmonics, spurious and residual modulations. This ensures that level accuracy will be maintained when you make measurements with wideband or narrow band detectors, or when the 9640A is intercomparing peak and RMS sensing instruments. You will avoid differences between the wideband/narrow band and peak/RMS sensors, without requiring additional filters.

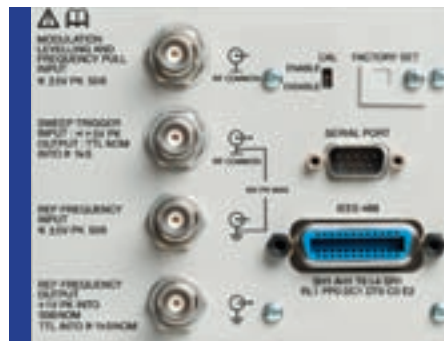
The importance of low phase noise on signal sources is often overlooked. The phase noise profiles of the 9640A are designed around the spectrum analyzer workload; the 9640A suits the vast majority, while the 9640A-LPN is capable of verifying the most demanding spectrum analyzers. Use the low phase noise specification to measure spectrum analyzer phase noise, close-in response and residual FM. Previous systems typically used two low noise signal generators to cover close-in and far-out measurements, or simply didn't cover the far out (>100 kHz offset). Now you can handle both with a single 9640A-LPN.



The 9640A-LPN offers a unique phase noise profile, offering leading edge performance "close in" and "far out" at all carrier frequencies from a single instrument.



Triangular modulation simplifies spectrum analyzer sweep testing.



9640A rear panel remote interface and I/O.

### Internal AM and FM modulation

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 9640A delivers it all.

Frequency modulation is available at rates up to 300 kHz for applications such as modulation analyzer testing.

Amplitude modulation is available at depths of up to 99 % and rates up to 200 kHz.

### Sweep function

RF applications often require a frequency sweep. The 9640A's

sweep functions simplify the application of manual legacy spectrum analyzer frequency response testing, as well as filter response measurements.

### External frequency reference input/output

Selectable external frequency reference input is available on the rear panel of the 9640A. The input allows you to lock the frequency output to an external reference, such as the Fluke 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 9640A internal reference clock. This configuration is often required to reduce frequency offset errors that may occur between the reference source and the UUT.

### HP 3335A and optional HP 8662A/8663A command emulation

The HP 3335A Synthesizer/Level Generator, discontinued long ago, has been an essential component in many users' RF calibration systems. Until now, there have been few alternatives to match its level and attenuation accuracy. The 9640A RF Reference Source matches or exceeds HP 3335A performance, and it has a GPIB command interpreter capable of emulating the HP 3335A in a calibration system (including 75 Ohm applications).

Another long-discontinued instrument is the HP 8662A or HP 8663A low phase noise synthesizer. The 9640A-LPN is designed to match or exceed all HP 8662A/8663A performance and functionality within the calibration system. HP 8662A and HP 8663A GPIB command emulation is available as a "try before you buy" optional license key enabling on the 9640A-LPN.

Either way, you can greatly simplify integration of the 9640A into an existing automated system.



