Anritsu Since 1895

Vector Network Analyzer
Portfolio Brochure

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Confidence
on the Cutting Edge

In the Lab | On the Manufacturing Floor | In the Field

For every measurement scenario from on-wafer device characterization to R&D testing to manufacturing and field operations, Anritsu continues to be the leader in VNA technologies and measurements.

VectorStar® 2 and 4 Port Millimeter-wave
Vector Network Analyzer

VectorStar Millimeter-wave Vector Network Analyzer

2 and 4 port version of the VectorStar ME7838A operating with external mm-wave modules

The VectorStar ME7838A mm-wave system combines the MS4640B series VNA and 3739C test set to control 2 external mm-wave modules for measurement frequencies from 110 GHz to 1.1 THz and higher in waveguide bands. The 3739C test set routes the internal RF and LO signals from VectorStar thus eliminating the need for external sources. If 4 ports are required, a 3736B test set and the MN4697C 4 port test set with 2 additional modules can be attached. OML or VDI modules may be used.

The VectorStar ME7838A, the first mm-wave VNA system with real-time power leveling, has best-in-class stability with the widest power level control. The mm-wave system detects IF and RF power and provides correction to the mm-wave power in real time and without the need for software correction feedback. The method delivers stable mm-wave power even at low levels and reduces the risk of overdriving power-sensitive mm-wave devices – inherent in other systems. Thus, power sweep is available in an industry-leading range of up to 55 dB and without the need for mechanical attenuators in the mm-wave module.

- The first millimeter-wave system with real time electronic power leveling eliminating power correction time lag found on alternative systems using software correction feedback.

- Provides accurate, stable power control with widest power sweep for safe, accurate gain compression measurements.

VectorStar ME7838A Millimeter-wave System

- 4 port test set (MN4697C) and master mm-wave test set (3736B) can be added to standard 2 port system for 4 port operation.

- No need to purchase expensive 4 port test sets initially – upgrade the VectorStar mm-wave system when needed and budget permits.

Key Specifications	
Frequency	Waveguide bands from 110 GHz to 1.1 THz and higher
Power, Dynamic Range and Residual Performance	As provided by vendor mm-wave modules and appropriate calibration kits.

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Configuration for ME7838A VectorStar 2 Port Millimeter-wave System (> 110 GHz)

Action	Part Number	Description
Choose and order one of the four base VNAs, with the options listed	MS4642B MS4640B-007 MS4642B-082	Vector Network Analyzer, 10 MHz to 20 GHz Receiver Offset Option Millimeter-wave Interface
	MS4644B MS4640B-007 MS4644B-082	Vector Network Analyzer, 10 MHz to 40 GHz Receiver Offset Option Millimeter-wave Interface
	MS4645B MS4640B-007 MS4645B-082	Vector Network Analyzer, 10 MHz to 50 GHz Receiver Offset Option Millimeter-wave Interface
	MS4647B MS4640B-007 MS4647B-082	Vector Network Analyzer, 10 MHz to 70 GHz Receiver Offset Option Millimeter-wave Interface
Order Test Set	3739C	Broadband & mm-Wave Test Set
Order system cables	SM6626	mm-Wave module interface cables substituting for broadband cables (1 pair)
Choose and order a pair of mm-Wave modules	OML VxxVNA2-T/R, 2 each -or-	Choose appropriate OML, Inc. mm-wave band module. Include external OML power supply or equivalent.
	VDI WRxxTxRx-20G, 2 each	Choose appropriate VIRGINIA Diodes, Inc. mm-wave band module
Add options if desired to the selected VNA	MS464xB-051	External VNA loops (Substitute MS464xB-082 with MS464xB-083)
	MS464xB-061	Active Measure Suite, 2 atten. (Substitute MS464xB-082 with MS464xB-083)
	-or- MS464xB-062	Active Measure Suite, 4 atten. Substitute MS464xB-082 with MS464xB-083)
	MS4640B-070	70 kHz coverage
	MS4640B-002	Time Domain

Configuration for ME7838A VectorStar 4 Port Millimeter-wave System (> 110 GHz)

| Action	Part Number	Description
Choose and order one of the four base VNAs, with the options listed	MS4642B MS4640B-007 MS4642B-082 MS4642B-051, 061, or 062	Vector Network Analyzer, 10 MHz to 20 GHz Receiver Offset Option Millimeter-wave Interface Access Loop or Active Suite
	MS4644B MS4640B-007 MS4644B-082 MS4644B-051, 061, or 062	Vector Network Analyzer, 10 MHz to 40 GHz Receiver Offset Option Millimeter-wave Interface Access Loop or Active Suite
	MS4645B MS4640B-007 MS4645B-082 MS4645B-051, 061, or 062	Vector Network Analyzer, 10 MHz to 50 GHz Receiver Offset Option Millimeter-wave Interface Access Loop or Active Suite
	MS4647B MS4640B-007 MS4647B-082 MS4647B-051, 061, or 062	Vector Network Analyzer, 10 MHz to 70 GHz Receiver Offset Option Millimeter-wave Interface Access Loop or Active Suite
Order Test Set	3739C	Broadband & mm-Wave Test Set
Order 4 Port Test Set	MN4697C	4 Port Test Set
Order Master Test Set	3736B	4 Port Master Test Set
Order system cables	SM6626(2)	mm-Wave module interface cables substituting for broadband cables (1 pair)
Choose and order mm-Wave modules	OML VxxVNA2-T/R, 4 each -or-	Choose appropriate OML, Inc. mm-wave band module. Include external OML power supply or equivalent.
	VDI WRxxTxRx-20G, 4 each	Choose appropriate VIRGINIA Diodes, Inc. mm-wave band module
Add options if desired to the selected VNA	MS4640B-070	70 kHz coverage
	MS4640B-002	Time Domain

VectorStar®
4 Port 110 GHz Broadband VNA

VectorStar 4 Port Broadband System
70 kHz to 110 GHz

4 port version of the VectorStar Broadband ME7838A with all the performance benefits

The ME7838A4 4 port 110 GHz broadband VectorStar offers a number of industry-best performance in the most critical aspects for design engineers: best calibration and measurement stability, widest frequency range, best power range and control, and optimum on-wafer installation. When multiport or differential devices must be measured, the 2 port ME7838A can easily be upgraded to a 4 port configuration yet still maintain the key performance advantages. The ability to purchase broadband four ports now or upgrade when budget permits is another example of how VectorStar is designed to adapt to growing needs.

- Widest broadband frequency coverage for best device characterization accuracy – 70 kHz to 110 GHz (40 kHz to 125 GHz operational).

- Industry-best dynamic range for best accuracy – 107 dB at 110 GHz.

- Industry-best calibration and measurement stability minimizes the need for recalibration.

- The first millimeter-wave system with real time electronic power leveling eliminating power correction time lag found on alternative systems using software correction feedback. Provides accurate, stable power control with widest power sweep for safe, accurate gain compression measurements.

- 3743A mm-wave module uses same Nonlinear Transmission Line technology found in VectorStar harmonic sampler offering excellent raw performance.
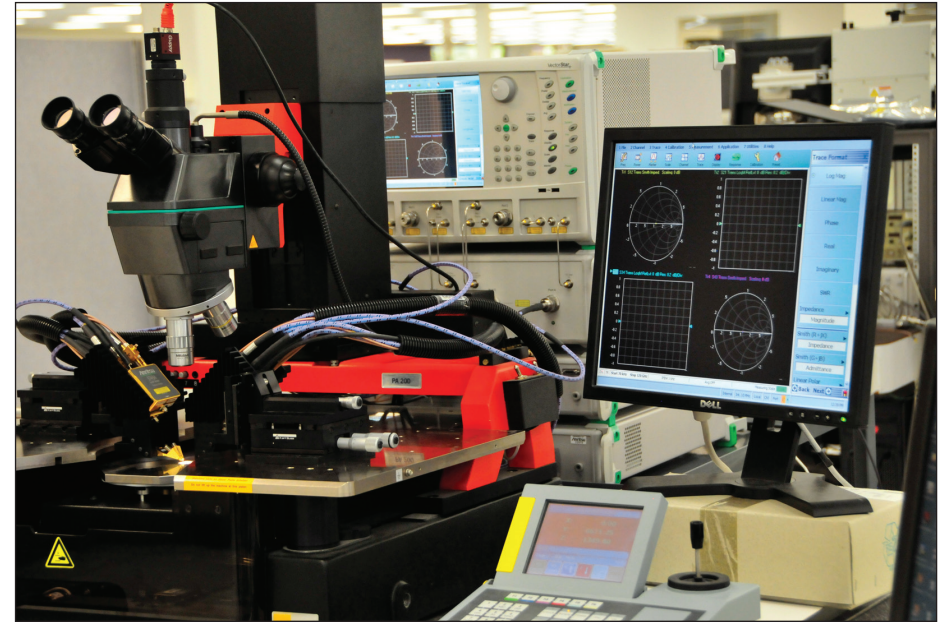
4 Port VectorStar ME7838A4 Broadband On-wafer System

- Compact, lightweight mm-wave modules for easy, precise, and economical positioning on the wafer probe station – 0.6 lb and 1/50 the volume. Four port configuration can be installed on smaller economical probe stations.

- 4 port test set (MN4697C) and the master test set (3736B) can be added to standard 2 port broadband system. No need to purchase expensive 4 port test sets initially – upgrade the VectorStar Broadband system when needed and budget permits.

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**VectorStar ME7838A4 4 Port VNA Broadband System
70 KHz to 110 GHz (operational to 125 GHz) consists of:**

Part Number	Qty	Description
MS4647B VNA,	1	10 MHz TO 70 GHz
With options:		
MS4640B-007		Option 7, Receiver Offset
MS4640B-070		Option 70, 70 kHz Low-end Frequency Extension
Add one of the following:		
MS4647B-051		Direct Access Loops
MS4647B-061		Active Measurements Suite, 2 attenuators
MS4647B-062		Active Measurements Suite, 4 attenuators
Add one of the following:		
MS4647B-080		Option 80, Millimeter Wave Interface (For MS4647B in ME7838D or ME7838A system)
MS4647B-081		Option 81, Millimeter Wave Interface (For MS4647B in ME7838D or ME7838A system ordered with Options 51, 61 or 62)
MS4647B-084		Option 84, Millimeter Wave Interface (For MS4647B in ME7838D or ME7838A system with Option 31 added)
MS4647B-085		Option 85, Millimeter Wave Interface (For MS4647B in ME7838D or ME7838A system with Option 31 and Option 51, 61 or 62 added)

Key Specifications	
Frequency	70 kHz – 110 GHz (40 kHz – 125 GHz operational)
Dynamic Range	2 MHz to 54 GHz; >/= 90 dB 54 to 110 GHz; 107 dB

Part Number	Qty	Description
3739C	1	Broadband and Millimeter-wave Test Set with 36 inch interface Cables.
MN4697C	1	4-Port Test Set, V (VNA must have at minimum, either Option 51, 61 or 62)
3736B	1	Master Test Set
3743A	4	3743A Frequency Extension Module (Note: Modules are ECCN 3A001 / IVL required to A1 Countries)
806-209	4	1.85mm phase stable VNA RF cable, 36", M-F

On-site system assembly and verification will be arranged by Customer Service upon delivery of all system items.

