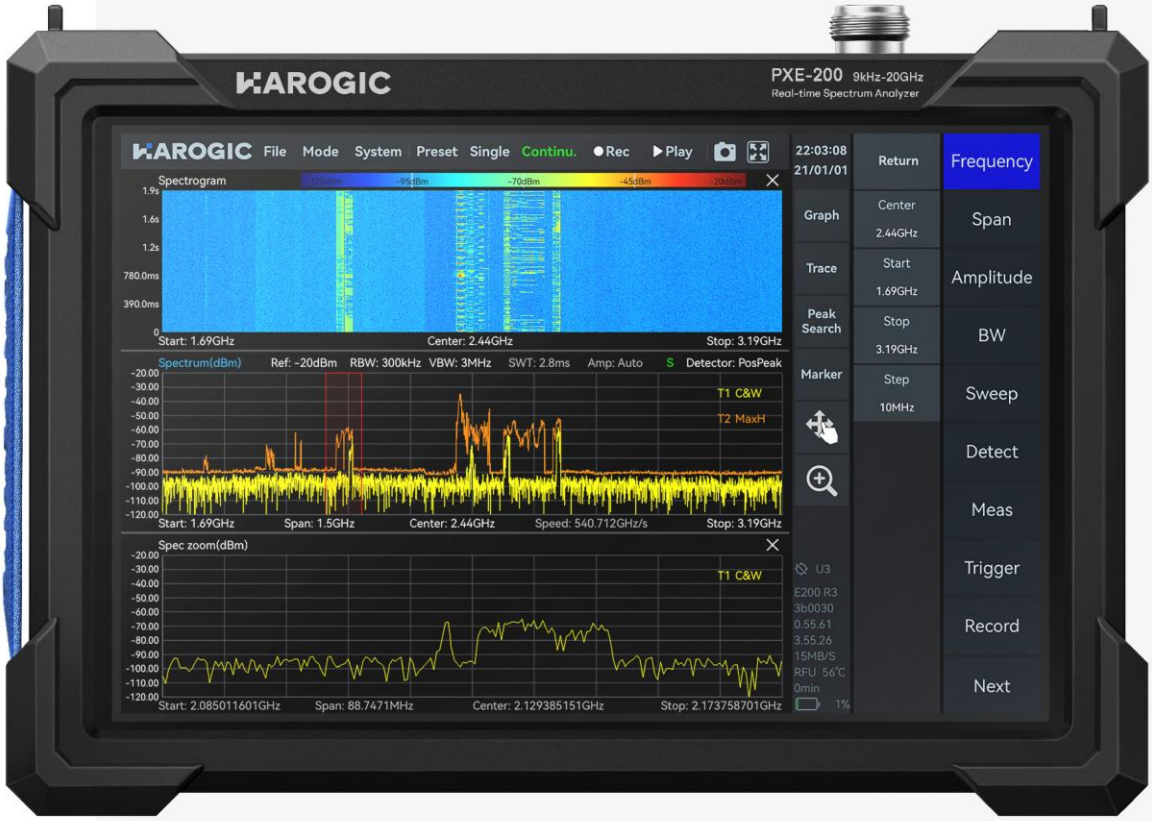
PX SERIES
PRODUCT MANUAL



HANDHELD REAL-TIME SPECTRUM ANALYZER

PX Series
9.5/20/40 GHz

V1.7
2025/11/05

PX Series Overview

OLID RF PERFORMANCE: PX series offers frequency ranges from 9 kHz up to 9.5/20/40 GHz and standard analysis bandwidth of 100 MHz. Based on fast FFT design, it also achieves a sweep speed up to 1 THz/s.

EASE OPERATION: The instrument is equipped with a 10.1-inch full touch screen with an intuitive user interface, which allows smartphone-like touch gestures. It weighs only around 1.5 kg for easy carry and operation in labs or fields.