HP 8662A High Performance Signal Generator



HP 3335A RF Synthesizer/Level Generator

# An RF calibration solution that sets new standards for usability

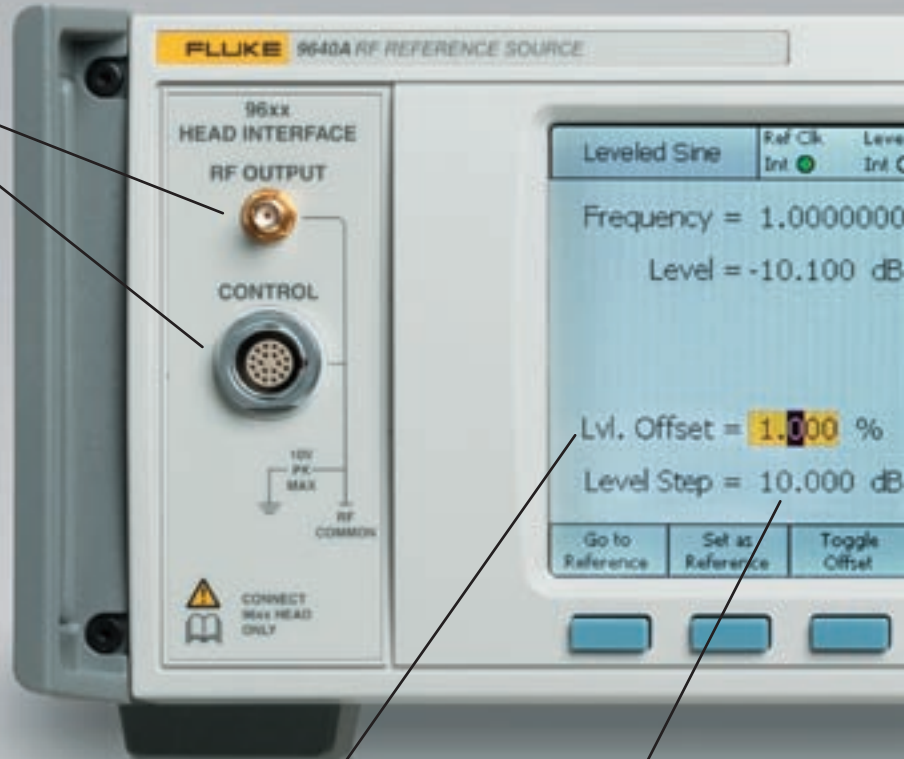


The 9640A front panel is equipped with dedicated function keys, context-sensitive softkeys, and a bright, easy-to-read color display that make it easy to learn and operate. Output levels may be set in terms of power (watts or dBm), voltage (RMS or peak to peak) using familiar multipliers and exponent forms. You can move easily between voltage, power and dBm units without losing entered values or accuracy.

The user interface is designed to simplify common calibration processes for typical items in your workload, such as spectrum analyzers, RF level meters and receivers. Offset, stepping, relative and error modes allow calibration technicians and metrologists to work quickly, accurately and efficiently, following familiar calibration procedures and making it easy to determine performance and tolerances of units under test.



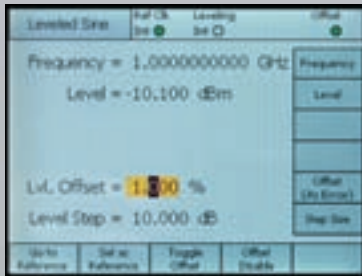
**The 9640A system includes a 50 Ohm or optional 75 Ohm precision leveling head. The head delivers fully floating signals directly to the UUT to ensure the accuracy and integrity of the reference generator's output signals at the device under test input.**



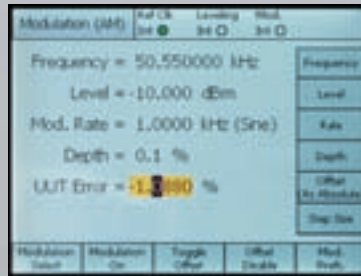
**Level offset function provides UUT or source error.**