Note: Option 51, 61,or 62 (for the MS4647B) is not included in system price and must be purchased separately

Master Test Sets	
3736B	4-Port Master Test Set
4-Port Test Sets	
MN4697C	4-Port Test Set, V (For MS4645B or MS4647B) (VNA must 3, 7c have, at minimum, either Option 51, 61, or 62)

VectorStar™
E and W Band Millimeter-wave VNA System

VectorStar E and W Band Millimeter-wave System

High performance waveguide band system using compact Anritsu mm-wave modules

The VectorStar E and W band millimeter-wave (mm-wave) system incorporates the high performance compact Anritsu mm-wave modules in an economical extended E or W band configuration. The compact size and weight of the 3743A mm-wave module allows users to easily set up a high performance waveguide banded system for the most demanding measurement and installation challenges. The compact modules are optimal for waveguide measurements where traditional large and cumbersome mm-wave modules provide limited power control and poor stability. For antenna measurements, the compact module is ideal when mm-wave modules must be placed on an X/Y positioner for pattern scanning.

The banded version modules are supplied with a standard 1 mm test port connector and appropriate waveguide adapter. The modules are thus ideally suited for typical waveguide measurements as well as on-wafer applications where DC bias is needed.

- The VectorStar E and W band system combines the 40 GHz MS4644B or higher frequency VNA with the 3739C test set to control the banded version mm-wave modules.

- The 3744A-EE mm-wave module provides extended E Band coverage from 56 to 94 GHz with WR12 waveguide flange and operates to 95 GHz.

- The 3744A-EW mm-wave module provides extended W Band coverage from 65 to 110 GHz with WR10 waveguide flange.

- The Anritsu mm-wave modules provide the first millimeter-wave system with real time electronic power leveling thereby eliminating power correction time lag found on alternative systems using software correction feedback.

VectorStar ME7838A Millimeter-wave System

- Provides accurate, stable power control with widest power sweep for safe, accurate gain compression measurements.

- The waveguide adapter can be removed for on-wafer applications and DC bias.

- The mm-wave module can be easily adapted for any waveguide band operating from 54 to 125 GHz.

As with the broadband ME7838A system, the VectorStar waveguide banded system provides power control and power sweep capabilities using real time monitoring and correction through a closed loop. Thus, power sweep is available in an industry-leading range of up to 55 dB or more and without the need for mechanical or electronic attenuators in the mm-wave module. The result is stable power even at extremely low levels.

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3744A-EE Extended-E Band Specifications (Summary)

Frequency (GHz)	Dynamic Range (dB)	Noise Floor (dBm)	Power Range (dBm)
56-80	106	–106 to –111	–55 to 1, –2, or –4
80-85	115	–112	–55 to –6
85-90	105	–110	–55 to –4
90-94	103	–105	–55 to 0

3744A-EW Extended-W Band Specifications (Summary)

Frequency (GHz)	Dynamic Range (dB)	Noise Floor (dBm)	Power Range (dBm)
65-80	106	–106 to –111	–55 to 1 or –2
80-85	115	–112	–55 to –6
85-90	105	–110	–55 to –4
90-105	103	–105	–55 to 0
105-110	103	–110	–55 to –5

Configuration for VectorStar ME7838 E Band Millimeter-wave System

Action	Part Number	Description
Choose and order one of the three base VNAs, with the options listed	MS4644B MS4640B-007 MS4644B-082	Vector Network Analyzer, 10 MHz to 40 GHz Receiver Offset Option Millimeter-wave Interface
	MS4645B MS4640B-007 MS4645B-082	Vector Network Analyzer, 10 MHz to 50 GHz Receiver Offset Option Millimeter-wave Interface
	MS4647B MS4640B-007 MS4647B-080	Vector Network Analyzer, 10 MHz to 70 GHz Receiver Offset Option Millimeter-wave Interface (Opt 081 if Opt -061 or -062 are used)
Order Test Set	3739C	Broadband and mm-Wave Test Set (Test set also drives mm-Wave modules >110GHz)
Order pair of EE Band mm-Wave modules	3744A-EE (2)	Millimeter-wave module with WR12 extended E Band waveguide output.
Add options if desired to the selected VNA	MS464xB-061	Active Measure Suite, 2 atten. (Substitute MS464xB-082 with MS464xB-083)
	-or- MS464xB-062	Active Measure Suite, 4 atten. (Substitute MS464xB-082 with MS464xB-083)
	MS4640B-070	70 kHz coverage
	MS4640B-002	Time Domain

Configuration for VectorStar ME7838 W Band Millimeter-wave System

Action	Part Number	Description
Choose and order one of the three base VNAs, with the options listed	MS4644B MS4640B-007 MS4644B-082	Vector Network Analyzer, 10 MHz to 40 GHz Receiver Offset Option Millimeter-wave Interface
	MS4645B MS4640B-007 MS4645B-082	Vector Network Analyzer, 10 MHz to 50 GHz Receiver Offset Option Millimeter-wave Interface
	MS4647B MS4640B-007 MS4647B-080	Vector Network Analyzer, 10 MHz to 70 GHz Receiver Offset Option Millimeter-wave Interface (Opt 081 if Opt -061 or -062 are used)
Order Test Set	3739C	Broadband and mm-Wave Test Set (Test set also drives mm-Wave modules >110GHz)
Order pair of EW Band mm-Wave modules	3744A-EW (2)	Millimeter-wave module with WR10 extended W Band waveguide output.
Add options if desired to the selected VNA	MS464xB-061	Active Measure Suite, 2 atten. (Substitute MS464xB-082 with MS464xB-083)
	-or- MS464xB-062	Active Measure Suite, 4 atten. (Substitute MS464xB-082 with MS464xB-083)
	MS4640B-070	70 kHz coverage
	MS4640B-002	Time Domain

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MS46121A 1-Port ShockLine™
Vector Network Analyzers

ShockLine™ 1-Port USB VNAs up to 6 GHz

The MS46121A is a series of two PC-controlled 1-Port USB ShockLine Vector Network Analyzers with frequency ranges from 40 MHz to 4 GHz and 150 kHz to 6 GHz. The VNAs are packaged in a compact housing and are externally controlled via USB from a user supplied PC running the same Graphical User Interface (GUI) software as the rest of the ShockLine family of VNAs.

The MS46121A is ideal for testing 1-port devices in university laboratories and production lines. The combination of small size and good performance make the MS46121A 1-Port VNAs ideal for passive device test applications where low cost, performance and small form factor are desired.

The MS46121A with Option 2 provides a Time Domain Reflectometry (TDR) like display that enables real impedance measurements over frequency. With Option 21, scalar transmission between two to four MS46121A instruments can be performed in various configurations.

ShockLine™ 1-Port VNA Highlights

- Enables multisite testing of 16 DUTs in one single sweep.
- Direct connection to DUT avoids the need for RF cables resulting in improved measurement stability.
- PC control takes advantage of external computer processing power and functionality.
- Compact package allows measurements at hard to reach places.
- No onboard data storage eliminates the need for data purging in secure applications.
- Standard bandpass time domain grants easier and faster fault identification.
- A common GUI interface within the ShockLine family reduces switching costs between models.
- Low cost, small and lightweight.

MS46121A 1-PORT VECTOR ANALYZER

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Key Specifications

Analyzer Performance	
Frequency Options	MS46121A-004, 40 MHz to 4 GHz, type N(m) ports MS46121A-006, 150 kHz to 6 GHz, type N(m) ports
Corrected Directivity	42 dB, typical
Sweep Speed	100 µs / data point, typical
Trace Noise	Magnitude: 0.01 dB, typical Phase Noise: 0.05 degree, typical

General	
Measurement Parameters	S_{11} and any user-defined combination of a_1, b_1,1. Option 21: $S_{|XY|}$ where Y is the source and X is the receiver
Display Graphs	Log Magnitude, Phase, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart, Polar
Measurements Data Points	2 to 20,000 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 30, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 3, 5, 7, 10, 20, 30, 50, 100 kHz **Option 21** External Reference Enabled 1, 2, 3, 5, 7, 10, 20, 30, 50, 100 kHz Internal Reference Enabled 10, 20, 30, 50, 100 kHz
Display Channels	ShockLine software can control up to 16 MS46121A VNAs at a time, each on an independent channel. Great for making parallel measurements and reducing test time.
Traces	A maximum of 16 traces each. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker per trace
Display	Powerful GUI displayed on user-provided computer.
Temperature	Operating Temperature 0 °C to 50 °C
Dimensions	52 mm x 36 mm x 144 mm (HxWxD)
Weight:	0.4 kg (0.9 lb)

Product Options

Option Number	Description
MS46121A-002	Low Pass Time Domain
MS46121A-021	Scalar Transmission Measurement

Calibration Accessories

Part Number	Description
MN25208A	2-Port SmartCal 8.5 GHz USB Auto Calibration Unit
TOSLN50A-18	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLNF50A-18	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee
TOSLK50A-40	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLKF50A-40	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee
36585K	2-Port AutoCal 40 GHz Auto Calibration Unit
3653A	Type N Calibration Kit
3652A	Type K Calibration Kit
3650A	SMA / 3.5 mm Calibration Kit

Accessories

Cables	Automatic Calibration Unit

Calibration Accessories	Torque Wrenches

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MS46122A Compact ShockLine™
Vector Network Analyzers

World's first series of compact VNAs to 43.5 GHz

The MS46122A is a series of three Compact ShockLine USB Vector Network Analyzers. The VNAs are packaged in a compact 1U chassis and are externally controlled via USB from a user supplied PC running the same Graphical User Interface (GUI) software as the rest of the ShockLine family of VNAs. The unit also comes standard with 19" rack mount hardware for convenient rack mount installation.

