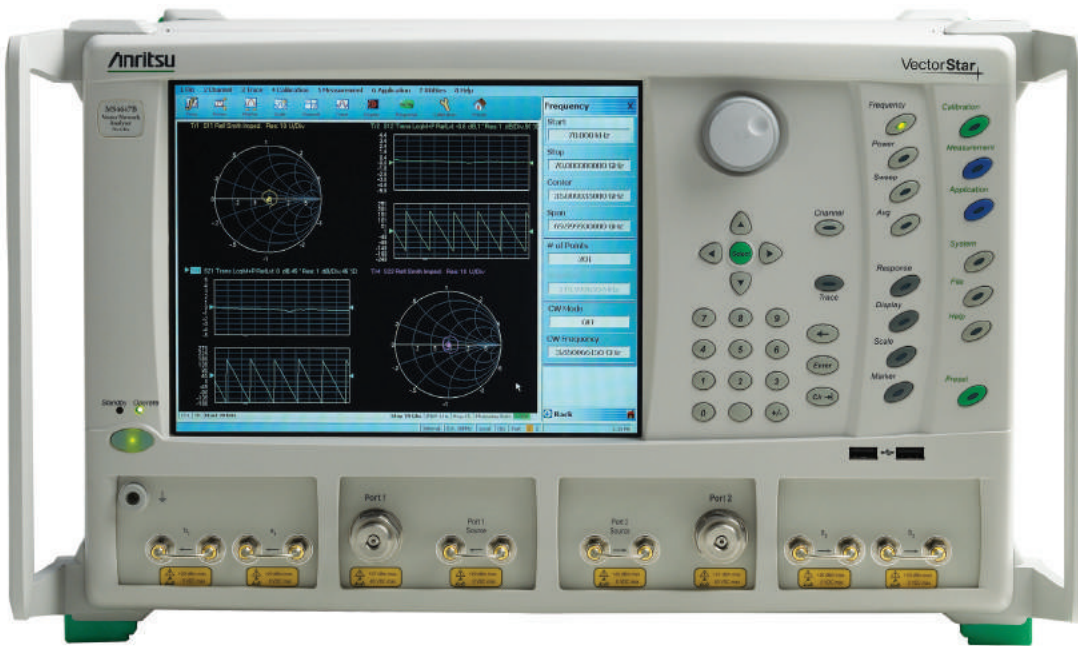


VectorStar™ MS4640B Series

Family of RF to Microwave and Millimeter-Wave Vector Network Analyzers with Industry-Leading Performance from 70 kHz to 1.1 THz



Introduction

Industry-Leading, Single Sweep Frequency Span from 70 kHz to 145 GHz

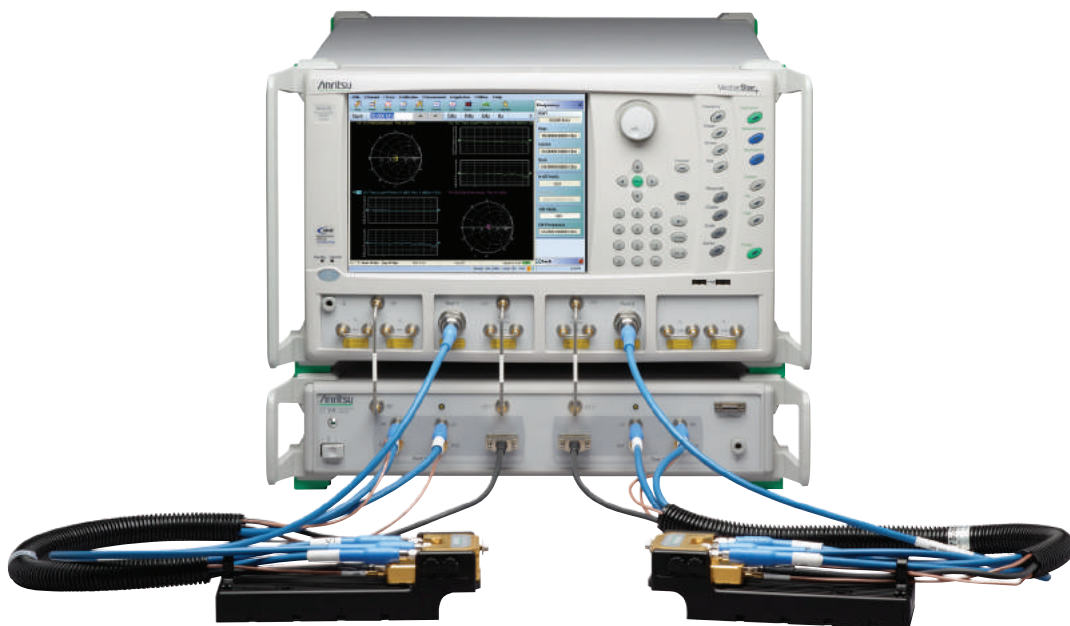
Building on design experience of more than 40 years, Anritsu has now broken the RF barrier with the VectorStar MS4640B Series — spanning from 70 kHz to 70 GHz in a single connector and 70 kHz up to 145 GHz in the broadband configuration (with options to 1.1 THz using mm-wave modules.)

The VectorStar vector network analyzer millimeter-wave (mmWave) VNA series offers a new performance benchmark for S-parameter measurements of RF, microwave, and mmWave devices. Anritsu now provides RF and Microwave engineers now have access to a powerful measurement tool for performance analysis of devices ranging from transistors in an on-wafer environment to communication systems in commercial or defense applications.

In addition to maintaining a peak level of measurement performance, each model can be upgraded to a broader frequency range, higher port count, and have additional options fitted. You can specify the features you need today and add new ones as needed in the future without fear of obsolescence or learning a new test system.

VectorStar VNA Features Include:

- Frequency coverage 70 kHz to 20 | 40 | 70 | 110 | 125 | 145 GHz with extensions to 1.1 THz
- Industry-leading broadband system with world's best dynamic range, accuracy, precision, and stability
- Unique, low-frequency coverage to 70 kHz with up to 100,000 measurement points to achieve the best time domain measurement accuracy
- Superior dynamic range: > 140 dB
- Best test port characteristic performance: up to 50 dB directivity, source match, and load match
- High compression point level: up to +15 dBm at 70 GHz
- Upgradable frequency range, port count, and options; start with 2-port, 20 GHz configuration and upgrade when needed
- Precision AutoCal™ units available
- Two independent sources with high output power: up to +14 dBm
- 4-port single-ended, mixed-mode, and true differential mode measurements
- mmWave noise figure measurements
- True mode stimulus analysis from 70 kHz to 20/40/70/110/145 GHz with industry-leading accuracy and stability
- PulseView™ with industry-leading 2.5 ns pulse measurement resolution
- Backed by a 3-year warranty



VectorStar ME7838D system operates from 70 kHz to 145 GHz through a single coaxial testport.

VectorStar MS4640B Broadband Vector Network Analyzer Series

Key Features and Benefits

Key Features	Benefits
Broadest frequency span from a single coaxial test port, covering 70 kHz to 70 GHz in a single instrument and 70 kHz to 145 GHz in the broadband configuration (with options up to 1.1 THz using mmWave modules)	<ul style="list-style-type: none"> • Obtain the most thorough and accurate broadband device characterization • Eliminate the time-consuming, error-prone concatenation process across the RF, microwave, and mmWave bands • Decrease test instrument expenses • Reduce the risk of DC extrapolation errors in your device modeling
Superior dynamic range: > 140 dB	<ul style="list-style-type: none"> • Accurately measure medium-and high-loss devices • Catch all potential filter feed-throughs in out-of-band regions • Quickly and easily perform high-sensitivity antenna measurements
Highest data resolution utilizing 100,000 points for maximum flexibility	<ul style="list-style-type: none"> • Zoom in on narrowband responses without recalibration • Calibrate the VectorStar solution once and have enough data points to test any range
High available power: up to +14 dBm	<ul style="list-style-type: none"> • Eliminate the need for an external amplifier • Reduce your test setup costs • Accurately test your non-linear devices with no compromises
High compression point level: up to +15 dBm at 70 GHz	<ul style="list-style-type: none"> • Eliminate the need for internal or external attenuators • Improve calibration and measurement accuracy
Best test port characteristic performance: up to 50 dB in directivity, source match, and load match	<ul style="list-style-type: none"> • Reduce measurement uncertainty • Reduce measurement guard bands • Improve productivity • Achieve optimum precision measurements in the R&D lab
Most convenient automatic calibration system with best accuracy	<ul style="list-style-type: none"> • Use Precision AutoCal for an easy, one-button method of VNA calibration • Better accuracy than traditional SOLT calibration • Spend less time setting up the VNA for the next production run
Best device modeling data	<ul style="list-style-type: none"> • Accelerate your design cycle • Accurately model devices down to DC using calibrated, traceable values starting at 70 kHz • Eliminate the need for concatenation of two VNAs
Best time domain analysis	<ul style="list-style-type: none"> • 100,000 points and 700 kHz frequency step size provide the most accurate, highest resolved, low pass mode measurements • Measure long transmission lines with the best, non-aliasing range
4-port single-ended, mixed-mode, and true differential measurements	<ul style="list-style-type: none"> • Measure all single-ended or mixed-mode responses • Make true mode stimulus measurements • Flexible calibration routines, using a Precision AutoCal • Excellent performance from 70 kHz to 70 GHz
Broadband VNA system provides single sweep coverage from 70 kHz to 145 GHz	<ul style="list-style-type: none"> • Improved power leveling accuracy and stability • Improved power sweep linearity and accuracy • Reduced module size • Reduces complexity of mechanical setup on wafer bed • Eliminate > \$30K cost of large mechanical positioners • Use smaller probe station platen
Upgradable frequency range, port count, and options	<ul style="list-style-type: none"> • Reduce initial investment cost • Upgrade only when requirements change • Reduce cost by not having to purchase a whole new instrument
Industry-leading pulse measurement performance	<ul style="list-style-type: none"> • Eliminate tradeoffs and limitations of older pulse measurement methods • Industry-leading 2.5 ns measurement resolution allows true view of device performance and see behavior that may have been missing
True Mode Stimulus analysis from 70 kHz to 145 GHz with industry leading accuracy and stability	<ul style="list-style-type: none"> • Ensures the stimulus signals to the differential device are calibrated and accurate for differential or common-mode operation • 70 kHz low end frequency ensures more accurate DC term estimation thus maximizing the chances of simulation convergence

VectorStar MS4640B Broadband Vector Network Analyzer Series

Application Ready

Discover how you can get better measurement confidence with VectorStar Vector network analyzers in both R&D and manufacturing environments. VectorStar VNAs offer accuracy and precision as well as a variety of features and options to cover a wide range of measurements — from S-parameter measurements on microwave filters to pulse distortion or noise figure measurements on mmWave components for use in high-performance radar systems.

Wide Range of Possible VectorStar Applications:

- Radar
- Antenna measurements
- Materials measurements
- On-wafer
- Signal integrity
- Active components
- Passive components
- Frequency conversion devices



Anritsu's 4-Port ME7838A4 70 kHz to 110 GHz broadband VNA system. 70 kHz to 145 GHz versions are also available.



Anritsu's VectorStar MS4647B VNA and MN4697C multi-port test set.

Radar

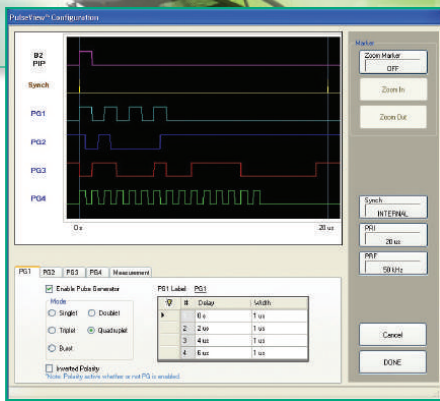
Bring Your Vision into Resolution with VectorStar MS4640B with PulseView

VectorStar VNAs give you the tools to confidently characterize radar components and subsystems. With industry-leading performance, it can eliminate tradeoffs and limitations of prior test methods. Higher resolution, greater timing accuracy, and longer record lengths, coupled with a graphical set up display, bring your vision into resolution.

VectorStar MS4640B, with options 035 and 042 (PulseView), offers the most advanced architecture available in a VNA for radar pulse measurements. PulseView, with its industry-leading 2.5 ns VNA pulse measurement resolution, helps meet today's demanding radar pulse measurement requirements with pulse profile, point-in-pulse, and pulse-to-pulse measurements. In addition, real-time set up/display capability offers confidence that both set up conditions and measurement results are consistent.

