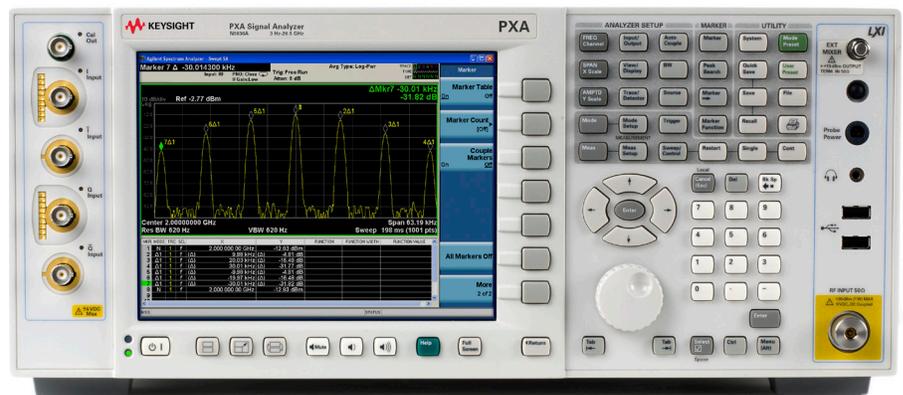


# Keysight Technologies

## Why Migrate from the PSA to the Keysight Technologies PXA?

### Technical Overview



- More Performance:  
create the highest performance designs
- More Capability:  
gain the most insight into your devices
- More Flexibility:  
obtain the best possible test system longevity
- More Compatibility:  
achieve seamless migration and reduce transition risks

## Reasons to Migrate to the PXA

### More Performance:

- Greatest sensitivity with -172 dBm/Hz DANL at 2 GHz
- Improved TOI (+21 dBm) and 3rd order dynamic range (115 dB) at 2 GHz
- Improved close-in phase noise: -129 dBc/Hz at 10 kHz offset (1 GHz)

### More Capability:

- Supports over 25 measurement applications, covering cellular communication, wireless connectivity, digital video, and general purpose.
- Ability to run Keysight's 89600B vector signal analysis (VSA) software internally, as well as other Windows PC programs such as MATLAB for custom analyses of non-standard signals
- Substantial improvements in speed over the PSA, with measurement rates up to 70% faster or more
- Wider analysis bandwidths up to 160 MHz available internally with outstanding flatness and up to 75 dB SFDR

### More Flexibility:

- Enhanced usability features like Auto tune, 12 available markers, Peak table, limit lines and more
- More high speed connectivity options beyond classic GPIB and 10Base-T ethernet: USB 2.0 and GBit LAN for faster data I/O and convenient remote control
- Simpler security procedures via an easily-removable solid state drive for easy declassification
- Scalability for the future with seven internal expansion slots and an easily upgradable CPU module

### More Compatibility:

- Form- and fit-compatible with the PSA, with nearly identical dimensions and rear-panel analog/ auxiliary IF outputs
- Functionally compatible with excellent backwards code compatibility with the PSA and legacy Keysight analyzers.

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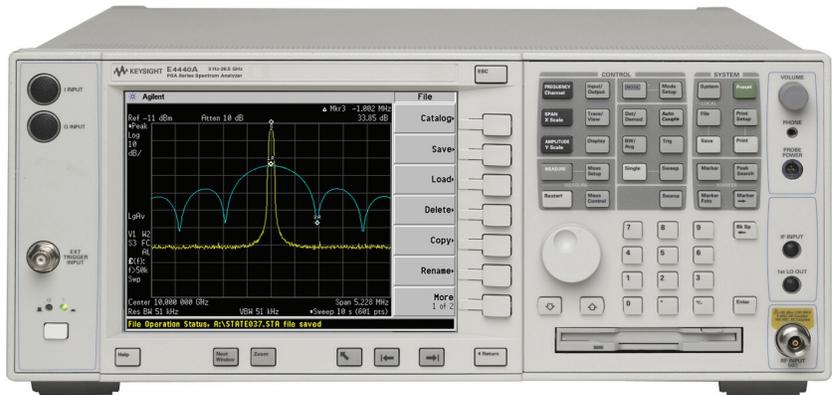
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The Keysight Technologies, Inc. future-ready PXA signal analyzer is the evolutionary replacement for your current high-performance analyzer. It helps you sustain past achievements, enhance current designs and accelerate future innovations.

# Overview: PSA and PXA

Making the transition to a new high-performance signal analysis instrument in R&D, manufacturing, or operations ATE requires careful consideration. This document provides an overview and comparison of the new Keysight N9030A PXA signal analyzer with the existing Keysight PSA Series high-performance spectrum analyzers (E4440A/43A/45A/46A/47A/48A).

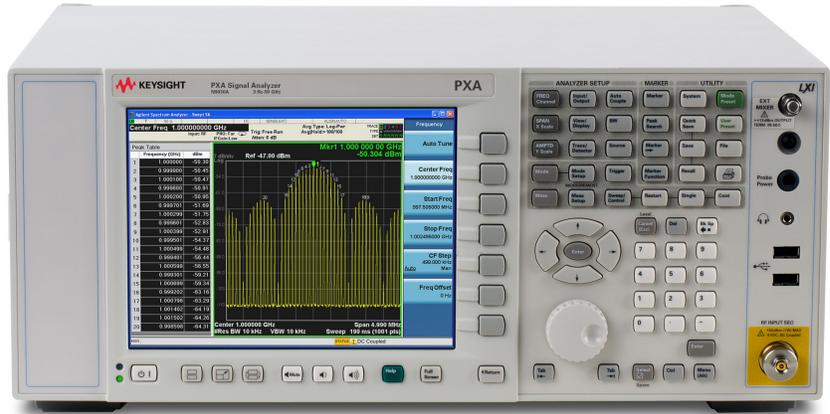
Since its introduction in 2000, the Keysight PSA spectrum analyzer has been continuously updated and enhanced, serving the aerospace/defense and communications industries in applications where the highest performance and wideband analysis capabilities are required.