The MS46122A benefits from patented Shockline VNA-on-chip technology which simplifies the internal VNA architecture at high frequencies, reduces instrument cost, and enhances accuracy and measurement repeatability. The combination of lower cost, small size and good performance make the MS46122A series VNAs ideal for passive device test applications where performance and small form factor are desired.
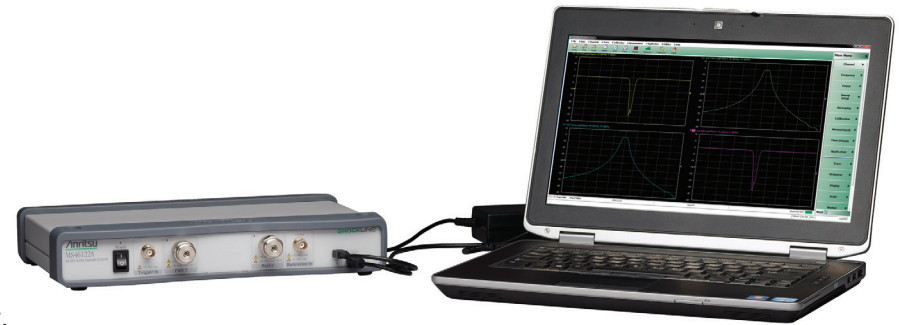
ShockLine™ Compact VNA Highlights

- World's first series of compact VNAs to 43.5 GHz for cost-effective measurements.
- Small, and lightweight, easily shared between test locations.
- PC control takes advantage of external computer processing power and functionality.
- Compact 1U high package for efficient use of bench and rack space.
- No onboard data storage eliminates the need for data purging in secure applications.
- Time domain with time gating option grants easier and faster fault identification.
- A common GUI interface within the ShockLine family reduces switching costs between models.
- Compatibility with the 36585K AutoCal enables fast calibrations up to 40 GHz

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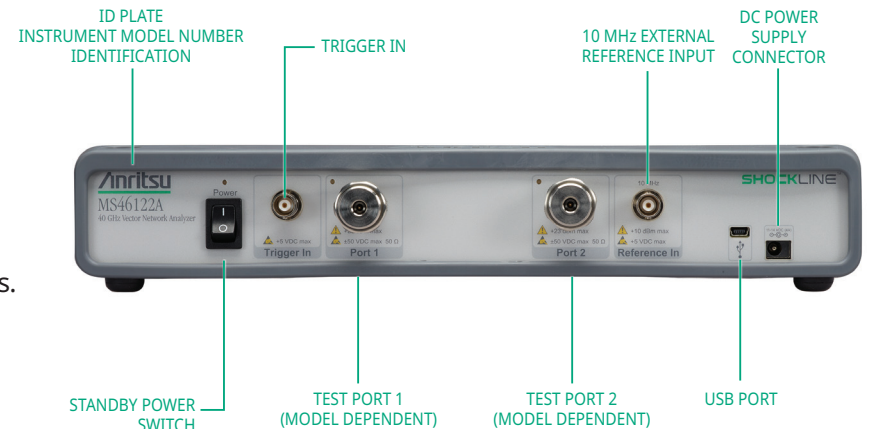
Key Specifications

Analyzer Performance	
Frequency Options	MS46122A-010, 1 MHz to 8 GHz, type N(f) ports MS46122A-020, 1 MHz to 20 GHz, type Ruggedized K(m) ports MS46122A-040, 1 MHz to 43.5 GHz, type Ruggedized K(m) ports (Ruggedized K(m) ports are compatible with 3.5 mm and SMA connectors)
Dynamic Range	> 110 dB, 14 GHz to 43.5 GHz, typical
Sweep Speed	220 µs / data point, typical
High Level Noise	1 mdB, 20 MHz to 43.5 GHz, typical

General	
Measurement Parameters	S_{11}, S_{21}, S_{22}, S_{12}, and any user-defined combination of a_1, a_2, b_1, b_2, 1.
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart, Polar
Measurements Data Points	2 to 16,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 5, 7, 10, 20, 30, 50, 70, 100, 300 kHz
Display Channels and Traces	Up to 16 channels with a maximum of 16 traces each. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker per trace
Display	Powerful GUI displayed on user-provided computer.
Temperature	Operating Temperature 0 °C to 50 °C
Dimensions	61 mm x 328 mm x 198 mm (H x W x D)
Weight:	< 2.2 kg (< 5 lbs), typical

Product Options

Option Number	Description
MS46122A-002	Time Domain with time gating

Calibration Accessories

Part Number	Description
MN25208A	2-Port SmartCal 8.5 GHz USB Auto Calibration Unit
TOSLN50A-18	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLNF50A-18	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee
TOSLK50A-40	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLKF50A-40	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee
36585K	2-Port AutoCal 40 GHz Auto Calibration Unit
3653A	Type N Calibration Kit
3652A	Type K Calibration Kit
3650A	SMA / 3.5 mm Calibration Kit

Accessories

Cables	Automatic Calibration Unit

Calibration Accessories	Torque Wrenches

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MS46322A Economy ShockLine™
Vector Network Analyzers

The Ideal Choice for Cost-Sensitive Applications

The MS46322A is a series of Economy ShockLine™ Vector Network Analyzers with frequency range from 1 MHz to 4/8/14/20/30/43.5 GHz. It is based on patented Shockline VNA-on-chip technology, which simplifies the internal VNA architecture at high frequencies, reduces instrument cost, enhances accuracy and minimizes measurement uncertainty.

The MS46322A are all 2-port VNAs packaged in a compact and rugged 2U chassis. The entire series has 220 microseconds per point sweep speed, and better than 100 dB dynamic range to 43.5 GHz, making it suitable for testing passive devices in engineering, manufacturing and cost-sensitive education applications.s.

ShockLine™ Economy VNA Highlights

- Ideal for testing RF and microwave devices
- Fast sweep speed and wide dynamic range minimizes production test time
- Excellent corrected directivity allows for less measurement uncertainty
- Time domain with time gating option grants easier and faster fault identification
- The LAN interface for remote control is faster than GPIB
- A common GUI and SCPI interface within the ShockLine family for ease of use
- USB ports allow for easy connection to peripherals like keyboard and mouse
- The small 2U packages allows for the efficient use of rack space
- Compatibility with the 36585K AutoCal enables fast calibrations up to 40 GHz

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Key Specifications

Analyzer Performance	
Frequency Options	MS46322A-004, 1 MHz to 4 GHz, type N(f) ports MS46322A-010, 1 MHz to 8 GHz, type N(f) ports MS46322A-014, 1 MHz to 14 GHz, type Ruggedized K(m) ports MS46322A-020, 1 MHz to 20 GHz, type Ruggedized K(m) ports MS46322A-030, 1 MHz to 30 GHz, type Ruggedized K(m) ports MS46322A-040, 1 MHz to 43.5 GHz, type Ruggedized K(m) ports (Ruggedized K(m) ports are compatible with 3.5 mm and SMA connectors)
Dynamic Range	> 100 dB
Sweep Speed	220 us / data point, typical
Corrected Directivity	≥ 30 dB at 30 - 43.5 GHz
General	
Measurement Parameters	S_{11}, S_{21}, S_{22}, S_{12}, and any user-defined combination of a_1, a_2, b_1, b_2, 1.
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart
Measurements Data Points	2 to 16,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 5, 7, 10, 20, 30, 50, 70, 100, 300 kHz
Display and Traces	Up to 16 traces. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker per trace
Remote Control Interface	SCPI/Software drivers over LAN
Display	Powerful GUI displayed on user-provided monitor, touchscreen compatible
Temperature	Operating Temperature 0 °C to 50 °C, humidity 95% or less at 40 °C
Dimensions	108 mm x 484 mm x 590 mm
Weight:	< 11 kg (< 25 lb), typical

Product Options

Option Number	Description
MS46322A-001	Rack mount
MS46322A-002	Time Domain with time gating

Calibration Accessories

Part Number	Description
MN25208A	2-Port SmartCal 8.5 GHz USB Auto Calibration Unit
TOSLN50A-8	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLNF50A-8	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee
TOSLK50A-40	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLKF50A-40	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee
36585K	2-Port AutoCal 40 GHz Auto Calibration Unit
3653A	Type N Calibration Kit
3650A	SMA / 3.5 mm Calibration Kit

Accessories

Cables	Automatic Calibration Unit

Calibration Accessories	Torque Wrenches

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MS46522B 2-Port ShockLine™ Performance
Vector Network Analyzer

RF and Microwave VNAs to 43.5 GHz

The MS46522B is a series of 2-port Performance ShockLine Vector Network Analyzers. Delivering an unprecedented level of value and performance, including best-in-class dynamic range, the MS46522B series lowers cost-of-test and speeds time to market in numerous test applications up to 43.5 GHz. These applications include characterizing and manufacturing mobile network equipment, mobile devices, automotive cables, high-speed data interconnects and system integration components.

The MS46522B configured with option 10, 20, or 40 brings RF to microwave frequency capabilities to the Performance ShockLine family. These frequency options, combined with powerful ShockLine software, provide a cost effective solution for the most challenging, passive device testing.

The MS46522B series comes in a 3U high chassis and uses the same GUI, software, command syntax, drivers, and programming environments as the rest of the ShockLine family.

MS46522B-010 (8.5 GHZ VNA SHOWN ABOVE)

ShockLine™ Performance VNA Highlights

- High output power allows measurement of high attenuation devices.
- Industry leading dynamic range enables measurement of very low reflection artifacts.
- Excellent corrected directivity minimizes measurement uncertainty.
- SmartCal auto calibration unit reduces calibration and setup time.
- Time domain with time gating option grants easier and faster fault identification.
- Modern LAN interface for remote control is faster than GPIB.
- A common GUI and SCPI interface within the Shockline Family for ease of use.
- USB ports allow for easy connection to peripherals like keyboard and mouse.
- The small 3U packages allows for the efficient use of rack space.

PORT 1   PORT 2   USB 2.0 CONNECTORS

POWER BUTTON   GROUND STRAP CONNECTOR

USB 2.0 CONNECTORS   LAN CONNECTOR   EXTERNAL CLOCK IN/OUT

HDMI CONNECTOR   USB 3.0 CONNECTORS   TRIGGER IN/OUT   AC CORD RECEPTACLE

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Key Specifications

Analyzer Performance	
Frequency Options	MS46522B-010, 50 kHz to 8.5 GHz, type N(f) ports MS46522B-020, 50 kHz to 20 GHz, type k(m) ports MS46522B-040, 50 kHz to 43.5 GHz, type k(m) ports
Dynamic Range	> 140 dB, (50 MHz to 2 GHz)
Output Power	–30 dBm to +15 dBm, (300 kHz to 6 GHz)
Corrected Directivity	> 42 dB
General	
Measurement Parameters	S_{11}, S_{21}, S_{22}, S_{12}, and any user-defined combination of a_1, a_2, b_1, b_2, 1.
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart (Impedance)
Measurements Data Points	2 to 20,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 30, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 3, 5, 7, 10, 20, 30, 50, 70, 100, 200, 300, 500 kHz
Display and Traces	Up to 16 traces. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker
Remote Control Interface	SCPI/Software drivers over LAN
Display	Powerful GUI displayed on user-provided monitor, touchscreen compatible
Dimensions (H x W x D)	152 mm x 445 mm x 442 mm
Weight:	< 11 kg (< 25 lb), typical

Product Options

Option Number	Description
MS46522B-001	Rack mount
MS46522B-002	Time Domain with time gating