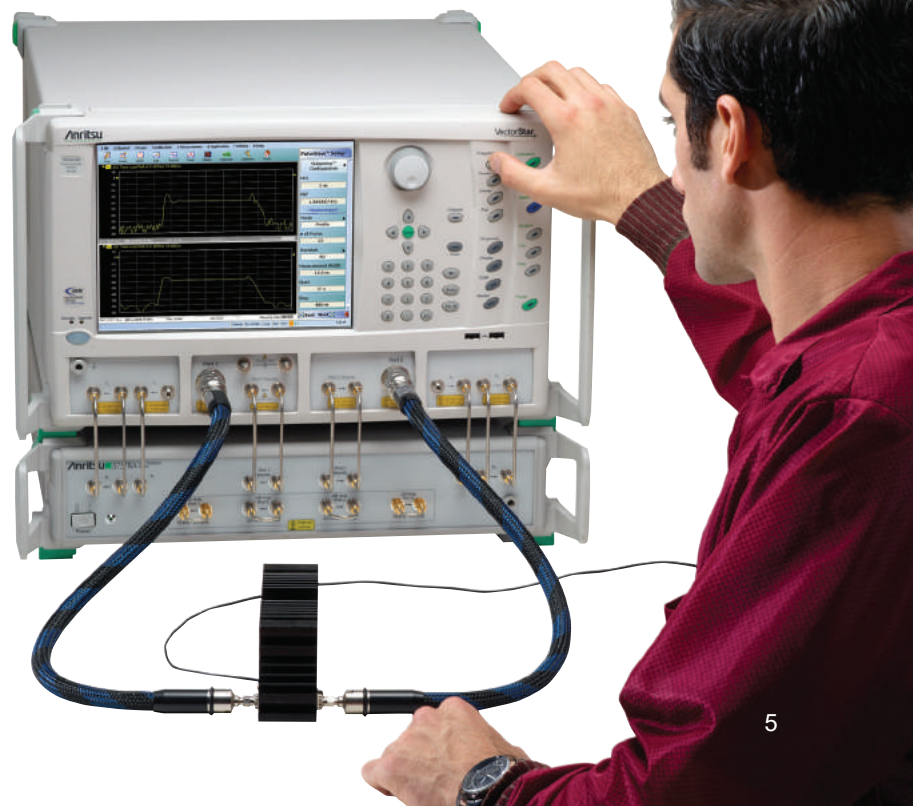
VectorStar MS4640B Features for Radar:

- Innovative, high-speed digitizer architecture: Enables unprecedented pulse measurement performance (200 MHz digital IF bandwidth)
- Industry's highest resolution pulse measurement: Provides superior performance, executing highly accurate measurements on the most demanding radar applications
- Long record length: Produces measurement of low repetition rate pulses without sacrificing resolution — up to 2.5 s with 2.5 ns resolution
- Graphical set up display: Get instant visual confirmation of initial measurement set-up
- Instant results on measurement parameter change: Modify pulse measurement set up parameters and see the measured results instantly
- Four Independent measurement windows/ receivers: Improves your calibration by adjusting independent receivers to account for any path delays / system timing issues



PulseView configuration dialog screen

Anritsu's VectorStar MS4647B and SM6631 pulse modulator test set



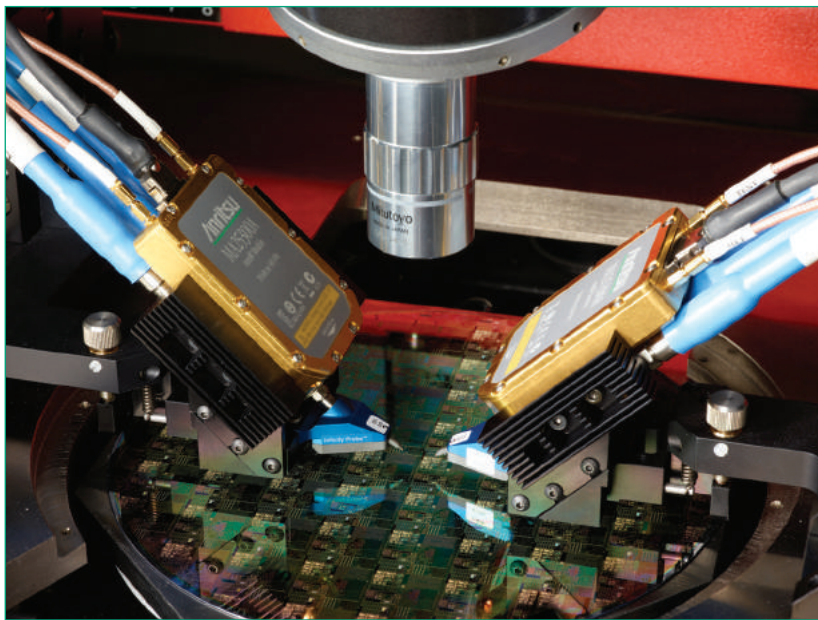
On-Wafer

The Answer to Your High-Stability Broadband On-Wafer Device Characterization Needs

VectorStar ME7838 series broadband VNA system — don't let expired calibrations spoil your data.

The VectorStar ME7838 VNA series delivers 94 dB dynamic range at 145 GHz for high-sensitivity measurements across 70 kHz to 110 / 125 / 145 GHz (up to 1.1 THz with mmWave modules) with typical performance better than 0.01 dB and 0.1 degrees S_{21} stability over 24 hours at 25° C. This stable broadband performance means you can make high-accuracy measurements all day, with the confidence that your calibration remains rock solid! Spend less time calibrating and more time measuring.

For on-wafer measurements, VectorStar offers the smallest, lightest, and easiest to position frequency extension modules that connect directly to wafer probes. Bulky, difficult-to-mount frequency extension modules are a thing of the past, even when working with 4-port measurements. New DifferentialView™ enhances accuracy with true mode stimulus (TMS) measurements — giving you confidence to achieve higher product specifications through testing.



This figure demonstrates the convenience of setting up broadband measurement to 145 GHz using the compact Anritsu mmWave modules.

VectorStar ME7838 Series Broadband VNA Features for On-Wafer:

Broadest frequency span 70 kHz to 110 / 125 / 145 GHz

Obtain the most thorough and accurate broadband measurements

- Accurate, low-frequency measurements eliminate the time-consuming, error-prone concatenation process across the RF, microwave, and mmWave bands

Industry-leading performance

- Industry-best dynamic range: 120 dB at 10 MHz; 108 dB at 65 GHz; 109 dB at 110 GHz; and 94 dB at 145 GHz
- Connect directly to probes and further enhance overall system performance

Extend test time by reducing calibration frequency

- Compact, integrated frequency extension modules provide enhanced stability as compared with old-style hybrid WG/coax modules
- S_{21} stability better than 0.1 dB and 0.5 degree over 24 hours
- Improved stability allows for a single calibration to be performed once for a four hour session or even once a day, resulting in an increase in measurement test time of over 37% in a single four hour session!

Only broadband VNA system with real-time power leveling

- Protect sensitive devices with power sweep control that provides the best power accuracy and stability to power levels as low as -55 dBm
- Real-time power leveling is more responsive than systems using software leveling. It also works with VDI and OML frequency extenders if added to cover higher mmWave bands.
- Real-time power level control of up to 55 dB enables accurate linear gain and 1 dB compression measurements.

VectorStar MS4640B Broadband Vector Network Analyzer Series

Signal Integrity

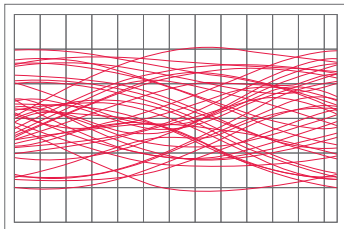
See the Signal Integrity of Your Design Come Through — VectorStar with DifferentialView

Today's signal integrity engineers are challenged to meet high data rates, minimize costs, and close the loop of simulation and measurement. VectorStar MS4640B VNA's industry-leading, low-frequency measurement capability as low (as 70 kHz) coupled with upper range as high (as 70 or 145 GHz) ensure that simulation-busting DC extrapolation and causality issues are minimized and your simulations match reality.

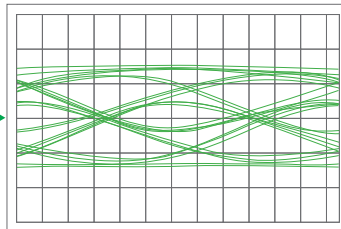
DifferentialView adds true mode stimulus (TMS) capability when you need it with non-linear devices. High-accuracy time domain and wide dynamic range frequency domain measurements make VectorStar VNAs an ideal tool for signal integrity designers. This solution offers multiport solutions for transmission, reflection, near-end crosstalk (NEXT) and far-end crosstalk (FEXT) measurements on high-speed balanced transmission lines and connectors. Best of all, VectorStar MS4640B is fully upgradable — so you can specify the features you need today and add new ones as needed in the future without fear of obsolescence or learning a new test system.

VectorStar MS4640B Features for Signal Integrity Include:

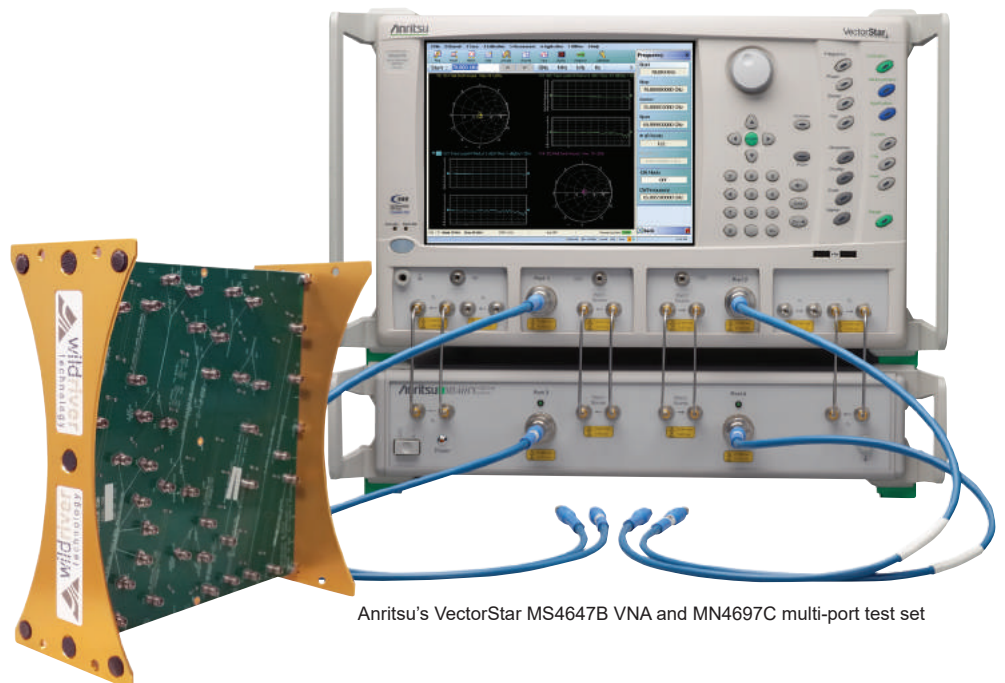
- Broadest frequency span — 70 kHz to 20 / 40 / 70 / 110 / 125 / 145 GHz — obtains the most thorough and accurate measurements
- Best time domain analysis: Provides the best combination of accuracy and high-resolution, low-pass time domain results
- Best modeling data: 70 kHz start frequency reduces the risk of DC extrapolation errors in your modeling
- New calibration and de-embedding techniques: Improves the ability to locate discontinuities, impedance changes, and crosstalk issues
- Upgradeable in frequency range, port count, and option additions



20 Gbit/s transmission with 0.5 dB insertion loss error at 10 MHz.



Using accurate low-frequency S-parameter data reveals a compliant eye pattern that is 85% open.



Anritsu's VectorStar MS4647B VNA and MN4697C multi-port test set

VectorStar MS4640B Broadband Vector Network Analyzer Series

Components

Confidence in Measurement Leads to Confidence in Component Design.

VectorStar MS4640B gives you the measurement capabilities you need to develop superior active and passive components.

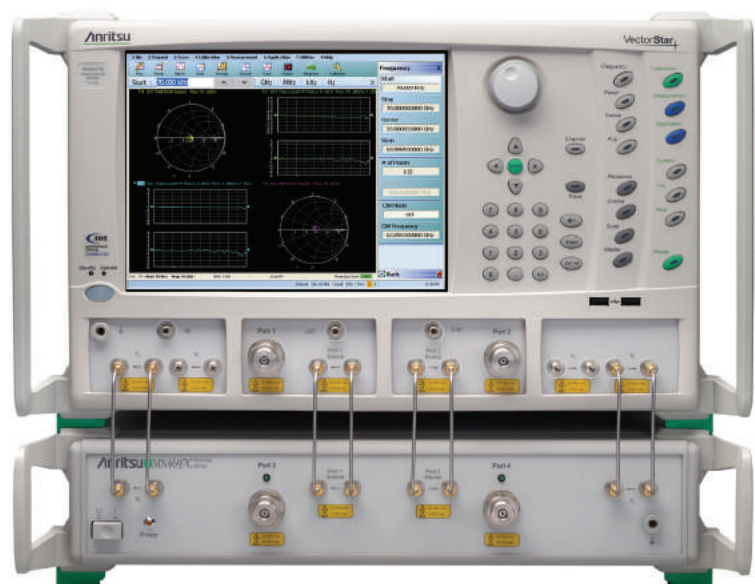
With the best VNA performance across the widest frequency bandwidth and dynamic range below 2 GHz, the Anritsu VectorStar MS4640B series helps R&D and production test engineers make better measurements faster and accelerate the design cycle. The VectorStar series provides full measurement capabilities across RF, microwave, mmWave, and terahertz regions for components, plus the ability to accurately analyze amplifiers over the entire range of measurements — including pulsed I/V, noise figure, and differential signal stimulation.

The optional 70 kHz start frequency provides accurate modeling and time domain readings, while Precision AutoCal minimizes uncertainty to maximize measurement confidence. DifferentialView provides TMS capability to 145 GHz and VectorStar features noise figure measurement leadership to 110 GHz. Best of all, you can easily upgrade VectorStar MS4640B in frequency range, port count, and option additions so your investment stays intact year after year.

VectorStar MS4640B Features for Components Include:

- Highest measurement performance over broadest frequency span: Covers 70 kHz to 20 / 40 / 70 / 110 / 125 / 145 GHz with one system and eliminates uncertainties due to concatenation of low-and high-frequency data
- Best time domain analysis with hybrid bridge-coupler VNA architecture: Minimize DC extrapolation errors in the time domain with the use of a bridge structure below 2.5 GHz to ensure high-quality, low-frequency S-parameter data capture down to 70 kHz
- Precision AutoCal: Increase measurement confidence on cutting-edge designs without time-consuming sliding load calibrations
- PulseView: Uncover causes of pulse distortion problems with 2.5 ns resolution using PulseView and VectorStar's IF digitizer option
- DifferentialView: Discover the performance of your differential amplifier
- Noise figure measurement: Measure noise figure to 110 GHz with VectorStar's unique capability
- Complete upgradability within family: Meet budget targets and protect your investment by buying only what is needed now and upgrading later

Anritsu's VectorStar MS4647B and MN4697C multi-port test set is ideally suited for component testing



DifferentialView

Achieving Both Accuracy and Throughput for Broadband Measurements

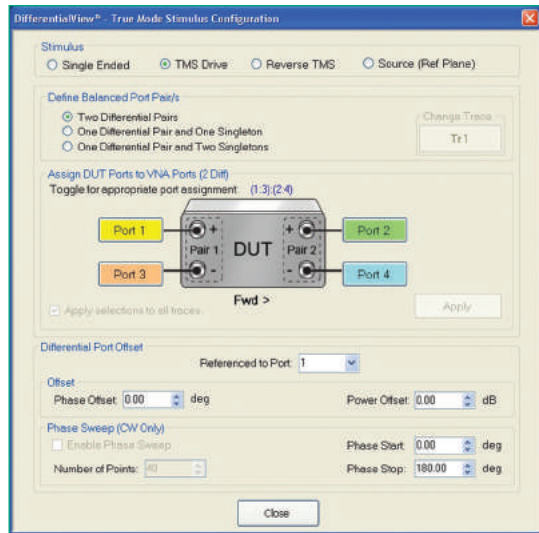
For active device and signal integrity engineers who need to measure differential devices and provide high-quality results for use in simulation tools, VectorStar 4-port VNA provides the ability to perform true mode stimulus differential analysis from 70 kHz to 145 GHz with industry-leading accuracy and stability. While some solution products have a start frequency of 10 MHz with degraded results beginning below 1 GHz, the VectorStar 4-port VNA provides high-quality S-parameter results down to 70 kHz. This ensures more accurate DC term estimation and maximizes the chances of simulation convergence.