RICH MEASUREMENT FUNCTIONS: PX series comes standard with a variety of advanced measurement functions, including channel power, OBW, XdB, harmonic measurement, SEM, AM/FM demodulation, and automatic phase noise analysis.

HIGHLY COMPATIBLE API INTERFACES: PX series supports mainstream programming languages including C/C++, C#, Python, MATLAB, Qt, and LabVIEW, allowing easy secondary development and seamless integration into versatile applications.

Key Features

- Ultra portable, flexible performance
- Standard 3-hour battery life with external power expansion support
- Portable design: 1.5kg with a 10.1-inch multi-touch screen
- Frequency range: 9 kHz to 9.5/20/40 GHz
- Analysis bandwidth: 100 MHz
- 1 GHz DANL: < -160 dBm/Hz
- 1 GHz Phase Noise: <-100 dBc/Hz@10 kHz
- Standard SCPI protocol support

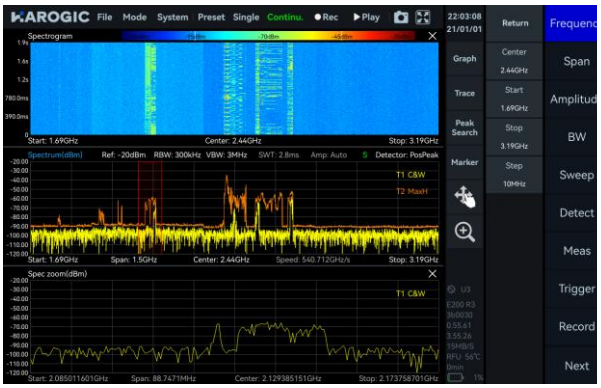
Main Operating Modes Overview

Offer seven main operating modes including: Standard Spectrum Analysis mode, IQ Streaming mode, Power Detection Analysis mode, Real-time Spectrum Analysis mode, Phase Noise Measurement mode, Digital Demodulation mode (option), and Harmonics Analysis mode.

SAStudio4 Main Operating Modes Description

■ Standard Spectrum Analysis Mode

This mode provides a wide range of measurement functions, including full-span spectrum sweep, channel power, OBW, ACPR, IM3 and SEM. It also supports spectrum recording and playback. Combined with auxiliary tools such as signal tracking, peak table, and amplitude correction, it delivers a one-stop platform for comprehensive spectrum check.



■ IQ Streaming Mode

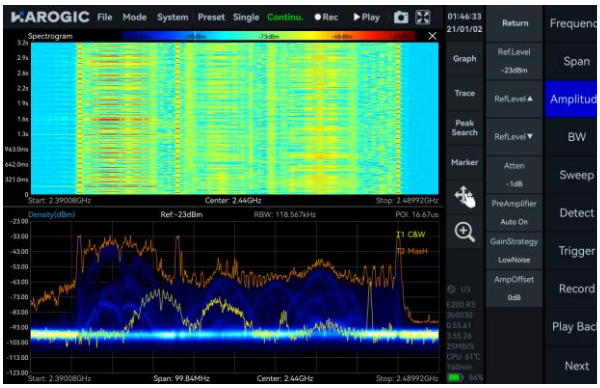
This mode supports up to 100 MHz analysis bandwidth and allows IQ data acquisition through multiple trigger methods. It provides IQ time-domain waveform display, spectrum and spectrogram views, AM/FM demodulation, and digital down conversion (DDC).

■ Power Detection Analysis Mode

This mode enables detection and analysis of time-domain signals within the analysis bandwidth, making it suitable for applications focused on in-band power-versus-time relationships, such as pulse signal measurements.

