TELEDYNE TEST TOOLS
Everywhereyoulook™

T3SA3100 / T3SA3200 Data Sheet

2.1 GHz and 3.2 GHz Spectrum Analyzers

Broad Measurement Range

Frequency Range: 9 kHz to 2.1 GHz / 3.2 GHz

Tools for Improved Debugging

• Frequency Range from 9 kHz to 3.2 GHz.	✓ More application coverage from a single Spectrum Analyzer.
• -161 dBm/Hz Displayed Average Noise Level (Typ.)	✓ View and measure very small signals.
• -98 dBc/Hz @10 kHz Offset Phase Noise (1 GHz, Typ.)	✓ Improved specification gives more accurate measurement results.
• Built-in switchable pre-amplifier.	✓ Integrated pre-amplifier allows higher sensitivity measurements.
• USB Device, USB Host and LAN support.	✓ Remote control your measurements.
• 10.1 inch (25.65 cm) color WVGA 1024 x 600 display.	✓ Clear and flexible display aids ease of use.
• 3 Years Warranty as standard.	✓ Peace of mind.

Key Specification

Model	T3SA3200	T3SA3100
Frequency Range	9 kHz ~ 3.2 GHz	9 kHz ~ 2.1 GHz
Resolution Bandwidth	1 Hz ~ 1 MHz, in 1-3-10 sequence	1 Hz ~ 1 MHz, in 1-3-10 sequence
Displayed Average Noise Level	-161 dBm/Hz, Normalize to 1 Hz (typ.)	-161 dBm/Hz, Normalize to 1 Hz (typ.)
Phase Noise	< -98 dBc/Hz@1 GHz, 10 kHz offset	< -98 dBc/Hz@1 GHz, 10 kHz offset
Amplitude Precision	< 0.7 dB	< 0.7 dB

PRODUCT OVERVIEW

Teledyne Test Tools T3SA3000 Spectrum Analyzer range consists of models with frequency ranges from 9 kHz to 2.1 GHz or 9 kHz to 3.2 GHz. The T3SA300 series comes in a small footprint and has easy and intutive user interface.

The T3SA3000 series Spectrum Analyzer offers high performance specifications as standard with built-in preamplifier to enhance the measurement capability and sensitivity when measuring small signals.

The T3SA3000 series has a large 10.1 inch matte finish display for easier viewing in various lighting conditions.

Features and Benefits

- Frequency Range from 9 kHz up to 3.2 GHz
- -161 dBm/Hz Displayed Average Noise Level (Typ.)
- -98 dBc/Hz @10 kHz Offset Phase Noise (1 GHz, Typ.)
- Total Amplitude Accuracy < 0.7 dB
- 1 Hz Minimum Resolution Bandwidth (RBW)
- All-Digital IF Technology
- Standard Preamplifier
- 10.1 Inch WVGA (1024 x 600) Display