When combined with the dual source option (option 031), DifferentialView software provides TMS capability that calibrates, controls, and manipulates the phase and magnitude between the two internal sources. TMS mode ensures the stimulus signals to the differential device are calibrated and accurate for differential or common-mode operation.

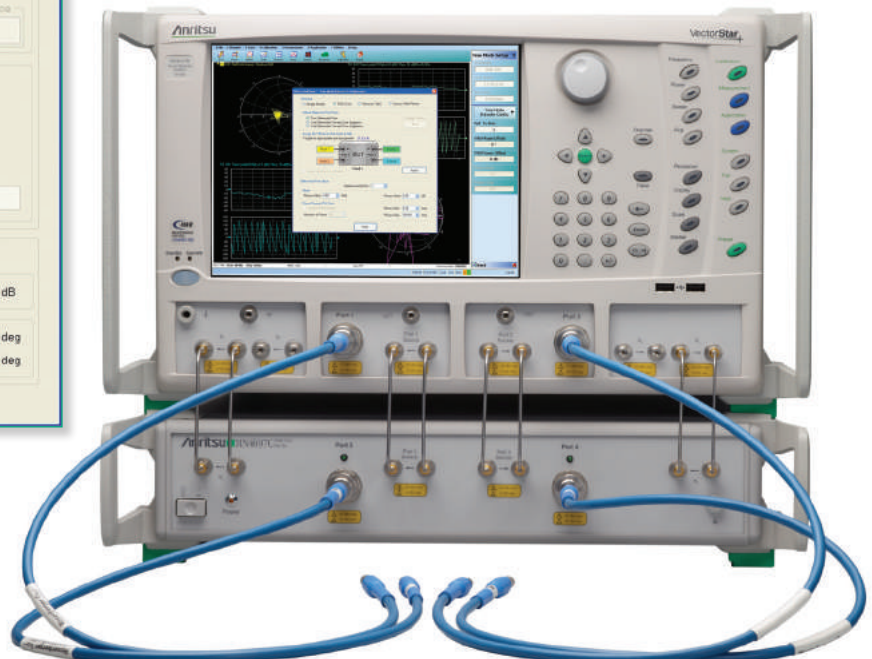
DifferentialView provides continuous measurement display while actively editing key parameters. In contrast, VNAs from other vendors hide the measurement with configuration panels during editing of parameters and do not display key parameter settings during the measurement.

Key Features and Benefits:

- Construct an in-phase and out-of-phase relationship between the two differential DUT stimulation signals
 - Provides accurate, calibrated control of two internal sources for complete analysis of differential devices
 - Superior differential phase accuracy means highly compressed, nonlinear devices are accurately characterized and modeled for faster design turns
- Sweep phase relationship between two stimulus signals
 - Verifies device performance over anticipated operating conditions for complete confidence
 - DifferentialView display offers faster manipulation of key parameters, thereby requiring less time searching for device trouble spots
- 70 kHz to 145 GHz frequency range
 - Widest frequency sweep analysis of differential devices
 - Provides lowest start frequency for best DC information with industry-best dynamic range for best device characterization and modeling accuracy



DifferentialView true mode stimulus configuration

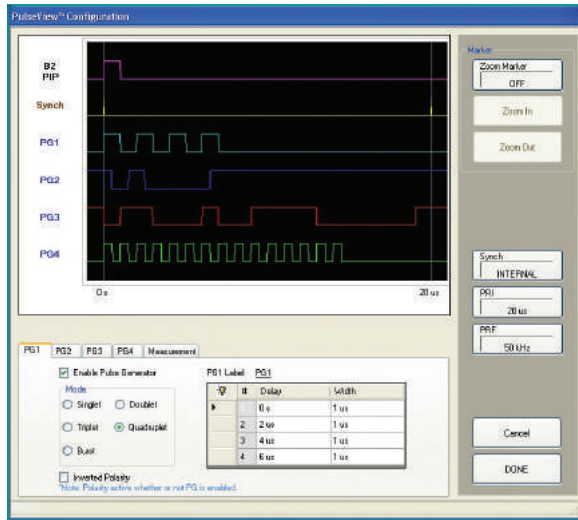


Anritsu's VectorStar MS4640B with MN4697C multi-port test set

PulseView™

Pulse Measurements

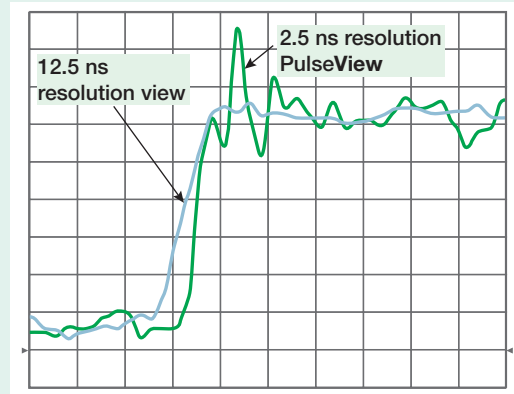
The Anritsu VectorStar MS4640B with options 035 and 042 (PulseView) offers the most advanced architecture available in a VNA for radar pulse measurements. It delivers industry-leading performance that eliminates the trade-offs and limitations of prior test methods. Higher resolution, greater timing accuracy, and longer record lengths coupled with a real-time display give you the performance and confidence needed to meet the most demanding radar pulse measurement requirements.



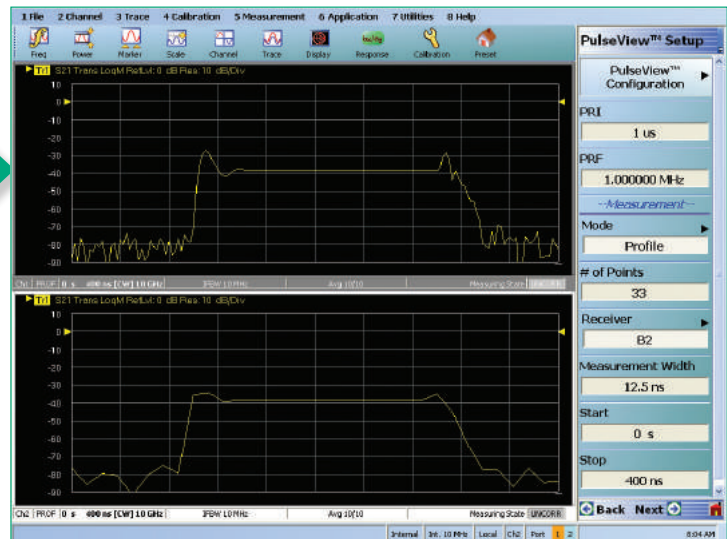
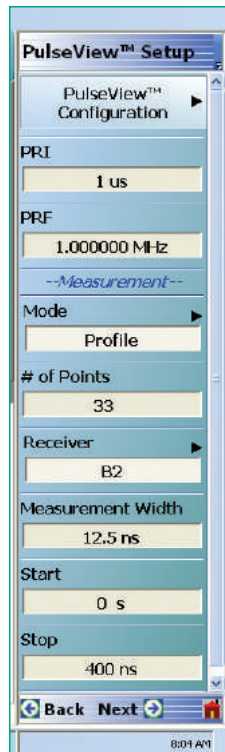
PulseView configuration screen

VectorStar MS4640B Provides:

- An innovative, high-speed digitizer architecture
- The industry's highest resolution measurements
- The longest record lengths
- Independent receiver measurements
- An intuitive graphical configuration tool
- Instant results on measurement parameter changes



VectorStar VNAs (with PulseView) enable industry-leading measurement 2.5 ns resolution. It enables users to get a true view of their device performance and see behavior they may have been missing. In the example above, the 12.5 ns resolution measurement of a typical VNA does not capture the full magnitude of the signal overshoot. For applications with very sensitive receivers, the full magnitude of the overshoot could be the difference of whether or not a receiver enters saturation resulting in a number of unwanted effects.



Change measurement parameters and see results in real time

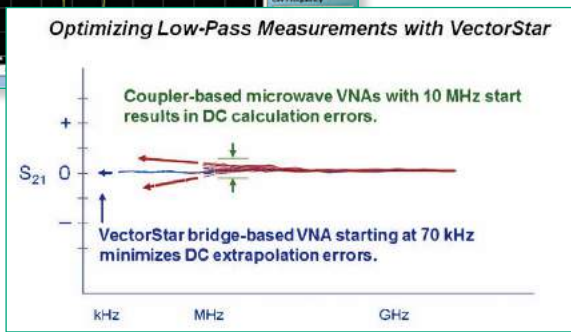
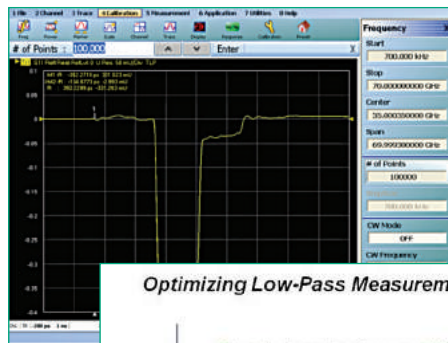
Time Domain Measurements

The time domain option (Option 002) allows you to display the performance of the device in the time or distance domain. It also provides a powerful ability to analyze the performance of the device at specific locations. For instance, when analyzing connectors, the distance information provides an indicator of the quality of the connection at different locations within the connector.

70 kHz to 70 GHz Provides Unprecedented Resolution

The unprecedented, low-end frequency range of the VectorStar VNAs provide a unique opportunity when using time domain analysis, especially when using the popular low-pass step mode. This powerful processing technique provides the highest performance and most versatile set of displays. The low-pass mode requires a harmonically related set of frequencies that start at the lowest frequency possible. A DC term is extrapolated that provides a phase reference, so the true nature of a discontinuity can be evaluated. Now, with a maximum of 100,000 points and a starting frequency as low as 70 kHz, the DC term extrapolation can begin at a near-DC data point. The result is a significant improvement in the capabilities of device analysis when analyzing in the Low-Pass Time Domain.

The VectorStar VNA continues to offer the Anritsu unique benefit of providing both real and imaginary information when measuring narrowband devices, such as bandpass filters and waveguides. The Anritsu-developed Phasor Impulse Mode provides true impedance information of these types of devices even when operating in time domain band pass mode.



Get unparalleled accuracy with VectorStar's 70 kHz start frequency.

Unique Time Domain Analysis Benefits

Three important parameters of a VNA have a direct impact on the quality and performance of Time Domain analysis:

Frequency Span

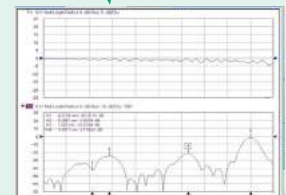
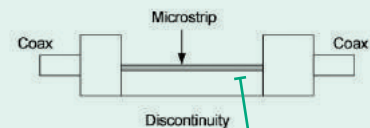
The wider the frequency span, the better the time domain resolution. A wide frequency span provides the resolution needed to resolve discontinuities that are too close together to be analyzed by a narrowband VNA. With the maximum broadband coverage of 70 GHz or 110 / 125 / 145 GHz, all starting at 70 kHz, VectorStar offers the widest range for the best resolution available.

Low-End Frequency

The lower the start frequency, the more accurate the measurement. The low-end frequency establishes the DC term when using low-pass step mode operation and the DC term establishes the characteristic impedance. With a start frequency as low as 70 kHz, VectorStar offers an accurate DC reference for the most accurate low-pass time domain measurement capability.

Maximum Data Points

More data points improve aliasing performance and low-pass step mode operation. With a maximum 100,000 points, the most available in the industry, VectorStar provides the longest non-aliasing range and widest harmonic step calibration for low-pass time domain processing.



VectorStar MS4640B Broadband Vector Network Analyzer Series

Component Testing

Active Measurements Suite

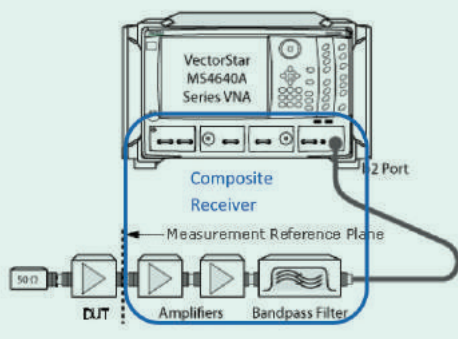
Add the Active Measurements Suite (Option 06x) to perform the most popular tests in a convenient, easy-to-use program. This versatile, application-oriented measurement system features:

- Choice of two or four internal step attenuators for forward and reverse sweeps
- Internal bias tees
- Gain compression software to evaluate over-swept frequency, swept power, or multiple CW frequencies
- Extended power range control

Noise Figure Measurements

The Noise Figure Measurement options (Option 41 for single-ended and Option 48 for differential) adds the capability to measure noise figure, which is the degradation of the signal-to-noise ratio caused by components in a signal chain. The noise figure measurement is based on a cold source technique for improved accuracy. Various levels of match and fixture correction are available for additional enhancement. The VectorStar VNA has the only platform capable of measuring single-ended or differential noise figure, and the only VNA capable of measuring single-ended and differential noise figure up to 110 GHz. VectorStar offers a unique receiver optimized for noise figure measurements from 30 to 110 GHz.

