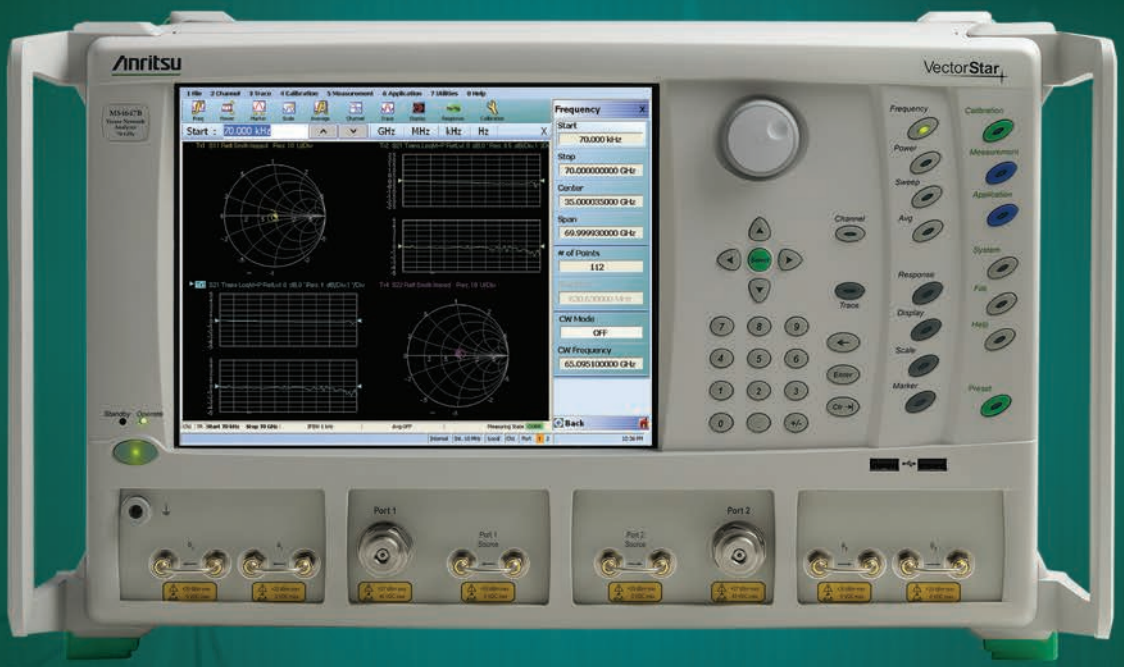
Product Brochure

Anritsu
envision : ensure

VectorStar®

MS4640B Series

Family of RF to Microwave and Millimeter-wave Vector Network Analyzers with industry leading frequency span from 70 kHz to 1.1 THz



VectorStar®

MS4640B Series Vector Network Analyzers

Industry leading Frequency Span from 70 kHz to 1.1 THz

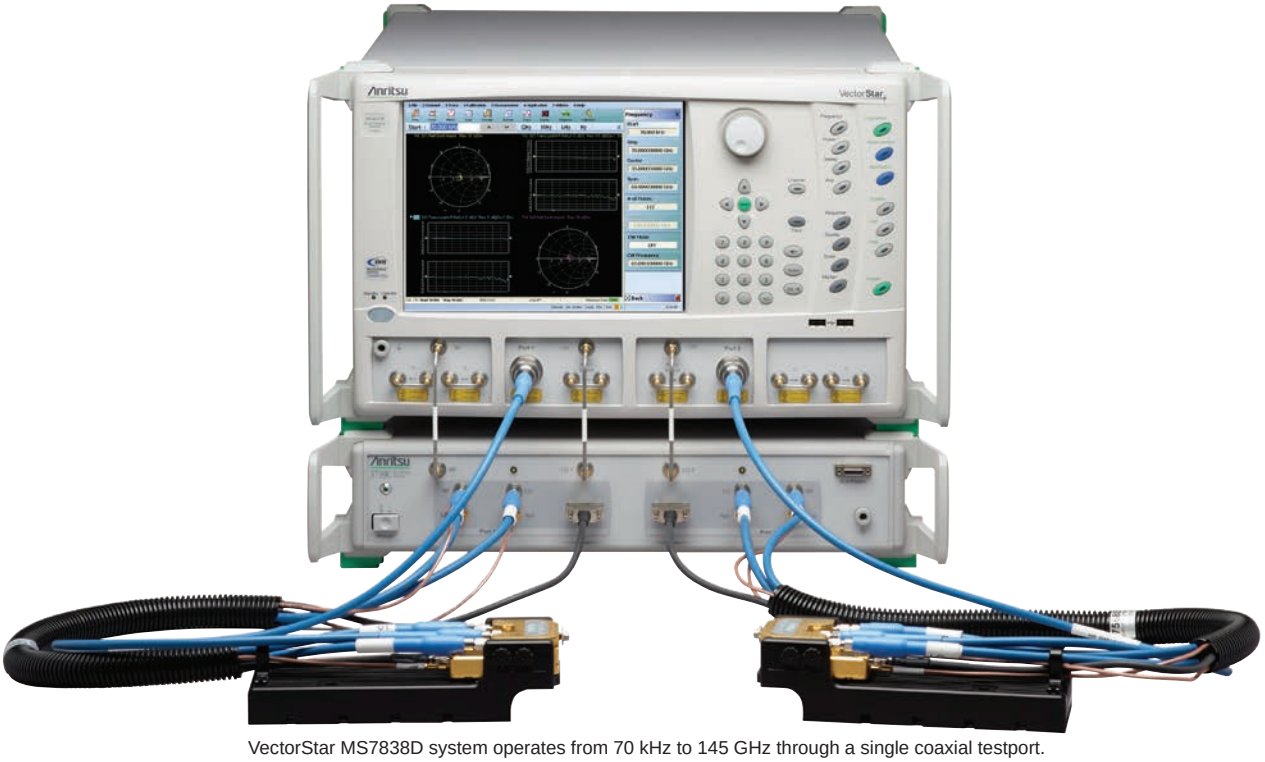
Building on design experience of more than 40 years, Anritsu has now broken the RF barrier with the Vector**Star** MS4640B Series — spanning from 70 kHz to 70 GHz in a single connector and 70 kHz up to 145 GHz in the Broadband configuration, with options to 1.1 THz using mm-wave modules.