*With frequency coverage to 50 GHz and beyond, and support for up to 80 MHz analysis BW internally or 300 MHz using external digitizers, the PSA will continue to provide excellent service for years to come.*

However, some new applications and technologies call for even more capability and performance in areas such as sensitivity, dynamic range, and analysis bandwidth. Also, many users prefer more powerful instrument connectivity interfaces such as USB 2.0 or Gigabit LAN, often coupled with a need for faster measurement throughput to handle more demanding test protocols.

If these aspects interest you, then now is the time for you to make the transition to the new PXA as your logical PSA replacement.



*As the highest performance flagship of Keysight's X-Series signal analyzers, the PXA is the ideal form, fit and functional replacement for the PSA. With models available up to 50 GHz (325 GHz and beyond with external mixing) and analysis bandwidths to 160 MHz, the PXA is the industry's highest performance signal analyzer, giving you more reasons to upgrade your test bench in R&D, manufacturing, or operations.*

General characteristics	PSA	PXA	Additional comments
RF input(s)	Precision Type N (female), for 6.7, 13.2, and 26.5 GHz Precision APC-3.5 mm (male), Opt BAB Precision 2.4 mm (male), for 42.98, 43, and 44 GHz	Precision Type N (female), for 3.6, 8.4, 13.6, and 26.5 GHz Precision APC-3.5 mm (male), Opt C35 Precision 2.4 mm (male), for 43, 44, and 50 GHz	Optional 3.5 mm RF input connector (available with 26.5 GHz analyzer only)
Display	640 x 480 (resolution)  S-VGA, 213 mm (8.4" diagonal) viewing area	1024 x 768 (resolution)  X-VGA, 213 mm (8.4" diagonal) viewing area	
Optional rear panel outputs	Y-axis video (Opt 124)  Aux log video output (Opt H7L)  IF Outputs : - 10 MHz (Opt HXX) - 21.4 MHz (Opt HB2) - 70 MHz (Opt H70) - 321.4 MHz (standard)	Y-axis video (Opt YAV)  Log video output (Opt ALV)  Aux IF output: - Programmable IF output (Opt CRP) 10 to 75 MHz, 500 kHz steps - 2nd IF output (Opt CR3)	(IF output frequency is programmable) (IF frequency 322.5 MHz Nominal, shifts depending on bandwidth options)
I/Q baseband inputs, analog	No	Yes (Opt BBA)	
CPU	150 MHz HP PA-RISC	Dual core high performance processor	
Operating system	Proprietary UNIX (closed)	Windows XP Pro (Open)	
Connectivity	GP-IB, device only (1) USB 2.0 Type B, (device only) 10Base-T ethernet	GP-IB, device or controller (6) USB 2.0, Type A (master) (1) USB 2.0, Type B (device) 1000Base-T ethernet	PXA is LXI compliant
On-board non-volatile storage memory	512 MB (Opt 115, ships standard unless Opt 117 is ordered)	80 GB removable solid state drive	Solid state drive is standard on PXA
Operating temperature range	0 to 55 °C	0 to 55 °C	
Measurement speed/throughput rating	★★★★	★★★★★★	
Dimensions (H x W x D)	177 mm x 426 mm x 483 mm (7.0" x 16.8" x 19.0")	177 mm x 426 mm x 532 mm (7.0" x 16.8" x 20.9")	
Height dimensions in rack units	1 full 4-U in 19 inch chassis	1 full 4-U in 19 inch chassis	Rack mount kit required
Weight	23 kg (50 lb.)	22 kg (48 lb.)	

# Maximize Signal Insight with the PXA

The Keysight PXA achieves breakthroughs in many areas, including industry-leading sensitivity and dynamic range. New Keysight innovations such as Noise Floor Extension (“NFE”-standard) allow for up to 12 dB greater sensitivity for low-level signal measurements.

A new RF front-end microcircuit design with a higher TOI point provides higher dynamic range for critical transmitter distortion measurements.

An optional Low Noise Path (Option LNP) allows some of the high insertion loss elements normally found in the RF input chain to be completely bypassed for highest sensitivity without

a preamplifier in the microwave bands above 3.6 GHz.

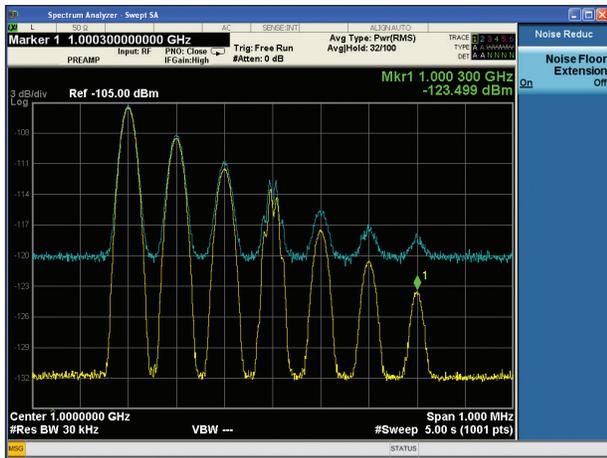
Plus, an improved LO tuning circuit design improves PXA’s close-in phase noise by over 10 dB relative to the PSA for optimum performance when required.

However, this improved performance is of limited use if one must first rewrite existing test software or manual test procedures and redesign test systems to take full advantage.