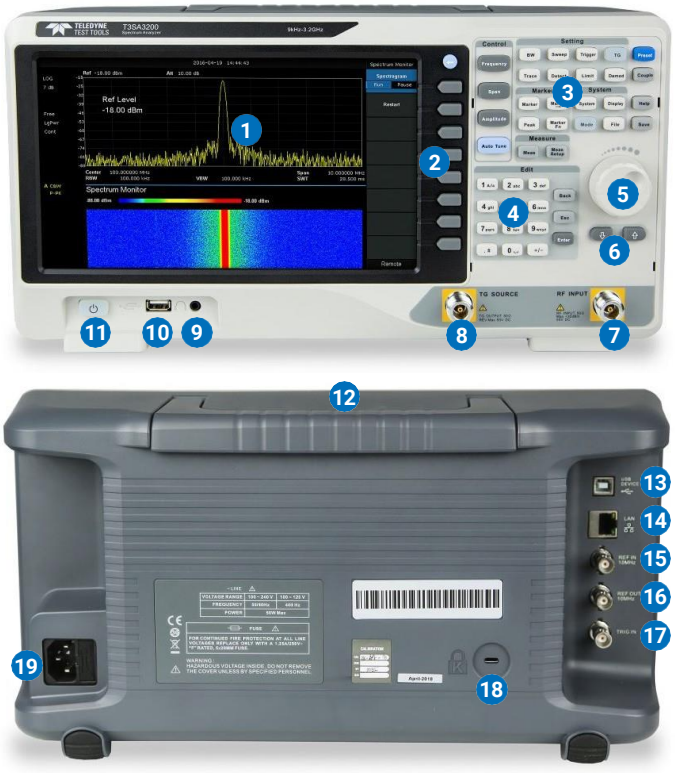
User-friendly Design

- 10.1 inch (25.65 cm) 1024*600 display
- Intuitive, easy to use menu system
- “Preset” and “Auto Tune” for quick set up
- Built-in front panel accessible help system
- File management (support for U-disc and local storage)
- Lightweight, small footprint, easy to transport

Typical Applications

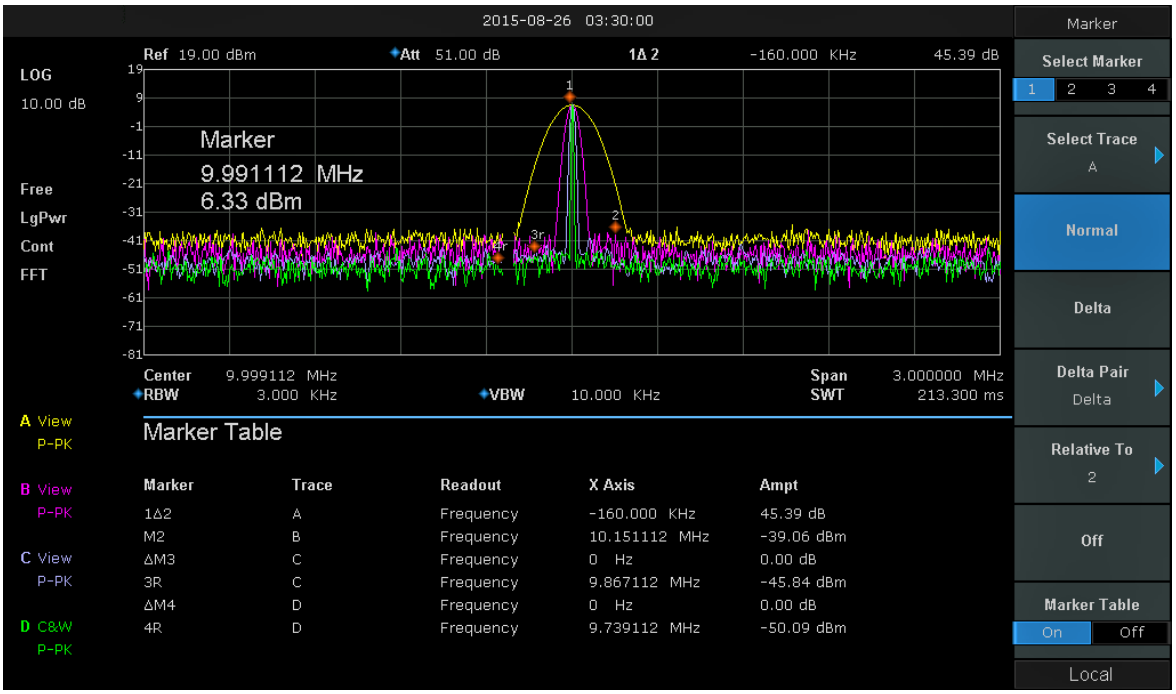
- Research Laboratory
- Development Laboratory
- Repair and Maintenance
- Calibration Laboratory
- Automatic Production Test
- General bench-top use