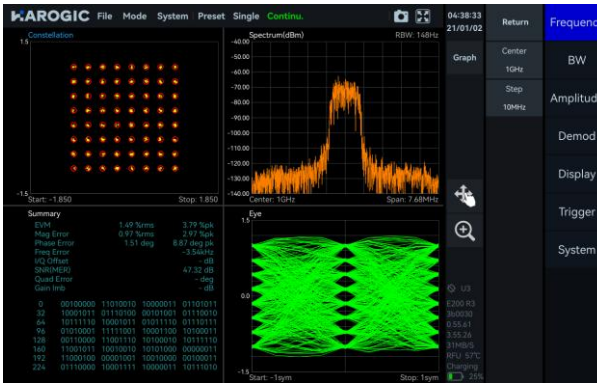
Real-time Spectrum Analysis Mode

This mode is powered by a high-speed FPGA-based FFT engine, featuring with strictly gapless and overlap-free FFT, achieving true real-time monitoring across the full bandwidth.



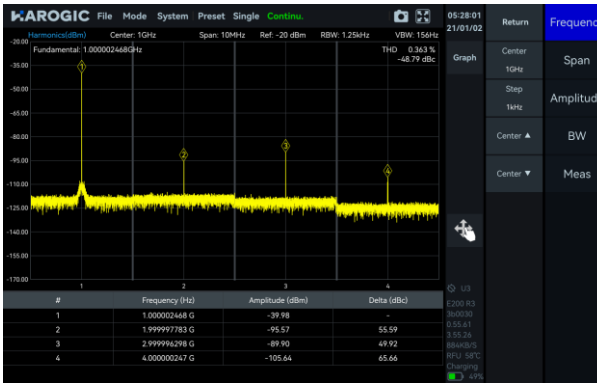
Digital Demodulation Mode (option)

This mode supports 2ASK, 2FSK, 4FSK, GMSK, BPSK, QPSK, 8PSK, 16QAM, 64QAM, 128QAM, and 256QAM signals.



Harmonics Analysis Mode

This mode supports detection and measurement of up to 10 harmonic components, including harmonic peaks, harmonic channel power, and total harmonic distortion.



Phase Noise Measurement Mode

This mode supports offset ranges from 1 Hz to 10 MHz for evaluating carrier phase stability. With the built-in automatic carrier search function, the software can quickly locate the target carrier without manual adjustment.