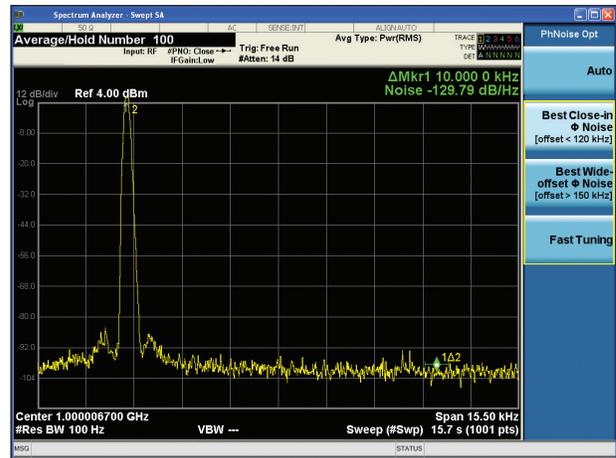
Keysight has made great efforts to address this issue by designing the PXA’s key physical attributes (form and fit) as well as its manual and

remote user interfaces (function) in a way that builds upon the foundation laid by the PSA.

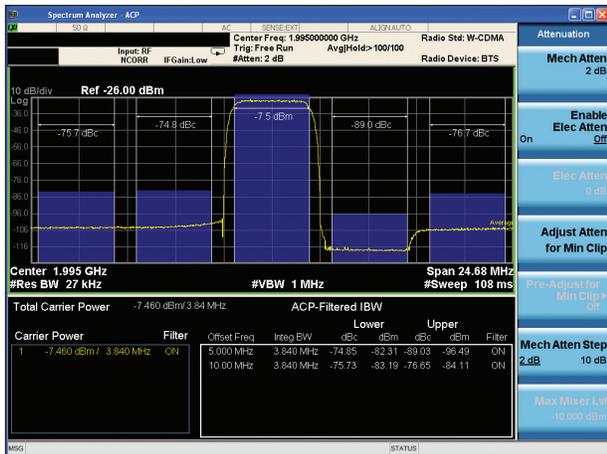
SCPI extensions and aliases are provided to support the new PXA features while retaining SCPI compatibility with the PSA. Thus, there is no need to rewrite existing test software or manual test procedures to take full advantage of the PXA’s outstanding performance.



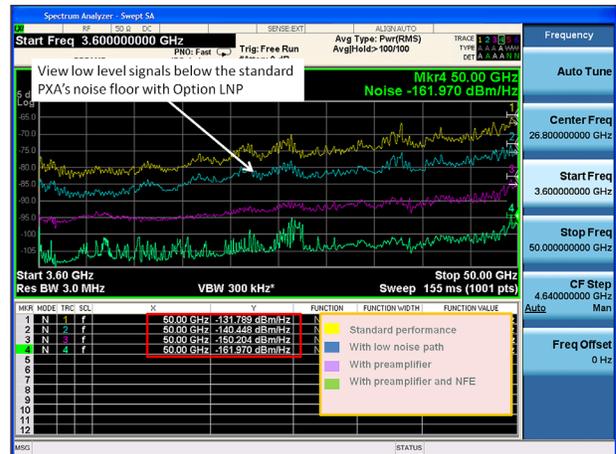
PXA’s Noise Floor Extension allows low-level signals to be observed and measured accurately



Narrow span measurement of a low phase noise 1 GHz source shows PXA’s excellent close-in noise sideband performance



Adjacent channel power measurement using high-side notch filter that shows the PXA’s outstanding dynamic range



PXA’s optional low noise path yields up to 10 dB improvement in noise floor above 3.6 GHz

# Why Upgrade to the PXA

## More performance to create the highest performance designs

Analyze signals over wider bandwidths, reduce measurement uncertainty and reveal previously hidden signals. The PXA's super-wide IF technology provides nearly twice the PSA's internal optional measurement bandwidth, an industry-leading 160 MHz, with up to 75 dB of spurious-free dynamic range.

- PXA matches PSA's breakthrough  $\pm 0.19$  dB 95% confidence level absolute power measurement accuracy
- PXA can look up to 12 dB deeper than PSA, with up to -172 dBm/Hz effective sensitivity (DANL, specified at 2 GHz using NFE, with optional RF preamp on)
- PXA's excellent TOI performance

coupled with its higher sensitivity surpasses PSA's available dynamic range, with -83 dBc W-CDMA ACPR measurements easily achievable and 115 dB of third order dynamic range available at 2 GHz

- PXA offers a > 10 dB improvement in close-in phase noise, relative to the PSA, to improve your test margin for this critical spec on many high-performance mission-critical communication transmitters

The PXA also supports Keysight's M1970V and M1970W waveguide harmonic mixers, providing exceptional performance up to 110 GHz. These smart mixers use a simple USB plug-and-play connection to automatically configure the PXA for the specific

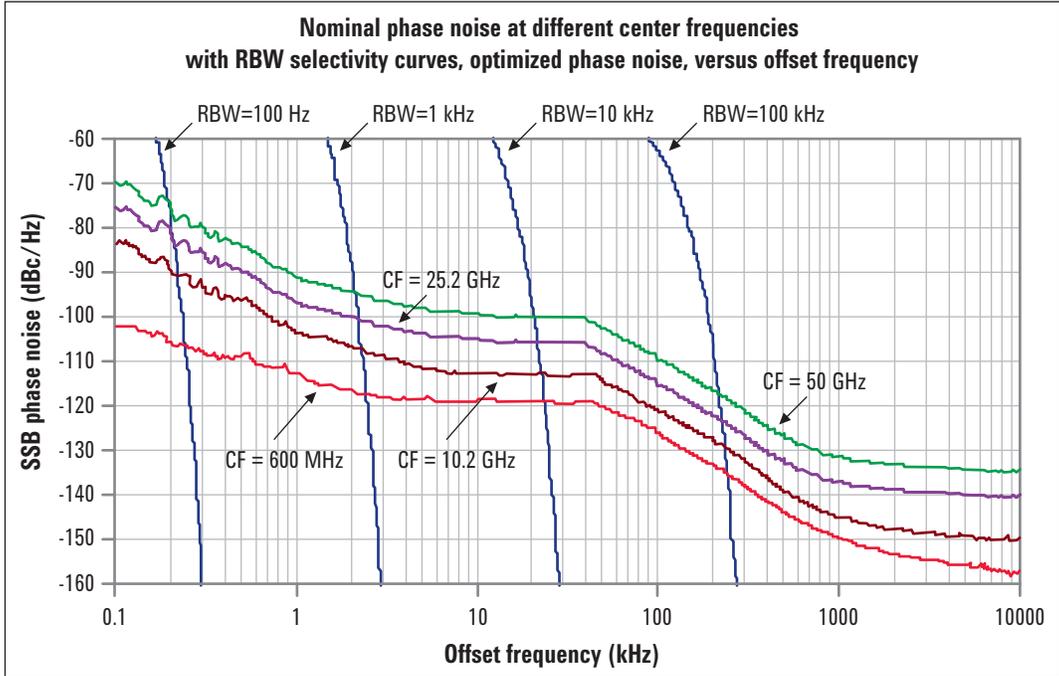
mixer connected, including downloading conversion loss data. They also automatically compensate for local oscillator path loss for different cable lengths.