Calibration Accessories

Part Number	Description
MN25208A	2-Port SmartCal 8.5 GHz USB Auto Calibration Unit
36585k	2-Port Precision AutoCal 40 GHz Auto Calibration Unit
TOSLN50A-8	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLNF50A-8	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee
TOSLK50A-40	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLKF50A-40	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee
3653A	Type N Calibration Kit
3650A	SMA / 3.5 mm Calibration Kit
15NN50-1.0B	Test port Cable, DC to 18 GHz, N(m)-N(m)

Accessories

Cables	Automatic Calibration Unit

Calibration Accessories	Torque Wrenches

MS46524B 4-Port ShockLine™ Performance
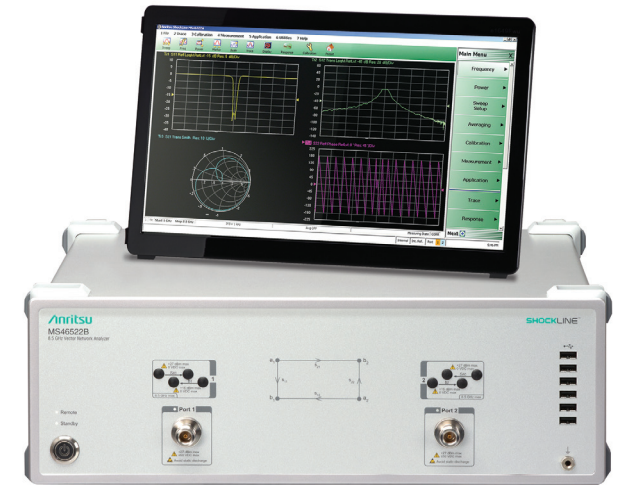## Vector Network Analyzer

RF and Microwave VNAs to 43.5 GHz

The MS46524B is a series of 4-port Performance ShockLine Vector Network Analyzers. Delivering an unprecedented level of value and performance, including best-in-class dynamic range, the Performance series lowers cost-of-test and speeds time to market in numerous test applications up to 43.5 GHz. These applications include characterizing and manufacturing, multi-port mobile network equipment, mobile devices, automotive cables, high-speed data interconnects and system integration components.

The MS46524B configured with option 10, 20, or 40 brings RF to microwave frequency capabilities to the Performance ShockLine family. These frequency options, combined with powerful ShockLine software, provide a cost effective solution for the most challenging, passive device testing.
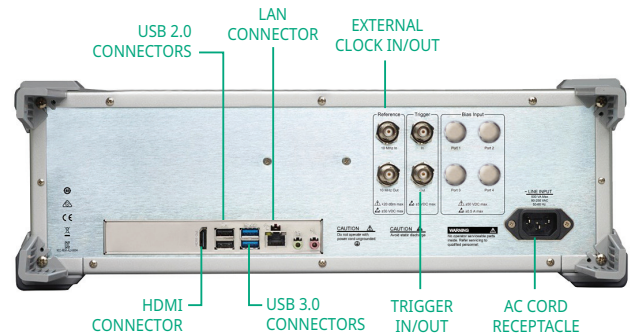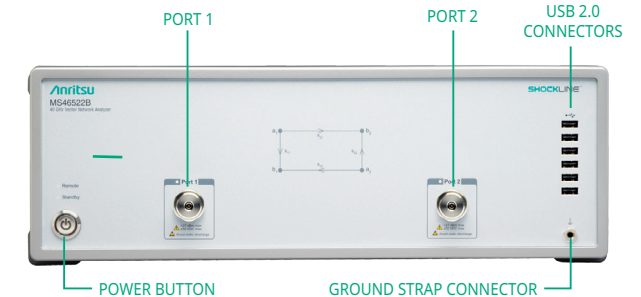
The MS46524B series comes in a 3U high chassis and uses the same GUI, software, command syntax, drivers, and programming environments as the rest of the ShockLine family.

ShockLine™ 4-Port VNA Highlights

- Ideal for testing single-ended and multi-port RF devices.
- Industry leading dynamic range enables measurement of very low reflection artifacts.
- Excellent corrected directivity minimizes measurement uncertainty.
- Time domain with gating option grants easier and faster fault identification.
- Modern LAN interface for remote control is faster than GPIB.
- A common GUI and SCPI interface within the ShockLine family.
- USB ports allow for easy connection to peripherals like keyboard and mouse.
- The compact 3U high packages allows for the efficient use of rack space.
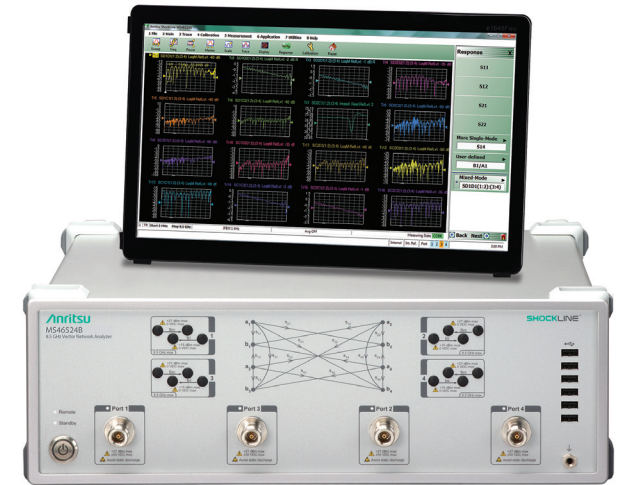
MS46524B-010 (8.5 GHZ VNA SHOWN ABOVE)

PORT 1 · PORT 3 · PORT 2 · PORT 4 · USB 2.0 CONNECTORS · POWER BUTTON · GROUND STRAP CONNECTOR

USB 2.0 CONNECTORS · LAN CONNECTOR · EXTERNAL CLOCK IN/OUT · HDMI CONNECTOR · USB 3.0 CONNECTORS · TRIGGER IN/OUT · AC CORD RECEPTACLE

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Key Specifications

Analyzer Performance	
Frequency Option	MS46524B-010, 50 kHz to 8.5 GHz, type N(f) ports MS46524B-020, 50 kHz to 20 GHz, type k(m) ports MS46524B-040, 50 kHz to 43.5 GHz, type k(m) ports
Dynamic Range	> 140 dB (50 MHz to 2 GHz)
Output Power	–30 dBm to +15 dBm (300 kHz to 6 GHz)
Corrected Directivity	> 42 dB

General	
Measurement Parameters	Single ended S-Parameters: S_{11}, S_{12}, S_{13}, S_{14}, S_{21}, S_{22}, S_{23}, S_{24}, S_{31}, S_{32}, S_{33}, S_{34}, S_{41}, S_{42}, S_{43}, S_{44} Mixed-Mode S-Parameters: SD1D1, SD1D2, SD1C1, SD1C2, SD2D1, SD2D2, SD2C1, SD2C2, SC1D1, SC1D2, SC1C1, SC1C2, SC1D2, SC2D2, SC2C1, SC2C2 User-defined combination: a_1, a_2, a_3, a_4, b_1, b_2, b_3, b_4, 1.
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart (Impedance)
Measurements Data Points	2 to 20,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 30, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 3, 5, 7, 10, 20, 30, 50, 70, 100, 200, 300, 500 kHz
Display and Traces	Up to 16 traces. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker per trace
Remote Control Interface	SCPI/Software drivers over LAN
Display	Powerful GUI displayed on user-provided monitor, touchscreen compatible
Dimensions (H x W x D)	152 mm x 445 mm x 442 mm
Weight:	< 13.6 kg (< 30 lbs), typical

Product Options

Option Number	Description
MS46524B-001	Rack mount
MS46524B-002	Time Domain with time gating

Calibration Accessories

Part Number	Description
MN25208A	2-Port SmartCal 8.5 GHz USB Auto Calibration Unit
36585k	2-Port Precision AutoCal 40 GHz Auto Calibration Unit
TOSLN50A-8	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLNF50A-8	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee
TOSLK50A-40	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLKF50A-40	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee
3653A	Type N Calibration Kit
3650A	SMA / 3.5 mm Calibration Kit
15NN50-1.0B	Test port Cable, DC to 18 GHz, N(m)-N(m)

Accessories

Cables	Automatic Calibration Unit

Calibration Accessories	Torque Wrenches

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MS46522B Option 82
ShockLine™ Performance Vector Network Analyzer

Dedicated E-Band VNA for 55-92 GHz Applications

Option 82 is the E-band frequency option for the 2-port MS46522B. It brings banded mm-wave measurement capabilities to an economic cost level unprecedented in the marketplace. For applications requiring only E-band frequency coverage, the new 500B series 55-92 GHz mm-wave option is the best value on the market and enables mass market production of E-band components.

The E-band VNA consists of small tethered source/receiver modules and a base chassis. The modules are attached to the chassis through one-meter cables that are permanently attached to the unit making this a compact, ready-to-use E-band VNA. The remote modules have native WR12 waveguide interface for convenient interfacing to typical waveguide devices.

The MS46522B series comes in a 3U high chassis and uses the same GUI, software, command syntax, drivers, and programming environments as the rest of the ShockLine family.

ShockLine™ Performance VNA Highlights

- Extended frequency range covering E-band and major parts of V band.
- 120 dB dynamic range enables measurement of very low reflection artifacts.
- Full-assembled test system eliminates setup errors and increases reliability.
- Tethered modules connect directly to the DUT increasing measurement stability.
- Modern LAN interface for remote control is faster than GPIB.
- A common GUI and SCPI interface within the Shockline Family for ease of use.
- USB ports allow for easy connection to peripherals like keyboard and mouse.
- The small 3U packages allows for the efficient use of rack space.