Industry first!
70 kHz to 70/110 GHz VNA
Differential noise figure measurement capability



Optimized noise receiver for mmWave measurements from 30 to 110 GHz

Gain Compression Analysis

The powerful gain compression software application in VectorStar VNA includes the ability to measure compression over multiple frequencies. By using the multiple frequency gain compression configuration, the VNAs will sweep power and detect the selected compression point at up to 401 frequencies. The results are then displayed in graphical and tabular format.



Mixer Measurements

Make Frequency-Translated Device Measurements with a VectorStar VNA

Frequency-translating devices are key components of any communication system, whether they are up-converters, down-converters, or basic mixers. Since their input and output frequencies are different, they require special features and setups for VNA measurements. With the frequency offset capability of the VectorStar VNAs, where the source and receiver are independently synthesized, such measurements are possible and require a much less complicated setup. With special calibration techniques, vector error-corrected measurements are possible for added accuracy, absolute phase, and group delay information.

Mixer Setup

The mixer setup application helps to create common mixer measurements with a user-friendly, and easy-to-understand GUI with diagrams. The application is also capable of setting up multiple measurement channels to handle any of a suite of possible mixer measurements and to list the required calibration steps. This tool is coupled with a mixer calibration menu system that enables both scalar and vector-corrected measurements.

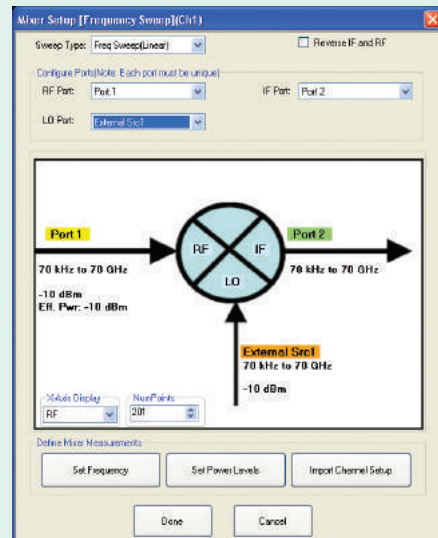
Independent Receiver Offset Control (Option 007)

For more advanced control over measurements, receiver offset control using the Multiple Source Control menu is a capability that independently controls the internal source and receiver as well as up to four external synthesizers. Since there are no constraints on frequency linkage (other than the ranges the hardware is capable of), a wide array of mixer, multiplier, converter, and other specialized measurements can be performed. Some examples include:

- Mixers (up and down conversion, many conversion stages)
- Frequency multipliers, dividers
- Harmonic measurements (including the ability to look at fractional harmonics)
- IMD measurements
- Very high frequency measurements where the source and LO are generated externally

Mixer Measurement Types:

- Scalar Measurements — The scalar measurement technique is the traditional way mixers are measured with a VNA, meaning that only magnitude information is gathered on the DUT. Since the source and receive frequencies are not the same, the VNA does not have a phase reference to make a phase measurement.
- Vector Error-Corrected Measurements (without a characterized mixer) — All mixer parameters, where the input and output frequencies are the same, can be performed with standard VNA calibrations. Parameters that meet this criterion are match and isolation terms.
- Vector Error-Corrected Measurements (using a characterized and de-embedded mixer) — Included with the Receiver Offset Option is the NxN Mixer Calibration and Measurement utility, providing an accurate method of measuring frequency-translated devices. The utility provides both magnitude and phase information, as well as the ability to measure absolute phase and group delay. By measuring the response characteristics of device pairs, the VectorStar VNA will solve and de-embed the device characteristics. The NxN application module includes capabilities for characterizing and de-embedding the IF path of frequency translation device measurements and delivering a real-time display of the de-embedding characteristics of the DUT for magnitude and absolute phase.



VectorStar MS4640B Broadband Vector Network Analyzer Series

Broadband/mmWave System Solutions

Industry's Only 70 kHz to 110 / 125 / 145 GHz Broadband Vector Network Analyzer DC to Daylight

Finally, an instrument that truly lives up to the challenge. The VectorStar ME7838 broadband system series provides an incredible frequency span of 70 kHz to 110 / 125 / 145 GHz through a single coaxial connection. Operation down to 70 kHz provides 8 additional octaves of low-end frequency information. With 70 kHz measured data, device modeling software can significantly improve DC extrapolation calculations, thereby increasing the accuracy of their models.

On-Wafer Measurements

The VectorStar ME7838 broadband VNA series is a high-performance measurement solution offering the best overall performance for on-wafer measurements including:

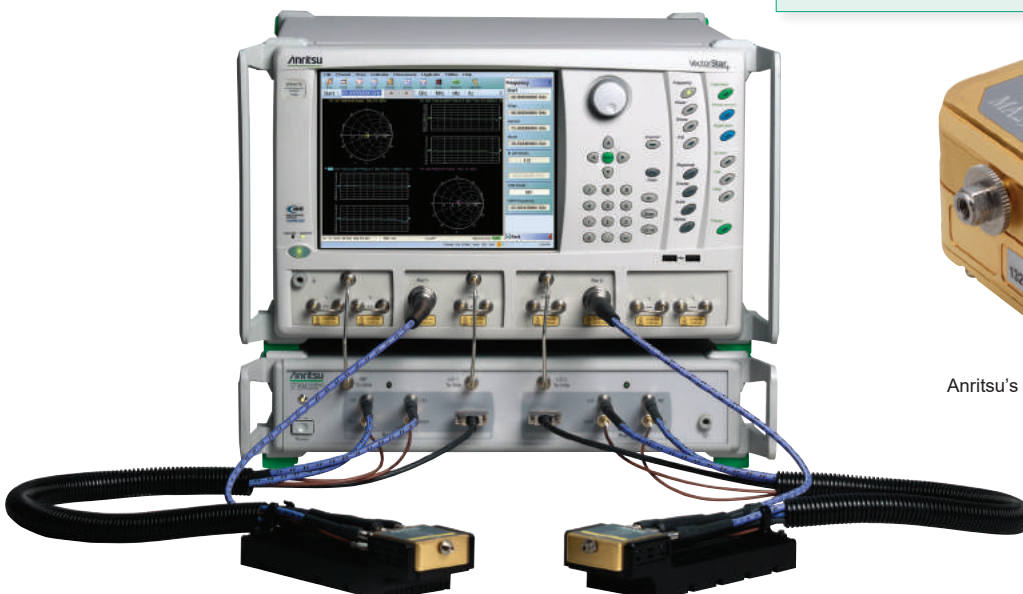
- A wide range of on-wafer optimal calibration choices:
 - SOLT/SOLR, LRL/LRM, A-LRM™
- Embedding/De-embedding including the ability to cascade multiple networks for extracting fixtures or embedding networks
- Compatibility with WinCal and IC-CAP
- High port power to overcome insertion losses at the probe tip
- Flat power calibration
- Merged calibrations

Key Features

- Continuous broadband frequency coverage from 70 kHz to 110 / 125 / 145 GHz using a 1 or 0.8 mm coaxial test port connector
- Banded mmWave operation up to 1.1 THz
- Industry-best dynamic range: 120 dB at 10 MHz; 108 dB at 65 GHz; 109 dB at 110 GHz; and 94 dB at 145 GHz
- Industry-best stability: performance better than 0.01 dB and 0.1 degrees S_{21} stability over 24 hours at 25° C, typical
- The broadest frequency span from 70 kHz to 145 GHz combined with 100,000 data points provides the industry's best time-domain resolution
- Kelvin bias tees located close to the DUT provides force, sense, and ground for optimum performance.

Applications

- Broadband characterization
- Parameter extraction
- Device modeling
- On-wafer measurements
- mmWave measurements
- Time domain analysis



VectorStar ME7838 broadband system series



Anritsu's MA25300A mmWave 145 GHz module

VectorStar MS4640B Broadband Vector Network Analyzer Series

On-Wafer Device Characterization Measurement Solutions

Balancing Accuracy and Throughput for Broadband Measurements

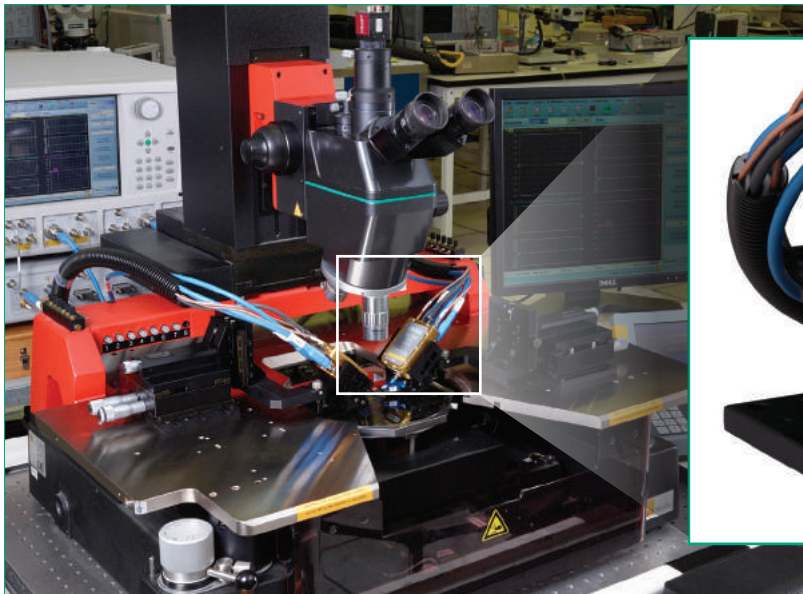
Semiconductor manufacturing test engineers face increased challenges today related to broadband mmWave on-wafer testing. Developing accurate models often requires measuring frequencies that range from near DC up to 100+ GHz. Achieving accurate, stable measurements over extended time periods is a challenge for foundries and fabless semiconductor companies that require extensive testing of on-wafer devices.

Achieving Both Accuracy and Throughput for Broadband Measurements

The VectorStar ME7838 broadband system series has been uniquely designed to meet on-wafer device characterization needs from 70 kHz to 110/125/145 GHz (and even up to 1.1 THz with waveguide-banded mmWave modules). It allows semiconductor test engineers to achieve accurate, stable measurements over extended time periods. The improvement in measurement efficiency allows these engineers to better characterize devices, more confidently set product specifications, and test more products during production.

Total Compatibility with Wafer-Probe Stations and On-Wafer Calibration Software

- Integrate the VectorStar VNA with probe stations from leading manufacturers for making accurate on-wafer measurements in both microwave and mmWave bands. Compatibility with calibration software enables fast, automated calibrations for accurate measurements of discrete FETs, MMICs, passive components, and others. In addition, the format and communication capabilities of this system provides compatibility with popular computer-aided design and test packages. This enables transfer of S-parameter data files (SnP) from the network analyzer directly into a microwave design simulation environment.
- Device characterization and parameter extraction are most commonly performed on a wafer probe system requiring specific on-wafer calibration methods. The VectorStar VNA provides an easy interface for entering the parameters for SOLT, LRL, and LRM calibrations. Other external calibration techniques, optimized for wafer probing applications, are also supported for users of probe systems.



Anritsu's VectorStar ME7838 broadband system integrated into an on-wafer probe station



Anritsu's MA25300A mmWave 145 GHz module

VectorStar MS4640B Broadband Vector Network Analyzer Series

Multi-Port, Single-Sweep Solutions 70 kHz to 110 / 125 / 145 GHz

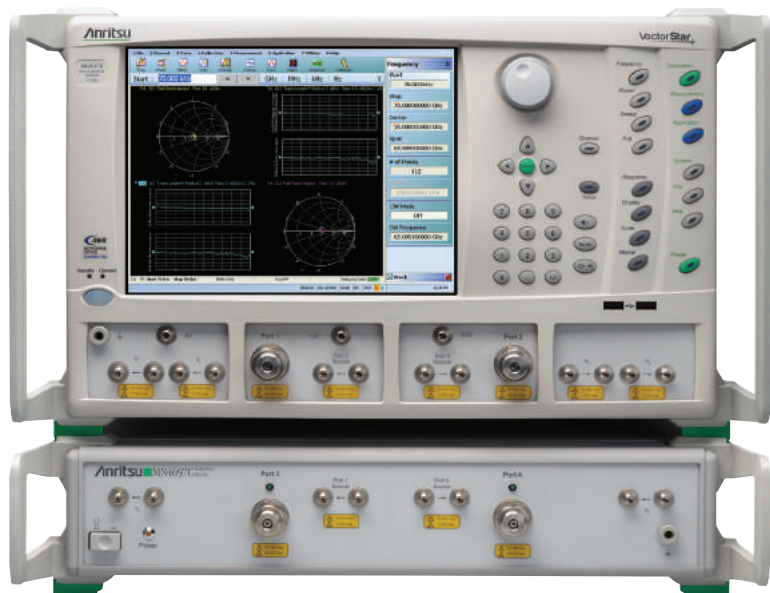
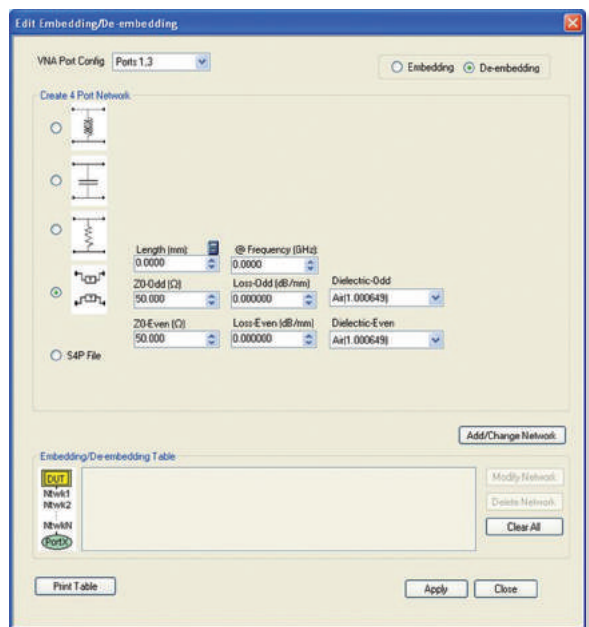
The VectorStar MS4640B 2-port VNA can be used in conjunction with an external MN469xC series 4-port test set and mmWave modules for 70 kHz to 110 / 125/ 145 GHz single-ended, mixed-mode, and true differential mode S-parameter measurements. The VectorStar 4-port solution is ideal for today's highly integrated multiport assemblies, common three-port devices (such as combiners, diplexers, and couplers), and balanced linear devices.

