Model RTSA7500 Specification V3

Real-Time Spectrum Analyzers - 100 kHz to 8/18/27 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

BNC Berkeley Nucleonics

Test, Measurement and Nuclear Instrumentation since 1963

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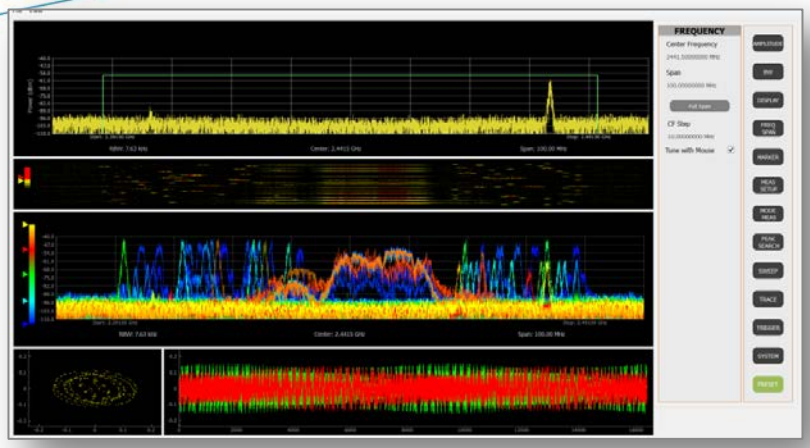
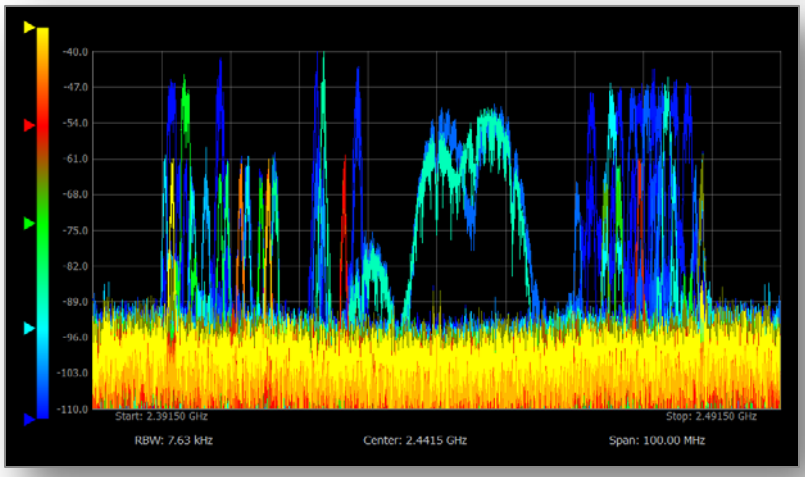
Introduction



What is a Real-Time Spectrum Analyzer?

A Real-Time Spectrum Analyzer (RTSA) processes RF signals at a speed fast enough as to not miss any signals for its given captured bandwidth, known as its Real-Time Bandwidth (RTBW) or Instantaneous Bandwidth (IBW). In addition an RTSA needs to provide views of the spectrum in the frequency and time domains, as well as power spectral density to enable analysis of signals that may be so fast as to be undetectable to the human eye. And finally an RTSA must provide the capability to trigger on events and capture them, and record them for playback enabling deeper analysis.



Who needs a Real-Time Spectrum Analyzer?

Anyone dealing with signals that may vary dynamically in amplitude or are agile in frequency. Examples include:

- Short duration intermittent signals such as pulsed radar systems, frequency-hopping spread spectrum radios, pulse modulated radios;
- Multi-signal environments such as ISM bands – 915 MHz, 2.4, 5.8, 24 GHz;
- Unwanted signals such as unintentional or self-interference, intentional interference (jammers), and listening devices (bugs).

What is the BNC solution?