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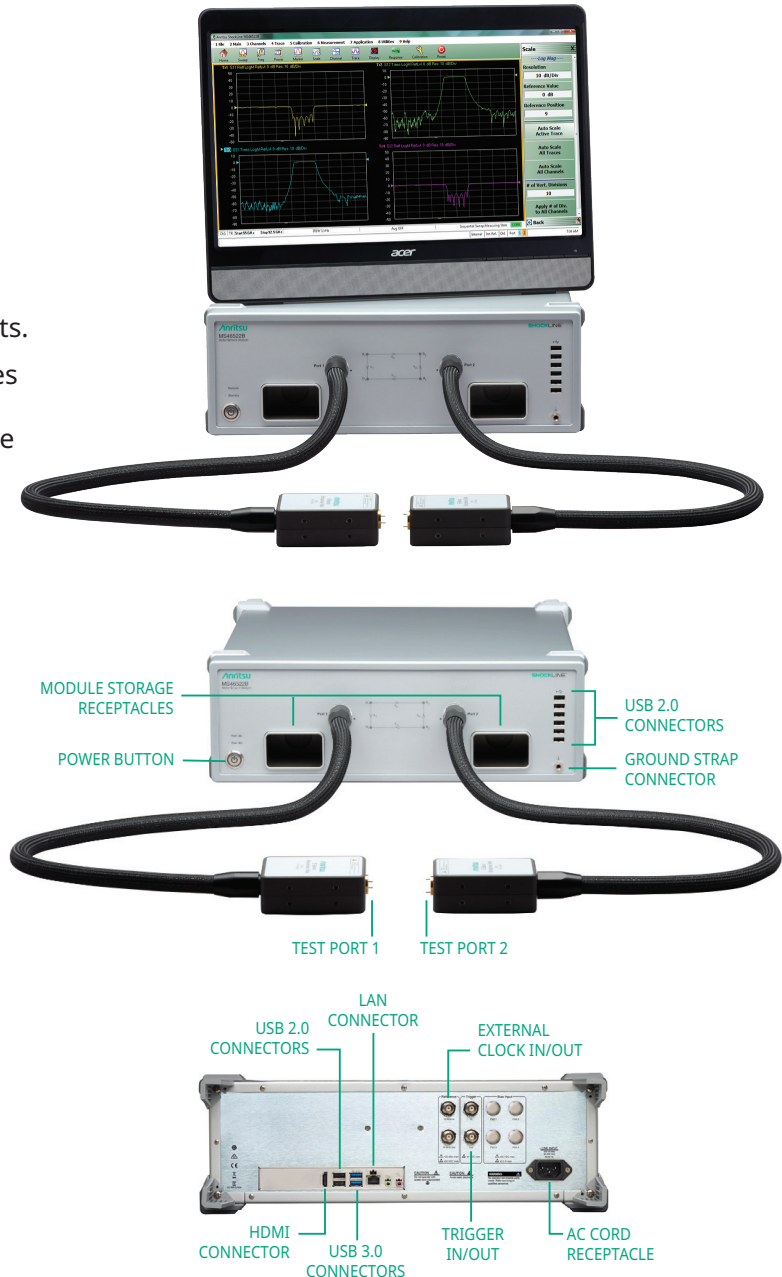
Key Specifications

Analyzer Performance	
Frequency Options	MS46522B-082, 55 to 92 GHz, WR-12 Waveguide Flange
Dynamic Range	120 dB
Output Power	–50 dBm to 0 dBm, (69 GHz to 85 GHz)

General	
Measurement Parameters	S_{11}, S_{21}, S_{22}, S_{12}, and any user-defined combination of a_1, a_2, b_1, b_2, 1.
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart (Impedance)
Measurements Data Points	2 to 20,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 30, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 3, 5, 7, 10, 20, 30, 50, 70, 100, 200, 300, 500 kHz
Display and Traces	Up to 16 traces. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker
Remote Control Interface	SCPI/Software drivers over LAN
Display	Powerful GUI displayed on user-provided monitor, touchscreen compatible

General (continued)	
Dimensions (H x W x D)	152 mm x 445 mm x 442 mm (Dimensions apply to chassis only)
Weight:	< 13 kg (< 28 lb), typical

Product Options

Option Number	Description
MS46522B-001	Rack mount
MS46522B-002	Time Domain with time gating

Calibration Accessories

Part Number	Description
3655E	Waveguide Calibration kit (WR12)

Accessories

Calibration Kit

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MS46524B Option 82
ShockLine™ Performance Vector Network Analyzer

Dedicated E-Band VNA for 55-92 GHz Applications

Option 82 is the E-Band frequency option for the 4-port MS46524B. It brings banded mm-wave measurement capabilities to an economic cost level unprecedented in the marketplace. For applications requiring only E-band frequency coverage, the new 500B series 55-92 GHz mm-wave option is the best value on the market and enables mass market production of E-band components.

The E-band VNA consists of small tethered source/receiver modules and a base chassis. The modules are attached to the chassis through one-meter cables that are permanently attached to the unit making this a compact, ready-to-use E-band VNA. The remote modules have native WR12 waveguide interface for convenient interfacing to typical waveguide devices.

The MS46524B series comes in a 3U high chassis and uses the same GUI, software, command syntax, drivers, and programming environments as the rest of the ShockLine family.

Key Features and Benefits

- Extended frequency range covering E-band and major parts of V band.
- 120 dB dynamic range enables measurement of very low reflection artifacts.
- Full-assembled test system eliminates setup errors and increases reliability.
- Tethered modules connect directly to the DUT increasing measurement stability.
- Modern LAN interface for remote control is faster than GPIB.
- A common GUI and SCPI interface within the Shockline Family for ease of use.
- USB ports allow for easy connection to peripherals like keyboard and mouse.
- The small 3U packages allows for the efficient use of rack space.

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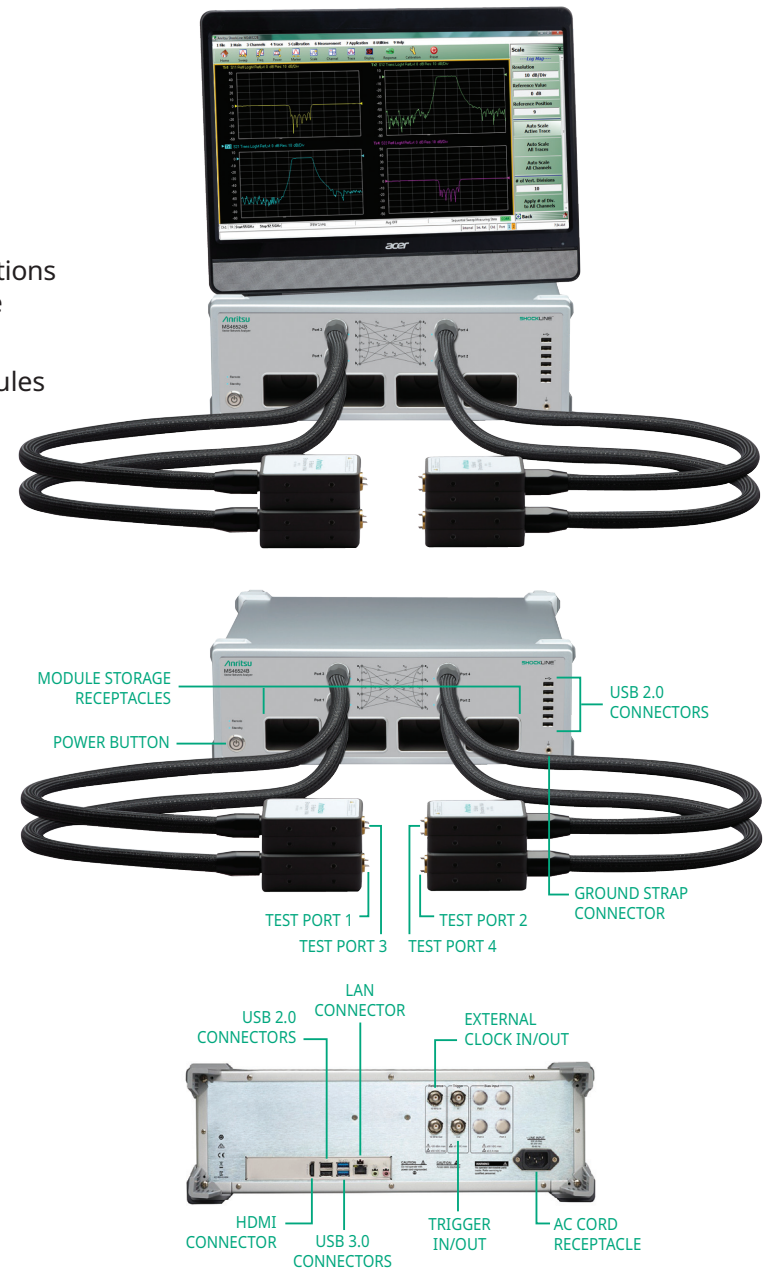
Key Specifications

Analyzer Performance	
Frequency Option	MS46524B-082, 55 to 92 GHz, WR-12 Waveguide Flange
Dynamic Range	120 dB
Output Power	–50 dBm to 0 dBm (69 GHz to 85 GHz)

General	
Measurement Parameters	Single ended S-Parameters: S_{11}, S_{12}, S_{13}, S_{14}, S_{21}, S_{22}, S_{23}, S_{24}, S_{31}, S_{32}, S_{33}, S_{34}, S_{41}, S_{42}, S_{43}, S_{44} Mixed-Mode S-Parameters: SD1D1, SD1D2, SD1C1, SD1C2, SD2D1, SD2D2, SD2C1, SD2C2, SC1D1, SC1D2, SC1C1, SC1C2, SC1D2, SC2D2, SC2C1, SC2C2 User-defined combination: a_1, a_2, a_3, a_4, b_1, b_2, b_3, b_4, 1.
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart (Impedance)
Measurements Data Points	2 to 20,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 30, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 3, 5, 7, 10, 20, 30, 50, 70, 100, 200, 300, 500 kHz
Display and Traces	Up to 16 traces. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker per trace
Remote Control Interface	SCPI/Software drivers over LAN

General (continued)	
Display	Powerful GUI displayed on user-provided monitor, touchscreen compatible
Dimensions (H x W x D)	152 mm x 445 mm x 442 mm (Dimensions apply to chassis only)
Weight:	< 15.9 kg (< 35 lbs), typical

Product Options

Option Number	Description
MS46524B-001	Rack mount
MS46524B-002	Time Domain with time gating

Calibration Accessories

Part Number	Description
3655E	Waveguide Calibration kit (WR12)

Accessories

Calibration Kit

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MN25208A SmartCal™
Automatic Calibration Unit

Low Cost USB Automatic Calibration Units

The SmartCal MN25208A is a series of 2-port automatic cablibration units covering a frequency range from 300 kHz to 8.5 GHz. The MN25208A has 4 different connector options which include a set of N(f), K(f), 3.5mm(f) or SMA(f) type connectors.

The MN25208A delivers automatic, fast and error-free calibrations for any ShockLine VNA. The SmartCal automatically powers on via an USB connection and loads calibration kit coefficients from on-board memory into the ShockLine software. The SmartCal is ready to use immediately after detection by the VNA because it doesn't require warm-up.

SmartCal improves productivity by providing easier and faster single connection calibrations. Port auto sense and port mapping feature reduce errors and make multiport calibrations easier. The MN25208A, along with easyTest, can also be used in guided graphical test procedures to further simplify complex calibrations.

MN25208A SmartCal™ Highlights

- Auto load of calibration kit coefficients speeds up setups and reduces calibration error.
- Auto sense determines the number of VNA ports connected preventing poor connections and calibration.
- VNA to SmartCal Port mapping increases flexibility and simplifies multiport calibrations.
- ShockLine software auto detects SmartCal providing simple and easy to use calibration software.
- No internal heater eliminates warm up time and provides a stable calibration.
- USB powered and controlled provides the convenience of a one plug interface without an external power supply.
- Single connection calibrations reduce wear and tear on connectors and cables over manual calibrations.
- Supports all ShockLine VNAs with 1-, 2-, 4-port calibration available.
- SCPI command set allows for easy integration into automated test environments.
- Automatic and fast calibrations at a low price.
- Small size provides easier use when moving between VNAs.

