T3VNA Data Sheet
1.5 GHz and 3.2 GHz Vector Network Analyzers

Broad Measurement Range
Frequency Range: 9 kHz to 3.2 GHz

Tools for Improved Debugging

- Vector Network Analyzer, Spectrum Analyzer and Distance To Fault modes.
  - ✓ More application coverage from a single instrument.

- -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 Advanced Measurement capability (CHP, ACPR, OBW, CNR, TOI, etc)
  - ✓ Excellent capability across all applications and measurement modes for a better user results

- Built-in switchable pre-amplifier.
  - ✓ Integrated pre-amplifier allows higher sensitivity measurements.

- 10.1 inch (25.65 cm) color WVGA 1024 x 600 display.
  - ✓ Clear and flexible display aids ease of use.

- USB Device, USB Host and LAN support.
  - ✓ Remote control your measurements.

Key Specifications

Model	T3VNA1500	T3VNA3200
Vector Network Analyzer Frequency Range	10 MHz to 1.5 GHz	100 kHz to 3.2 GHz
Spectrum Analyzer Frequency Range	9 kHz to 1.5 GHz	9 kHz to 3.2 GHz
Resolution Bandwidth	1 Hz to 1 MHz	1 Hz to 1 MHz
Displayed Average Noise Level	-156 dBm / Hz	-161 dBm / Hz
Phase Noise	< -98 dBc / Hz	< -98 dBc / Hz
Total Amplitude Accuracy	< 1.2 dB	< 0.7 dB

Teledyne Test Tools T3VNA family of Vector Network Analyzers consists of models with various Vector Network Analysis frequency ranges from as low as 100 kHz up to 3.2 GHz and Spectrum Analysis frequency range from 9 kHz up to 3.2 GHz depending on model. The small footprint and easy user interface is augmented by a high performance specification with many advanced measurement functions and capabilities.

The high performance Vector Network Analysis capability is enhanced further by the full featured Spectrum Analysis Capability and the Distance To Fault mode.

- High performance Vector Network Analysis capability from 100 kHz to 3.2 GHz
- Full Spectrum Analysis measurements from 9 kHz to 3.2 GHz
- Distance To Fault measurement to > 30 meters.

Teledyne Test Tools vector network analyzers offers comprehensive measurement capabilities supporting the user when conducting more complex measurements and make daily measurement tasks easier and faster.