**Level step function enables repetitive measurements to be performed quickly.**

**Sine**



**Modulation**

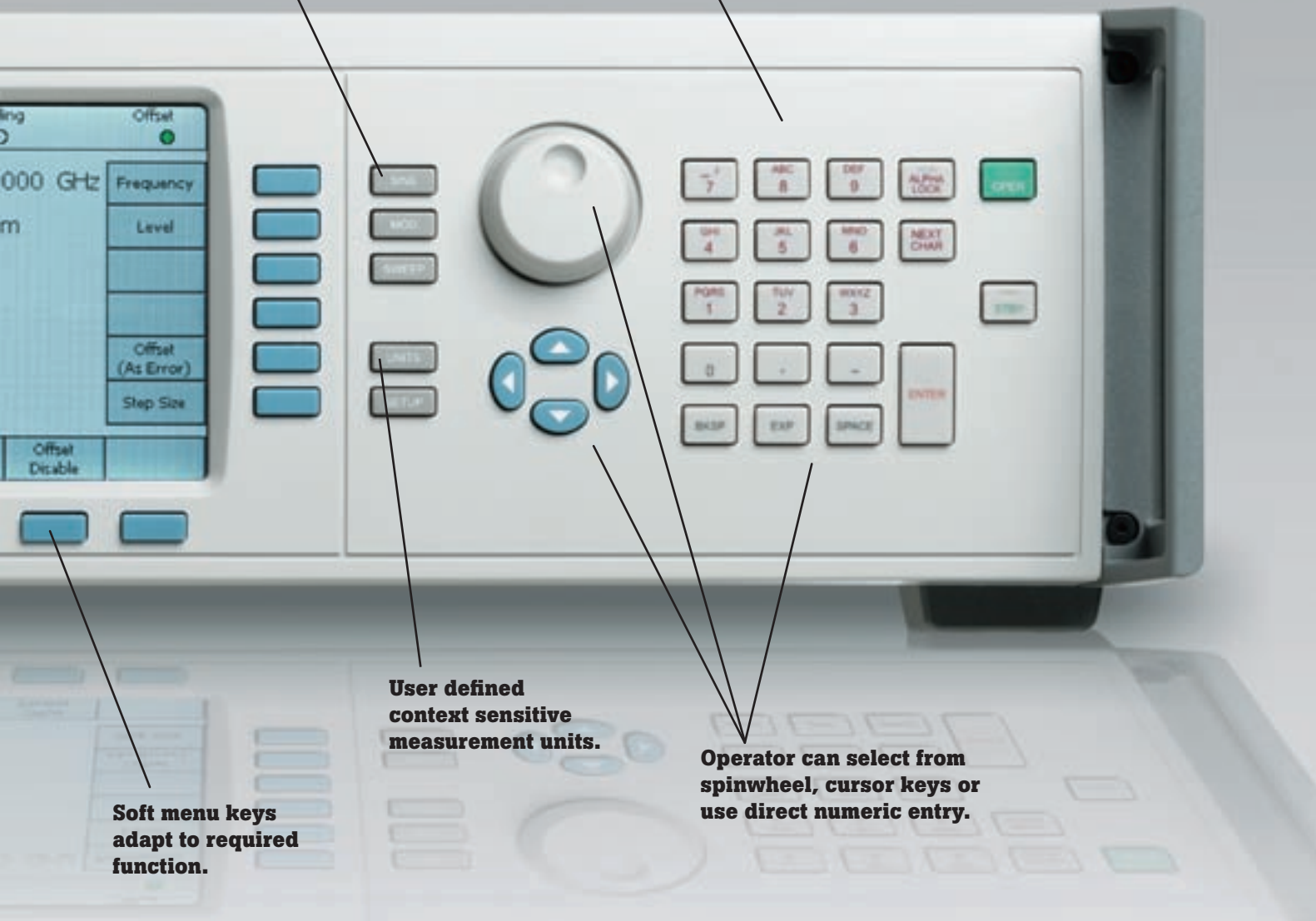


**Sweep**



**Primary function keys select sine, modulation or sweep.**

**Clean, simple front panel with a large display screen makes the 9640A easy to learn and straightforward to use. The color LCD display clearly indicates output conditions and simplifies operator execution.**

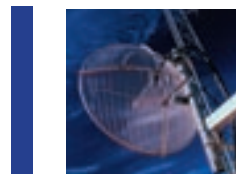


**Soft menu keys adapt to required function.**

**User defined context sensitive measurement units.**

**Operator can select from spinwheel, cursor keys or use direct numeric entry.**

# Automation and support



## **MET/CAL<sup>®</sup> Plus procedures for RF calibration**

The following list shows only some of the procedures available for use with the 9640A RF Reference Source. For a more complete and current list, visit the Fluke web site at [www.fluke.com/mclist](http://www.fluke.com/mclist).