The BNC RTSA7500 is a PC-controlled Real-Time Spectrum Analyzer (RTSA) which includes:

- 100 kHz to 8, 18 or 27 GHz frequency range
- Real-time spectrum graph
- Real-time spectrogram view
- Real-time power spectral density display (persistence)
- Real-Time Triggering
- Real-time I/Q plots
- Real-Time Recording and Playback

The RTSA7500 can be utilized anywhere in the wireless ecosystem – R & D, Education, Manufacturing, Deployment, and Monitoring.

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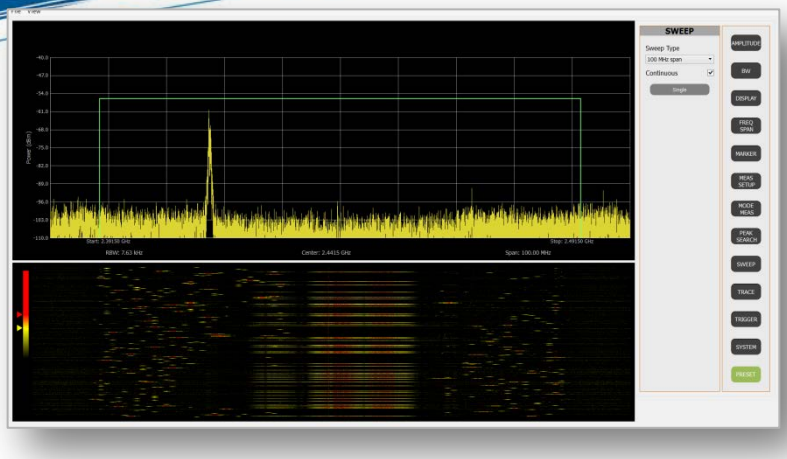
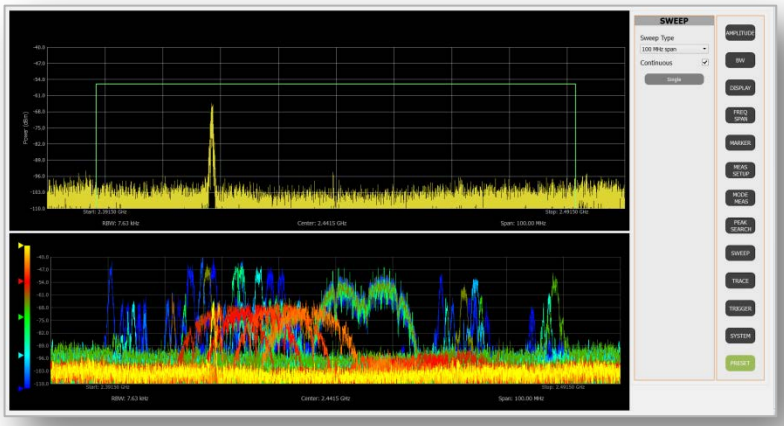
RTSA7500 RTSA Displays



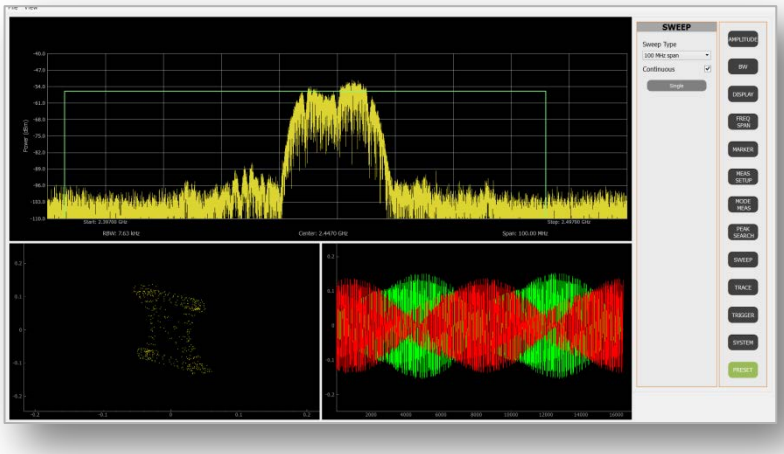
Spectrogram View

Along with the standard spectrum graph which plots Power versus Frequency the user can select the Spectrogram View. The Spectrogram View provides a 3-dimensional view of the spectrum adding the dimension of Time. Time zero is at the top of the Spectrogram view and measurements in the past scroll down. The color indicates the relative magnitude of the Power. In this case, white being the highest power. Several palettes are available to optimize for best viewing depending on the signals to be evaluated. By looking at Time, one can see the periodicity of any given signal.