Typical Applications

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

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

Features and Benefits

- Vector Network Analyzer Frequency Range from 100 kHz up to 3.2 GHz
- Spectrum Analyzer 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
- Distance to fault capability using VNA time domain analysis
- Up to 3.2 GHz Tracking Generator Kit
- Built-in Advanced Measurement capability (CHP, ACPR, OBW, CNR, TOI, etc)
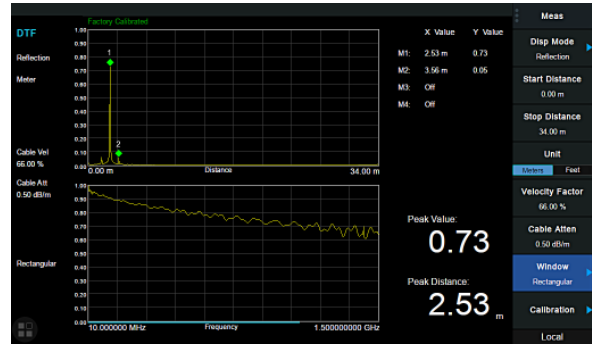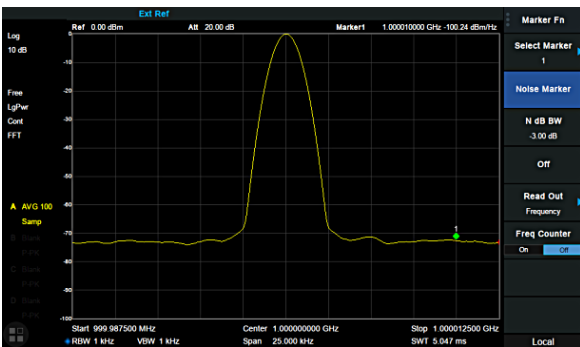- 10.1 Inch WVGA (1024 x 600) Display
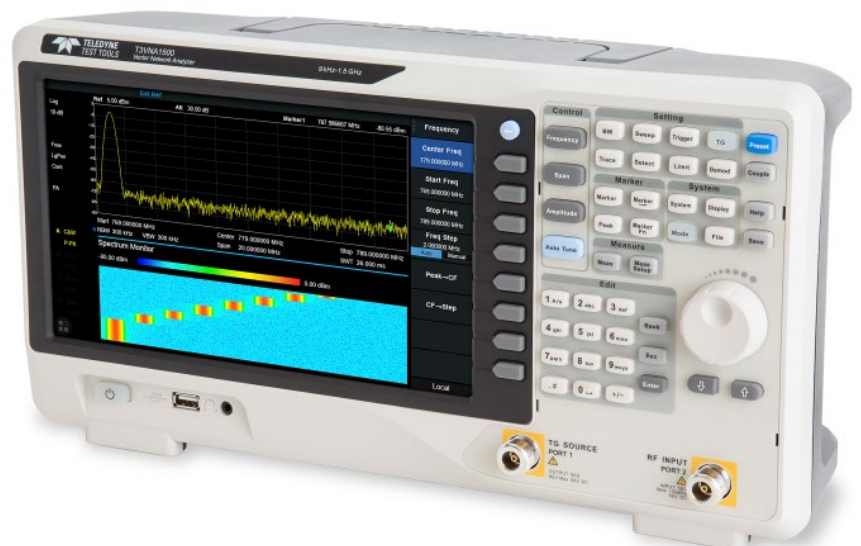
Vector Network Analyzer Mode with multi-format overlay display
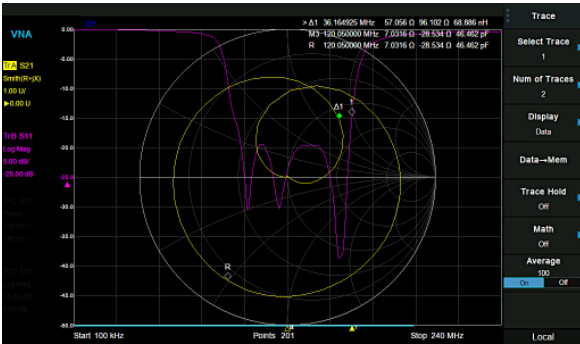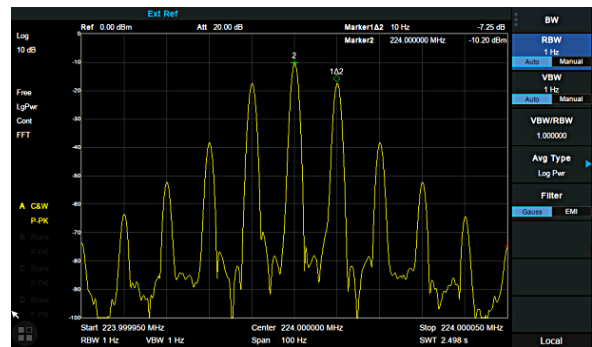

Distance to Fault Mode based on time domain analysis
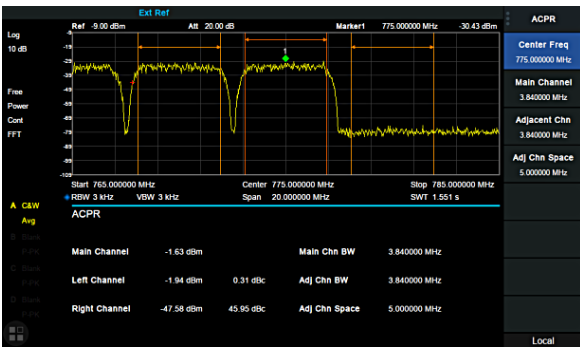

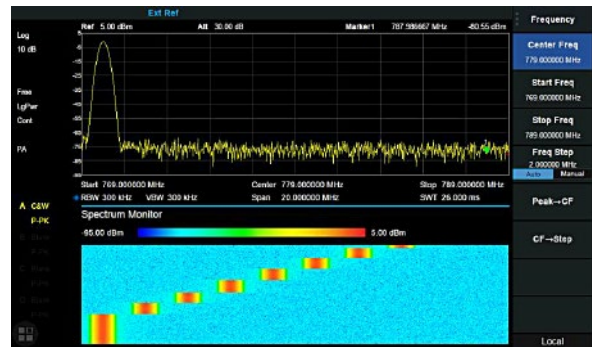## Phase noise -98 dBc/Hz @1 GHz, offset 10 kHz

