PX SERIES
PRODUCT MANUAL

HANDHELD/BENCHTOP REAL-TIME SPECTRUM ANALYZER

PXE-90/200 R
9.5/20 GHz

V1.5 25/09/01

HAROGIC

PXE-90/200 RUGGED
Rugged Spectrum Analyzer
OVERVIEW

Key facts

Rugged design, IEC IP68-rated waterproof and dustproof

2.5 kg portable design, 10.1-inch multi-touch screen

Frequency range: 9 kHz - 9.5/20 GHz

1 GHz DANL: -166 dBm/Hz

1 GHz phase noise: -99.7 dBc/Hz@10 kHz

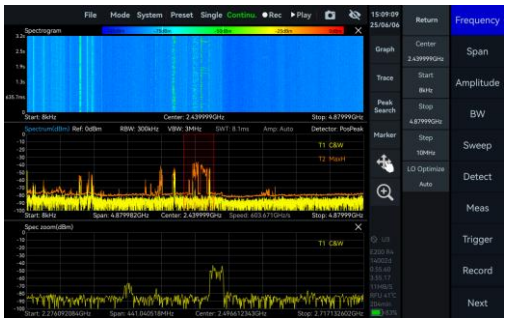
Analysis bandwidth: up to 100 MHz

4 GB RAM and 32 GB EMMC

Environmental adaptability: GJB150.16A-2009 and GJB150.18A-2009 standards

Applications

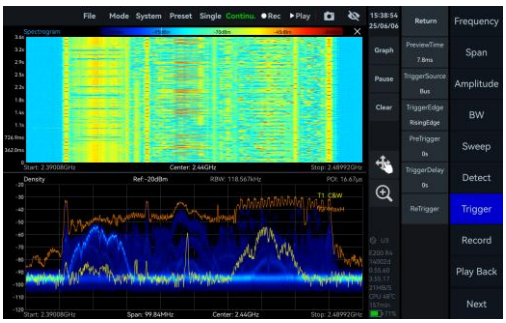
Standard spectrum sweep



IQ streaming and analysis

Power vs time measurement

Real-time analysis



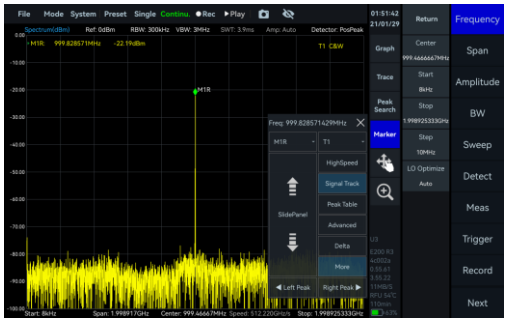
PX Series

Applications

Channel power/ACPR

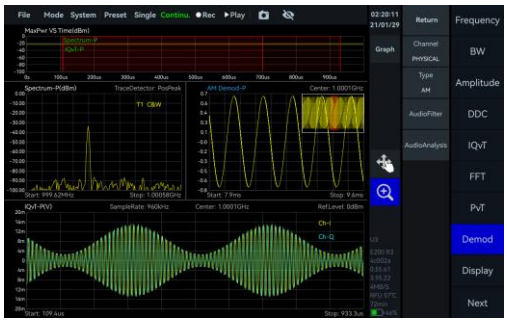
Phase noise

Frequency tracking

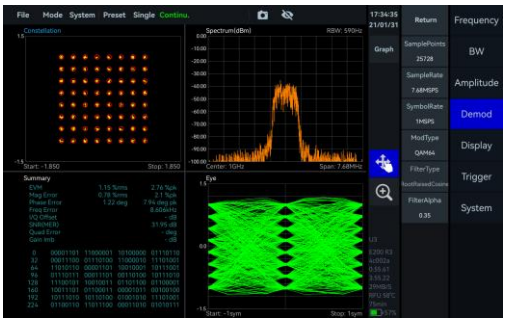


Pulse signal measure

AM/FM demodulation



Basic digital demodulation



Specifications*(Preview)

FREQUENCY

Frequency range	PXE-90 R	PXE-200 R
	9 kHz - 9.5 GHz	9 kHz - 20 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 R		PXE-200 R	
Carrier frequency	1 GHz	9.5 GHz	1 GHz	20 GHz
1 kHz	-95.2	-91.5	-91.2	-80.6
10 kHz	-101.6	-98.5	-99.7	-90.6
100 kHz	-100.6	-99.7	-101.1	-96.2
1 MHz	-120.9	-116.2	-121.6	-111.5

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

	PXE-90 R		PXE-200 R	
Reference level (R.L.)	0 dBm	-50 dBm	0 dBm	-50 dBm
9 kHz - 1 GHz	-83	-120	-90	-120
1 GHz - 3 GHz	-83	-120	-80	-120
3 GHz - 9.5/20 GHz	-90	-130	-90	-120