PANEL INTRODUCTION

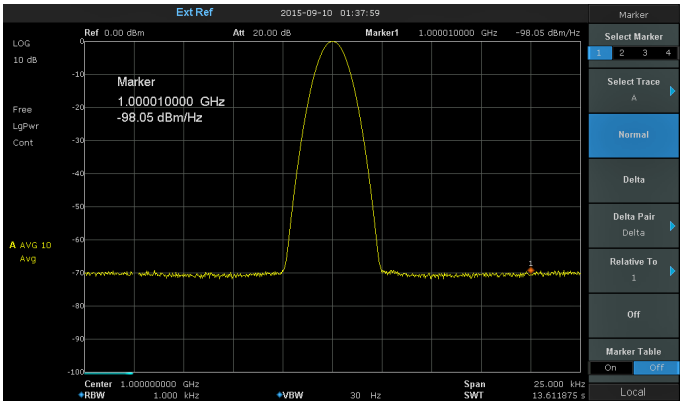


1. Graphical User Interface
2. Menu Control Keys
3. Function Keys
4. Numeric Keyboard
5. Adjust Knob
6. Arrow Keys
7. RF Input
8. Tracking Generator Output
9. Earphone interface
10. USB Host
11. Power Switch
12. Handle
13. USB Device
14. Function Keys
15. 10 MHz Reference In
16. 10 MHz Reference Out
17. External Trigger In
18. Kensington Lock Point
19. AC Power Socket

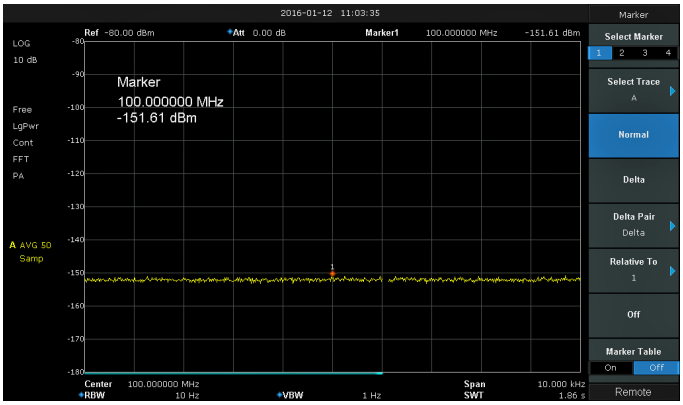
Supports four independent traces and cursors



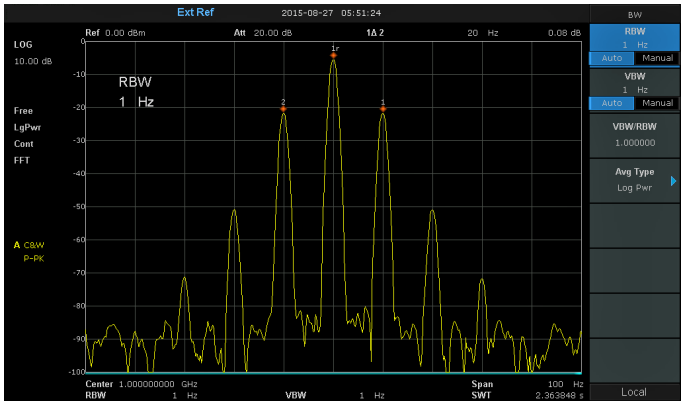
Phase noise -98 dBc/Hz @ 1 GHz, offset 10 kHz



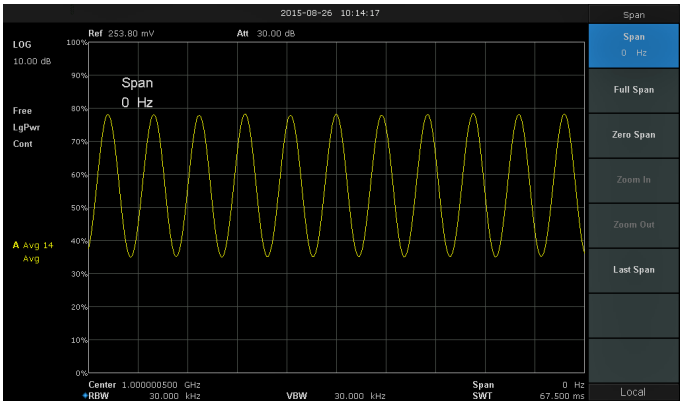
-151 dBm Displayed Average Noise Level (RBW = 10 Hz)



1 Hz Minimum Resolution Bandwidth (RBW)



Zero span and demodulation capabilities



SPECIFICATIONS

Specifications are valid under the following conditions: The instrument is within the calibration period, has been stored between 0 and 50°C for at least 2 hours prior to use, and has been powered on and warmed up for at least 40 minutes. The specifications include the measurement uncertainty, unless otherwise noted.