Two models are offered, the multipoint VectorStar MN4694C in K and the multipoint VectorStar MN4697C in V connector output. The former can be used with the VectorStar MS4642B or MS4644B VNA for 70 kHz to 20 GHz or 40 GHz coverage respectively. The latter can be used with the VectorStar MS4647B VNA for 70 kHz to 70 GHz coverage. The only option that is necessary on the base 2-port VNA is the direct access loops available with Option 051. Option 070 is needed for coverage down to 70 kHz.

For signal integrity measurements on high-speed, balanced transmission lines and connectors, the VectorStar 4-port solution offers an unprecedented 70 kHz low-end operation with upper frequencies to 70 / 110 / 145 GHz. Direct measurements from practically DC to 110 / 125 / 145 GHz, high-accuracy time domain, and wide dynamic range frequency domain make the VectorStar 4-port the ideal tool for designers concerned with signal integrity.

Advanced 4-port Capabilities

- 16 single-ended S-parameters
- 16 mixed-mode S-parameters
- Flexible port assignments
- Differential, common, and mixed-mode S-parameters
- 1-, 2-, 3-, and 4-port calibrations using AutoCal, SOLT/R, SSLT/R, SSST/R, LRL/M, A-LRM
- Simultaneous 1- or 2-port measurements
- Arbitrary impedance transformation
- Hybrid-Cal for combining 1- or 2-port cals to create 2-, 3-, or 4-port cals with the addition of thru/reciprocal step's. (Ideal for mixed-media applications)
- FlexCal for a calibration to be used for a lesser port correction, thus faster measurements
- Embedding and de-embedding of 2- or 4-port networks, using circuit elements or .snp files
- Extensive network extraction of one, two, or four 2-port networks, or two 4-port networks, including /2 capability for extracting fixtures that cannot be calibrated at the inner plane



Anritsu's VectorStar MS4647B with MN4697C multi-port test set

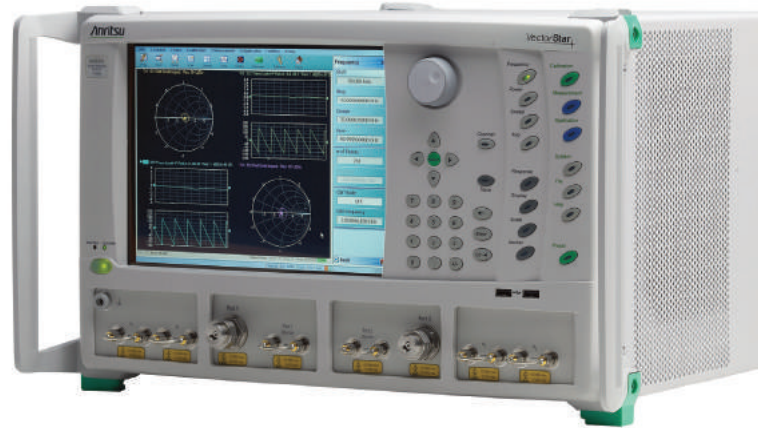
VectorStar MS4640B Broadband Vector Network Analyzer Series

Upgradability

Purchase Only What You Need Now and Upgrade Later When Your Needs Change

The Anritsu VectorStar series of performance VNAs is designed with upgradability in mind. Have the peace of mind that you can start with the basic 2-port, 20 GHz model knowing that you can upgrade frequency coverage (70 kHz to 1.1 THz) as well as number of ports and options when requirements change. With other manufacturers, you will need to decide ahead of time what your future needs may be or you may end up with an expensive system that will not grow with your needs.

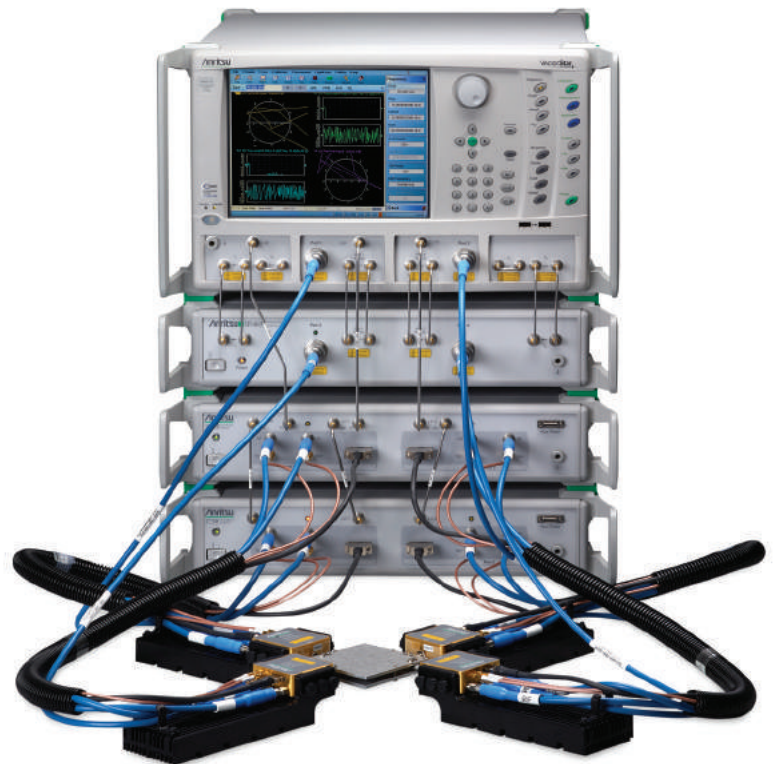
Part Number	Description
Base Models	
MS4642B	70 kHz to 20 GHz
MS4644B	10 MHz to 40 GHz
MS4647B	10 MHz to 70 GHz
ME7838E	70 kHz to 110 GHz
ME7838A	70 kHz to 110/125 GHz
ME7838D	70 kHz to 145 GHz



VectorStar™ MS4640B vector network analyzer series



36585V AutoCal™



Anritsu's 4-Port ME7838A4 broadband VNA system

VectorStar MS4640B Broadband Vector Network Analyzer Series

Accuracy Enhancements

Embedding/De-embedding

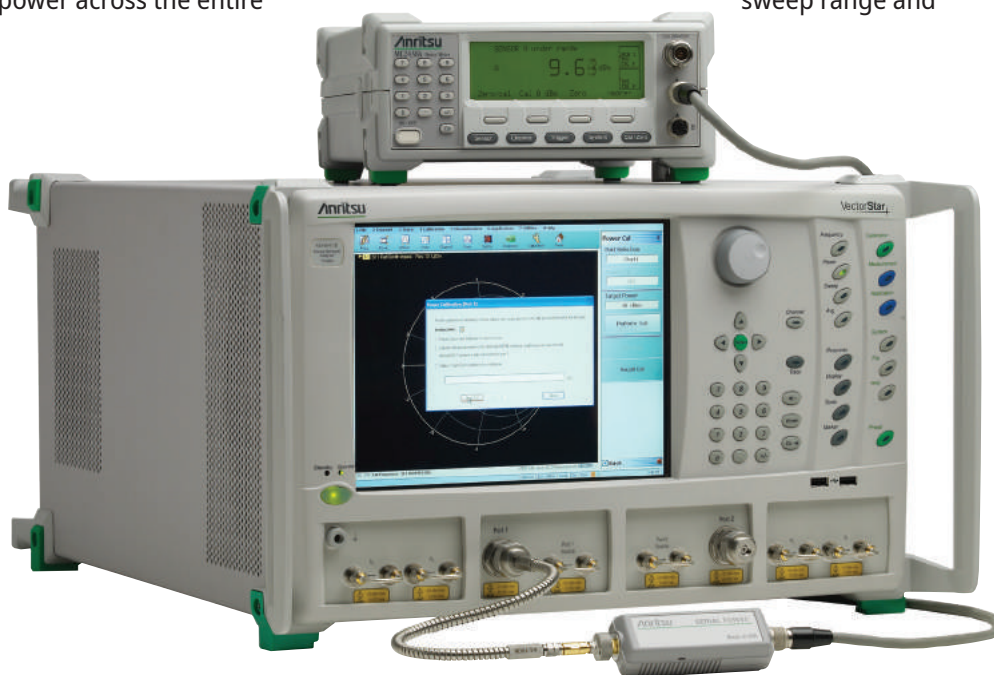
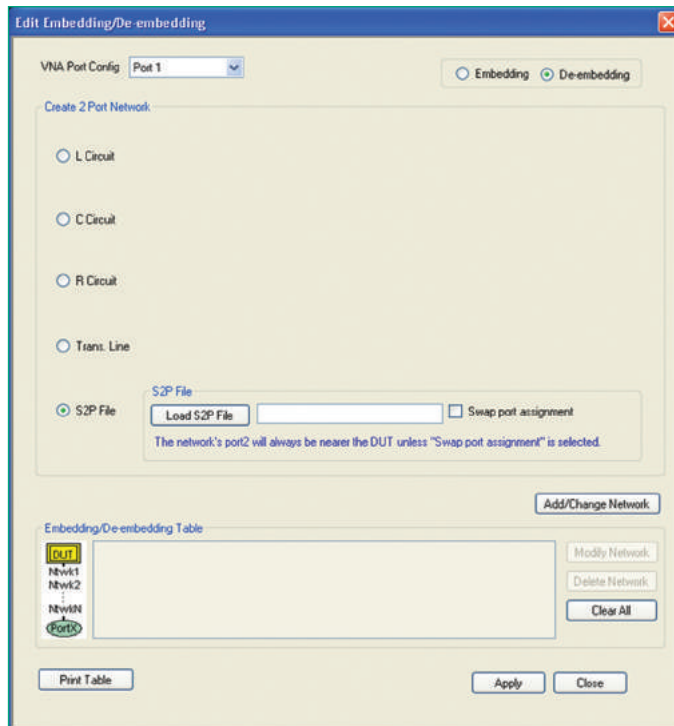
The de-embedding capabilities of VectorStar can be used to remove test fixture contributions, modeled networks, and other networks described by S-parameters (S2P files) from the measurements. Similarly, the embedding function can simulate matching circuits for optimizing amplifier designs or simply adding effects of a known structure to a measurement. Changing the port and network orientations is easy, making embedding/de-embedding multiple networks straightforward and effortless.

Adapter Removal

Quickly and easily characterize and “remove” the effects of an adapter attached during calibration and not used during device measurements. This de-embedding technique is useful when measuring non-insertable devices and optimizes the calibration procedure. Using this method requires only two normal insertable SOLT calibrations. VectorStar VNAs retain both calibrations in internal memory and automatically extract the effects of the adapter during measurement.

Test Port Power with Power Meter Accuracy

S-parameter measurements of active devices, such as amplifiers, require accurate knowledge of the input and output power levels of the device. Also, for optimum swept frequency gain compression measurements, the output power of the analyzer test port should be flat over the frequency range. The VectorStar MS4640B VNA provides an automated power flatness calibration program for characterizing test port power. When calibrated with the Anritsu ML24XX series power meters, the calibration routine automatically stores a power correction table in the analyzer for later recall. The result is a VNA with flat, leveled power across the entire sweep range and with power meter accuracy.



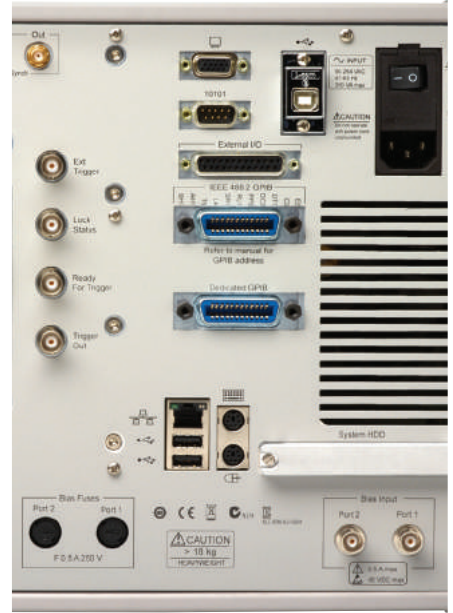
Anritsu's VectorStar MS4647B with ML2438A power meter

VectorStar MS4640B Broadband Vector Network Analyzer Series

Connectivity Options

VectorStar VNAs provides a unique set of interconnectivity tools in addition to multiple options of computer and printer interfaces. The range of interface capabilities includes:

- LAN – Control the VectorStar VNA over the LAN via VXI-11 or TCP/IP protocols, 10/100Base T Ethernet.
- USB – Use the TMC protocol to connect to the VNA using a USB cable: one Type B USB 2.0 port for controlling the VectorStar externally; four Type A USB 2.0 ports for peripherals (such as keyboard, mouse, flash drives, hardware key, and others)
- GPIB via IEEE 488.2 – Compatible with previous generation Anritsu VNA; use native GPIB commands
- Serial-ATA Hard Drive – Easily remove and replace from the rear panel.
- External I/O Port 25-pin D-Sub – Custom test set interface, and synchronize with different sweep states (such as Start, Stop, Driven Port, and others)
- Serial Port 9-pin D-Sub RS-232 – Control for AutoCal modules and other devices
- IF Inputs/Outputs – Use with mmWave modules, antenna testing, and others
- BNC connectors – Access directly to triggers, lock status, and others

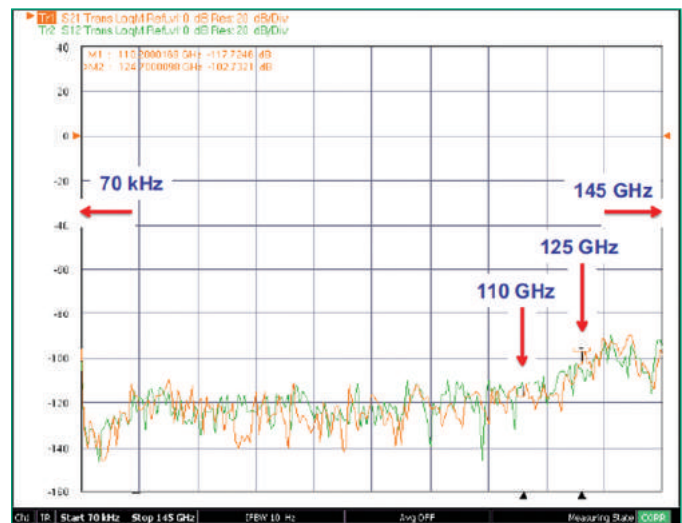


Class-Leading Features

Best Broadband Dynamic Range

- 120 dB at 10 MHz
- 108 dB at 65 GHz
- 109 dB at 110 GHz
- 94 dB at 145 GHz

Thanks to incorporating two optimized VNAs in one instrument, VectorStar VNAs deliver full spectrum performance. You're no longer subject to losing dynamic range at the low end of the frequency range due to coupler roll-off. Nor will you have to worry about the high end due to a drop in available port power. By utilizing high directivity couplers for the microwave region and resistive bridges for the RF range, critical performance parameters (such as directivity and available measurement power) are maximized. Add to that a receiver compression level up to 20 dB higher and a noise floor up to 15 dB lower. The result is a VNA with the best overall dynamic range over the widest frequency range available in the industry.



