Product Brochure and Technical Datasheet

RTSA7500

Wireless Signal and Spectrum Analyzer

100 kHz to 8 GHz / 18 GHz / 27 GHz

Featuring

- Real-Time Bandwidth (RTBW) up to 100 MHz
- Probability of Intercept (POI) as short as 1.02 µs
- Spurious Free Dynamic Range (SFDR) up to 100 dBc

Overview

BNC's 10x Better Solution

BNC makes possible the cost-effective testing and monitoring of billions of wireless devices.

Using patented innovation, BNC's RTSA7500 wireless signal and spectrum analyzer has the performance of traditional high-end lab spectrum analyzers at a fraction of the cost, size, weight and power consumption and is designed for distributed deployment.

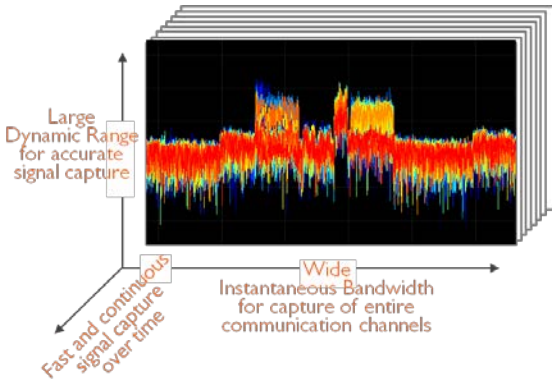
The RTSA7500 Wireless Signal Analyzer has a highly optimizable software-defined radio receiver coupled with real-time digitization and digital signal processing. This enables wide bandwidth, deep dynamic range and 27 GHz frequency range in a small one-box platform.

On top of this market disruptive platform, BNC provides a rich set of standard APIs and programming environments for easy and quick use with existing or new test and monitoring applications.

RTSA7500 Performance

Large Frequency Range

The frequencies and bandwidths of commercial wireless systems have been increasing steadily to accommodate the growing demand for larger data rates. The RTSA7500 supports frequency ranges from 100 kHz up to 27 GHz which enables testing of modern systems and doesn't exclude tests such as third-order intercepts.



Wide Instantaneous Bandwidth

Modern waveforms such as 802.11ac standard utilize waveforms occupy up to 80 MHz in bandwidth and LTE-Advanced aims to utilize bandwidths of up to 100 MHz. The RTSA7500 provides up to 100 MHz of instantaneous bandwidth in its direct conversion mode.

Deep Dynamic Range

RF measurements for characterizing IP3 generally require a dynamic range of around 100 dB. The RTSA7500 supports multiple ADCs thereby providing wide IBW with 70 dB dynamic range and a narrow IBW with 100 dB dynamic range.

Real-Time Acquisition Memory and Trigger Capability

Modern waveforms such as those associated with the wireless LAN standards utilize packet-based signaling techniques. The RTSA7500 enable real-time capture of multiple data packets by providing real-time hardware-based frequency domain triggering capability in conjunction with real-time memory storage of up to 128 million samples.

Fast Scan Speed

Scan speed determines how fast the analyzer can jump from analyzing one set of frequencies to another set. The RTSA7500 has fast setup times and provides sophisticated capture control.