- Agilent E4402B
- Agilent E4403B
- Agilent E4404B
- Agilent E4405B
- Agilent E4407B
- Agilent E4408B
- Agilent E4411B
- Agilent E4440A
- Agilent E4443A
- Agilent E4445A
- Agilent E4446A
- Agilent E4447A
- Agilent E4448A
- Agilent E4440A
- Agilent E4443A
- Agilent E4445A
- HP 8590L/8592L/8594E/8596E
- HP 8560A/8561B/8563A
- Rohde & Schwarz FSH3
- Rohde & Schwarz FSH6
- Rohde & Schwarz FSH13
- Rohde & Schwarz FSH23
- Rohde & Schwarz FSH26

## **MET/CAL Flexible Standards**

The following examples are available to be used with procedures developed for the 9640A; for a more complete and current list, visit the fluke web site at [www.fluke.com/9640](http://www.fluke.com/9640), or contact your local Fluke representative.

- Agilent E4400A/B
- Agilent E4420B
- Agilent E4421B
- Agilent 4422A/B
- Agilent 4425B
- Agilent 4426B
- Fluke 6060A/B
- Fluke 6062A
- HP 3336B
- HP 8671A
- HP 83630A/B
- HP 83751

## **Automate calibration and manage calibration assets with MET/CAL<sup>®</sup> Plus software**

MET/CAL<sup>®</sup> Plus Calibration Management Software is the most complete software solution available to calibration professionals for automating calibration, documenting procedures and results, and managing calibration assets. It can help you realize significant productivity improvements by increasing throughput and consistency. It can also provide the documentation required by quality standards like ISO 9000, ANSI Z540, ISO/IEC 17025, NRC 10 CFR, and others.

Use MET/CAL software's Flexible Standards feature to automate the other instruments in your system. This capability allows you to substitute equivalent standards within the procedures, so you aren't locked into a specific reference model. Flexible Standard drivers .INI files are available for popular microwave synthesizers such as the HP8340, HP83630, Agilent E8254 and E8257.

Fluke maintains a procedure library with thousands of procedures that you can use as-is or modify to meet your specific needs. A rich set of statements and functions give the procedure writer complete control of the calibration process, even for complex items such as spectrum analyzers and signal generators.

Fluke has developed calibration procedures for many instruments that make up the calibration workload for the 9640A, and new procedures are created regularly. A current list of procedures is available on the Fluke web site at [www.fluke.com/mclist](http://www.fluke.com/mclist).

A wide variety of accessory products exist to perform batch updates using bar code readers or scanners; view data over the Internet; log temperature and humidity data and import it directly in to MET/CAL software.

## **Compatibility with SureCAL<sup>®</sup> Automated Calibration Software**

For companies with a significant investment in SureCAL automated software, Northrop can supply a 9640A driver that supports all SureCAL procedures.

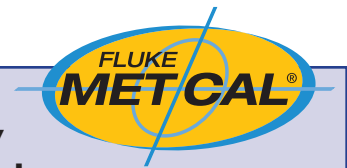
**The support you need, when you need it**

When you register MET/CAL Plus, you are enrolled automatically in the MET/SUPPORT Silver program for 60 days of free support via telephone, fax, and email—to help get you up and running quickly and easily. But the support doesn't stop there. Enroll in the annual MET/SUPPORT Gold program and receive additional premium support and services to help keep you as productive as possible. In addition to priority support by telephone, fax or email, you get free access to the Fluke library of Warranted Procedures, software updates and upgrades, discounts on training courses and more. Even if you use only a few of the Gold services, you can easily recover more than the cost of your membership fee.