- The PXA can act as a system controller, eliminating the need for an additional PC in your rack—one less PC needs to be declassified when transferring systems.
- Decrease test time and greatly improve test throughput with much-improved measurement and data transfer speeds—up to 70% faster than PSA.

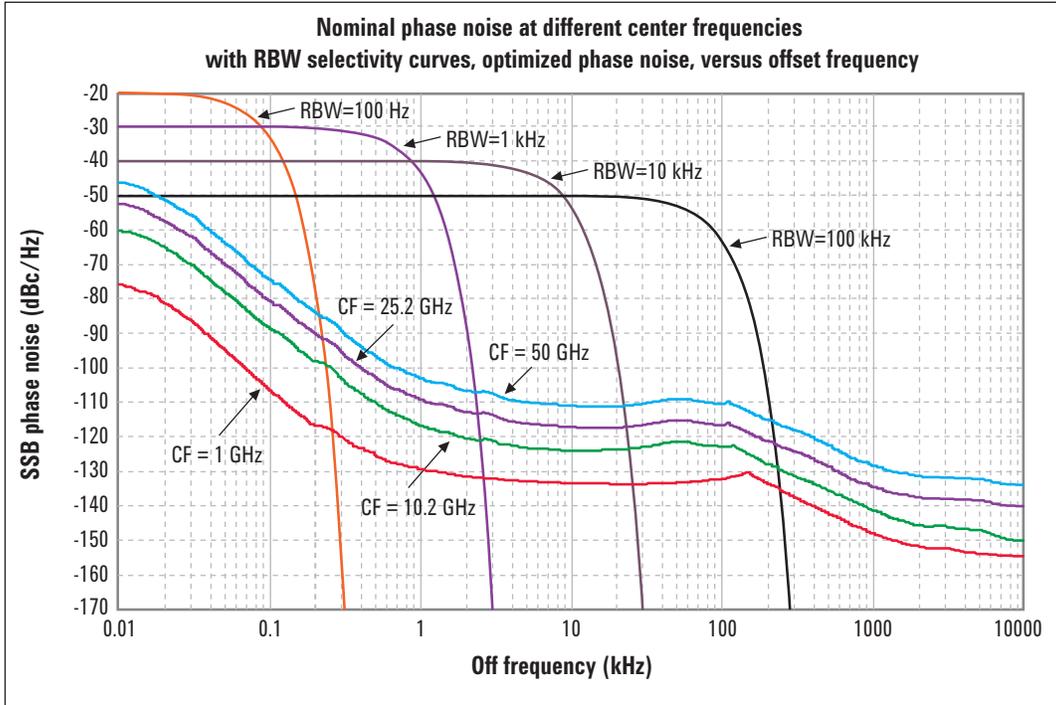
Table 1. PSA and PXA key specifications at a glance

RF performance		PSA		PXA		
Frequency range		3 Hz to 6.7 GHz		3 Hz to 3.6 GHz		
		3 Hz to 13.2 GHz		3 Hz to 8.4 GHz		
		3 Hz to 26.5 GHz		3 Hz to 13.6 GHz		
		3 Hz to 42.98 GHz		3 Hz to 26.5 GHz		
		3 Hz to 44 GHz		3 Hz to 43 GHz		
		3 Hz to 50 GHz		3 Hz to 44 GHz		
				3 Hz to 50 GHz		
TOI	2 GHz	+17 dBm		+21 dBm		
	10 GHz	+8 dBm		+15 dBm		
	50 GHz	+12.5 dBm (nom)		+13 dBm (nom)		
DANL		Preamp off	Preamp on	Preamp off NFE on	LNP	Preamp on NFE on
	2 GHz	-153 dBm	-166 dBm	-159 dBm	N/A	-172 dBm
	10 GHz	-150 dBm	-163 dBm	-157 dBm	-155 dBm	-170 dBm
	50 GHz	-127 dBm	-140 dBm	-136 dBm	-138 dBm	-153 dBm
Phase noise (at 1 GHz)	10 kHz offset	-116 dBc/Hz		-129 dBc/Hz		
	1 MHz offset	-145 dBc/Hz		-145 dBc/Hz		
Phase noise (at 50 GHz, nominal)	10 kHz offset	-100 dBc/Hz		-110 dBc/Hz		
	1 MHz offset	-130 dBc/Hz		-129 dBc/Hz		
Amplitude accuracy	Warranted	$\pm 0.62$ dB ( $\leq 3.0$ GHz)		$\pm 0.59$ dB (0.01 to 3.6 GHz)		
	95% confidence	$\pm 0.19$ dB ( $\leq 3.0$ GHz)		$\pm 0.19$ dB ( $\leq 3.6$ GHz)		
Maximum analysis bandwidth		80 MHz (Opt 122)		160 MHz (Opt B1X)		
IF frequency response over max BW		$\pm 0.30$ dB (typical)		$\pm 0.25$ dB (typical)		
W-CDMA ACPR	Normal	-75 dBc		-80 dBc		
	User noise cal	-81 dBc		-83 dBc		
3rd order dynamic range	2 GHz	113 dB		115 dB		
	10 GHz	105 dB		109 dB		