Small Size, Weight, and Power

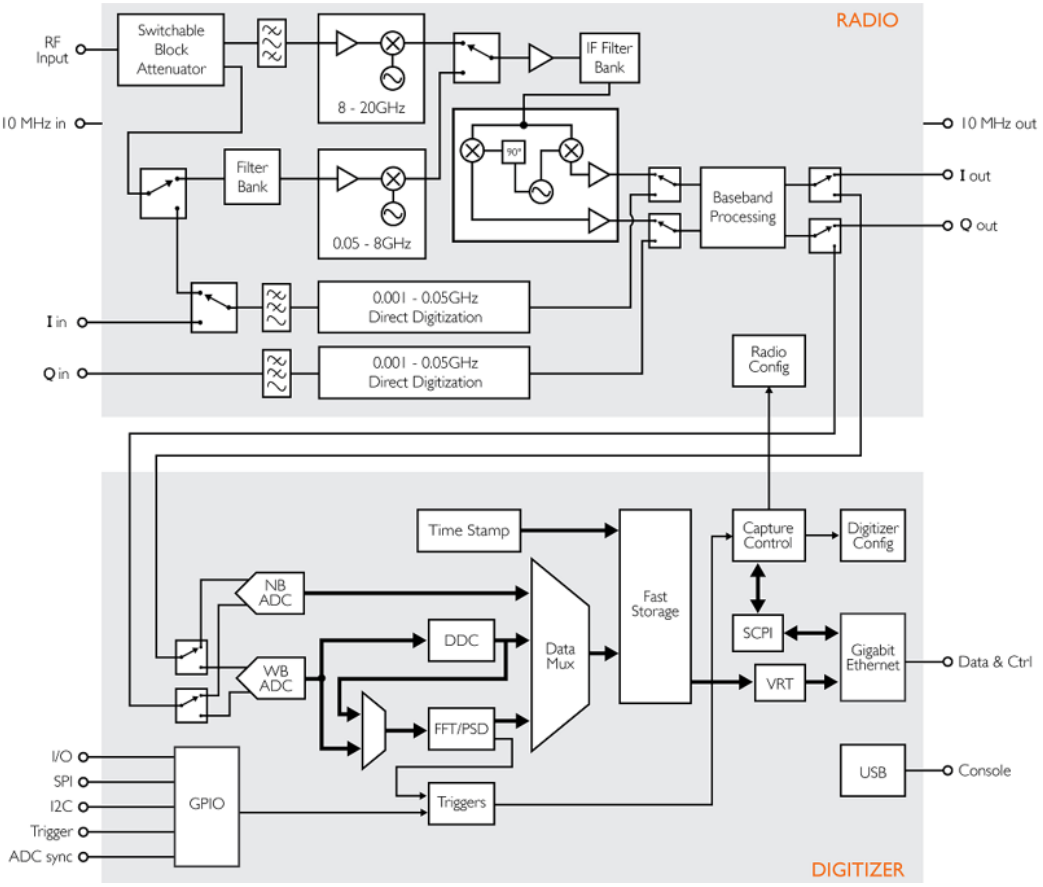
The RTSA7500 has a length and width less than a sheet of paper, weighs less than 3 kg and consumes less than 20 W of power making it a fraction of the size, weight and power of traditional lab spectrum analyzers.

RTSA7500 Architecture

The Receiver

The RTSA7500 has a patented hybrid receiver consisting of a super-heterodyne front-end with a backend that utilizes an I/Q mixer similar to that in a direct-conversion receiver. Depending on the frequency of the signals being analyzed, one of three receiver signal processing paths is selected. Signals in the frequency range 100 kHz to 50 MHz are directly digitized, while all other signals are translated to the frequencies of the first IF block via one of the two signal processing paths.

The IF block consists of a bank of multiple surface acoustic wave (SAW) filters. Depending on the mode of operation, i.e. super-heterodyne or homodyne, either one or both outputs are utilized to process either 40 MHz or 100 MHz instantaneously. The IF analog outputs are digitized using one of two ADCs: a 125 MS/s sampling rate with a typical dynamic range of 70 dB; or a 300 kS/s sampling rate with a typical dynamic range in excess of 100 dB.



The Digitizer

The digitized signal is real-time and continuously processed. The RTSA7500 provides digital signal processing including optional digital down conversion; FFT and optional frequency domain triggering; sophisticated capture controlled; and optionally stored in fast local memory for subsequent forwarding or streaming across the Ethernet.

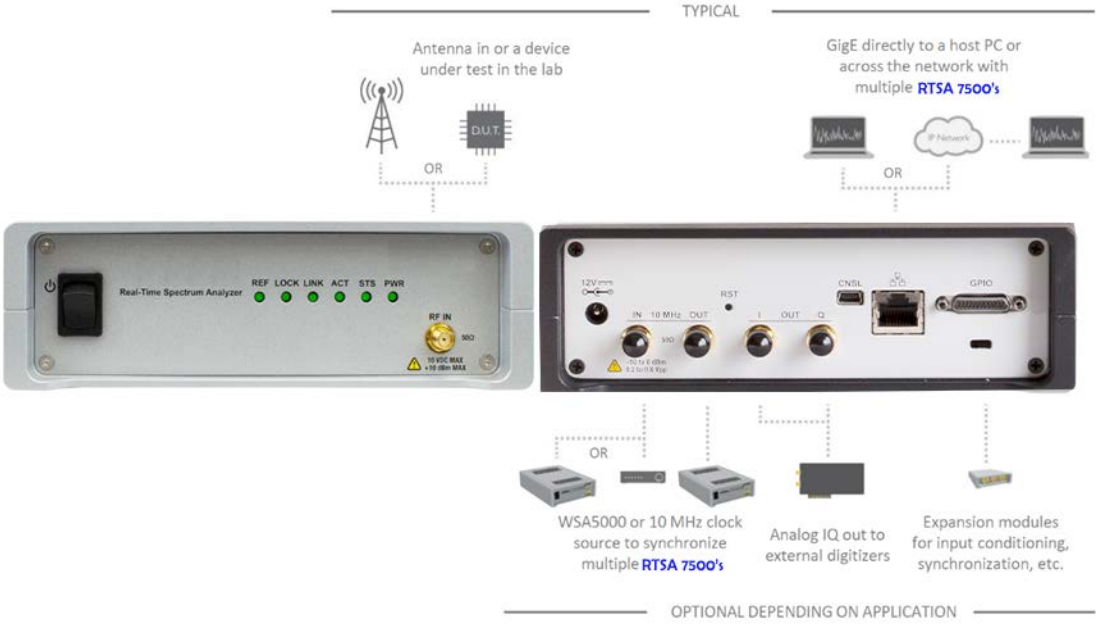
User configurable sophisticated capture control combined with fast deep caching enables fast signal searches, sweeps, triggering and captures of only the signals of interest.