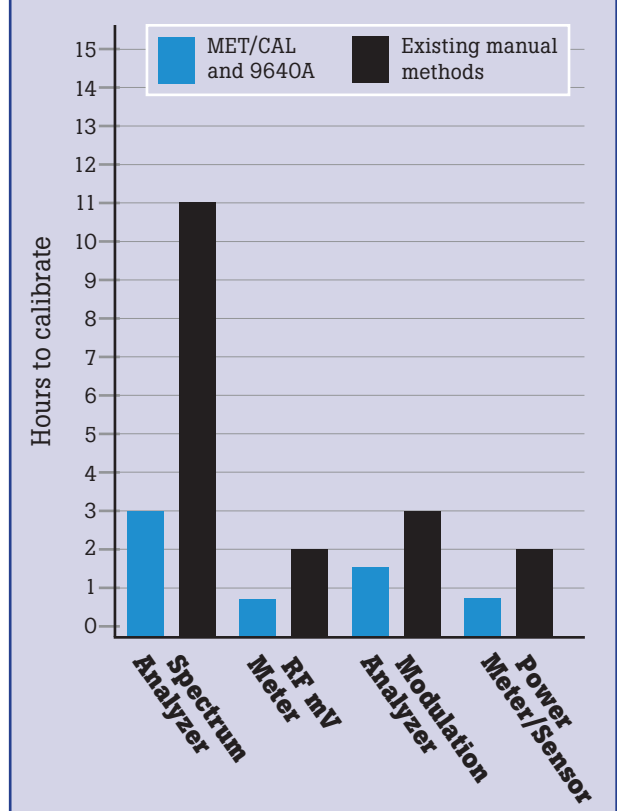
Fluke also operates global calibration and repair facilities to keep your hardware in top working order. A variety of service programs are available, including the Priority Gold CarePlan, which features priority turnaround on calibration and repairs plus a host of additional features.

If you need to arrange for training for yourself or your staff, Fluke can help there too, with a broad range of classes on metrology principles, lab management, software use, procedure writing and more.

Fluke's commitment to support provides additional benefits as well, including invitations to software user group meetings and conferences, periodic email bulletins and a newsletter.



**Productivity improvements with MET/CAL® software and the 9640A.**



# Summary specifications



Refer to the Extended Specifications for full detailed specifications. The Extended Specifications are available from your local Fluke representative or may be downloaded at [www.fluke.com](http://www.fluke.com).