1. Typically  $\pm 0.75$  dB for analysis bandwidth up to 140 MHz



*PSA nominal phase noise performance at different center frequencies, starting from 100 Hz offset*



*PXA nominal phase noise performance at different center frequencies, starting from 10 Hz offset*

## Building on the speed of the X-Series signal analyzers

The PXA's tremendous on-board processing power and new data interfaces yield great speed improvements over the PSA. Switching modes between out of band swept-tuned measurements and in-channel modulation analysis are radically faster, by a factor of 10 over the PSA in some cases! Marker peak search is over 20 times faster for improved spur searching. Typically, the PXA will offer up to 70% faster throughput and more over the PSA in many use cases for greater efficiency.

*Table 2. PSA and PXA measurement speed comparisons*

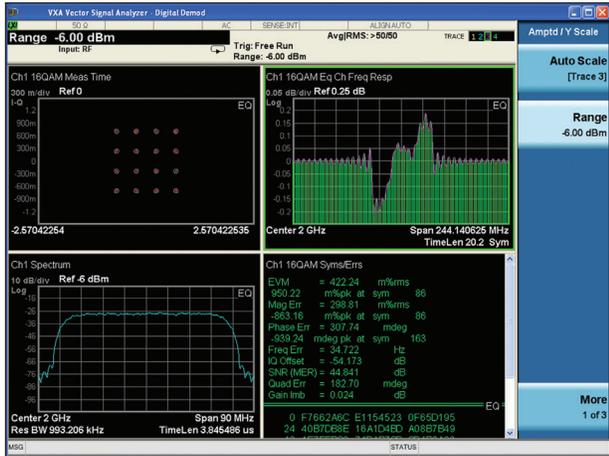
Measurement throughput	PSA (msec)	PXA (msec)	Speed improvement
Instrument preset	168	28	6X
Marker peak search	78	2.5	31X
Local update	17	10	1.7X
Data transfer (501 pts)	15	5	3X
Data transfer (10001 pts)	217	30	7X
CF tune and transfer (4-5 GHz)	209	69	3X
Remote sweep and trace transfer	30	10	3X
Measurement/ mode switch	~1000	40	25X

## More capability to gain the most insight into your devices

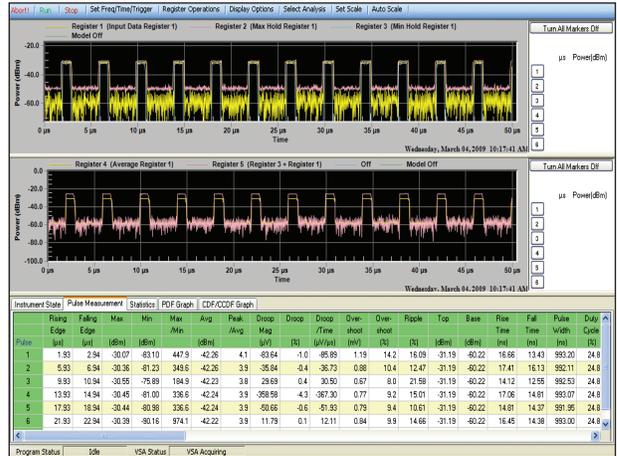
The PXA offers as standard the main PSA applications such as the basic spectrum analyzer mode for general-purpose spectrum analysis, I/Q Analyzer (e.g. PSA's optional "Basic Mode") for demodulation measurements, and Power Suite for convenient "1-button press" standards-based power measurements of signals found in the most common radio formats used in modern cellular communications. The PSA's most popular measurement personalities such as phase noise and noise figure have been enhanced and are available on the PXA.

The PXA's optional measurement applications are fully "transportable" to other PXA analyzers, as well as the MXA and EXA X-Series signal analyzers. Additionally, a 14-day free trial licensing is also available for the PXA application software. The industry-leading 89600B VSA software running internally in the PXA, or externally on a PC, is fully supported with the PXA at introduction, as well as the N9064A for digital modulation analysis of non-standard or proprietary signals when hardkey/softkey and SCPI programming are desired.

Pulse analysis is supported using Keysight's N9051A pulse measurement software. Additionally, 3rd party PC software such as MATLAB can be operated directly in the PXA for customized data analysis.



The N9064A vector signal analyzer measurement application enables flexible digital modulation analysis using a traditional front panel interface and SCPI remote programming



Pulse analysis using N9051A pulse measurement software

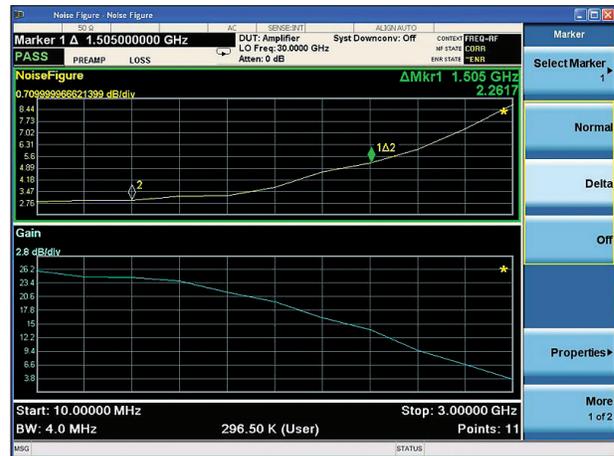
- PXA provides more than 25 powerful standard and optional measurement applications: general purpose spectrum analysis measurements and PowerSuite are standard, just like PSA. I/Q analyzer mode is also included standard (optional on PSA).
- PXA can run Keysight's industry-leading 89600B VSA software internally for analysis of all major cellular and wireless networking standards, as well as many non-standard or specialized modulation types.
- For digital modulation analysis where a more traditional hardkey/softkey manual interface or SCPI remote programming interface is needed, the N9064A signal analyzer measurement application is available.
- Pulse analysis can be performed with the N9051A pulse measurement software. And for more custom analyses, you can run MATLAB directly inside the PXA.