Image rejection	PXE-90 R	PXE-200 R
9 kHz - 3 GHz	>90 dBc (typ.)	>90 dBc (typ.)
3 GHz - 9.5 GHz	>90 dBc(typ.) , spur reject = enhanced >60 dBc (typ.) , spur reject = bypass	>90 dBc (typ.)
9.5 GHz - 20 GHz		>90 dBc(typ.) , spur reject = enhanced >60 dBc (typ.) , spur reject = bypass

IF rejection	>90 dBc (typ.) for spur reject = enhanced; >80 dBc (typ.) for spur reject = bypass
Local oscillator related spurious	<-65 dBc Center frequency ± (N/M) * 125 MHz, N, M = 1, 2, 3, 4, 5...

IIP3 / IIP2 (dBm)

	PXE-90 R		PXE-200 R	
Carrier frequency	1 GHz	9.5 GHz	1 GHz	20 GHz
R.L. = 20 dBm	46.1/83.2	40.5/92.8	45.5/82.6	35.3/93.6
R.L. = 0 dBm	26.7/85.0	19.2/90.3	25.5/81.1	21.0/89.0
R.L. = -20 dBm	10.5/82.2	2.0/49.3	7.9/81.5	-4.5/55.3

AMPLITUDE

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

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

	PXE-90 R		PXE-200 R	
Reference level	-20 dBm	-50 dBm	-20 dBm	-50 dBm
9 kHz - 1 MHz	-143.0	-152.4	-143.6	-152.6
1 MHz - 90 MHz	-152.0	-159.2	-151.8	-160.0
90 MHz - 3.0 GHz	-146.0	-167.5	-149.7	-166.3
3.0 GHz - 9.5 GHz	-153.6	-167.0	-151.4	-157.5
9.5 GHz - 20 GHz	-	-	-156.1	-160.6

STANDARD SPECTRUM ANALYSIS

Detector	PosPeak, NegPeak, Sample, Average, RMS, MaxPower
RBW	1 Hz - 10 MHz
VBW	1 Hz - 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	PXE-90 R	PXE-200 R
RBW ≥ 1 MHz FPGA spur reject = bypass	about 1.0 THz/s	about 1.1 THz/s
RBW = 250 kHz FPGA spur reject = standard	about 577.5 GHz/s	about 558.8GHz/s
RBW = 50 kHz FPGA spur reject = bypass	about 212.6 GHz/s	about 213.4 GHz/s
RBW = 1 kHz CPU spur reject = bypass	about 2.6 GHz/s	about 2.9 GHz/s

IQ RECORDING

Burst recording bandwidth	Maximum: 100 MHz The built-in memory depth is 128 Mbytes
Continuous recording bandwidth	Maximum: 25 MHz Limited by the bandwidth of USB interface and hard disk The storage depth is limited by the hard disk capacity
IQ sample rate	Maximum: 125 MSPS decimate factor: 1, 2, 4, 8, 32, 64, 128, 256, 512, 1024, 2048, 4096
External trigger response	Maximum response frequency 500 times/s

DETECTION ANAYLSYS

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

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/s	16.384 us
N = 32, D = 1	3,906,250 times/s	0.256 us

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

Environmental adaptability

Water and Dust Resistance	IEC 60529 IP68 rating, MIL-STD-810H-512.6 and GJB150.14A-2009 certified
Drop Resistance	MIL-STD-810H-516.8 and GJB150.18A-2009 Certifications
Vibration Resistance	MIL-STD-810H-514.8 and GJB150.16A-2009 certifications

GENERAL

Input and output	
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
RF input	N(F), Input impedance 50 Ω
External reference clock input	MMCX (F), amplitude ≥ 1.5 Vpp, input impedance is about 330 Ω
Reference clock output	Integrated in MUXIO, 3.3 V CMOS, programmable on/off
External trigger input	MMXC (F), 3.3 V CMOS, input: 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, output impedance 50 Ω supported, 307.2 MHz ± 50 MHz

Display	IPS LCD 1280 * 800, 10.1-inch multi-touch screen	
RAM and EMMC storage	4 GB/32 GB	
Power consumption	25 W (typ.)	
Battery life	about 4 hours, external power bank supply supported	
Size (D * W * H)	about 285 mm * 208 mm * 58 mm	
Weight	2.5 kg	
GNSS synchronization	GNSS (only support external antenna)	±100 ns
Operating temperature (ambient)	T1 class (std.)	-20 - 65 °C
Storage temperature (ambient)	T1 class (std.)	-40 - 85 °C
Operating Relative Humidity	0 -40 °C	5 – 75%
	>40 °C	5 – 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, 400-8000MHz, Gain<2dBi	accessory
71	Basic digital demodulation	software
72	Pulse detection	software

www.harogic.com
info@harogic.com