Minimum 1 Hz Resolution Bandwidth

Adjacent Channel Power Ratio (ACPR) in advanced measurement mode

2D Time – Frequency spectrogram in advanced measurement mode

DESIGN FEATURES

	T3VNA1500	T3VNA3200
Vector Network Analyzer Frequency Range	10 MHz − 1.5 GHz	100 kHz − 3.2 GHz
Spectrum Analyzer Frequency Range	9 kHz − 1.5 GHz	9 kHz − 3.2 GHz
Resolution Bandwidth	1 Hz − 1 MHz	1 Hz − 1 MHz
Displayed Average Noise Level	-156 dBm/Hz	-161 dBm/Hz
Phase Noise	<-98 dBc/Hz	<-98 dBc/Hz
Total Amplitude Accuracy	< 1.2 dB	< 0.7 dB
Tracking Generator	5 MHz − 1.5 GHz	100 kHz − 3.2 GHz
Touch Screen	Multi Touch, Mouse and Keyboard supported	
Advanced Measurement	CHP, ACPR, OBW, CNR, Harmonic, TOI, Monitor	
Vector Network Analysis	Vector S11, Vector S21	
Distance to Fault	VNA Timing Domain Analysis	
Communication Interface	LAN, USB Device, USB Host(USB-GPIB)	
Remote Control Capability	SCPI/Labview/IVI based on USB-TMC/VXI-11/Socket/Telnet	
Remote Controller	NI-MAX, Web Browser, File Explorer	

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: The T3VNA1500 and T3VNA3200 are guaranteed to meet published specifications when operating at room temperature (approximately 25 °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.

SPECIFICATIONS

Vector Network Analyzer Mode

	T3VNA1500	T3VNA3200
Stimulus and Measurement		
Frequency Range	10 MHz − 1.5 GHz	100 kHz − 3.2 GHz
Measurement	S11, S21	S11, S21
IFBW	10 kHz	10 kHz
Port1 Stimulus Power	0 dBm (Nom.)	-5 dBm (Nom.)
Format	Lin Mag, Log Mag, Phase, Group Delay, SWR,	
	Smith Chart (Lin/Phase, Log/Phase, Real/Imag, R+j∗X, G+j∗B),	
	Polar Chart (Lin/Phase, Log/Phase, Real/Imag)	
Sweep Points	101 − 751, default 201	
Trace	4 traces, Mem, Math, Hold, Overlay	
Marker	(6 + Ref) ∗ 4 traces	
Calibration		
Directivity of Calibration	S11, Log mag, Average = 50, >50MHz	
Dynamic Range	> 40 dB	
	S21, IFBW = 10 kHz, Port1 level = -5 dBm, Log Mag, Average = 50	
	100 kHz − 10 MHz 75 dB	75 dB
	10 MHz − 1.5 GHz 80 dB	80 dB
	1.5 GHz − 3.2 GHz −	80 dB
Trace Noise	10 kHz RBW, Log mag, Average = 50, >10 MHz	
	0.1 dB	
Calibration	Full 1-Port(OSL), Open Response, Short Response	
	Response Through, Enhanced Response,	
Mechanical Calibration Kit	Open, Short, Load, Through;	
	User Cal Kit	
Port Extensions	Port 1, Port 2, Auto Open Port 1	
System Z0	50 Ω	
Velocity Factor	0.1 − 1	

Spectrum Analyzer Mode

	T3VNA1500	T3VNA3200
Frequency		
Frequency range	9 kHz − 1.5 GHz	9 kHz − 3.2 GHz
Frequency resolution	1 Hz	
Frequency Span		
Range	0 Hz, 100 Hz to Max Frequency	
Accuracy	± Span / (number of display points - 1)	
Internal Reference Source		
Reference frequency	10.000000 MHz	
Reference frequency accuracy / uncertainty	± [(time since last adjustment × frequency ageing rate) + temperature stability + initial 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 display points - 1)	
Marker uncertainty	± [frequency indication × reference frequency uncertainty + 1% × span + 10% × resolution bandwidth + marker resolution]	
Freq Counter resolution	0.01 Hz	
Bandwidths		
Resolution bandwidth (-3 dB)	1 Hz − 1 MHz, in 1-3-10 sequence	1 Hz − 3 MHz, 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	1 Hz − 10 MHz, in 1-3-10 sequence
VBW uncertainty	<5 %	