Table 3. Key measurement applications comparison

Applications/software	PSA	PXA
General spectrum analysis	Standard	Standard
PowerSuite	Standard	Standard
I/Q analyzer	Optional (Opt B7J, 140, or 122)	Standard
Phase noise	Optional (Opt 226)	Optional (N9068A)
Noise figure	Optional (Opt 219)	Optional (N9069A)
89600B VSA software	External PC operation	Runs internally or on external PC
Flexible digital demodulation	Optional (Opt 241)	N9064A (Opt 1FP/2FP)
Analog demodulation	N/A	Optional (N9063A)
Pulse analysis	External PC operation with N9051A pulse measurement software (Opt B7J, 140 or 122 required)	N9051A pulse measurement software
Custom analysis using MATLAB	External PC operation (Opt B7J, 140 or 122 required)	Internal or external PC operation



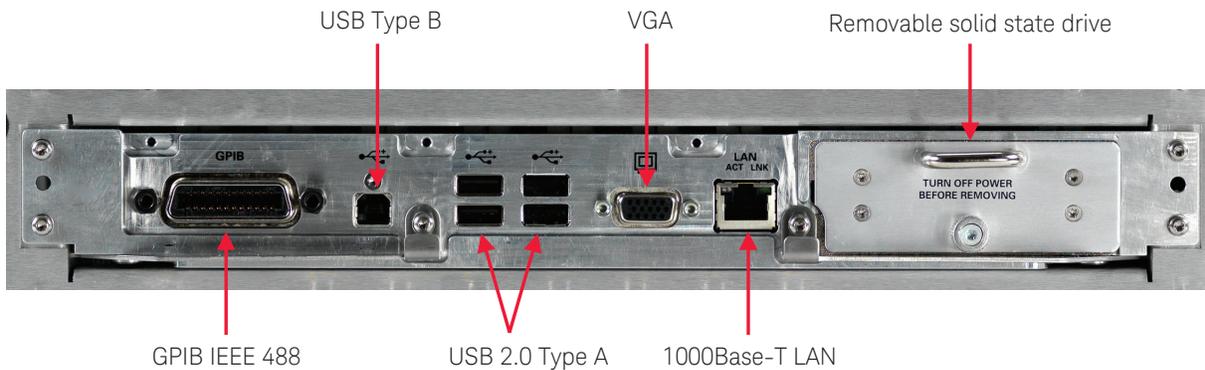
PXA phase noise measurement application



PXA noise figure measurement application

## More flexibility to obtain the best possible test system longevity

For an investment of this magnitude, obtaining a long and reliable instrument lifespan with an easy method of upgrading to new technologies as they become available is vitally important. The PXA offers great scalability and longevity with upgradable measurement hardware, such as a user-upgradable CPU module, a removable solid state drive and electronically-licensed measurement application software that can be transported across multiple instruments (not available on PSA). Additionally, PXA's seven internal expansion slots (versus only three on PSA) allow ample room for future growth.



*PXA rear panel close-up view shows modern connectivity, faster I/O, removable solid state drive and the potential for future technology adoption via an easily removable, upgradable CPU module*

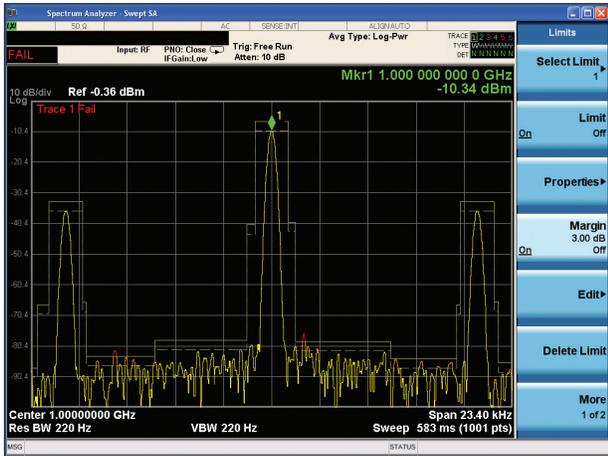
## Increased bandwidth, flexible choices

The PXA offers optional internal analysis bandwidths of 25 MHz, 40 MHz and 160 MHz (10 MHz standard). The 160 MHz analysis bandwidth is achieved utilizing a 14-bit, 400 Msps ADC coupled with Keysight-proprietary ASIC technology for real-time I/Q corrections and further processing, resulting in outstanding flatness and spurious-free dynamic range for the best possible wideband measurements. For applications where even more bandwidth is required, the PXA offers an optional auxiliary IF output with a bandwidth of over 160 MHz (up to 900 MHz above 3.6 GHz with preselector bypassed). The PXA also offers analog baseband I/Q inputs with up to 40 MHz baseband bandwidth and 500 Msa (2 GB) deep capture memory standard.

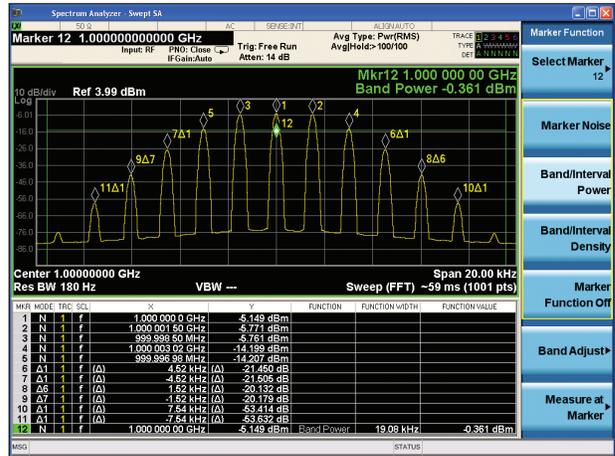
## Enhanced usability

The PXA offers all of the popular X-Series analyzer UI features such as 12 Markers with flexible modes and references, Peak Table for convenient tabular display of peaks, Marker Table for full marker readouts, advanced Trace Math, and Delta Band-Power Markers. These features allow easy characterization of complex modulated or multitone signals. Auto Tune improves user efficiency by rapidly optimizing the analyzer's frequency, span and amplitude level for on-screen viewing and measurement of signals. User-definable limit lines and amplitude corrections are available, and PowerSuite has been enhanced with 1-button measurements for TOI and harmonics.