<b>Frequency range</b>	10 Hz to 4 GHz		
<b>Frequency resolution</b>	<100 MHz: 0.001 Hz, >100 MHz: 11 digits		
<b>Frequency accuracy</b>	$\pm(0.04 \text{ ppm} + 0.16 \text{ mHz})$		
<b>Frequency sweep</b>	10 Hz to 4 GHz, linear or logarithmic		
<b>External reference input</b>	1 MHz to 20 MHz in 1 MHz steps		
<b>Frequency reference output</b>	1 MHz or 10 MHz, user selectable		
<b>Amplitude range</b>	<b>Into 50 <math>\Omega</math>:</b> -130 dBm to +24 dBm (0.2 $\mu$ V to 10 V pk-pk) >125 MHz: +20 dBm >4 GHz: +14 dBm	<b>Into 75 <math>\Omega</math>:</b> -136 dBm to +18 dBm >125 MHz: +14 dBm >4 GHz: +8 dBm	
<b>Amplitude resolution</b>	0.001 dB		
<b>Absolute level accuracy into 50 <math>\Omega</math></b>	<b>100 kHz:</b>	<b>100 MHz:</b>	<b>4 GHz:</b>
	-48 to +24 dBm $\pm 0.05$ dB	-48 to +24 dBm $\pm 0.05$ dB	-74 to +20 dBm $\pm 0.5$ dB
	-74 to -48 dBm $\pm 0.2$ dB	-74 to -48 dBm $\pm 0.2$ dB	-84 to -74 dBm $\pm 1.0$ dB
	-94 to -74 dBm $\pm 0.5$ dB	-94 to -74 dBm $\pm 0.5$ dB	
	-130 to -94 dBm $\pm 0.2$ dB	-130 to -94 dBm $\pm 0.2$ dB	
<b>Attenuation accuracy into 50 <math>\Omega</math></b>	10 MHz to 128 MHz, relative to +16 dBm output: 0 to 33 dB $\pm 0.035$ dB, 33 to 64 dB $\pm 0.04$ dB, 64 to 100 dB $\pm 0.1$ dB		
<b>Output impedance</b>	50 $\Omega$ with precision N-series male connector (Optional 75 $\Omega$ leveling head available)		
<b>VSWR</b>	$\leq 500$ MHz: $\leq 1.1$ , $\leq 1$ GHz: 1.2, $\leq 3$ GHz: 1.3, $\leq 4$ GHz: 1.3 (50 $\Omega$ output)		
<b>Spectral purity</b>	Harmonics $\leq -60$ dBc. Spurious $\leq -75$ dBc, >3 kHz offset.		
<b>Phase noise at 1 GHz (typical)</b>	<b>9640A:</b> 10 kHz offset -118 (-122) dBc/Hz, 1 MHz offset -124 (-130) dBc/Hz <b>9640A-LPN:</b> 10 kHz offset -134 (-138) dBc/Hz, 1 MHz offset -148 (-152) dBc/Hz		
<b>Internal modulation</b>	<b>Amplitude modulation:</b> Sinusoidal and triangular waveform 0.1 % to 99 % depth 1 Hz to 220 kHz rate	<b>Frequency/phase modulation:</b> Sinusoidal only 10 Hz to 750 kHz deviation ( $\leq 1000$ rad) 1 Hz to 300 kHz rate	
	Available rate and depth/deviation settings are limited at some carrier frequencies.		
<b>Temperature</b>	<b>Operating:</b> 0 °C to 50 °C, 23 °C $\pm 5$ °C for specified performance <b>Storage:</b> -20 °C to +70 °C		
<b>Calibration report</b>	Detailed calibration report that states actual performance to specification. You can see actual performance data for your source, giving you much better uncertainties than if you relied on the guaranteed specification alone.		
<b>Calibration interval</b>	All specifications apply to a 1 year calibration interval at a nominal calibration temperature of 23 °C.		
<b>Standard interfaces</b>	IEEE-488.2 (GPIB)		
<b>GPIB command emulation</b>	<b>9640A, 9640A-LPN:</b> HP 3335A* <b>9640A-LPN + Opt 8662/8663 GPIB:</b> HP 3335A, HP 8662A, HP 8663A*		
<b>Dimensions (WxHxD)</b>	433 mm x 381 mm x 559 mm (17 in x 15 in x 22 in). Industry-standard 483 mm (19 in) rack mounting when fitted with Y9600 rack mounting kit.		
<b>Weight</b>	18 kg (40 lb)		

**\*Notes:** Fluke has extensively tested the command and functional emulation of the legacy HP 3335A and HP 8662A/8663A and will support customers in resolving any unforeseen difficulty. However, Fluke does not guarantee that complete emulation will be possible for all systems, software and procedures encountered.

The 9640A cannot emulate the HP 3335A and the HP 8662A/8663A simultaneously on the GPIB interface. However, testing has shown that many procedures and software can run successfully by manually switching the 9640A emulation personality at the signal generator lead change points.

## Ordering information

### Models

9640A-STD	4 GHz RF Reference Source including 50 Ω leveling head and HP 3335A GPIB command emulation
9640A-STD/75	4 GHz RF Reference Source including 50 Ω and 75 Ω leveling head and HP 3335A GPIB command emulation
9640A-LPN	4 GHz RF Reference Source with low phase noise, including 50 Ω leveling head and HP 3335A GPIB command emulation
9640A-LPN/75	4 GHz RF Reference Source with low phase noise, including 50 Ω and 75 Ω leveling heads and HP 3335A GPIB command emulation