The RTSA7500 digitizer has an embedded microprocessor with a Linux OS and control, management and remote maintenance application. It supports the SCPI standard for user control and VITA VRT for data path.

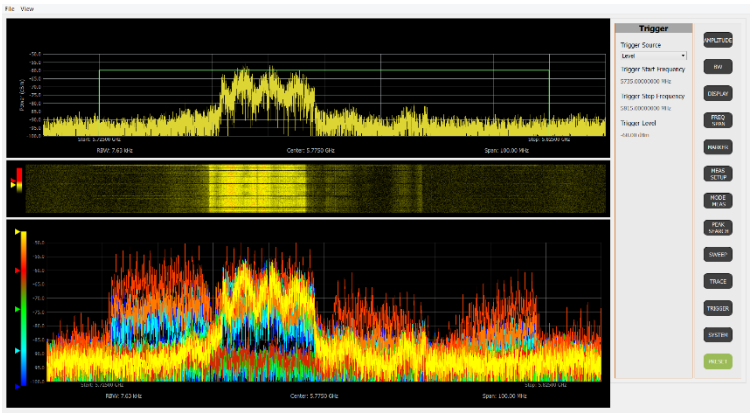
RTSA7500 Extensible Hardware Interfaces

Whether you're looking for a high-powered receiver to integrate with your existing digitizer solution or you need powerful, cost-effective spectrum analyzer hardware to pair with your software, the RTSA7500 Wireless Signal Analyzer is a universal and versatile platform designed for use across wireless industries and applications.

- 10 MHz input and output clock references for multi-unit synchronization
- Analog I/Q output enables OEM high speed digitizers
- GPIO for external triggers 10/100/1G Ethernet port for control and networking
- +12 V DC power input allowing automobile sources and personal mobility with an external battery
- External support for 80 MHz and 160 MHz RTBW (optional)
- External local oscillator inputs for phase-coherent radio front-ends (not shown and optional)



RTSA v3 Real-Time Spectrum Analysis Application



By utilizing the power of the RTSA7500, the RTSA v3 application has all the standard features you expect from a traditional lab spectrum analyzer as well as powerful features such as real-time triggering.

The RTSA v3 will run on any Windows PC. Simply install the software and connect your device through an Ethernet or Internet connection and you're ready to get started.

With the RTSA v3's simple and intuitive user interface you'll be using your new device in no time.

RTSA7500 APIs and Programming Environments

By supporting a rich set of industry-leading standard protocols, the RTSA7500 can easily integrate into your new or existing applications.

Python™ and PyRF development framework

PyRF enables rapid development of powerful applications that leverage the new generation of measurement-grade software-defined radio technology. It is built on the Python Programming Language and includes feature-rich libraries, example applications and source code and is openly available, allowing commercialization of solutions through BSD open licensing.

NI LabVIEW®

Easily and quickly integrate the RTSA7500 into your existing or new NI LabVIEW® based acquisition, measurement, automated test and validation systems.

MATLAB®

BNC provides MATLAB® drivers for connecting to BNC's RTSA7500 Wireless Signal Analyzers and MATLAB® program code examples to get you started towards developing your own.

C/C++ Drivers and DLL

Underneath our rich set of APIs and programming environments is the C/C++ driver and DLL which abstracts the SCPI command and VITA VRT dataflow from the RTSA7500. The C/C++ driver is openly available to you in source code allowing commercialization of solutions through BSD open licensing.

SCPI and VITA VRT

Compliance with standard protocols provides you both multi-vendor independence and device interoperability.