Detailed built-in context-sensitive help information including the SCPI command syntax for a specific function key is available at the touch of the Help button... so you can rapidly construct your ATE code per the manual hardkey/softkey keystroke sequence.



The PXA's limit lines show where the signal exceeds prescribed limits including an allowance margin



The PXA provides up to 12 arbitrary delta markers that are fully configurable relative to each other or across different traces

## Modern connectivity

For connectivity to external controllers, PXA offers a variety of high-speed interfaces such as 7 USB 2.0 ports, and GigaBit (1000 Base-T) ethernet LAN in addition to classic GPIB.

## Convenient security

Convenient instrument sanitization procedures are enabled with an easily removable solid state drive for fast swapping with non-classified solid state drives when needed.

## Scalability for future growth

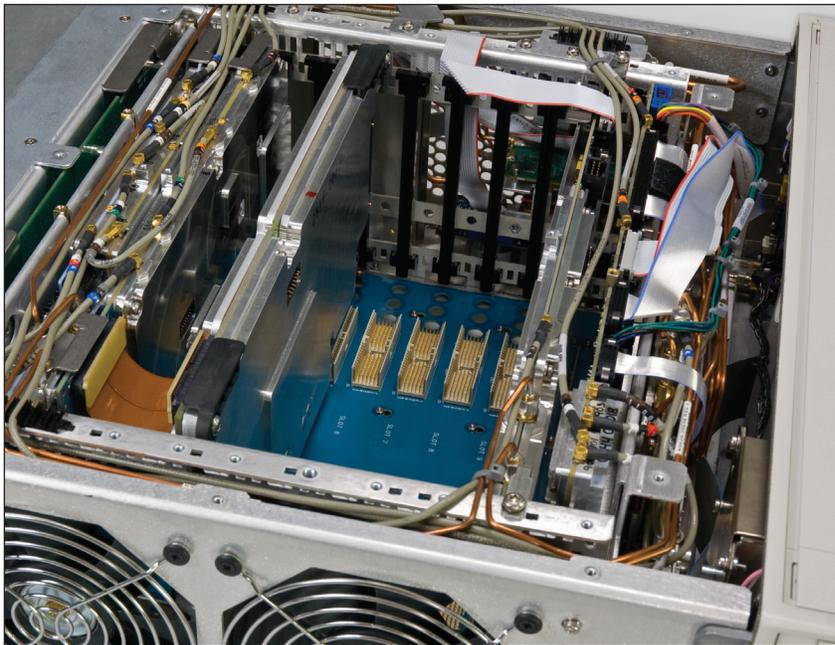
With ample internal room for expansion and a field-upgradable CPU module, the Keysight PXA signal analyzer is your best long-term investment to extend your high performance R&D bench or mission-critical automated test system far into the future.



*Easily removable solid state drive*



*Field-upgradable CPU module*



*Seven internal expansion slots for future growth*

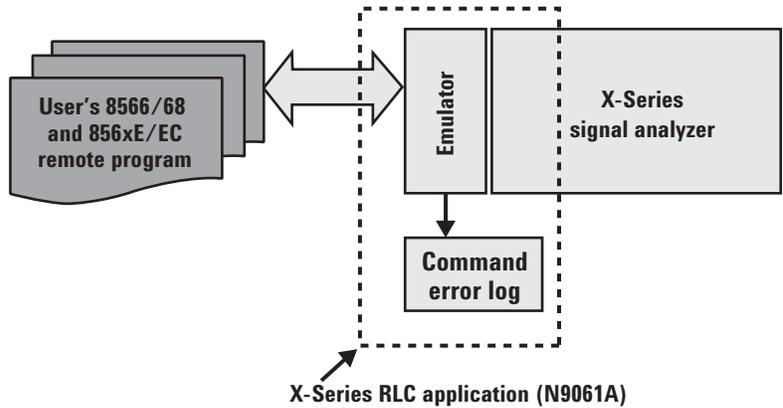
- PXA is a Windows PC-based signal analyzer offering modern connectivity such as Gigabit LAN and USB 2.0 in addition to classic GPIB. Convenient data and screen captures as well as firmware upgrades are accomplished via front- or rear-panel USB ports using portable memory devices.
- Optional measurement personalities such as the Phase Noise and Noise Figure measurement applications are electronically licensed so that they can easily be added when needed, or transported across multiple instruments. These capabilities are not available on PSA.

Table 4. PSA and PXA summary of key attributes

Features comparison	PSA	PXA
Instrument connectivity	GPIB, 10Base-T, (1) USB 2.0 Type B (device)	GPIB, 1000Base-T, (6) USB 2.0 Type A (1) USB 2.0 Type B
Instrument security	Opt 117 or HS1/HE1 special options required	No special options required
USB Power sensor support	No	Yes
SNS Noise source support	No	Yes
Firmware updates	Via external PC operation	Via fast USB 2.0 devices
Upgradability	3 internal expansion slots	7 internal expansion slots, upgradable CPU module, removable solid state drive
Transportable licensing of measurement applications	No	Yes
Trial licensing (14 days) of measurement applications	No	Yes

More compatibility to achieve seamless migration and reduce transition risks

The PXA uses the same SCPI command language and command set as originally developed for the PSA, so you can use your existing test software. The PXA also provides SCPI command alias capability to recognize and mimic PSA’s remote command responses in many cases. Additionally, the PXA also leverages and extends the PSA’s remote language compatibility option using the N9061A Remote Language Compatibility application for compatibility with the 856xEC (Option N9061A-2FP) and 8566/68 analyzers (Option N9061A-1FP) (both options are free of charge when purchased with the new PXA).