SPECIFICATIONS

	T3VNA1500	T3VNA3200
Sweep and Trigger		
Sweep time	1 ms to 1500 s	1 ms to 3200 s
Sweep mode	RBW = 30 Hz − 1 MHz, Sweep RBW = 1 Hz − 10 kHz, FFT	
Sweep rule	Single, Continuous	
Trigger source	Free, Video, External	
External trigger	5 V TTL level, Rising edge/Falling edge	

Amplitude Accuracy and Range Specifications

	T3VNA1500	T3VNA3200
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	-200 dBm to +30 dBm, 1 dB steps	
Preamplifier	20 dB (nom.)	
Input attenuation	0 − 30 dB, 1 dB steps	0 − 50 dB, 1 dB steps
Maximum input DC voltage	+/- 50 V_{DC}	
Maximum average 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 to 30°C, attenuation = 0 dB, sample detector, trace average > 50, Normalized to 1 Hz, TG off	
Preamp off	100 kHz − 1 MHz -101 dBm, -107 dBm (typ.)	-107 dBm, -111 dBm (typ.)
	1 MHz − 10 MHz -124 dBm, -130 dBm (typ.)	-132 dBm, -136 dBm (typ.)
	10 MHz − 200 MHz -128 dBm, -134 dBm (typ.)	-137 dBm, -141 dBm (typ.)
	200 MHz − 1.5 GHz -121 dBm, -127 dBm (typ.)	-135 dBm, -139 dBm (typ.)
	1.5 GHz − 3.2 GHz	-126 dBm, -132 dBm (typ.)
Preamp on	100 kHz − 1 MHz -120 dBm, -128 dBm (typ.)	-132 dBm, -137 dBm (typ.)
	1 MHz − 10 MHz -147 dBm, -152 dBm (typ.)	-148 dBm, -154 dBm (typ.)
	10 MHz − 200 MHz -150 dBm, -156 dBm (typ.)	-156 dBm, -161 dBm (typ.)
	200 MHz − 1.5 GHz -142 dBm, -148 dBm (typ.)	-155 dBm, -158 dBm (typ.)
	1.5 GHz − 3.2 GHz	-145 dBm, -149 dBm (typ.)
SSB Phase Noise		
	20°C to 30°C, fc = 1 GHz, Normalized to 1 Hz	
10 kHz offset	< -95 dBc/Hz, < -99 dBc/Hz (typ.)	< -95 dBc/Hz, < -98 dBc/Hz (typ.)
100 kHz offset	< -96 dBc/Hz, < -98 dBc/Hz (typ.)	< -96 dBc/Hz, < -97 dBc/Hz (typ.)
1 MHz offset	< -115 dBc/Hz, < -120 dBc/Hz (typ.)	< -115 dBc/Hz, < -117 dBc/Hz (typ.)
Level Display		
Logarithmic level axis	1 dB to 200 dB	
Linear level axis	0 to reference level	
Units of level axis	dBm, dBmV, dBµV, dBµA, Volt, Watt	
Number of display points	751	
Number of traces	4	
Trace detectors	Positive-peak, Negative-peak, Sample, Normal, Average(Voltage/RMS/Video), Quasi-peak	
Trace functions	Clear write, Max Hold, Min Hold, View, Blank, Average, Math	
Frequency Response		
	20°C to 30°C, 30% to 70 % relative humidity, att = 20 dB, relative to fc = 50 MHz	
Preamp off	±0.8 dB, ±0.4 dB (typ.)	
Preamp on	±1.2 dB, ±0.5 dB (typ.)	

SPECIFICATIONS

	T3VNA1500	T3VNA3200
Error and Accuracy		
Resolution bandwidth switching uncertainty	Logarithmic resolution, relative to RBW = 10 kHz	
	± 0.2 dB (nom.)	
Input attenuation switching uncertainty	20 °C to 30 °C, fc = 50 MHz, preamp off, relative to att = 20 dB	
	± 0.5 dB	
Absolute amplitude accuracy	20 °C to 30 °C, fc = 50 MHz, RBW = VBW = 1 kHz, att = 20 dB, peak detector, 95 % reliability	
	±0.4 dB, input signal -20 dBm, Preamp off	
	±0.6 dB, input signal -40 dBm, Preamp on	
Total amplitude accuracy	20 °C to 30 °C, fc >100 kHz, input signal -50 dBm − 0 dBm, att = 20 dB, RBW = VBW = 1 kHz, peak detector, preamp off, 95 % reliability	
	±1.2 dB	±0.7 dB
RF input VSWR	Att = 10 dB, >1 MHz	
	<1.5 (nom.)	
Distortion and Spurious Responses		
Second harmonic distortion (SHI)	20 °C to 30 °C, fc ≥ 50 MHz, mixer level -20 dBm, att = 0 dB, preamp off	
	-65 dBc / +45 dBm (nom.)	
Third-order intercept (TOI)	20 °C to 30 °C, fc ≥ 50 MHz, two -20 dBm tones spaced by 100 kHz, att = 0 dB, preamp off	
	+10 dBm (typ.)	
1 dB gain compression	20 °C to 30 °C, fc ≥ 50 MHz, att = 0 dB, preamp off	
	> -5 dBm (nom.)	
Residual response	20 °C to 30 °C, input terminated = 50 Ω, att = 0 dB	
	< -90 dBm	
Input related spurious	20 °C to 30 °C, mixer level = -30 dBm	
	< -65 dBc	