Power Spectral Density Display

The Power Spectral Density Display is commonly called the Persistence Display. Both names give a partial description of what the display does. The color is an indication of how dense or how often the signal is present at the respective power level. In this case yellow represents the level the signal is at most of the time. And signals persist on the screen for a few seconds before fading out allowing you to see signals that come too fast to view in the spectrum graph. One can see the Wi-Fi signal, the Bluetooth Signals, and the Microwave Oven Signals that were present just a few seconds earlier.



I /Q Plots

The I/Q plot consists of two plots, the I/Q Constellation (if available) on the left, and the I/Q Time Domain on the right. The Constellation data displays the In-phase (I data) vs. the Quadrature (Q data). The Time domain plot shows a trace for the In-phase (I data in green) and a trace for the Quadrature (Q data in red, if available in the mode).

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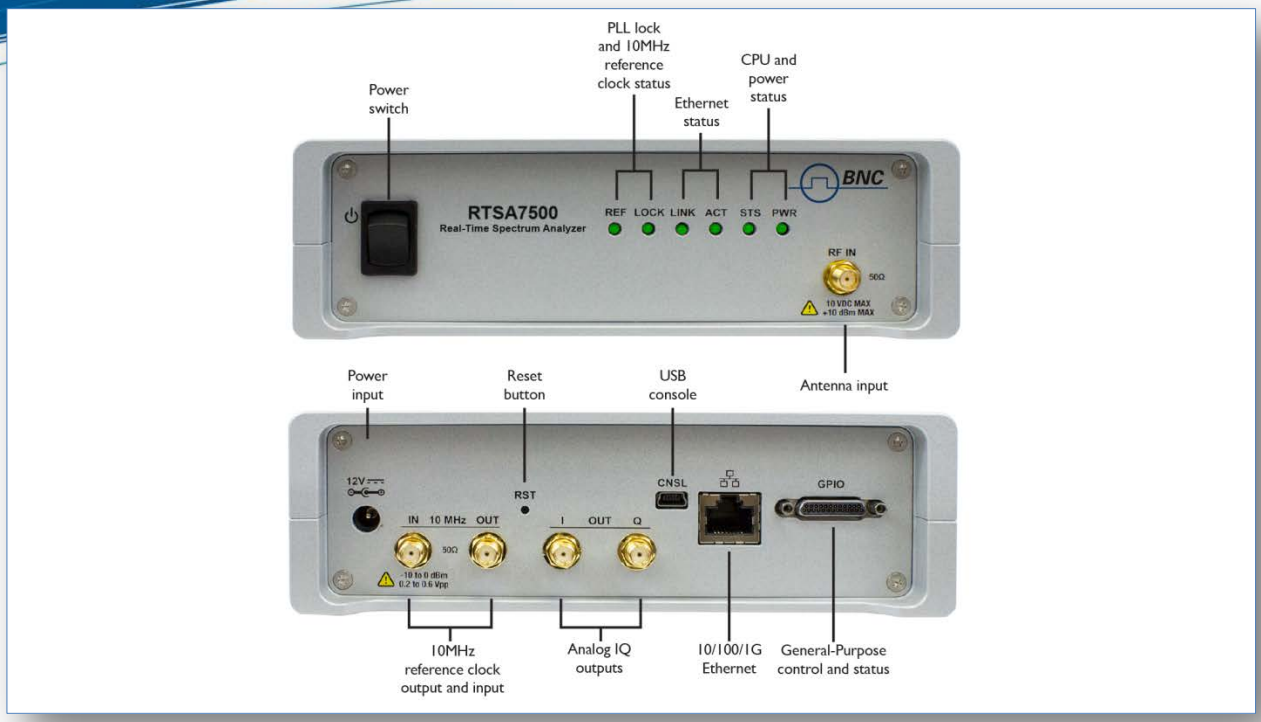
RTSA7500 RTSA Interfaces