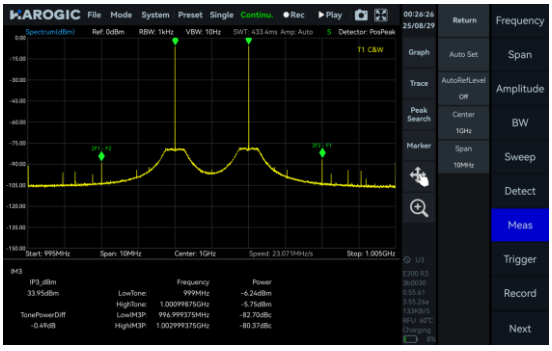
Main Functions Overview

Channel Power

OBW

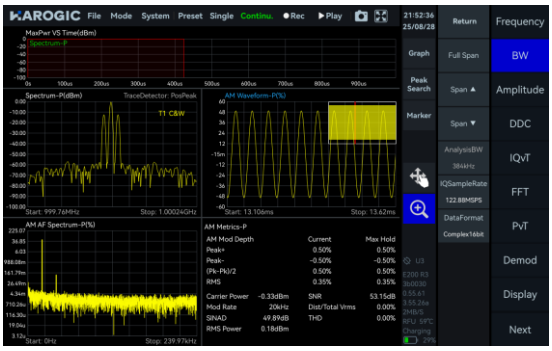
ACPR

IM3

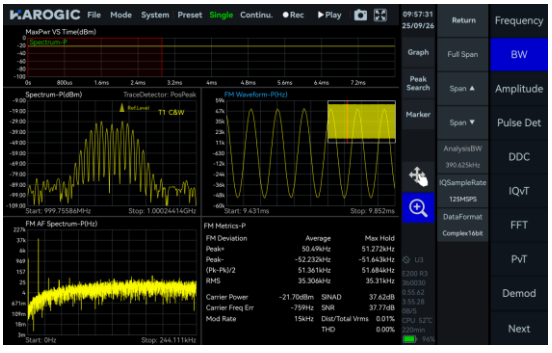


SEM

AM Demodulation



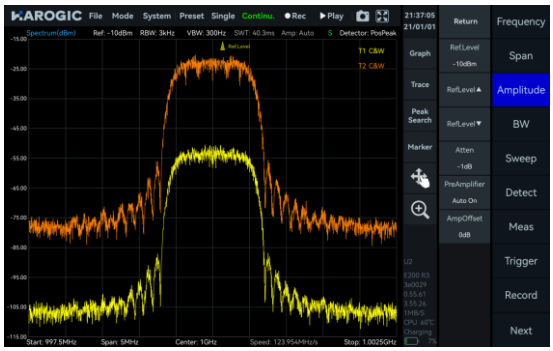
FM Demodulation



Pulse Detection (option)

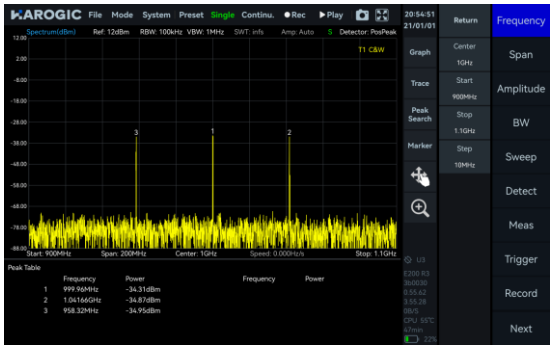
Antenna Factor

Amplitude Offset



Signal Track

Peak Table



Data Record and Playback

Multiple Unit Display

Specifications*

FREQUENCY

	PXE-90	PXE-200	PXN-400
Frequency range	9 kHz to 9.5 GHz	9 kHz to 20 GHz	9 kHz to 40 GHz
Reference clock	Internal or external		
Frequency accuracy	TCXO (std.)	<1 ppm, manual correction is available	
	OCXO (opt01)	<1 ppm, manual correction is available	
Aging and temperature stability	TCXO (std.)	<1 ppm/year, <1 ppm	
	OCXO (opt01)	<1 ppm/year, <0.15 ppm	

SPECTRUM PURITY

SSB phase noise (dBc/Hz)

	PXE-90		PXE-200		PXN-400	
Carrier frequency	1 GHz	9.5 GHz	1 GHz	20 GHz	1 GHz	40 GHz
1 kHz	-95.2	-91.5	-91.2	-80.6	-99.0	-78.4
10 kHz	-101.6	-98.5	-99.7	-90.6	-107.5	-85.7
100 kHz	-100.6	-99.7	-101.1	-96.2	-107.7	-85.1
1 MHz	-120.9	-116.2	-121.6	-111.5	-122.7	-100.8

Residual response (dBm)
Spur reject = bypass
RBW = 1 kHz
PosPeak detector

	PXE-90		PXE-200		PXN-400	
Reference level (R.L.)	0 dBm	-50 dBm	0 dBm	-50 dBm	0 dBm	-50 dBm
9 kHz to 1 GHz	-83	-120	-90	-120	-72	-103
1 GHz to 3 GHz	-83	-120	-80	-120	-72	-103
3 GHz to 10 GHz	-90	-130	-90	-120	-72	-103
10 GHz to 20 GHz	-	-	-90	-120	-91	-115
20 GHz to 40 GHz	-	-	-	-	-85	-105

IF rejection (dBc) Typical

	PXE-90		PXE-200		PXN-400	
Spur reject function	enhanced	bypass	enhanced	bypass	enhanced	bypass
	>90	>80	>90	>80	8.2 to 21.75GHz >68 Other bands >90	-

Image rejection (dBc)	Typical					
	PXE-90		PXE-200		PXN-400	
Spur reject function	standard	bypass	standard	bypass	standard	bypass
90 MHz to 3 GHz	>90	>76	>90	>79	>90	-
3 GHz to 9.5 GHz	>90	>60	>90	>68	>90	-
9.5 GHz to 20 GHz	-	-	>90	>60	>90	-
20 GHz to 33 GHz	-	-	-	-	>90	-
33 GHz to 40 GHz	-	-	-	-	>58	-

Local oscillator related spurious	<-65 dBc Center frequency ± (N/M) × 125 MHz, N, M = 1, 2, 3, 4, 5...