The RTSA7500 supports the Standard Commands for Programmable Instruments (SCPI) for control and the VITA-49 Radio Transport (VRT) protocol for data flow. BNC provides extensive documentation and examples for programming and interfacing at the SCPI and VITA-49 VRT level.

Contact us for more information

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Real-time spectrum analyzer mode with BNC RTSA v3 software		
Display Modes	Real-time Spectrum Real-Time Spectrogram Real-Time Persistence Spectrum Real-Time I and Q	
Real-time bandwidth (RTBW)	0.1 / 10 / 40 /100 MHz	
100% Probability of Intercept (POI)		
	1.02 µs minimum signal duration	976.56 kHz RBW
	8.19 µs minimum signal duration	122.07 kHz RBW
Spurious free dynamic range (SFDR)	≥ 60 dBc (nominal)	100 MHz RTBW
	≥ 70 dBc (nominal)	10 / 40 MHz RTBW
	≥ 100 dBc (nominal)	0.1 MHz RTBW
Data Acquisition		
A/D Converter Sampling Rate and Resolution	125 MS/s,12 bit	10 / 40 / 100 MHz RTBW
	300 kS/s, 24 bit	0.1 MHz RTBW
FFT lengths	128 to 524288 in powers of 2	
Resolution Bandwidth (RBW)		
Range	0.24 kHz to 976.56 kHz	10 / 40 /100 MHz RTBW
	0.62 Hz to 2543.12 Hz	0.1 MHz RTBW
Windowing	Hanning	
Traces	6	Clear/Write, Trace Average, Max Hold, Min Hold
Markers	12	
Modes	Normal (Tracking), Delta, Fixed	Peak Search, Next Peak, Next Left/Right, Center
Marker Frequency Resolution	0.01 Hz	
Triggers	1	Real-Time Level Trigger
APIs	Python™	PyRF RTSA
	LabVIEW	LabVIEW Base Development System for Windows
	MATLAB®	MATLAB® Release 2014b
	C/C++	ISO/IEC 14882:2011
	SCPI	IEEE 488.2 - Standard Commands for Programmable Instruments
Record/Playback	VITA Radio Transport (VRT)	VITA-49.0 – 2007 Draft 0.21
Preferences	Save/Load Settings	Save settings for easy recall
Export Data	CSV	Comma Separated Values
Frequency		
Frequency Ranges		
Sweep/RTSA Mode (100/40/10/0.1 MHz)	50 MHz to 8 GHz, 18 GHz or 27 GHz	
Baseband Mode	100 kHz to 62.5 MHz	Non-tunable
Frequency Reference	± 1.0 x 10–6 per year	Aging
	± 1.0 x 10–6 per year	Accuracy + aging
Tuning Resolution	1 Hz	
Amplitude		
Amplitude Accuracy		
25 °C ± 5 °C	± 2.00 dB typical	100 kHz to 3 GHz
	± 2.75 dB typical	>3 GHz to 8 GHz
Amplitude Ranges		
Measurement Range	DANL to maximum safe input level	
Attenuator Range	0 or 20 dB	8 GHz only (Front-end Attenuation)
	0 to 25 dB in 1 dB steps	18 and 27 GHz only (IF Attenuation)
Maximum Safe RF Input Level	+10 dBm, 0 V DC	

Spectral Purity

SSB Phase Noise	at 1 GHz (as an RTSA)	(phase noise of LO measured at 1 GHz)	Carrier Offset
	-80 dBc/Hz typical	-85 dBc/Hz typical	100 Hz
	-90 dBc/Hz typical	-90 dBc/Hz typical	1 kHz
	-97 dBc/Hz typical	-105 dBc/Hz typical	10 kHz
	-102 dBc/Hz typical	-115 dBc/Hz typical	100 kHz
	-123 dBc/Hz typical	-143 dBc/Hz typical	1 MHz