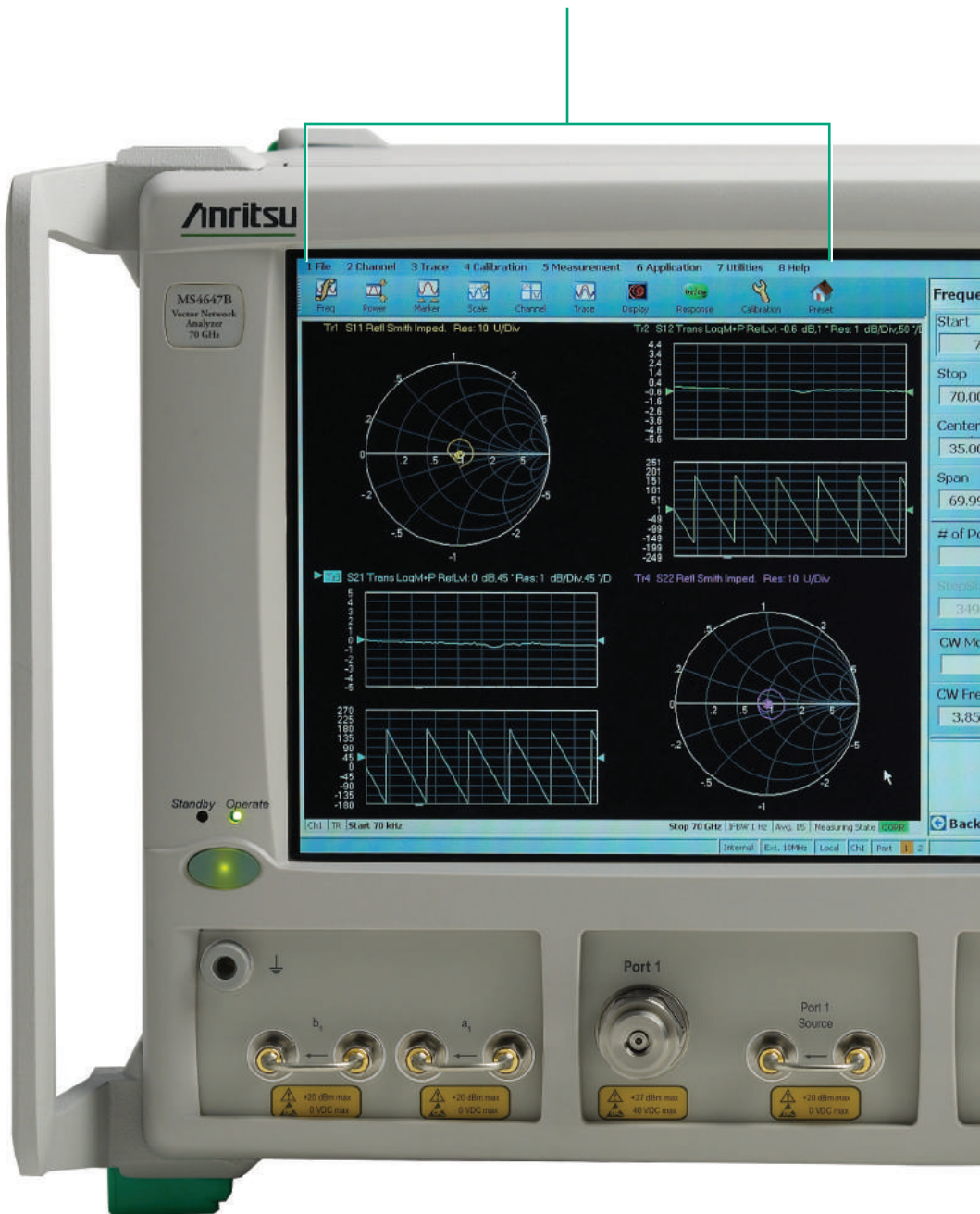
Dynamic range of VectorStar ME7838D system at the 0.8 mm coaxial test port from 70 kHz to 145 GHz

VectorStar MS4640B Broadband Vector Network Analyzer Series

Full-Featured Front Panel for Easy Access to Powerful Functionality

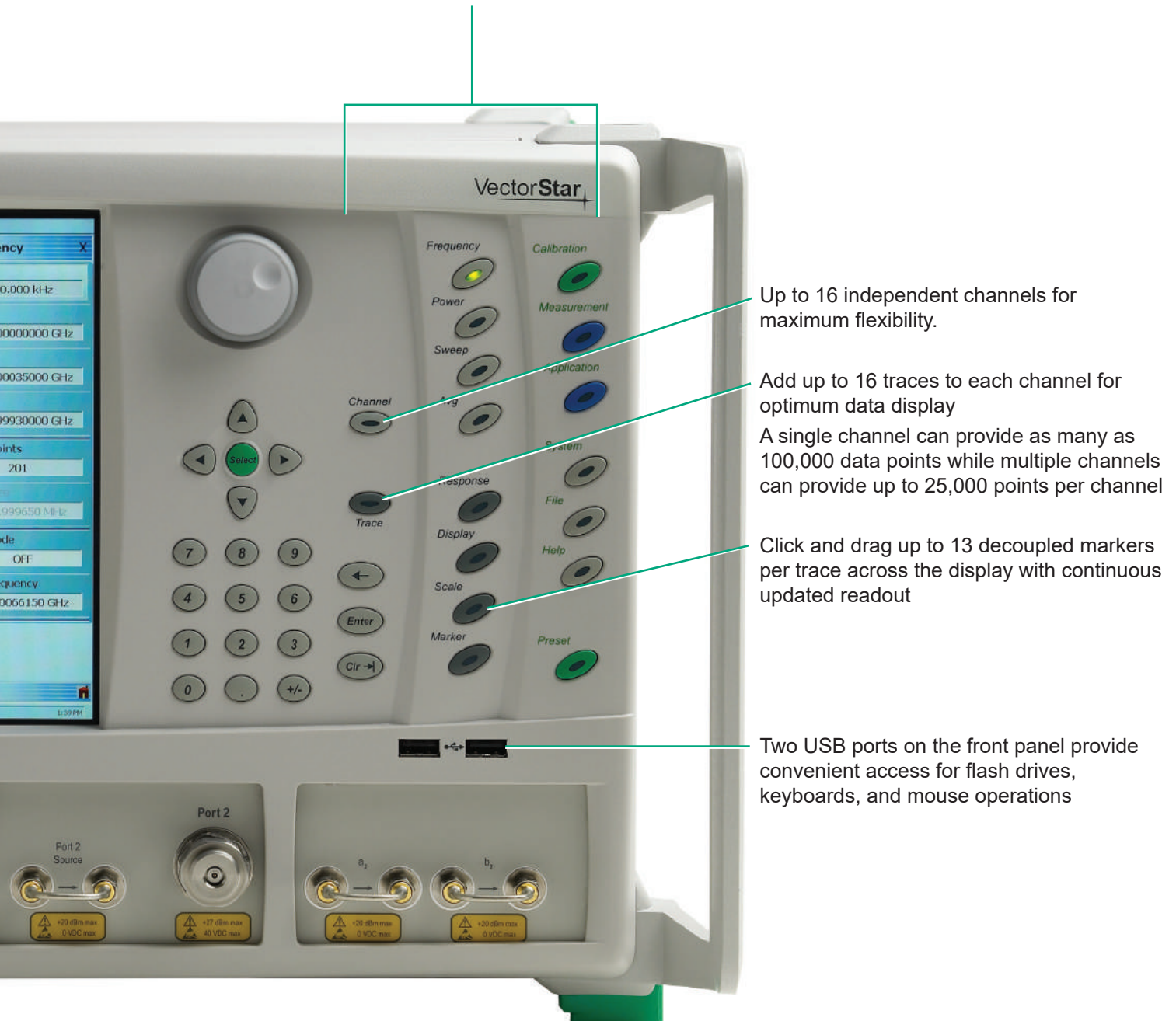
- Access the features and functions of the VectorStar VNA through dedicated keys, touchscreen, and mouse driven selections
- Input extensive data via your external keyboard
- Custom toolbars provide easy set-up configurations for specific measurements
- Select and organize up to 10 icons for fast selection of the most common measurements
- Increase security using the removable SATA hard drive accessible from the rear panel
- Multiple sweep options include: frequency (lin or log), power, and with Option 002, frequency with time gate, and time domain (low pass or bandpass)

Minimize menus and tool bars for optimum viewing of data



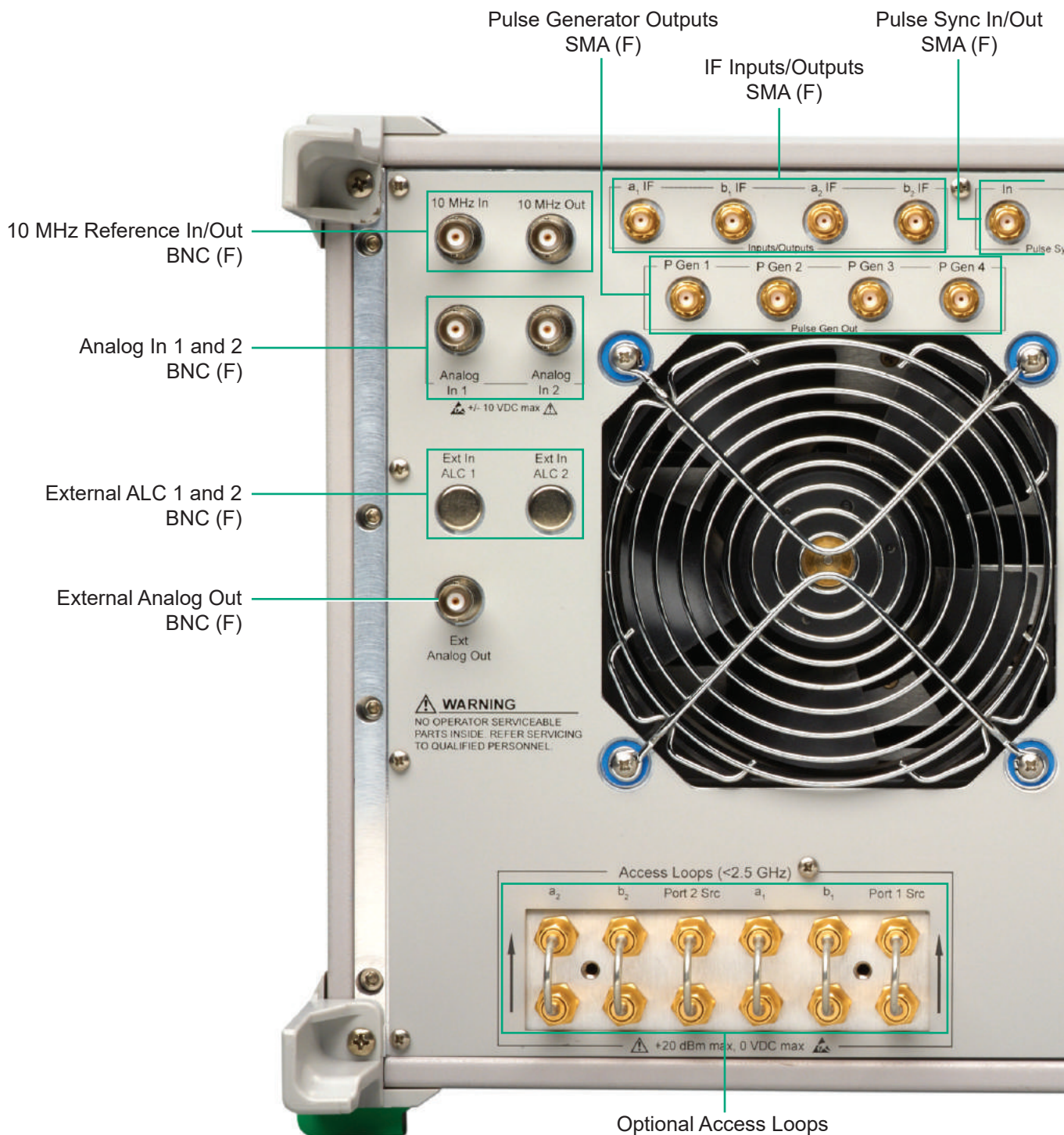
VectorStar MS4640B Broadband Vector Network Analyzer Series

Grouped by category and application, the hard keys provide all the control options dedicated to perform all front panel setups and measurements