N(F) CONNECTOR
(OTHER CONNECTOR OPTIONS AVAILABLE)

TWO COLOR LED
REPORTS FUNCTIONAL STATUS OF SMARTCAL

USB MICRO-B PORT
FOR PC CONNECTIVITY

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Key Specifications

Analyzer Performance		
SmartCal Corrected Performance		
Typical Performance	MS46524B/522B	MS46322A/122A
Corrected Source Match	> 35 dB (300 kHz - 8.5 GHz)	≥ 33 dB (1 MHz - 8 GHz)
Corrected Load Match	> 38 dB (300 kHz - 5 GHz) > 33 dB (5 GHz - 8 GHz)	≥ 42 dB (1 MHz - 6 GHz) ≥ 37 dB (6 GHz - 8 GHz)
Corrected Directivity	> 42 dB (300 kHz - 5 GHz) > 36 dB (5 GHz - 8 GHz)	≥ 42 dB (1 MHz - 6 GHz) ≥ 37 dB (6 GHz - 8 GHz)
Transmission Tracking	± 0.08 dB (30 MHz - 8 GHz)	± 0.06 dB (1 MHz - 3 GHz) ± 0.08 dB (3 GHz - 8 GHz)
Reflection Tracking	± 0.08 dB (30 MHz - 8 GHz)	± 0.15 dB (1 MHz - 8 GHz)

ShockLine™ Vector Network Analyzer Family

Frequency Ranges from 50 kHz to 92 GHz

MS46121A 1-port USB VNA
MS46122A 2-port USB VNA
MS46322A 2-port Economy VNA

Performance E-Band VNA
MS46522B Option 82
(Not Pictured: MS46524B Option 82)

Performance VNA
MS46522B 2-port
MS46524B 4-port

For more information visit: **www.anritsu-shockline.com**

Product Options
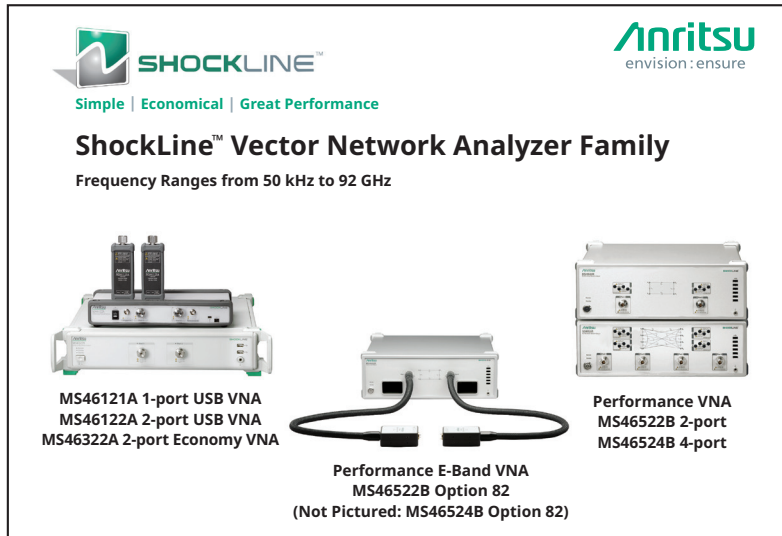
Option Number	Description
MN25208A-001	Option1, N(f) - N(f) Connectors
MN25208A-002	Option 2, K(f) - K(f) Connectors
MN25208A-003	Option 3, 3.5 mm(f) - 3.5 mm(f) Connectors
MN25208A-004	Option 4, SMA(f) - SMA(f) Connectors

Included Accessories

Option Number	Description
2000-1606-R	1.8 m USB A/ Micro-B latch cable

Recommended Accessories

Option Number	Description
01-200	Torque Wrench, 3/4 in. 0.9 N*m (8 lbf*in), Type N
01-201	Torque Wrench, 5/16 in, 0.9 N*m (8 lbf*in)
34NN50A	Precision Adapter, DC to 18 GHz, N(m) - N(m), 50 Ω
33NNF50B	Calibration Grade Adapter, DC to 18 GHz, N(m) - N(f), 50 Ω
33SS50	Calibration Grade Adapter, DC to 26.5 GHz, 3.5 mm (m) - 3.5 mm (m), 50 Ω
K220B	Precision Adapter, DC to 40 GHz, K(m)-K(m), 50 Ω

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ShockLine™ VNA Comparison

	MS46522B/524B	MS46322A	MS46122A	MS46121A
Frequency range	50 kHz to 8.5, 20, 43.5 GHz E-Band Option 82: 55 GHz to 92 GHz	1 MHz to 4, 8, 14, 20, 30, 43.5 GHz	1 MHz to 8, 20, 43.5 GHz	40 MHz to 4 GHz 150 kHz to 6 GHz
Number of ports	2 and 4-port	2 port	2 port	1 port
Dynamic Range (@10 Hz IFBW)	≥90 dB 300 kHz to 1 MHz ≥100 dB (>1 MHz to 50 MHz) ≥140 dB (>50 MHz to 2 GHz) ≥137 dB (>2 GHz to 4 GHz) ≥130 dB (>4 GHz to 6 GHz) ≥128 dB (>6 GHz to 8 GHz) ≥120 dB (>8 GHz to 8.5 GHz) ≥117 dB (8.5 GHz to 25 GHz) ≥120 dB (>25 GHz to 40 GHz) 120 dB, typ (>40 GHz to 43.5 GHz) E-Band Option 82: 120 dB typ, 60 GHz to 90 Ghz	≥100 dB 20 MHz to 43.5 GHz	≥100 dB 20 MHz to 43.5 GHz	Corrected Directivity: 42 dB (150 kHz to 6 GHz)
Trace noise (rms) (100 Hz IFBW)	4 mdB (3 mdB typ, >300 kHz to 1 GHz) 3 mdB (2 mdB typ, >1 GHz to 25 GHz) 4 mdB (2 mdB typ, >25 GHz to 40 GHz) 2 mdB typ, >40 GHz to 43.5 GHz E-Band Option 82: 4 mdB, 60 GHz to 90 GHz	6 mdB	6 mdB	10 mdB (typical)
Port Power	−30 to +15 dBm E-Band Option 82: −50 to 0 dBm	High State: −3 dBm Low State: −20 dBm	High State: −3 dBm Low State: −20 dBm	Nominal State: −3 dBm
Corrected directivity	>42 dB, 300 kHz to 10 GHz ≥36 dB >10 GHz to 20 GHz ≥32 dB >20 GHz to 30 GHz ≥30 dB >30 GHz to 43.5 GHz E-Band Option 82: 27 dB typ, 60 GHz to 90 GHz	≥42 dB, 1 MHz to 10 GHz ≥36 dB, 10 GHz to 30 GHz ≥30 dB, 30 GHz to 43.5 GHz	≥42 dB, 1 MHz to 10 GHz ≥36 dB, 10 GHz to 30 GHz ≥30 dB, 30 GHz to 43.5 GHz	42 dB, typical

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	MS46522B/524B	MS46322A	MS46122A	MS46121A
Measurement speed, typical (@widest IFBW)	30 us/point typ	220 μs/point	220 μs/point	100 μs/point
Sweep type	Freq: Linear, Log, CW, Segment Power: Linear	Freq: Linear, Log, CW, Segment	Freq: Linear, Log, CW, Segment	Freq: Linear, CW
Max number of points	20,000	16,000	16,000	20,000
Calibration	SOLT, SOLR, SSLT, SSST, LRL/LRM, WG, Microstrip, Autocal / SmartCal, Thru update	SOLT, SSLT, SSST, WG, Microstrip, Autocal / SmartCal, Thru update	SOLT, SSLT, SSST, WG, Microstrip, Autocal / SmartCal, Thru update	SOL, SmartCal
Embedding, de-embedding	Yes, including multiple networks and extraction utility	Yes, including multiple networks and extraction utility	Yes, including multiple networks and extraction utility	Yes
Marker statistics function	Mean, maximum, minimum, standard deviation Per trace or over a marker region	Mean, maximum, minimum, standard deviation Per trace or over a marker region	Mean, maximum, minimum, standard deviation Per trace or over a marker region	Mean, maximum, minimum, standard deviation Per trace or over a marker region
Pass/fail testing	Yes	Yes	Yes	Yes
Remote Control	LAN	LAN	USB	USB
Programming	IVI-C, LabView, LabWindows, , C#, .NET, MATLAB, and Python34	IVI-C, LabView, LabWindows, , C#, .NET, MATLAB, and Python34	IVI-C, LabView, LabWindows, , C#, .NET, MATLAB, and Python34	IVI-C, LabView, LabWindows, , C#, .NET, MATLAB, and Python34
Major Options	Time Domain and Rack-mount E-Band Frequency (55 GHz to 92 GHz)	Time Domain and Rack-mount	Time Domain and Rack-mount (standard)	Low Pass Time Domain Scalar Transmission Measurement

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Site Master™ S820E
Microwave Cable and Antenna Analyzer

S820E 1 MHz to 8, 14, 20, 30, and 40 GHz

The World's First Handheld 40 GHz Cable and Antenna Analyzer

The Microwave Site Master S820E is designed for installation and maintenance of microwave communication systems up to 40 GHz. Measurements and features for maximum productivity include:

Standard Measurements:

- 1-port measurements: Return Loss, VSWR, Cable Loss, Distance-to-Fault, Phase, and Smith Chart (50/75 Ω)
- 2-port Transmission Measurement
- 2-port Swept Cable Loss Measurement (external sensor required)
- Optical connector inspection with IEC 61300-3-35 based Pass/Fail standard (requires Anritsu USB Video Inspection Probe, sold separately)

Standard Features:

- Three year standard warranty, lowering cost of ownership
- Advanced Mode and Classic Mode (similar look and feel as the S820D)
- Line Sweep Tools for easy reporting easyTest Tools™ enables standardized testing for repeatable measurements
- Certified for use in explosive atmosphere (MIL-PRF-28800F Section 4.5.6.3)
- Optional Vector Network Analyzer Mode
- Optional Vector Voltmeter Mode

Setting the standard for 15 years

Anritsu set the standard in 1999 with the world's first 18 GHz broadband Site Master. 15 years later Anritsu has set a new standard for performance and accuracy in a portable handheld analyzer with its Microwave Site Master S820E's unsurpassed coverage to 40 GHz.