Displayed Average Noise Level (DANL)	8 GHz	18 and 27 GHz	Frequency
25 °C ± 5 °C	-151 dBm/Hz typical	-164 dBm/Hz typical	100 MHz
	-151 dBm/Hz typical	-163 dBm/Hz typical	500 MHz
	-150 dBm/Hz typical	-161 dBm/Hz typical	1000 MHz
	-149 dBm/Hz typical	-152 dBm/Hz typical	2000 MHz
	-145 dBm/Hz typical	-157 dBm/Hz typical	3000 MHz
	-140 dBm/Hz typical	-155 dBm/Hz typical	4000 MHz
	-142 dBm/Hz typical	-149 dBm/Hz typical	5000 MHz
	-134 dBm/Hz typical	-143 dBm/Hz typical	6000 MHz
	-134 dBm/Hz typical	-149 dBm/Hz typical	7000 MHz
	-131 dBm/Hz typical	-163 dBm/Hz typical	8000 MHz
		-162 dBm/Hz typical	9000 MHz
		-162 dBm/Hz typical	10000 MHz
		-160 dBm/Hz typical	11000 MHz
		-158 dBm/Hz typical	12000 MHz
		-156 dBm/Hz typical	13000 MHz
		-155 dBm/Hz typical	14000 MHz
		-159 dBm/Hz typical	15000 MHz
		-155 dBm/Hz typical	16000 MHz
		-152 dBm/Hz typical	17000 MHz
		-149 dBm/Hz typical	18000 MHz

Third Order Intercept/(TOI)	at 1 GHz	
	+12 dBm, typical	

General Specifications

PC Required		
Operating System	Windows XP (32 bit)	
	Window 7 and 8 (32 or 64 bit)	
RAM	2 GB	
Hard Disk	1 GB	

Status Indicators	PLL Lock / 10 MHz reference clock status	
	Ethernet Link and Activity status	
	CPU and Power status	

Connectors		
RF In	SMA female, 50 Ω	
10 MHz Reference In and Out	SMA female, 50 Ω	0 or 35 MHz
Analog I and Q Out	SMA female, 50 Ω	
10/100/1000 Ethernet	RJ45	
USB Console	mini-USB	
GPIO	25-pin male D-Subminiature	
Coaxial Power	Type A: 5.5 mm OD, 2.5 mm ID	

Physical		
Power Supply	+12 V DC	
Power Consumption	18 W	
Operating Temperature Range	0 °C to +50 °C	
Storage Temperature Range	-40 °C to +85 °C	
Size		
	269 x 173 x 61 mm (10.58 x 6.81 x 2.40 inches)	with mounting feet (shipped installed on unit)
	269 x 173 x 55 mm (10.58 x 6.81 x 2.15 inches)	without mounting feet
Weight	2.7 kg (6 lbs.)	

Regulatory Compliance

RoHS Compliance	RoHS/RoHS 2	
Marks	CE	European Union
EMC Directive 2014/30/EU	EN 61326-1:2013	Electromagnetic Compatibility
Low Voltage Directive 2006/95/EC	EN 61010-1:2010 Class 1	Safety

Ordering Information

8 GHz RTSA	RTSA7500-8B	100 kHz to 8 GHz, RTBW up to 10 MHz *
8 GHz RTSA	RTSA7500-8	100 kHz to 8 GHz, RTBW up to 100 MHz
18 GHz RTSA	RTSA7500-18	100 kHz to 18 GHz, RTBW up to 100 MHz
27 GHz RTSA	RTSA7500-27	100 kHz to 27 GHz, RTBW up to 100 MHz
8 GHz Preamp	RTSA7500-8-P	8 GHz spectrum analyzer with 100 kHz to 100 MHz RTBW with pre-amp and additional preselect filtering. Applicable only to the RTSA7500-408.
80 MHz and 160 MHz RTBW Support	RTSA7500-xxx-WBIQ **	External support for 80 MHz Super-Heterodyne and 160 MHz Zero-IF RTBW. The RTBW of 160 MHz is intended for IQ out only. The internal digitizer remains at 125 MSa/s.
External Local Oscillator Support	RTSA7500-xxx-ELO **	External Local Oscillator inputs for phase-coherent radio front-ends
High IF	RTSA7500-xxx-HIF **	Radio receiver front-end with IF output between 800 and 2500 MHz When this option is selected, the lower IF outputs at 0 or 35 MHz or the RF digitization will not be available
80 MHz and 160 MHz RTBW and External Local Oscillator Support	RTSA7500-xxx-WBIQ-ELO **	Radio receiver front-end support for external Local Oscillator inputs and 80 MHz Super-Heterodyne and 160 MHz Zero-IF RTBW. The instantaneous BW of 160 MHz is intended for IQ out only. The internal digitizer remains at 125 MSa/s.
Software Included	RTSA	Real-Time Spectrum Analyzer software
Rack Shelf	RTSA7500-RACK-SHELF	19" rack shelf supports two horizontally mounted RTSA7500s
External Battery	EXTERNAL-BATTERY	20,000 mAh 12 V / 1.5 A battery, >3.5 hours typ.

* The -8B does not include 10 MHz Out or I/Q Out

* * xxx = -8, 18 or 27 for 8 GHz, 18 GHz, or 27 GHz models respectively