IIP3/IIP2 (dBm)

	PXE-90		PXE-200		PXN-400	
Carrier frequency	1 GHz	9.5 GHz	1 GHz	20 GHz	1 GHz	40 GHz
R.L. = 20 dBm	46.1 / 83.2	40.5 / 92.8	45.5 / 82.6	35.3 / 93.6	40.3 / 75.5	31.7 / 88.6
R.L. = 0 dBm	26.7 / 85.0	19.2 / 90.3	25.5 / 81.1	21.0 / 89.0	27.4 / 45.3	10.3 / 86.1
R.L. = -20 dBm	10.5 / 82.2	2.0 / 49.3	7.9 / 81.5	-4.5 / 55.3	8.7 / 25.2	4.8 / 66.6

AMPLITUDE

	PXE-90 PXE-200	PXN-400
Display range	DANL to 23 dBm (typ.)	DANL to 20 dBm (typ.)
Reference level (R.L.)	-50 dBm to +23 dBm (typ.)	-50 dBm to +20 dBm (typ.)
VSWR	90 MHz to 9.5/20 GHz: <2.0:1	90 MHz to 16 GHz: <2.0:1 16 GHz to 40 GHz: <3.0:1
Max. DC voltage	±10 VDC	
IF in-band flatness	±2.0 dB	
Max. input power (CW)	23 dBm: 50 MHz to 9.5/20/40 GHz and the preamplifier is off 10 dBm: 9 kHz to 50 MHz or preamplifier is on	
Amplitude accuracy	9 kHz to 9.5 GHz: ±2.0 dB 9.5GHz to 20/40GHz: ±3.0 dB	
RF preamplifiers	Automatically turn on or forcibly turn off	

Display average noise level
(DANL)
dBm/Hz
RBW=1 kHz

	PXE-90		PXE-200		PXN-400	
Reference level (R.L.)	-20 dBm	-50 dBm	-20 dBm	-50 dBm	-20 dBm	-50 dBm
9 kHz to 1 MHz	-143.0	-152.4	-143.6	-152.6	-136.0	-145.8
1 MHz to 90 MHz	-152.0	-159.2	-151.8	-160.0	-153.7	-158.0
90 MHz to 3 GHz	-146.0	-167.5	-149.7	-166.3	-154.1	-159.9
3 GHz to 9.5 GHz	-153.6	-167.0	-151.4	-157.5	-154.1	-159.9
9.5 GHz to 19 GHz	-	-	-156.1	-160.6	-156.8	-161.5
19GHz to 20 GHz	-	-	-156.1	-160.6	-145.2	-149.3
20 GHz to 40 GHz	-	-	-	-	-145.2	-149.3

STANDARD SPECTRUM ANALYSIS

Detector	PosPeak, NegPeak, Sample, Average, RMS, MaxPower
RBW	1 Hz to 10 MHz
VBW	1 Hz to 10 MHz
Data chart	SAStudio4 software provides spectrum, spectrogram, and historical trace
Measurements	Channel power, OBW, X dB bandwidth, Adjacent channel power ratio, IM3

Sweep Speed	
RBW = 250 kHz FPGA spur reject = bypass	1.0THz/s
RBW = 250 kHz FPGA spur reject = standard	577.5 GHz/s
RBW = 50 kHz FPGA spur reject = bypass	212.6 GHz/s
RBW = 1 kHz CPU spur reject = bypass	2.6 GHz/s