Product Highlights:

1. **Broadest frequency ranges** from 1 MHz to 8, 14, 20, 30, and 40 GHz
2. **Best frequency resolution** of 1 Hz for maximum frequency flexibility
3. **Unprecedented dynamic range** of 110 dB all the way up to 40 GHz for real benchtop performance in the field
4. **Fastest sweep speed** of 650 µs/data point for fast field measurements
5. **Highest RF immunity** of +17 dBm for operation in harsh RF environments
6. **Unsurpassed directivity** in a handheld for maximum field accuracy
7. **Longest battery life** with six hours (typical) of operation for the most field uptime on one charge
8. **Largest and highest resolution display** (8.4 inch, 800x600) for maximum readability in all lighting conditions with an intuitive graphical user touchscreen interface
9. **Full temperature coax calibration kits** from −10 ˚C to +55 ˚C for field precision measurement
10. **Widest calibration temperature window** of ±10 ˚C requiring less recalibrations
11. **Unique 2-port Swept Cable Loss Measurement** across the whole frequency range of interest in a quick one-step measurement
12. **The most pre-loaded waveguide calibration component coefficients** in the instrument with ten bands for SSL and SSLT calibrations making it convenient for the customer to quickly make calibrations.

![Anritsu logo] **Anritsu**
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Frequency Options (select one frequency option only)

Option	Description	Ordering Number
Option 708	1 MHz to 8 GHz, type N(f) ports	S820E-0708
Option 714	1 MHz to 14 GHz, type N(f) ports	S820E-0714
Option 720	1 MHz to 20 GHz, type Ruggedized K(m) ports (compatible with 3.5mm & SMA)	S820E-0720
Option 730	1 MHz to 30 GHz, type Ruggedized K(m) ports (compatible with 3.5mm & SMA)	S820E-0730
Option 740	1 MHz to 40 GHz, type Ruggedized K(m) ports (compatible with 3.5mm & SMA)	S820E-0740

Phase-Stable Test Port Extension Cables (Armored and Flexible)

Part Number	Description
14RKFKF50-0.6	0.6 m (24"), DC to 40 GHz, Ruggedized K(f) to K(f), 50 Ω
14RKFKF50-1.0	1.0 m (39"), DC to 40 GHz, Ruggedized K(f) to K(f), 50 Ω
14RKFK50-0.6	0.6 m (24"), DC to 40 GHz, Ruggedized K(f) to K(m), 50 Ω
14RKFK50-1.0	1.0 m (39"), DC to 40 GHz, Ruggedized K(f) to K(m), 50 Ω
14KFKF50-0.6	0.6 m (24"), DC to 40 GHz, K(f) to K(f), 50 Ω
14KFKF50-1.0	1.0 m (39"), DC to 40 GHz, K(f) to K(f), 50 Ω
14KFK50-0.6	0.6 m (24"), DC to 40 GHz, K(f) to K(m), 50 Ω
14KFK50-1.0	1.0 m (39"), DC to 40 GHz, K(f) to K(m), 50 Ω
15NN50-1.0B	1.0 m (39"), DC to 18 GHz, N(m) to N(m), 50 Ω
15NNF50-1.0B	1.0 m (39"), DC to 18 GHz, N(m) to N(f), 50 Ω
15LL50-1.0A	1.0 m (39"), DC to 20 GHz, 3.5 mm(m) to 3.5 mm(m), 50 Ω
15LLF50-1.0A	1.0 m (39"), DC to 20 GHz, 3.5 mm(m) to 3.5 mm(f), 50 Ω
15KK50-1.0A	1.0 m (39"), DC to 26.5 GHz, K(m) to K(m), 50 Ω
15KKF50-1.0A	1.0 m (39"), DC to 26.5 GHz, K(m) to K(f), 50 Ω

High performance, full temperature Coaxial Calibration Kits

Model	Frequency Range	Connector	Through	RL Specification (load)	Technical Data Sheet
OSLN50A-8	DC to 8 GHz	N(m)	No	6/8 GHz ≥ 42/37 dB	11410-00733
OSLNF50A-8	DC to 8 GHz	N(f)	No	6/8 GHz ≥ 42/37 dB	11410-00735
TOSLN50A-8	DC to 8 GHz	N(m)	Yes	6/8 GHz ≥ 42/37 dB	11410-00737
TOSLNF50A-8	DC to 8 GHz	N(f)	Yes	6/8 GHz ≥ 42/37 dB	11410-00739
OSLN50A-18	DC to 18 GHz	N(m)	No	6/9/18 GHz ≥ 42/37/33 dB	11410-00734
OSLNF50A-18	DC to 18 GHz	N(f)	No	6/9/18 GHz ≥ 42/37/33 dB	11410-00736
TOSLN50A-18	DC to 18 GHz	N(m)	Yes	6/9/18 GHz ≥ 42/37/33 dB	11410-00738
TOSLNF50A-18	DC to 18 GHz	N(f)	Yes	6/9/18 GHz ≥ 42/37/33 dB	11410-00740
TOSLK50A-20	DC to 20 GHz	K(m)	Yes	10/20 GHz ≥ 42/36 dB	11410-00741
TOSLKF50A-20	DC to 20 GHz	K(f)	Yes	10/20 GHz ≥ 42/36 dB	11410-00743
TOSLK50A-40	DC to 40 GHz	K(m)	Yes	10/20/30/40 GHz ≥ 42/36/32/30 dB	11410-00742
TOSLKF50A-40	DC to 40 GHz	K(f)	Yes	10/20/30/40 GHz ≥ 42/36/32/30 dB	11410-00744

USB Transmission Sensors and
USB Extender Kit
(For 2-Port Cable Loss/Transmission
(Ext. Sensor) Measurements)

Model Number	Description
MA24108A	Microwave USB Power Sensor, N(m), 10 MHz to 8 GHz, +20 dBm to –40 dBm
MA24118A	Microwave USB Power Sensor, N(m), 10 MHz to 18 GHz, +20 dBm to –40 dBm
MA24126A	Microwave USB Power Sensor, K(m), 10 MHz to 26 GHz, +20 dBm to –40 dBm
SC8268	USB Transmission Sensor, K(m), 1 MHz to 40 GHz, +10 dBm to –50 dBm
2000-1717-R	USB Extender, Requires Cat 5e extension cable (sold separately)
2100-28-R	Cat 5e extension cable for use with USB Extender (22.5 m)

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VNA Master™ MS202xB / MS203xB
Handheld Vector Network Analyzer + Spectrum Analyzer

MS2024B
VNA: 500 kHz to 4 GHz

MS2025B
VNA: 500 kHz to 6 GHz

MS2034B
VNA: 500 kHz to 4 GHz
SPA: 9 kHz to 4 GHz

MS2035B
VNA: 500 kHz to 6 GHz
SPA: 9 kHz to 6 GHz

S-Parameter Analysis in the Field

The VNA Master™ MS202xB/3xB series is a compact handheld multi-function instrument that offers a portable yet powerful vector network analyzer, allowing you to do S-parameter analysis in the field – anytime, anywhere. The MS203xB models also offer a high-performance spectrum analyzer with industry-leading ultra-low noise floor. Based on Anritsu's 9th generation handheld platform, the VNA Master offers unmatched measurement breadth, depth, and precision; reducing the number of different tools needed to analyze modern communication systems in the field, on a tower, on a flightline or in a vehicle.

Vector Analyzer Key Features

● Broadband coverage of 500 kHz to 4/6 GHz
1-path, 2-port Vector Network Analyzer
● Intuitive Graphical User Interface (GUI) with convenient
   Touch Screen
● VNA-quality error correction for directivity and source match
● 2-port Transmission Measurements: High/Low Power

+ Spectrum Analyzer Key Features

   All of the above VNA features, PLUS:
● Measure: Occupied Bandwidth, Channel Power, ACPR, C/I
● Interference Analyzer: Spectrogram, Signal Strength, RSSI, Signal ID
● Frequency Accuracy: < ± 50 ppb with GPS On
● Traces: Normal, Max Hold, Min Hold, Average, # of Averages
● Detectors: Peak, Negative, Sample, Quasi-peak, and true RMS
● Markers: 6, each with a Delta Marker, or 1 Reference with 6 Deltas

SIZE: 273 (W) X 199 (H) X 91 (D) MM (10.7 X 7.8 X 3.6 IN.). WEIGHT: 3.5 KG (7.6 LBS)

MS2024/25B VNA MASTER

MS2034/35B VNA MASTER + SPECTRUM ANALYZER

ALL CONNECTORS ARE CONVENIENTLY LOCATED ON THE TOP PANEL, LEAVING THE SIDES CLEAR FOR HANDHELD USE

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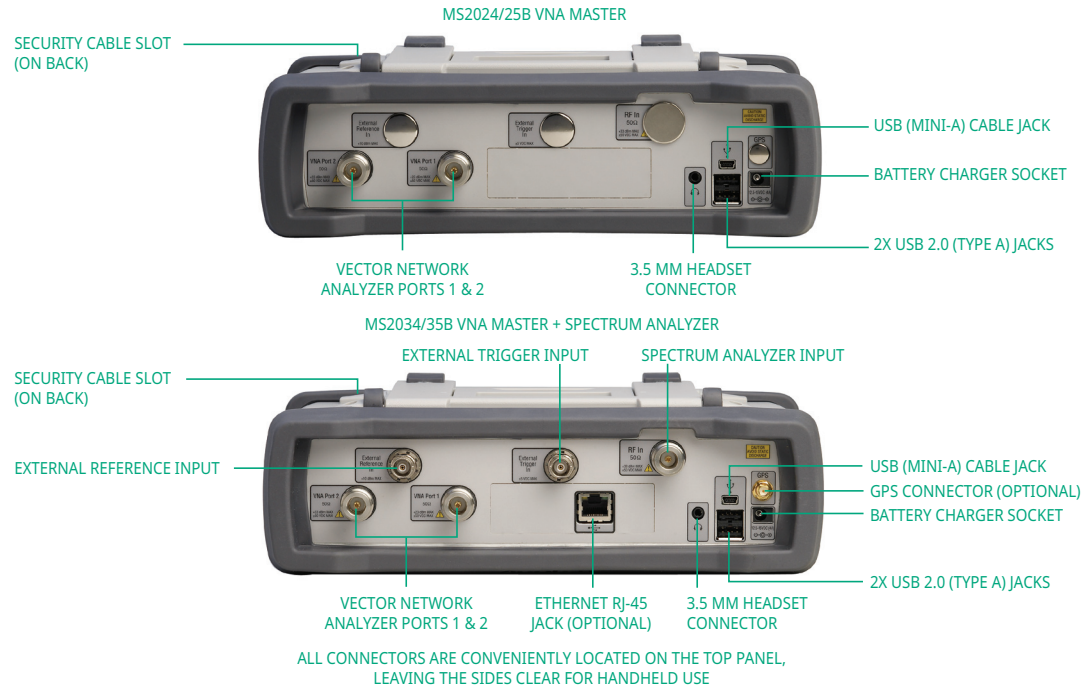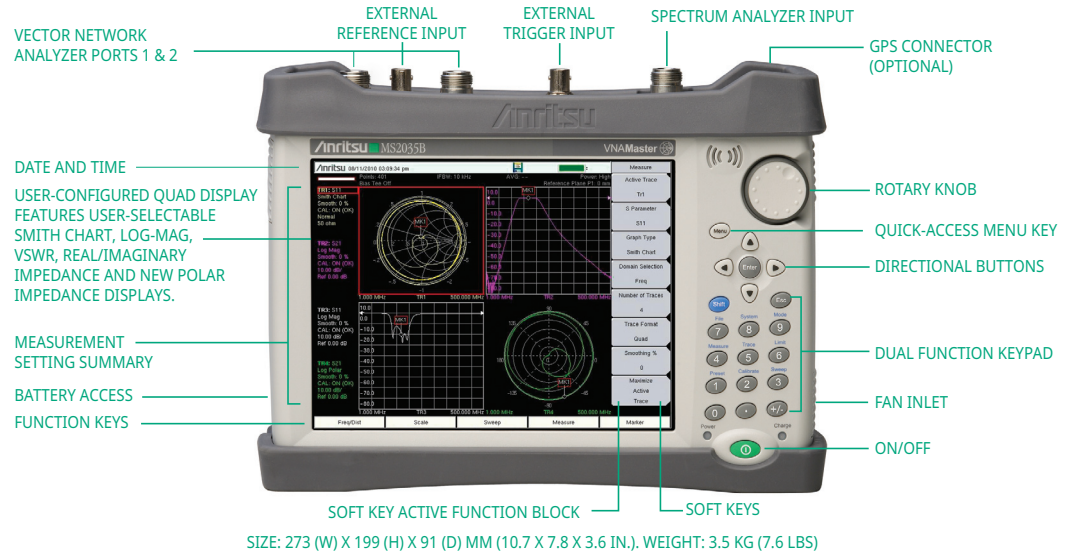
Key Specifications