Extensibility of the RTSA7500 for additional functionality and OEMs

- 10 MHz In for external references and a 10 MHz Out reference for multi-unit synchronization
- Analog I/Q Out enables OEM high speed digitizers and post-processing software tools
- GPIO for external triggers and exterior modules such as antenna switches, downconverters, and GPS
- 10/100/1000 Ethernet port for control and networking the RTSA7500
- +12 V DC power input allowing drive testing with automobile 12 V DC sources and personal mobility with an external 12 Volt 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)

Industry-leading APIs for customization

BNC utilizes industry-leading APIs/standards and open-source code for easy customization and remote control. University students can take advantage of it as well for their research and develop new applications.

- PyRF RTSA
- LabVIEW Base Development System for Windows
- MATLAB® R2014b
- C++ programming
- SCPI Commands

Standard saved file formats for deeper analysis:

- VITA Radio Transport (VRT)
- Comma Separated Values (CSV)

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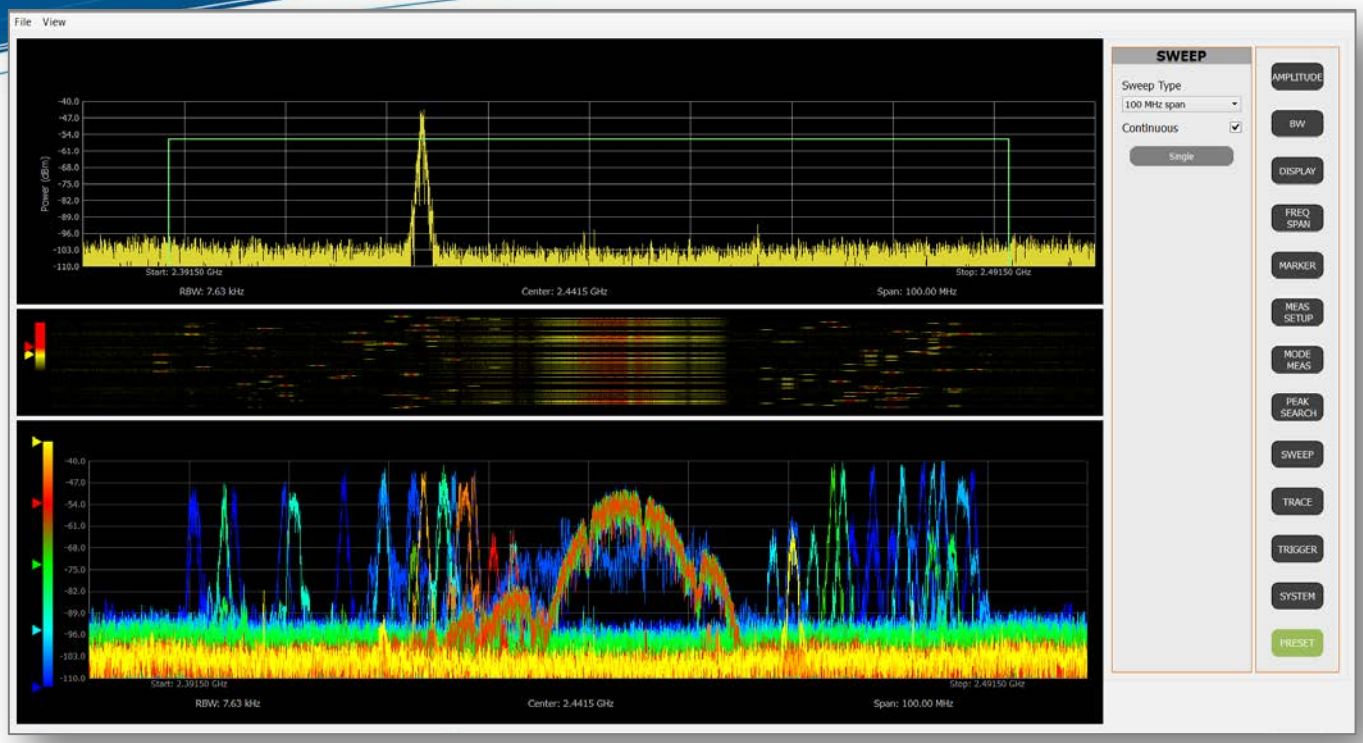
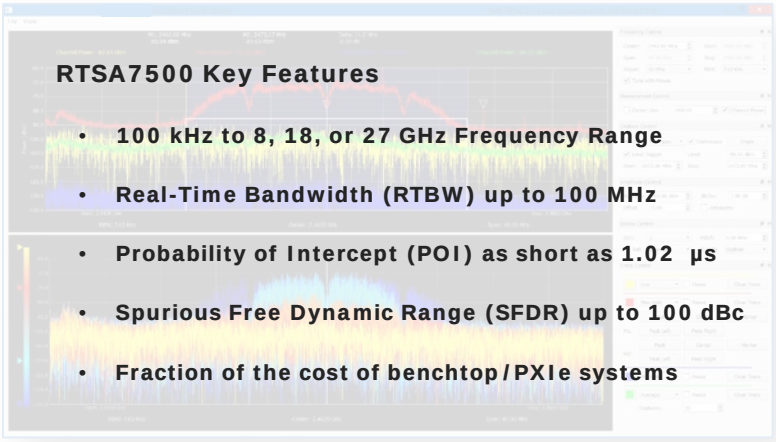
RTSA7500 RTSA Measurements