### Option

8662/8663 GPIB	9640A-LPN HP 8662A/8663A Emulation (not available for 9640A-STD)
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### Accessories

9600CASE	Rugged Transit Case
Y9600	Rack Mount Kit (Slides)
96XXCONN	Adaptor/Torque kit

### Software

MET/BASE-7	Calibration Software Database System
MET/BASE-7J	Japanese version of MET/BASE
MET/CAL-L	License disk for MET/CAL
MET/CAL-LU	License disk upgrade
MET/TRACK-L	License disk for MET/TRACK
MET/TRACK-LU	License disk upgrade

### Upgrades and support plans

9640A-STD->9640A-STD/75	Upgrade 9640A-STD to 9640A-STD/75
9640A-LPN->9640A-LPN/75	Upgrade 9640A-LPN to 9640A-LPN/75
GCP9640-STD*	One-year Gold CarePlan with annual standard calibration.
GCP9640-ACR*	One-year Gold CarePlan with annual accredited calibration.
8662/8663 GPIB	License Key to enable HP 8662A/8663A GPIB Command Emulation. Only available for 9640A-LPN.
9640A-STD->9640A-LPN	Upgrade 9640A-STD to 9640A-LPN

\*Gold CarePlans are available for one, three and five years. Contact your local Fluke sales office for information.



Adaptors and torque wrench kit as supplied with 96XXCONN



### Visit Fluke online for more information

Go to [www.fluke.com](http://www.fluke.com) for detailed 9640A product and application information, including links to these publications:

- *A Guide to Calibrating Your Spectrum Analyzer*
- *Signal Sources Required for Spectrum Analyzer Calibration*
- Detailed product specifications
- List of current MET/CAL procedures
- 9640A users manual and verification procedures

## How the 9640A can solve your RF calibration problems

What problem are you trying to solve?	9640A and 9640A-LPN benefits
Replace a failed, obsolete and expensive-to-maintain signal generator or attenuator in your existing RF cal system	<p><b>Manual system</b></p> <ul style="list-style-type: none"> <li>• Calibration user interface</li> <li>• Reduced lead changes</li> <li>• Simpler test setup and operation</li> <li>• Reduced errors</li> <li>• Reduced skill set requirement</li> </ul> <p><b>Automated system</b></p> <ul style="list-style-type: none"> <li>• Automate with MET/CAL software, using flexible standards feature</li> <li>• <sup>Sure</sup>CAL users: replace multiple generators; use existing procedures with 9640 driver</li> <li>• Procedures replace and expand existing automation capabilities</li> <li>• GPIB emulation for same day integration to existing system and software</li> <li>• Reduced lead changes</li> <li>• Simpler test setup and operation</li> </ul> <p><b>General advantages</b></p> <ul style="list-style-type: none"> <li>• Reduced obsolescence</li> <li>• Improved reliability</li> <li>• Lower maintenance cost</li> <li>• Certified traceable uncertainties at UUT input</li> <li>• Switch system impedance by simply changing 9640A leveling head</li> <li>• Cost effective to replace only the LF generators and ancillary components</li> </ul>
Gain capability for on-site calibration (current station is too bulky, fragile or environmentally sensitive to work)	<ul style="list-style-type: none"> <li>• Fewer pieces of equipment—more portable system</li> </ul>
Extending an existing or assembling a new RF system, probably out to 26 GHz or 50 GHz	<ul style="list-style-type: none"> <li>• Simplified solution requires fewer pieces of equipment</li> <li>• Full automation</li> <li>• You will need a high frequency system generator to partner with the 9640A</li> </ul>
Automate your system (current system is high skill manual process)	<ul style="list-style-type: none"> <li>• Simplify automation with MET/CAL software</li> </ul>
Automate your system (current system is automated but it's fragmented, partial or limited to certain workload items)	<ul style="list-style-type: none"> <li>• Large and growing procedure library</li> <li>• Custom procedure development available</li> </ul>

**Fluke.** *Keeping your world up and running.*®

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