Specifications: All products are guaranteed to meet published specifications when operating in temperatures from 5 to 45 °C, unless otherwise noted.

Typical: Performance deemed typical implies that 80 percent of the measurement results will meet the typical published performance with a 95th percentile confidence level at room temperature (approximately 25 °C). Typical performance is not warranted and does not include measurement uncertainty.

Nominal: The expected performance or design attribute.

Frequency Characteristic

	T3SA3200	T3SA3100
Frequency		
Frequency range	9 kHz – 3.2 GHz	9 kHz – 2.1 GHz
Frequency resolution	1 Hz	1 Hz
Frequency Span		
Range	0 Hz, 100 Hz to 3.2 GHz	0 Hz, 100 Hz to 2.1 GHz
Accuracy	± Span / (number of sweep points - 1)	
Internal Reference Source		
Reference frequency	10.000000 MHz	
Frequency reference accuracy	± [(time since last adjustment × frequency aging rate) + temperature stability + calibration accuracy]	
Initial calibration accuracy	< 1 ppm	
Temperature stability	< 1 ppm/year, 0 °C ~ 50 °C	
Frequency aging rate	< 0.5 ppm/first year, 3.0 ppm/20 years	
Marker		
Marker resolution	Span / (number of sweep points - 1)	
Marker uncertainty	± [frequency indication × frequency reference uncertainty + 1 % × span + 10 % × resolution bandwidth + marker resolution]	
Frequency counter resolution	1 Hz	
Frequency counter uncertainty	± [frequency indication × frequency reference accuracy + counter resolution]	
Bandwidths		
Resolution bandwidth (-3 dB)	1 Hz ~ 1 MHz [1)], in 1-3-10 sequence	
Resolution filter shape factor	< 4.8:1 (60 dB:3 dB), Gaussian-like	
RBW uncertainty	< 5 %	
Video bandwidth (-3 dB)	1 Hz ~ 3 MHz, in 1-3-10 sequence	
VBW uncertainty	< 5%	

[1)] The DANL with RBW set to 1 or 3 Hz will be similar to 10 Hz.