DETECTION ANAYLSYS

Lowest time resolution	8 ns
Max. analysis bandwidth	100 MHz
Detector	PosPeak, NegPeak, Sample, Average, RMS, MaxPower

IQ RECORDING

Burst recording bandwidth	Maximum: 100 MHz The built-in memory depth is 128 Mbytes
Continuous recording bandwidth	Maximum: 25 MHz
IQ sample rate	Maximum: 125 MSPS decimate factor: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096
External trigger response	Maximum frequency response: 500 times/s

REAL TIME SPECTRUM ANALYSIS

FFT analysis

FFT engine is implemented in FPGA. Frame compression and trace detection are supported. No missing samples between FFT frames

FFT frame update rate=10 ^ 9 ns/(N × D × 8 ns); POI = N × D × 8 ns
N for FFT points (2048, 1024, 512, 256, 128, 64, 32)
D for decimate factor (1, 2, 4, 8...)

Typical settings	FFT refresh rate	POI
N = 2048, D = 1	61,035 times/sec	16.384 us
N = 32, D = 1	3,906,250 times/sec	0.256 us

Max. analysis bandwidth	100 MHz
Window function	B-Nuttall, Flat-top, LowSideLobe
RBW	14.73 MHz to 3.59 kHz (Flat-top) 7.81 MHz to 1.90 kHz (B-Nuttall) 13 grades for each window type
Amplitude resolution	0.75 dB

GENERAL

Input and output

	PXE-90 PXE-200	PXN-400
RF input	N (F), impedance 50 Ω	2.4mm (M), impedance 50 Ω
Power	USB PD (65W)	
USB port	USB3.0 Type-C * 1, USB2.0 Type-C * 1, USB2.0 Type-A * 1	
Audio interface	Micro HDMI * 1 (support for extended display), 3.5 mm headphone port * 1	
External reference clock input	MMCX (F), 10MHz, amplitude ≥ 1.5 Vpp, impedance is about 330 Ω	
Reference clock output	Integrated in AUXIO, 10MHz, 3.3 V CMOS, programmable on/off	
External trigger input	MMCX (F), 3.3 V CMOS, high impedance	

Trigger output	MMCX (F), 3.3 V CMOS	
External antenna input	MMCX (F)	
Analog IF output	MMCX(F), -25 dBm max output power, impedance 50 Ω, 307.2 MHz ± 50 MHz	
Display	IPS LCD 1280 × 800, 10.1-inch multi-touch screen	
RAM / EMMC storage	4 GB/32 GB	
Power consumption	25 W (typ.)	
Size (D × W × H)	260 × 179 × 46mm	
Weight	1.5 kg	
GNSS 1PPS Synchronization Accuracy	±100 ns, built-in GNSS (only support external antenna)	
Operating Temp. (Ambient)	0 to 50 °C	
Storage Temp. (Ambient)	-20 to +70 °C	
Operating Relative Humidity	Ambient Temp.: 0 to 40 °C	5 to 75%
	Ambient Temp.: > 40 °C	5 to 45%
Packaging and accessories	Protected main unit * 1, power adapter * 1, power cord * 1, lanyard * 1	

*Specification applies under the following conditions:
(1) Start up and warm up for 10 minutes
(2) Ambient temperature 25 °C (core temperature 50 °C)
(3) Standard spectrum analysis mode-spurious rejection standard on.
(4) Necessary heat dissipation is provided to ensure the ambient and core temperature within the rated range at the same time
(5) Sweep speed and display average noise level test conditions: MCU:0.55.57, FPGA:0.55.22, API:0.55.61

OPTIONS

Code		
01	Built-in OCXO reference clock	built-in hardware
34	External omnidirectional antenna, 400MHz to 8000MHz, Gain<2dBi	accessory
35	External active directional antenna, frequency range: 0.5 to 10 GHz Gain: < 5 dBi (amp off); < 25 dBi(amp on)	accessory
71	Basic digital demodulation	software
72	Pulse detection	software

www.harogic.com
info@harogic.com
+65-8299 8857