Make measurements locally or remotely

Measurement can be made remotely via the Internet around the globe. Ideal for remote monitoring applications.

- Up to six traces are available as Trace Normal, Trace Average, Max Hold, and Min Hold.
- Twelve Markers are available as Normal (tracking), Delta, and Fixed with Peak Search functions that can be assigned to any trace.
- The Real-Time Level Trigger only captures signals over a certain level and is useful for viewing signals over the Internet.
- For remote applications, Record data on the local PC and then use Playback to view the data without any Internet latency.
- The widescreen view of a laptop or PC monitor enables enhanced viewing not available on instruments with built-in screens.
- The intuitive GUI display makes it easy to operate for anyone familiar with a benchtop spectrum analyzer.



BNC, the source for real-time analysis

BNC combines patented technology, low-cost digital software-defined radio technology, open source software, standard APIs, and a PC-controlled architecture to provide unparalleled performance for the price. If you are dealing with dynamic and agile signals and could be more productive with an RTSA but thought it was out of your budget, then BNC. Only BNC can deliver these Real-Time Spectrum Analysis features with this performance at a price that is affordable to everyone who can afford a spectrum analyzer. We invite you to BNC in Real-Time!

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Real-time spectrum analyzer mode		
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)	(minimum signal duration) 1.02 µs @ 976.56 kHz RBW 8.19 µs @ 122.07 kHz RBW	 Specification may not be met when the PC is heavily loaded with other processing tasks
Spurious free dynamic range (SFDR)	≥ 60 dBc (nominal) ≥ 70 dBc (nominal) ≥ 100 dBc (nominal)	100 MHz RTBW 10 / 40 MHz RTBW 0.1 MHz RTBW
Data Acquisition		
A/D Converter Sampling Rate and Resolution	125 MS/s,12 bit 300 kS/s, 24 bit	10 / 40 / 100 MHz RTBW 0.1 MHz RTBW
FFT lengths	128 to 524288 in powers of 2	
Resolution Bandwidth (RBW)		
Range	0.24 kHz to 976.56 kHz 0.62 Hz to 2543.12 Hz	10 / 40 /100 MHz RTBW 0.1 MHz RTBW
Traces	6	Clear/Write, Trace Average, Max Hold, Min Hold
Markers	12	
Modes	Normal (tracking), Delta, Fixed	Peak, Next Peak (Right/Left), Center
Marker Frequency Resolution	0.01 Hz	
Triggers	1	Real-Time Level Trigger
APIs	Python™ LabVIEW MATLAB® C/C++ SCPI	PyRF RTSA LabVIEW Base Development System for Windows MATLAB® Release 2014b ISO/IEC 14882:2011 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		
Swept Mode / 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 ± 1.0 x 10–6 per year	Aging Accuracy + aging