N9061A Remote Language Compatibility application for legacy GPIB command compatibility with HP 8566/68 and 856xE/EC spectrum analyzers

## PXA analog and auxiliary IF outputs

### For analog monitoring of signal envelopes:

- Optional Y-axis video output with screen video, linear, or log video output capability (Option YAV)

### For narrowband applications:

- Optional user-programmable IF output to closely approximate the PSA's optional 21.4 MHz and optional 70 MHz IF outputs is programmable in frequency from 10 to 75 MHz, in 500 kHz increments (Option CRP)

### For wideband applications:

- Optional fast rise time log video output for custom applications where wideband external envelope and video detection is desired (Option ALV)
- Optional second IF output with a nominal bandwidth > 160 MHz where external wideband complex demodulation is needed (Option CR3)

- If you are considering updating your legacy high-performance analyzer with a PXA, the PXA is the exact same rack height (4RU) and width as the PSA for easy placement in your existing test system rack. Approximately 5 cm (2 in.) additional depth is required relative to the PSA. Weight is approximately the same as the PSA at 23 kg (~50 lbs.).
- The PXA offers several analog and auxiliary IF output options that mimic the key optional Y-axis analog and IF output capabilities sometimes used on the PSA and earlier legacy analyzers. (see sidebar)
- Many of the measurement algorithms employed by the PXA are derived from those originally developed for the PSA, which allows for maximum backwards compatibility and measurement consistency between these instruments.
- In cases where additional PSA emulation is required, Keysight can provide specialized software utilities and tools, along with support through our local Applications Engineering Services to make the PXA function within your existing test software without changes to your own test code.

## Did you know?

Keysight's Instrument Migration and Planning Services (IMPS) process can help you remove barriers for migrating your outdated test equipment to Keysight's modern instruments. The IMPS team analyzes the customer's inventory of Keysight equipment, generates a report that summarizes production status of every model number and provides specific dates for discontinuance, obsolescence and end of support life.

Keysight also offers three follow-on services:

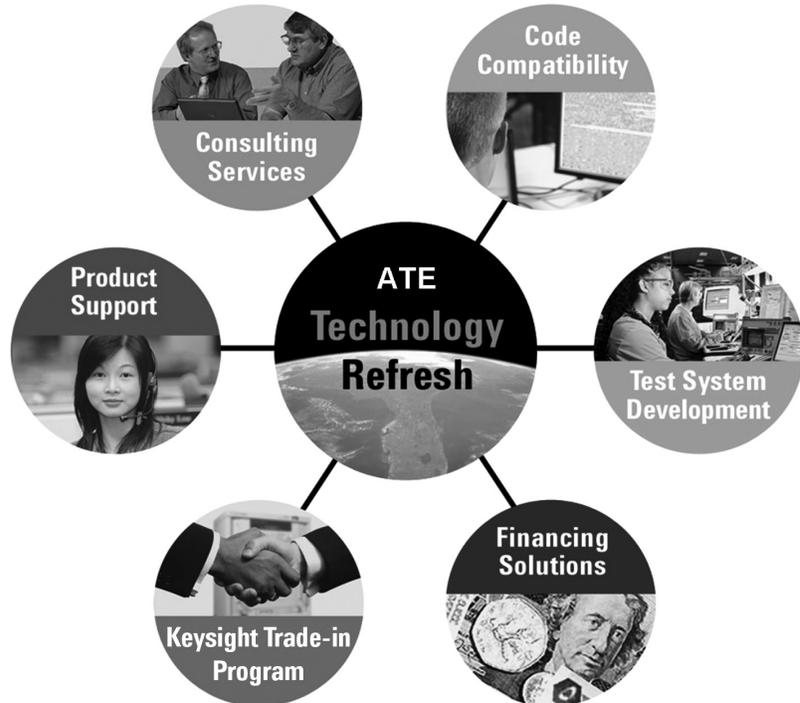
- Test equipment replacement engineering support
- Integrated system modernization service
- Cost of ownership analysis

For more information about Keysight's IMPS programs, please visit:

[www.keysight.com/find/techrefresh](http://www.keysight.com/find/techrefresh)

## Instrument Migration Planning Services

Keysight also offers Instrument Migration Planning Services (IMPS) to help you implement Technology Refresh programs, and can help you to identify and optimize your migration from legacy or obsolete test equipment to the latest technology. Contact your Keysight Sales Representative for more information.



## Web Resources

For more information, visit Keysight's website:

PXA signal analyzer:  
[www.keysight.com/find/pxa](http://www.keysight.com/find/pxa)

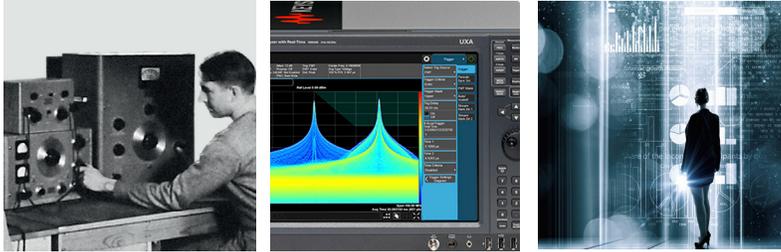
PXA migration:  
[www.keysight.com/find/psa2pxa](http://www.keysight.com/find/psa2pxa)

Waveguide harmonic mixers:  
[www.keysight.com/find/smartmixers](http://www.keysight.com/find/smartmixers)

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