Vector Network Analyzer (now with standard Distance To Fault (DTF))	
Frequency	MS2024/34B 500 kHz to 4 GHz / MS2025/35B: 500 kHz to 6 GHz
Sweep Speed	850 µs/data point
Directivity	> 42 dB at ≤ 6 GHz
Dynamic Range	> 95 dB in 10 Hz RBW
+ Spectrum Analyzer (Models MS203xB Only)	
Frequency	MS2034B: 9 kHz to 4 GHz / MS2035B: 9 kHz to 6 GHz
Sweep Time	Minimum 100 ms, 10 µs to 600 seconds in zero span
Dynamic Range	> 95 dB (2.4 GHz), 2/3 (TOI-DANL) in 10 Hz RBW
General	
Internal Trace	2,000 traces, 2,000 Setups
External Trace	Limited by the size of the USB Flash Drive
Connectivity	Ethernet, USB cable, USB Flash drive
Displa	Resistive Touch Screen, 8.4 in. daylight viewable LCD 800 x 600 resolution
Temperature	Operating Temperature –10 ℃ to 55 ℃, humidity 85% or less
Battery	Field replaceable Li-ion battery, 3.6 hours typical
Dimensions	273 mm x 199 mm x 91 mm (10.7 in x 7.8 in x 3.6 in)
Weight:	3.5 kg (7.6 lbs) including battery

Options

Option Number	Description
Option 10	Built-in Variable Voltage Bias Tee
Option 15	Vector Voltmeter
Option 19	High Accuracy Power Meter (Requires USB Sensors, sold separately)
Option 25	Interference Analysis (requires external antenna, option 31 recommended) (MS203xB Only)
Option 27	Channel Scanner (requires external antenna) (MS203xB Only)
Option 31	GPS Receiver (requires GPS antenna, sold separately)
Option 411	Ethernet Connectivity
Option 431	Coverage Mapping (requires option 31) (MS203xB Only)
Option 509	AM/FM/PM Demodulation Analyzer (MS203xB Only)
Option 98	Z-540 Calibration
Option 99	Premium Calibration

Standard Accessories

Part Number	Description
10920-00060	Handheld Instruments Documentation Disc
2000-1691-R	Stylus with Coiled Tether
2000-1797-R	Screen Protector Film (x2, one factory installed, one spare)
2000-1654-R	Soft Carrying Case
2300-577	Anritsu Software Tool Box for Handheld RF Instruments Disc
	Warranty: 3 years standard (battery 1 year)
	Certificate of Calibration and Conformance
633-75	Rechargeable Battery, Li-Ion, 7500 mAh
40-187-R	AC-DC Adapter
806-141-R	Automotive Power Adapter, 12 VDC, 60 W
3-2000-1498	USB A-type to Mini USB B-type cable, 3.05 m (10 ft.)

Optional Accessories

Portable Antennas	Adapters

Filters	Attenuators

Directional Antennas	Transit Cases
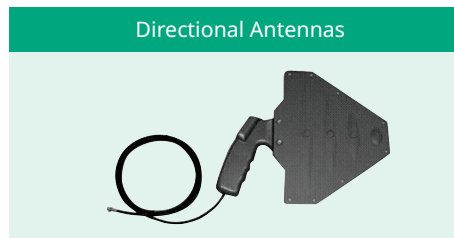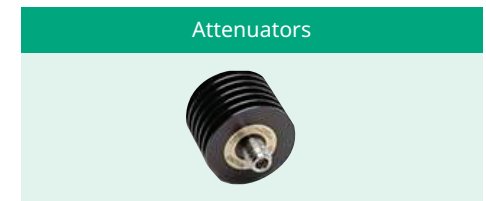
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VNA Master™ MS202xC / MS203xC

MS2026C	MS2027C	MS2028C		MS2036C	MS2037C	MS2038C
5 kHz to 6 GHz	5 kHz to 15 GHz	5 kHz to 20 GHz ← Vector Network Analyzer → + Spectrum Analyzer →		5 kHz to 6 GHz 9 kHz to 9 GHz	5 kHz to 15 GHz 9 kHz to 15 GHz	5 kHz to 20 GHz 9 kHz to 20 GHz

Handheld Vector Network Analyzer + Spectrum Analyzer

The Grand Master of Handheld S-Parameters

The title *Grand Master* suggests the ultimate level of skill, experience, accomplishment and recognition as best in class. The VNA Master Series is the industry's highest performance, handheld solution for 2-port, 2-path measurements, anytime, anywhere. It specifically addresses complex cable, waveguide and antenna measurement needs in the field with accurate, vector corrected 2-port magnitude, phase, and Time or Distance Domain measurements.

Vector Analyzer Key Features

- 2-port, 2-path, fully-reversing VNA; measures and displays all S-parameters with a single connection
- 350 µsec per data point, ideal for filter tuning
- 12-term error correction algorithm
- Vector Voltmeter option, ideal for cable phase matching
- Time Domain option for precise Time or Distance Domain diagnostics, includes Gated Time Domain, LP Processing, and Phasor Impulse mode

+ Spectrum Analyzer Key Features

- Detectors: Peak, Negative, Sample, Quasi-peak, and true RMS
- Markers: 6, each with a Delta Marker, or 1 Reference with 6 Deltas
- Industry leading DANL performance
- Interference Analyzer Option: Spectrogram, Signal Strength, RSSI

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MS2026C / MS2027C / MS2028C VNA MASTER

MS2036C / MS2037C / MS2038C VNA MASTER + SPECTRUM ANALYZER

Key Specifications

Vector Network Analyzer (now with standard Distance To Fault (DTF))	
Frequency	5 kHz to 6 GHz (MS2026C / MS2036C), 5 kHz to 15 GHz (MS2027C / MS2037C), 5 kHz to 20 GHz (MS2028C / MS2038C)
Sweep Speed	350 µsec/data point
Directivity	> 42 dB up to 5 GHz (all models), > 36 dB up to 15 GHz (MS2027C / MS2037C), > 32 dB at 20 GHz (MS2028C / MS2038C)
Dynamic Range	> 100 dB 2 MHz - 3 GHz (all models), > 90 dB 3 GHz - 6 GHz (all models), > 85 dB 6 GHz - 20 GHz (MS2027C / MS2037C, MS2028C / MS2038C)
+ Spectrum Analyzer	
Frequency	9 kHz to 9 GHz (MS2036C), 9 kHz to 15 GHz (MS2037C), 9 kHz to 20 GHz (MS2038C)
DANL	–164 dBm in 1 Hz RBW (typical)
Phase Noise	–106 dBc/Hz @ 10 kHz offset at 1 GHz (typical)
Dynamic Range	> 104 dB in 1 Hz RBW
General	
Internal Trace	Store more than 4000 traces and setups in memory
External Trace	Limited by size of USB Flash drive
Connectivity	Ethernet, USB cable, USB Flash drive
Display	8.4" daylight viewable color LCD, resolution 800 x 600
Temperature	Operating Temperature –10 °C to 55 °C
Battery	Li-Ion, 3.0 hours, typical
Dimensions	211 mm x 315 mm x 78 mm (8.3 in x 12.4 in x 3.1 in) (MS202xC models) 211 mm x 315 mm x 97 mm (8.3 in x 12.4 in x 3.8 in) (MS203xC models)
Weight	4.5 kg (9.9 lbs) (MS202xC models), 4.8 kg (10.5 lbs) (MS203xC models)

Options

Option Number	Description
Option 0002	Time Domain with Low Pass TDR step response
Option 0007	Secure Data Operation
Option 0010	Built-in Variable Voltage Bias Tee
Option 0011	K(f) Test Port Connector (MS2027C/MS2028C and MS2037C/MS2038C only)
Option 0015	Vector Voltmeter
Option 0019	High Accuracy Power Meter (requires USB sensors, sold separately)
Option 0025	Interference Analysis (requires external antenna, MS203xC models only)
Option 0027	Channel Scanner (requires external antenna, MS203xC models only)
Option 0031	GPS Receiver (requires GPS antenna, sold separately)
Option 0077	Balanced / Differential S-Parameters, 1-port
Option 0431	Coverage Mapping (requires Option 31, GPS)
Option 0098	Standard Calibration (ISO 17025 and Z540.1)
Option 0099	Premium Calibration (ISO 17025 and Z540.1 plus test data)

Standard Accessories

Part Number	Description
10920-00060	Handheld Instruments Documentation Disc
2000-1685-R	Soft Carrying Case (supplied with MS202xC only)
2000-1686-R	Soft Carrying Case (supplied with MS203xC only)
2300-577	Anritsu Software Tool Box for Handheld RF Instruments Disc
40-187-R	AC-DC Adapter
806-141-R	Automotive Cigarette Lighter 12 VDC Adapter
3-2000-1498	USB A/5-pin mini-B Cable, 10 feet/305 cm
2000-1371-R	Ethernet cable, 2.13 m (7 ft)
	Three Year Warranty
	Certificate of Calibration and Conformance

Optional Accessories

Calibration Kits	Phase-Stable Test Port Cables, Armored w/ Reinforced Grip
High Accuracy Power Sensors	**Phase-Stable Test Port Cables, Armored**
Precision Adapters	**Antennas**

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