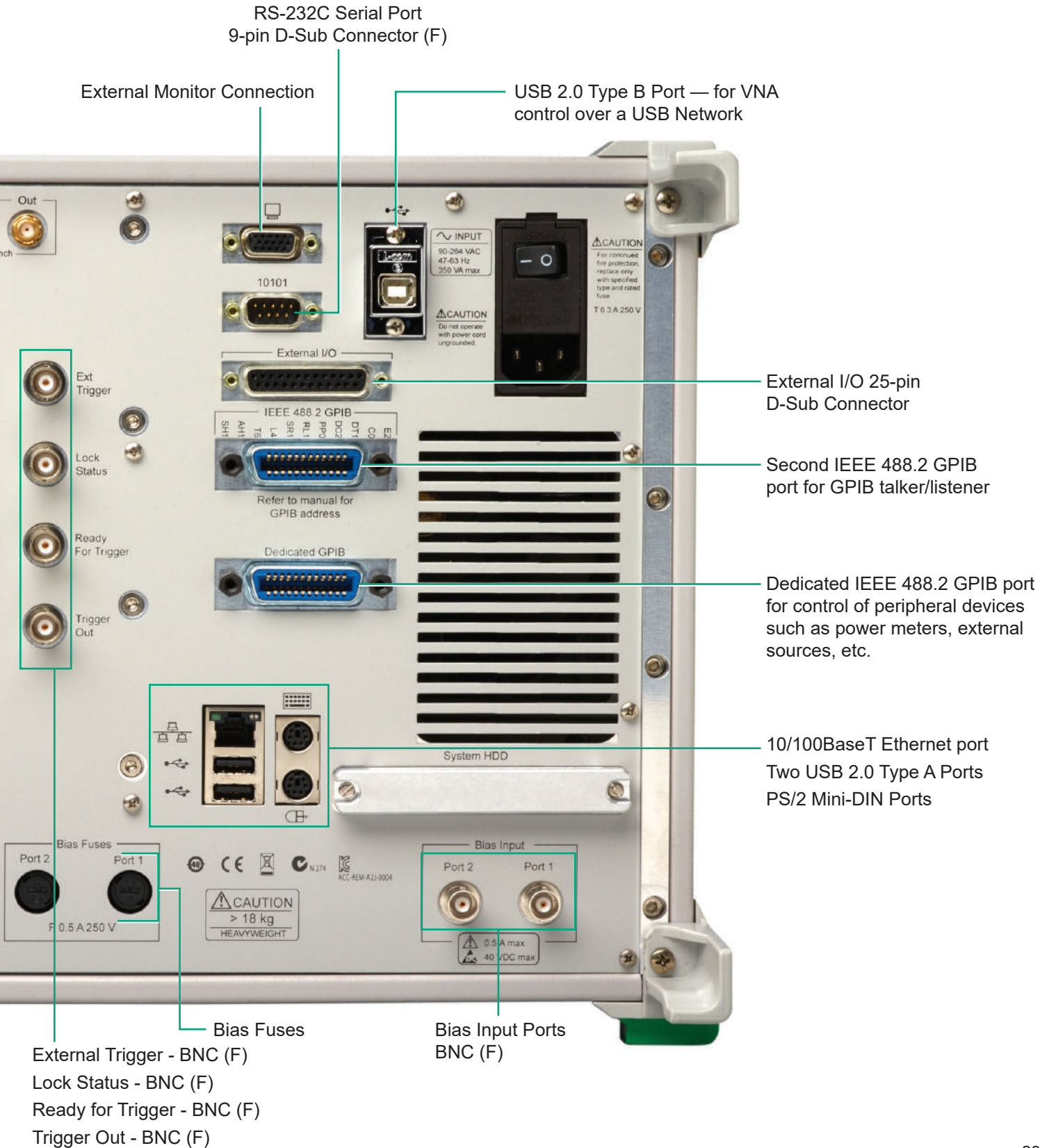


VectorStar MS4640B Broadband Vector Network Analyzer Series

Customizable Rear Panel with Connectivity Options



VectorStar MS4640B Broadband Vector Network Analyzer Series



Calibration Choices

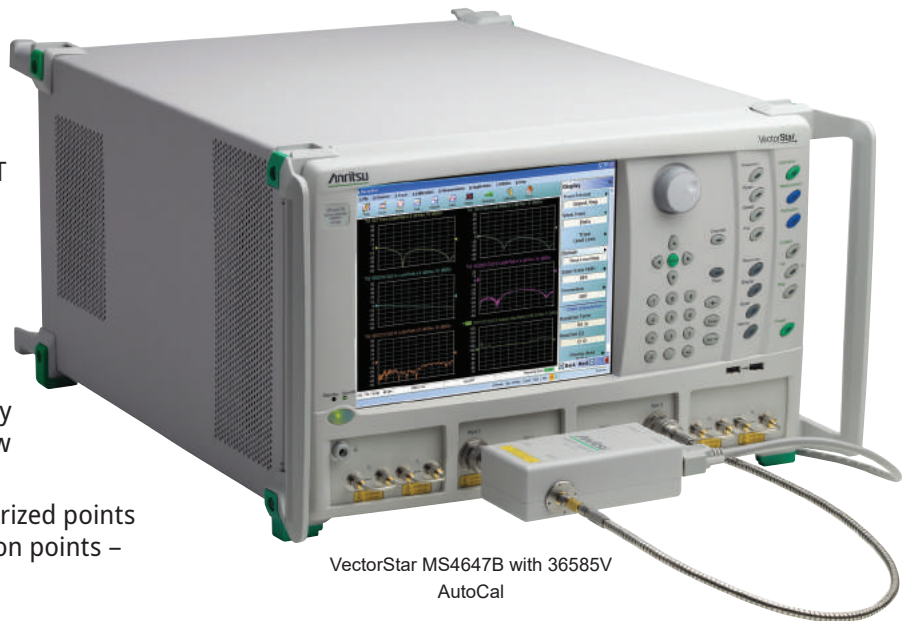
Optimum Measurement Accuracy for a Wide Range of Application Environments

- Precision AutoCal module for automatic calibrations
- SOLT/SOLR for traditional mechanical calibrations
- LRL/LRM for metrology-grade accuracy
- ALRM, SSLT to SSSR for on-wafer, waveguide and other unique requirements

Precision AutoCal

The most efficient calibration solution:

- Reduces calibration time and potential operator errors
- Improves accuracy over traditional SOLT by utilizing innovative characterization and calibration algorithms
- Performs the widest frequency span calibration in a single, automatic calibration module: 70 kHz to 70 GHz
- Provides the largest number of internal characterization points for best accuracy simultaneously over a broad and narrow frequency span
- Combines the most number of characterized points with up to 100,000 instrument calibration points – all with a single click



VectorStar MS4647B with 36585V
AutoCal

The concept of AutoCal was first introduced by to decrease the possibility of improper connections or connecting the wrong standard. Combining over-determined characterization algorithms with Anritsu's Multiple Line Calibration kit, the Precision AutoCal provides unprecedented accuracy. It now surpasses the accuracy of mechanical standards kits, including those with sliding loads, resulting in a simple to use calibration method providing metrology-grade performance.

Fast, Easy, and Accurate Non-Insertable Measurements

Non-insertable measurements require the use of an adapter during the thru calibration setup. Often, extraction methods utilizing S2P files are used to remove the effects of the adapter. This requires yet another calibration and a challenge to perform the measurement with the desired degree of accuracy. That's why the Precision AutoCal module is available in a variety of connector configurations, and can easily connect the non-insertable test ports to provide the most accurate alternative to non-insertable calibrations.

For cases where the correct connector version of AutoCal may not be available, VectorStar VNAs provide an easy method of incorporating an adapter during the thru calibration step. This improved method eliminates the need for additional S2P files. The procedure works in conjunction with the insertable AutoCal and simply requires reversing the combination and re-calibrating. The result is an automatic adapter removal calibration using only four connections (unlike other methods that require as many as 22 reconnections during the calibration procedure).

VectorStar MS4640B Broadband Vector Network Analyzer Series

Substantial advancements in automatic calibration performance with Precision AutoCal's superior switching of internal standards, coupled with the highest available calibration points, provides the most accurate, stable, and user-friendly automatic calibration system available for a VNA. And the unique topology of the AutoCal module provides a number of significant advances in automatic calibration procedure:

- Hybrid GaAs PIN diode technology, with its unique standards mapping technique, provides a wide range of impedance reference points without the high insertion loss of cascading multiple switches. With a wide variety of impedance points to choose from, the VectorStar VNA's over-determined algorithm finds the optimum characterization combination to provide the fastest, most accurate calibration possible. The higher number of available reference points, coupled with over-determined characterization algorithms, provides wider reference coverage of the impedance map, increased source match accuracy, and minimization of interpolation errors across the entire Smith Chart.
- Turnstile approach to impedance switching provides a low insertion loss path between ports 6 dB or better — for a far more accurate through-path characterization and superior transmission tracking performance.
- Get an accurate through-path characterization without the need to reconnect test port cables or perform an additional calibration step as with other electronic calibrators.
- A maximum number of over-characterized points, combined with an optimal segmented sweep, results in a calibrated step size as narrow as 20 kHz (compared to 10 MHz for other electronic calibrators). The result is low interpolation errors, even when sweeping extremely narrow band ranges.
- Availability of the SOLR calibration routine for applications where transitions in connector types are required.
- AutoCal can also be characterized in the field with an adapter. No need to send the module back to the factory. When finished, the adapter can be removed and the initial characterization file restored to the original state.



Unsurpassed Accuracy

Accuracy is determined by numerous system performance aspects, such as corrected test port characteristics and trace noise. Uncertainty curves provide a graphical representation of total system accuracy and offer a complete picture of precise and expected measurements. The overall test port characteristics of the VectorStar VNAs are unsurpassed, whether compared to traditional SOLT calibration kits or automated calibration methods. For example, note the significant advantage in accuracy of the VectorStar VNAs when calibrated with the Precision AutoCal and compared to other VNAs calibrated with similar automated calibration modules (or even with traditionally more accurate mechanical calibration kits using sliding loads). Further proof that not only will VectorStar VNAs provide the most accurate measurements, they are also easy to calibrate and operate.

LRL/LRM Multiple Line Calibration Kits

Utilizing the Model 3657 series multiple line calibration kits from Anritsu, the VectorStar VNA can be calibrated to unprecedented levels of performance. The six male-to-male, beadless airlines contained in the 3657-1 multiple line calibration kit provide the highest level quality NIST traceable impedance standard. When calibrated with the internal LRL/LRM calibration routine, the VectorStar VNA's corrected directivity and load match is specified to be up to 50 dB.



Model 3659 0.8 mm Calibration and Verification Kit

Calibration Kits and Accessories

70 kHz to 70 GHz of Fully Specified, Traceable Measurements

Anritsu has pioneered metrology measurements using airline technology. Airlines establish the characteristic impedance of the measurement system and are traceable through mechanical measurements. Traceable, beadless airlines are then used to confirm performance of a calibrated VNA. Anritsu has established a traceable path for airlines up to 70, 110, and 145 GHz. A traceable path to 70 kHz has also been established by using DC coupled thermal power sensors. Thus, utilizing a combination of traceable Anritsu-designed thermal power sensors and traceable airlines, calibration and specifications covering the entire 70 kHz to 70 / 110 / 145 GHz range in a single sweep is achieved.

36580 Series AutoCal and Precision AutoCal

The Anritsu 36580 series AutoCal modules are automatic calibrators that provide fast, repeatable, and high-quality coaxial calibrations up to 70 GHz. These modules contain precisely characterized calibration standards that aid in the removal of normal systematic errors of VNAs. These calibrators are ideal for the manufacturing environment where speed, accuracy, and reliability are important.



36585V precision AutoCal

3650 Series Calibration Kits

Accurate operation of your VectorStar VNA is ensured by using Anritsu's precision coaxial SOLT (sliding load) calibration kits. These kits include precision components for calibrating measurements in SMA, 0.8mm, 1mm, 3.5 mm, K Connector® and V Connector®. For waveguide measurements, standard kits offer offset-short calibration capabilities. Anritsu's microstrip calibration kits include all the components necessary for SOLT, LRL, and LRM calibrations using the Anritsu 3680 series Universal Test Fixture.



3650 series coaxial calibration kits

3657 Series Multiple Line Calibration Kits

The Anritsu 3657 series Multiple Line Calibration kits provide six V Connector airlines ranging from 15.00 mm to 49.84 mm in length. All airlines are configured with male- to-male connectors. The airlines can be used to calibrate the VectorStar VNA using TRL / LRL / LRM / calibration techniques. Using the proper combination of airline lengths and the VectorStar internal calibration routines, the VNA can be consistently calibrated to 50 dB directivity. Insertion and removal tools are also supplied with the kits. The kits can be provided with and without fixed offset shorts.



3657 series multiple line calibration kits

3660 Series Verification Kits

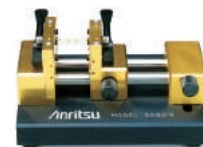
Anritsu offers a complete line of coaxial verification kits to confirm a system's performance. All verification kits contain precision components with characteristics traceable to NIST. Verification kits can be kept in a metrology laboratory where they provide the most dependable means of checking system accuracy.



3660 series verification kits

3680 Series Universal Test Fixtures (UTF)

Anritsu's Universal Test Fixture accommodates measurements in microstrip and coplanar waveguide. Spring-loaded jaws help to provide 0.1 dB repeatability on devices from 5 to 75 mils thick. Special fixtures are available for testing packaging transistors. An optional MMIC attachment helps you test integrated circuits.



3680 series universal test fixture

3670 and 3671 Series Test Port Cables

Anritsu offers laboratory-quality, semi-rigid, and flexible test port cables for K and V connectors.

34 Series Test Port Converters

Test port converters allow you to change the connectors on the VNA's test ports. Converters are available for K and V connectors.

35 Series Waveguide-to-Coaxial Adapters

These precision waveguide-to-coax adapters transform standard or double-ridge waveguide to coaxial K or V connectors.