Amplitude Characteristic

T3SA3200	T3SA3100		
Amplitude and Level			
Measurement range	DANL to +10 dBm, 100 kHz ~ 1 MHz, preamplifier off DANL to +20 dBm, 1 MHz ~ 3.2 GHz, preamplifier off		
Reference level	-100 dBm to +30 dBm, 1 dB steps Preamplifier		
	20 dB (nom.), 9 kHz ~ 3.2 GHz Input attenuation		
	0 ~ 51 dB, 1 dB steps		
Maximum input DC voltage	±50 VDC		
Maximum average RF power	30 dBm, 3 minutes, fc ≥ 10 MHz, attenuation > 20 dBm, preamp off Maximum		
damage level	33 dBm, fc ≥ 10 MHz, attenuation > 20 dBm, preamp off		
Displayed Average Noise Level (DANL)			
	20 °C ~ 30 °C, attenuation = 0 dB, sample detector, trace average > 50		
Preamp off		RBW = 10 Hz	Normalization to 1 Hz
	9 kHz ~ 100 kHz	-100 dBm (nom.)	-110 dBm (nom.)
	100 kHz ~ 1 MHz	-97 dBm, -101 dBm (typ.)	-107 dBm, -111 dBm (typ.)
	1 MHz ~ 10 MHz	-122 dBm, -126 dBm (typ.)	-132 dBm, -136 dBm (typ.)
	10 MHz ~ 200 MHz	-127 dBm, -131 dBm (typ.)	-137 dBm, -141 dBm (typ.)
	200 MHz ~ 2.1 GHz	-125 dBm, -129 dBm (typ.)	-135 dBm, -139 dBm (typ.)
	2.1 GHz ~ 3.2 GHz	-116 dBm, -122 dBm (typ.)	-126 dBm, -132 dBm (typ.)
Preamp on	9 kHz ~ 100 kHz	-107 dBm (nom.)	-117 dBm (nom.)
	100 kHz ~ 1 MHz	-122 dBm, -127 dBm (typ.)	-132 dBm, -137 dBm (typ.)
	1 MHz ~ 10 MHz	-138 dBm, -144 dBm (typ.)	-148 dBm, -154 dBm (typ.)
	10 MHz ~ 200 MHz	-146 dBm, -151 dBm (typ.)	-156 dBm, -161 dBm (typ.)
	200 MHz ~ 2.1 GHz	-145 dBm, -148 dBm (typ.)	-155 dBm, -158 dBm (typ.)
	2.1 GHz ~ 3.2 GHz	-135 dBm, -139 dBm (typ.)	-145 dBm, -149 dBm (typ.)
Phase Noise			
	20 °C ~ 30 °C, f c = 1 GHz		
Phase Noise	<-95 dBc/Hz @10 kHz offset, <-98 dBc/Hz (typ.)		
	<-96 dBc/Hz @100 kHz offset, <-97 dBc/Hz (typ.)		
	<-115 dBc/Hz @1 MHz offset, <-117 dBc/Hz (typ.)		
Level Display			
Logarithmic level axis	10 dB to 200 dB		
Linear level axis	0 to reference level		
Units of level axis	dBm, dBmV, dBμV, dBμA, V, W		
Number of display points	751		
Number of traces	4		
Trace detectors	Positive-peak, Negative-peak, Sample, Normal, Average (Voltage/RMS/Video), Quasi-peak (with EMI option)		
Trace functions	Clear write, Max Hold, Min Hold, View, Blank, Average		
Frequency Response			
	20 °C to 30 °C, 30 % to 70 % relative humidity, attenuation = 20 dB, reference frequency 50 MHz		
Preamp off	±0.8 dB		
	±0.4 dB, (typ.)		
Preamp on	±0.9 dB		
	±0.5 dB, (typ.)		

Amplitude Characteristic

	T3SA3200	T3SA3100
Error and Accuracy		
Resolution bandwidth switching uncertainty	10 kHz RBW Logarithmic resolution ±0.2 dB, liner resolution ±0.01, nominal	
Input attenuation switching uncertainty	20 to 30 , fc = 50 MHz, preamp off, Relative to 20 dB, 1 to 51 dB attenuation ±0.5 dB	
Absolute amplitude accuracy	20 °C to 30 °C, fc = 50 MHz, RBW = 1 kHz, VBW = 1 kHz, peak detector, attenuation = 20 dB, 95th percentile reliability	
	preamp off ±0.4 dB, input signal -20 dBm	
	preamp on ±0.5 dB, input signal -40 dBm	
Total amplitude accuracy	20 °C to 30 °C, Fc >100 kHz, input signal -50 dBm ~ 0 dBm, RBW = 1 kHz, VBW = 1 kHz, peak detector, attenuation = 20 dB, preamp off, 95th percentile reliability ± 0.7 dB	
RF input VSWR	input attenuation 10 dB, 1 MHz ~ 3.2 GHz <1.5, nominal	
Distortion and Spurious Responses		
Second harmonic distortion	fc ≥ 50 MHz, mixer level -30 dBm, attenuation = 0 dB, preamp off, 20 °C to 30 °C, typ. -65 dBc	
Third-order intercept	fc ≥ 50 MHz, two -20 dBm tones at input mixer spaced by 100 kHz, attenuation = 0 dB, preamp off, 20 °C to 30 °C, typ. +10 dBm	
1dB Gain Compression	fc ≥ 50 MHz, attenuation = 0 dB, preamp off, 20 °C to 30 °C, nom. >-5 dBm	
Residual response	input terminated = 50 Ω, attenuation = 0 dB, 20 °C to 30 °C, typ. <-90 dBm	
Input related spurious	Mixer level = -30 dBm, 20 °C to 30 °C <-65 dBc	