Amplitude		
Amplitude Accuracy		
25 °C ± 5 °C, typical	± 2.00 dB typical ± 2.75 dB typical	100 kHz to 3 GHz >3 GHz to 8 GHz
Amplitude Ranges		
Measurement Range	DANL to maximum safe input level	8 GHz only
Attenuator Range	0 or 20 dB 0 to 25 dB, 1 dB steps	IF Attenuator for 18 and 27 GHz only
Maximum Safe RF Input Level	+10 dBm, O V DC	

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Spectral Purity

SSB Phase Noise 25 °C ± 5 °C, typical	at 1 GHz (as an RTSA)	at 1 GHz (as a Receiver)	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) 25 °C ± 5 °C, typical	**7500-8**	**7500-8P, 7500-18**	**7500-27**	**Frequency**
	-151 dBm	-164 dBm	-162 dBm	100 MHz
	-151 dBm	-163 dBm	-162 dBm	500 MHz
	-150 dBm	-161 dBm	-160 dBm	1000 MHz
	-149 dBm	-152 dBm	-144 dBm	2000 MHz
	-145 dBm	-157 dBm	-157 dBm	3000 MHz
	-140 dBm	-155 dBm	-154 dBm	4000 MHz
	-142 dBm	-149 dBm	-145 dBm	5000 MHz
	-134 dBm	-143 dBm	-143 dBm	6000 MHz
	-134 dBm	-149 dBm	-143 dBm	7000 MHz
	-131 dBm	-163 dBm	-158 dBm	8000 MHz
		-162 dBm	-158 dBm	9000 MHz
		-162 dBm	-157 dBm	10000 MHz
		-160 dBm	-160 dBm	11000 MHz
		-158 dBm	-154 dBm	12000 MHz
		-156 dBm	-146 dBm	13000 MHz
		-155 dBm	-150 dBm	14000 MHz
		-159 dBm	-147 dBm	15000 MHz
		-155 dBm	-150 dBm	16000 MHz
		-152 dBm	-145 dBm	17000 MHz
		-149 dBm	-147 dBm	18000 MHz
			-147 dBm	19000 MHz
			-151 dBm	20000 MHz
			-146 dBm	21000 MHz
			-145 dBm	22000 MHz
			-149 dBm	23000 MHz
			-151 dBm	24000 MHz
			-148 dBm	25000 MHz
			-143 dBm	26000 MHz
			-133 dBm	27000 MHz

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

General Specifications

PC Required		
Operating System	Window 7 , 8, 10 (32 or 64 bit)	*For best performance, a dedicated PC is recommended.
Minimum RAM Size	2 GB	
Minimum Hard Disk Space	1 GB	
Ethernet Port	1 GigE	
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	
Analog I and Q Out	SMA female, 50 Ω	0 or 35 MHz
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.)	

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Ordering Information		
8 GHz Preamp	RTSA7500-8P	8 Ghz spec an with 100 kHz to 100 MHz RTBW with pre-amp & additional preselect filtering.
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
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
Laptop Accessory	P/N7128	Laptop accessory - GUI installed for RTSA7500 - includes Toshiba L55-B5276 (or equivilent) loaded with MS Home and Business 2013, Adobe PDF Viewer & Windows 7 or 8 operating software
Rack Shelf	P/N7123	19" rack shelf supports two horizontally mounted
External Battery	P/N7127	20,000 mAh 12 V / 1.5 A battery, >3.5 hours typ.

* The 8P 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

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

REF:08172016

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