VectorStar MS4640B Broadband Vector Network Analyzer Series

Ordering Information

Instrument Models	The VectorStar MS4640B series VNAs are available in three models to meet different frequency range requirements. Refer to "Standard Capabilities" in the Technical Datasheets for extended operational frequency ranges.
MS4642B	Vector Network Analyzer 70 kHz to 20 GHz (Minimum configuration requires either Options 8 or 9)
MS4644B	Vector Network Analyzer 10 MHz to 40 GHz
MS4647B	Vector Network Analyzer 10 MHz to 70 GHz
Included Accessories	Each VNA comes with a set of included accessories
User Documentation USB	User documentation files include the: VectorStar Operation Manual, User Interface Reference Manual, Programming Manual, Programming Manual Supplement, Calibration and Measurement Guide, Technical Data Sheet and Configuration Guide, and Maintenance Manual. They can be downloaded from the Anritsu website.
Online Help	The instrument is equipped with context-sensitive help built from the first five documents above.
Peripherals	Optical USB Mouse
Power	Power Cord
Main VNA Options	
MS4640B-001	Rack Mount, adds handles and removes feet for shelf-mounting into a 19" universal rack
MS4640B-002	Time Domain
MS4640B-004	Additional Serial-ATA (SATA) Solid State Drive (SSD) with OS and VectorStar Application Software
MS4640B-007	Receiver Offset
MS4640B-008	Active Device Measurements, with 2 Step Attenuators
MS4640B-009	Active Device Measurements, with 4 Step Attenuators
MS4640B-021	Universal Picture Extraction
MS4640B-031	Dual Source Architecture
MS464xB-032	Internal RF Combiner, requires Option 31
MS4640B-035	IF Digitizer
MS4640B-036	Extended IF Digitizer Memory
MS4640B-041	Noise Figure, requires Option 051, 061, or 062
MS4640B-042	PulseView™, requires Option 035
MS4640B-043	DifferentialView™
MS4640B-044	IMDView™
MS4640B-046	Fast CW, requires Option 35
MS4640B-047	Eye Diagram, requires Option 2
MS4640B-048	Differential Noise Figure, requires Option 051, 061, or 062
MS464xB-051	Direct Access Loops, see description below
MS464xB-061/062	Active Measurement Suite options, see description below
MS4640B-070	70 kHz Low-End Frequency Extension
Direct Access Loop Options	Note: Direct access loops are not available for VNAs equipped with Options 061 or 062, which include loops.
MS4644B-051	Direct Access Loops for MS4644B, not available with Options 061 or 062
MS4647B-051	Direct Access Loops for MS4647B, not available with Options 061 or 062
Active Measurement Suite Options	
MS4642B-008	Active Measurements Suite, with 2 Step Attenuators
MS4642B-009	Active Measurements Suite, with 4 Step Attenuators
MS4644B-061	Active Measurements Suite, for MS4644B, with 2 Step Attenuators
MS4644B-062	Active Measurements Suite, for MS4644B, with 4 Step Attenuators
MS4647B-061	Active Measurements Suite, for MS4647B, with 2 Step Attenuators
MS4647B-062	Active Measurements Suite, For MS4647B, with 4 Step Attenuators
Pulse Modulator Test Sets	Note: Pulse Modulator Test Set options require the VNA to be equipped with Options 35, 42, and Option 51, 61, or 62)
SM6628	Pulse Modulator Test Set, 70 kHz to 40 GHz, for source modulation with an MS4642B or MS4644B
SM6629	Pulse Modulator Test Set, 70 kHz to 40 GHz, for source and receiver modulation with an MS4642B or MS4644B
SM6630	Pulse Modulator Test Set, 70 kHz to 70 GHz, for source modulation with an MS4647B
SM6631	Pulse Modulator Test Set, 70 kHz to 70 GHz, for source and receiver modulation with an MS4647B
Multiport VNA Options	The multiport VNA option provides four test ports for all VectorStar MS4640B Series VNAs with the MN4690B Series Multiport Test Sets. The option provides the test set, necessary cabling, and installation documentation. The test set frequency range is limited to that of the attached VNA.
MN4694C	70 kHz to 40 GHz, use the MN4694C Test Set with MS4642B and MS4644B VNAs
MN4697C	70 kHz to 70 GHz, use the MN4697C Test Set with MS4647B VNAs
Documentation	For detailed MN4690C specifications, refer to the VectorStar MN4690C Series Multiport VNA Technical Data Sheet pn: 11410-00528

VectorStar MS4640B Broadband Vector Network Analyzer Series

Ordering Information (continued)

Broadband/Millimeter-Wave Systems

For details on the MS464xB-08x series of options, see the:
 VectorStar ME7838A Modular Broadband/Millimeter-Wave Technical Data Sheet - 11410-00593
 VectorStar ME7838D Modular Broadband/Millimeter-Wave Technical Data Sheet - 11410-00778
 VectorStar ME7838E Modular Broadband/Millimeter-Wave Technical Data Sheet - 11410-00767
 VectorStar ME7838A4 4-Port Modular Broadband/Millimeter-Wave Technical Data Sheet - 11410-00704

Calibration Options

MS4640B-097	Accredited Calibration, with Data
MS4640B-098	Z540/Guide 25 Calibration, no Data
MS4640B-099	Premium Calibration, with Data

OE Calibration Module

MN4765B-0040	Configured for 70 kHz to 40 GHz range, with 850 nm wavelength coverage
MN4765B-0042	Configured for 70 kHz to 40 GHz range, with 850 and 1060 nm wavelength coverage
MN4765B-0043	Configured for 70 kHz to 40 GHz range, with 850 / 1030 / 1310 / 1550 nm wavelength coverage
MN4765B-0070	Configured for 70 kHz to 70 GHz range, with 1550 nm wavelength coverage
MN4765B-0071	Configured for 70 kHz to 70 GHz range, with 310 nm wavelength coverage
MN4765B-0072	Configured for 70 kHz to 70 GHz range, with 1310 and 1550 nm wavelength coverage
MN4765B-0110	Configured for 70 kHz to 110 GHz range, with 1550 nm wavelength coverage

Precision Automatic Calibrator Modules (Precision AutoCal)

Part Number	Description
36585K-2M	K Precision AutoCal Module, 70 kHz to 40 GHz, K (male) to K (male)
36585K-2F	K Precision AutoCal Module, 70 kHz to 40 GHz, K (female) to K (female)
36585K-2MF	K Precision AutoCal Module, 70 kHz to 40 GHz, K (male) to K (female)
36585V-2M	V Precision AutoCal Module, 70 kHz to 70 GHz, V (male) to V (male)
36585V-2F	V Precision AutoCal Module, 70 kHz to 70 GHz, V (female) to V (female)
36585V-2MF	V Precision AutoCal Module, 70 kHz to 70 GHz, V (male) to V (female)

Mechanical Calibration/Verification Kits

3650A	SMA/3.5 mm Calibration Kit, Without Sliding Loads
3650A-1	SMA/3.5 mm Calibration Kit, With Sliding Loads
3652A	K Calibration Kit, With Pin Depth Gauge
3652A-2	K Calibration Kit, With No Pin Depth Gauge
3652A-3	K Calibration Kit, With Pin Depth Gauge and .s1p Characterization Files
3652A-4	K Calibration Kit, With .s1p Characterization Files
3654D	V Calibration Kit, With Pin Depth Gauge
3654D-2	V Calibration Kit With No Pin Depth Gauge
3654D-3	V Calibration Kit, With Pin Depth Gauge and .s1p Characterization Files
3654D-4	V Calibration Kit, With .s1p Characterization Files and No Pin Depth Gauge
3657	V Multi-Line Calibration Kit, Without Shorts
3657-1	V Multi-Line Calibration Kit, With Shorts
3666-1	SMA/3.5 mm Verification Kit
3668-1	K Verification Kit
3669B-1	V Verification Kit

External Power Meters/Sensors

ML243xA	CW Power Meter, Single Input or Dual Input (Recommended Power Sensors: SC7770, MA247xD, MA244xD, MA248xD, MA2400xA)
ML249xB	Wideband Power Meter, Single Input or Dual Input (Recommended Power Sensors: MA249xA, MA2411B)
ML249xA	Pulse Power Meter, Single Input or Dual Input (Recommended Power Sensors: MA249xA, MA2411B)
MA24106A	USB Power Sensor, 50 MHz to 6 GHz
MA24108A	USB Power Sensor, 10 MHz to 8 GHz
MA24118A	USB Power Sensor, 10 MHz to 18 GHz
MA24126A	USB Power Sensor, 10 MHz to 26 GHz
MA24208A	USB Power Sensor, True-RMS, 10 MHz to 8 GHz
MA24218A	USB Power Sensor, True-RMS, 10 MHz to 18 GHz
MA24330A	USB Power Sensor, 10 MHz to 33 GHz
MA24340A	USB Power Sensor, 10 MHz to 40 GHz
MA24350A	USB Power Sensor, 10 MHz to 50 GHz
MA24507A	Power Master™ Frequency Selectable mm-Wave Power Analyzer, 9 kHz to 70 GHz
MA24510A	Power Master™ Frequency Selectable mm-Wave Power Analyzer, 9 kHz to 110 GHz
MA24510A	Note that usage of the MA24507A and MA24510A Power Master™ sensors require connection to two USB ports to supply needed current draw.

VectorStar MS4640B Broadband Vector Network Analyzer Series

Ordering Information (continued)

Test Port Cables, Ruggedized Semi-Rigid

3670K50-1	Test Port Cable, K (female) to K (male), 1 each, 30.5 cm (12 in)
3670K50-2	Test Port Cable, K (female) to K (male), 1 each, 61.0 cm (24 in)
3670V50A-1	Test Port Cable, V (female) to V (male), 1 each, 30.5 cm (12 in), rated to 70 GHz
3670V50A-2	Test Port Cable, V (female) to V (male), 1 each, 61.0 cm (24 in), rated to 70 GHz

Test Port Cables, Flexible, Ruggedized-Style Female Connectors, Phase Stable

Ruggedized style female connectors for VNA test ports.

3671KFS50-60	K (female) to 3.5 mm (male), 1 each 63.5 cm (25 in) Note: Due to length, two (2) cables are required for each system
3671KFK50-60	K (female) to K (male), 1 each, 63.5 cm (25 in) Note: Due to length, two (2) cables are required for each system
3671KFK50-100	K (female) to K (male), 1 each, 96.5 cm (38 in)
3671KFK50-60	K (female) to K (female), 1 each 63.5 cm (25 in) Note: Due to length, two (2) cables are required for each system
3671KFK50-60	K (female) to K (male), 1 each 63.5 cm (25 in) Note: Due to length, two (2) cables are required for each system
3671V50-60	V (female) to V (male), 1 each, 63.5 cm (25 in), rated to 70 GHz Note: Due to length, two (2) cables are required for each system
3671V50-100	V (female) to V (male), 1 each 96.5 cm (38 in), rated to 70 GHz

Test Port Converters To change or replace VNA test ports.

34YK50C	Universal Test Port Connector to K (male), installation requires wrench 01-202 (not included)
34YV50C	Universal Test Port Connector to V (male), installation requires wrench 01-202 (not included)
34YSS0A	Universal Test Port Connector to 3.5 mm (male), Installation requires wrench 01-202 (not included)
34YQ50A	Universal Test Port Connector to 2.4mm (male), installation requires wrench 01-202 (not included)

Universal Test Fixture (UTF)

41W-3	Precision Fixed Attenuator, 3 dB, DC to 110 GHz, W1(m) – W1(f), 50 Ω
41W-6	Precision Fixed Attenuator, 6 dB, DC to 110 GHz, W1(m) – W1(f), 50 Ω
41W-10	Precision Fixed Attenuator, 10 dB, DC to 110 GHz, W1(m) – W1(f), 50 Ω
W240A	Precision Power Divider, DC to 110 GHz, W1(f) input, W1(f) outputs, 3 resistor, 50 Ω
W241A	Precision Power Splitter, DC to 110 GHz, W1(m) input, W1(f) outputs, 2 resistor, 50 Ω
MN25110A	Precision Directional Coupler, 20 GHz to 110 GHz, W1(f) input, W1(f) output, W1(f), 50 Ω
3680-20	UTF, DC to 20 GHz
3680K	UTF, DC to 40 GHz
3680V	UTF, DC to 60 GHz
36801K	UTF Right Angle Launcher, DC to 30 GHz
36801V	UTF Right Angle Launcher, DC to 50 GHz
36803	Bias Probe
36804B-10M	Microstrip Calibration/Verification Kit, 10 mil, DC to 50 GHz
36804B-15M	Microstrip Calibration/Verification Kit, 15 mil, DC to 30 GHz
36804B-25M	Microstrip Calibration/Verification Kit, 25 mil, DC to 15 GHz

Precision Fixed Attenuators, Adapters (in and out of series, waveguide to coaxial), and more

Refer to our extensive Precision RF & Microwave Components Catalog – 11410-00235

GPIB Cables

2100-5	GPIB Cable, 0.5 m long
2100-1	GPIB Cable, 1 m long
2100-2	GPIB Cable, 2 m long
2100-4	GPIB Cable, 4 m long

Transit Case

760-2647	Transit Case, for all MS4640B series VNAs, hard plastic with wheels, 85 cm x 70 cm x 45 cm
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Tools

01-201	Torque End Wrench, 5/16 in, 0.9 N-m (8 lbf-in), For tightening male devices, For SMA, 3.5 mm, 2.4 mm, K, and V connectors.
01-202	Torque End Wrench, 1/2 in, 60 lbf-in, For servicing the universal test port, For the removal or installation of a test port.
01-203	Torque End Wrench, 20.6 mm (13/16 in), 0.9 N-m (8 lbf-in), For tightening the VNA test ports to female devices.
01-204	End Wrench, 5/16 in, Universal, Circular, Open-ended, For SMA, 3.5 mm, 2.4 mm, K and V connectors.
01-504	Torque End Wrench, 6 mm, 0.45 N-m (4 lbf-in), For tightening 1 mm connectors.
01-505	6 mm x 7 mm Open End Wrench, Backing wrench for 6 mm torque wrench above for W1 connectors.
01-511	Torque End Wrench, 4 mm (5/32 in), 0.22 N-m (2 lbf-in), For tightening the SSMC TEST and REF connectors on 3743A Modules.

VectorStar MS4640B Broadband Vector Network Analyzer Series

Ordering Information (continued)

Documentation

User Documentation: USB Device	Soft copies of the manuals as Adobe PDF files are included on the User Documentation USB Storage Device that is provided with the instrument. The Maintenance Manual PDF is available from Anritsu Customer Service. All other manuals available as free downloads at www.anritsu.com . Printed manuals in 3-ring binders are available for a nominal charge.
10410-00317	MS4640B Series VNA Operation Manual (OM)
10410-00318	MS4640B Series VNA Calibration and Measurement Guide (MG)
10410-00319	MS4640B Series VNA User Interface Reference Manual (UIRM)
10410-00320	MS4640B Series VNA Maintenance Manual (MM)
10410-00322	MS4640B Series VNA Programming Manual (PM), for IEEE 488.2, System, and SCPI Commands
10410-00323	MS4640B Series VNA Programming Manual Supplement (PMS), for Lightning 37xxxx and HP8510 Emulation

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