Tracking Generator

Frequency Parameter		
Frequency Range	5 MHz − 1.5 GHz	100 kHz − 3.2 GHz
Frequency resolution	1 Hz, Zero Span	
RBW	100 Hz − 1 MHz, sweep mode	
Power Parameter		
Output level	-20 dBm − 0 dBm	
Output level resolution	1 dB	
Output flatness	+/-3 dB (nom.)	
Normalization Trace	Ref A/B/C/D → Ref	
VSWR	< 2 (nom.)	
Connector and Impendence	N-type female, 50 Ω	
Average safe reverse power	Total : 30 dBm (1 W)	
Maximum safe reverse level	Voltage: ±50 V_{DC}	

Advanced Measurements

Power Measurement	
CHP, Channel Power	Channel Power, Power Spectral Density
ACPR, Adjacent Channel Power Ratio	Main CH Power, Left channel power, Right channel power
OBW, Occupied Bandwidth	Occupied Bandwidth, Transmit Frequency Error
T-Power, Time Domain Power	Zero Span Integrated Power
CNR, Carrier Noise Ratio	C/N, Noise Power
Non-Linear Measurement	
Harmonic measurement	Max Harmonic number 10
TOI, Third-Order Intercept	Measure the third-order products and intercepts from two tones
Spectrum Monitor Measurement	
Spectrogram	

SPECIFICATIONS

Distance to Fault Mode

	T3VNA1500	T3VNA3200
Measurement		
Frequency Range	10 MHz − 1.5 GHz	100 kHz − 3.2 GHz
Maximum Distance (meters)	(76800 × Velocity Factor) / (stop freq − start freq (MHz))	
Resolution (meters)	(150 × Velocity Factor) / (stop freq − start freq (MHz))	
Windows	Rectangular, Hamming	
Calibration	Full 1-Port (OSL)	
Velocity Factor	0.1 − 1	

External input and external output

Front panel RF input, Port 2	50 Ω, N-female Front
Front panel TG output, Port 1	50 Ω, N-female Front
10 MHz reference output	Ⓐ 10 MHz, >0 dBm, 50 Ω, BNC-female
10 MHz reference input	Ⓑ 10 MHz, -5 dBm to +10 dBm, 50 Ω, BNC-female
External Trigger input	Ⓒ 10 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

SPECIFICATIONS

General Specification

	T3VNA1500	T3VNA3200
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 50/60 Hz or 100 − 120V 400 Hz, Power consumption 35 W	
Temperature	Working temperature 0 °C to 40 °C, Storage temperature -20 °C to 70 °C	
Humidity	90 % RH up to 30 °C; derates to 50 % at 50 °C	
Dimensions	393 mm × 207 mm × 116.5 mm (W × H × D)	
Weight	T3VNA1500 4.30 kg (9.5 lb)	T3VNA3200 4.40 kg (9.7 lb)
Warranty	3 years return to Teledyne LeCroy	

Electromagnetic Compatibility and Safety

EMC	EN 61326-1:2013
Electrical safety	EN 61010-1:2015

Ordering Information

Product Description	T3VNA Vector Network Analyzer	Order Number
Product code	Vector Network Analyzer, 9 kHz − 1.5 GHz Vector Network Analyzer, 9 kHz − 3.2 GHz	T3VNA1500 T3VNA3200
Standard configurations	A Quick Start, A USB Cable, A Calibration Certificate, Power cord, Calibration Kit, Utility Kit	
Near Field Probe Kits	Near Field Probe: H field probe set, 30 MHz − 3.0 GHz (4 H Field Probes: 25 mm, 10 mm, 5 mm, 2 mm)	T3SA3000-NFP
	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