Sweep and Trigger

Sweep time	1 ms to 3000 s	
Sweep accuracy	Accuracy, Speed	
Sweep mode	Sweep	FFT
	RBW = 30 Hz ~ 1 MHz	RBW = 1 Hz ~ 10 kHz
Sweep rule	Single, Continuous	
Trigger source	Free, Video, External	
External trigger	5 V TTL level, rising edge/falling edge	

External input and external output

Front panel RF input	50 Ω, N-female Front
panel TG output	50 Ω, N-female
10 MHz reference output	10 MHz, >0 dBm, 50 Ω, BNC-female
10 MHz reference input	10 MHz, -5 dBm ~ +10 dBm, 50 Ω, BNC-female
External Trigger input	1 kΩ, 5 V TTL , BNC-female
Security	Kensington Lock point

Communication Interface

USB Host	USB-A 2.0 + USB
Device	USB-B 2.0
LAN	LAN (VXI11), 10/100 Base, RJ-45

General Specification

	T3SA3200 T3SA3100
Display	TFT LCD, 1024 × 600 (waveform area 751 × 501), 10.1 inch (25.65 cm)
Storage	Internal (Flash) 256 MByte, External (USB storage device) 32 GByte
Source	Input voltage range (AC) 100 V ~ 240 V, AC frequency supply 45 Hz ~ 440 Hz, Power consumption 30 W
Temperature	Working temperature 0 °C to 50 °C, Storage temperature -20 °C to 70 °C
Humidity	0 °C to 30 °C, ≤ 95 % Relative humidity; 30 °C to 50 °C, ≤ 75 % Relative humidity
Dimensions	393 mm × 207 mm × 116.5 mm (W × H × D)
Weight	Including the tracking generator 4.60 kg (10.1 lb)
Warranty	3 years return to Teledyne LeCroy

Electromagnetic Compatibility and Safety

EMC	EN 61326-1:2013
Electrical safety	EN 61010-1:2010

Ordering Information

Product Description	T3SA3000 Spectrum Analyzer	Order Number
Product code	Spectrum Analyzer, 9 kHz ~ 3.2 GHz	T3SA3200
	Spectrum Analyzer, 9 kHz ~ 2.1 GHz	T3SA3100
Standard configurations	A Quick Start, A USB Cable, A Calibration Certificate Power cord	
Utility Options	Utility Kit: N(M)-SMA(M) cable N(M)-N(M) cable N(M)-BNC(F) adaptor (2 pcs) N(M)-SMA(F) adaptor (2 pcs) 10 dB attenuator	T3SA3000-UTL
Near Field Probe Kits	Near Field Probe: H / E field probe set, 300 kHz – 3.0 GHz (3 H Field Probes: 20 mm, 10 mm, 5 mm) (1 E Field Probe: 5 mm)	T3NFP3

ABOUT TELEDYNE TEST TOOLS

TELEDYNE TEST TOOLS
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Company Profile

Teledyne LeCroy is a leading provider of oscilloscopes, protocol analyzers and related test and measurement solutions that enable companies across a wide range of industries to design and test electronic devices of all types. Since our founding in 1964, we have focused on creating products that improve productivity by helping engineers resolve design issues faster and more effectively. Oscilloscopes are tools used by designers and engineers to measure and analyze complex electronic signals in order to develop high-performance systems and to validate electronic designs in order to improve time to market.

The Teledyne Test Tools brand extends the Teledyne LeCroy product portfolio with a comprehensive range of test equipment solutions. This new range of products delivers a broad range of quality test solutions that enable engineers to rapidly validate product and design and reduce time-to-market. Designers, engineers and educators rely on Teledyne Test Tools solutions to meet their most challenging needs for testing, education and electronics validation.

Location and Facilities

Headquartered in Chestnut Ridge, New York, Teledyne Test Tools and Teledyne LeCroy has sales, service and development subsidiaries in the US and throughout Europe and Asia. Teledyne Test Tools and Teledyne LeCroy products are employed across a wide variety of industries, including semiconductor, computer, consumer electronics, education, military/aerospace, automotive/industrial, and telecommunications.

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T3 stands for Teledyne Test Tools.

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