The Vector**Star** VNA offers a new performance benchmark for S-parameter measurements of RF, Microwave, and Millimeter-wave devices. Anritsu now provides RF and Microwave engineers 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 spec the features you need today and add new ones as needed in the future without fear of obsolescence or learning a new test system.

Vector**Star** VNA Features Include:

- Frequency coverage 70 kHz to 20 | 40 | 50 | 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, 10 MHz to 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
- Mm-wave Noise Figure measurements
- True Mode Stimulus analysis from 70 kHz to 145 GHz with industry leading accuracy and stability
- Pulse**View**™ with industry-leading 2.5 ns pulse measurement resolution
- Backed by a 3-year warranty



VectorStar MS7838D system operates from 70 kHz to 145 GHz through a single coaxial testport.

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 mm-wave modules	• Obtain the most thorough and accurate broadband device characterization • Eliminate the time consuming, error prone concatenation process across the RF, microwave, and millimeter-wave bands • Decrease test instrument expenses • Reduce the risk of DC extrapolation errors in your device modeling
Superior dynamic range: > 140 dB	• 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	• Zoom in on narrow band responses without re-calibration • Calibrate the VectorStar once and have enough data points to test any narrow-band device at any frequency
High available power: up to +14 dBm	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• 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	• Eliminate tradeoffs and limitations of older pulse measurement methods • Industry leading 2.5 ns measurement resolution allows users to get a true view of their device performance and see behavior they may have been missing
True Mode Stimulus analysis from 70 kHz to 145 GHz with industry leading accuracy and stability	• 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

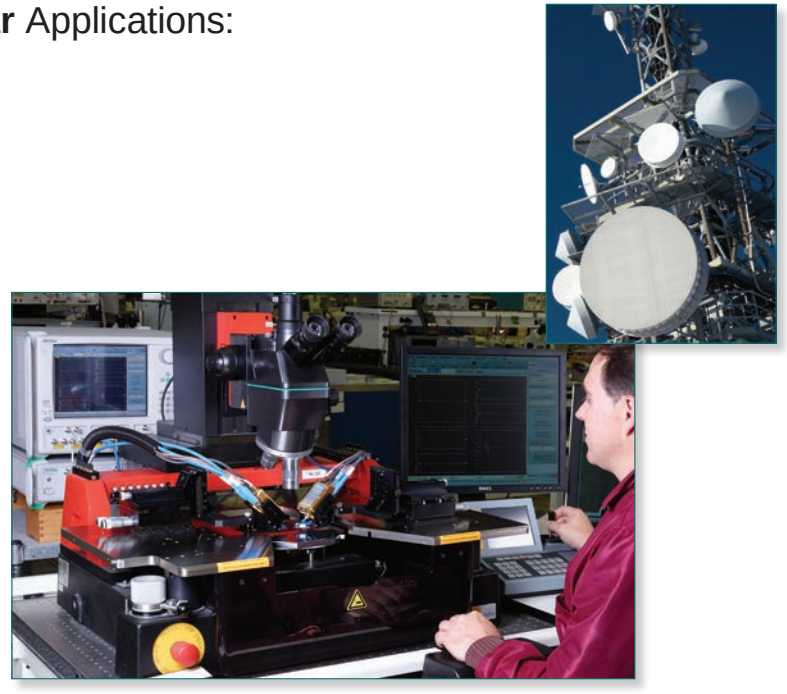
VectorStar®

Application Ready

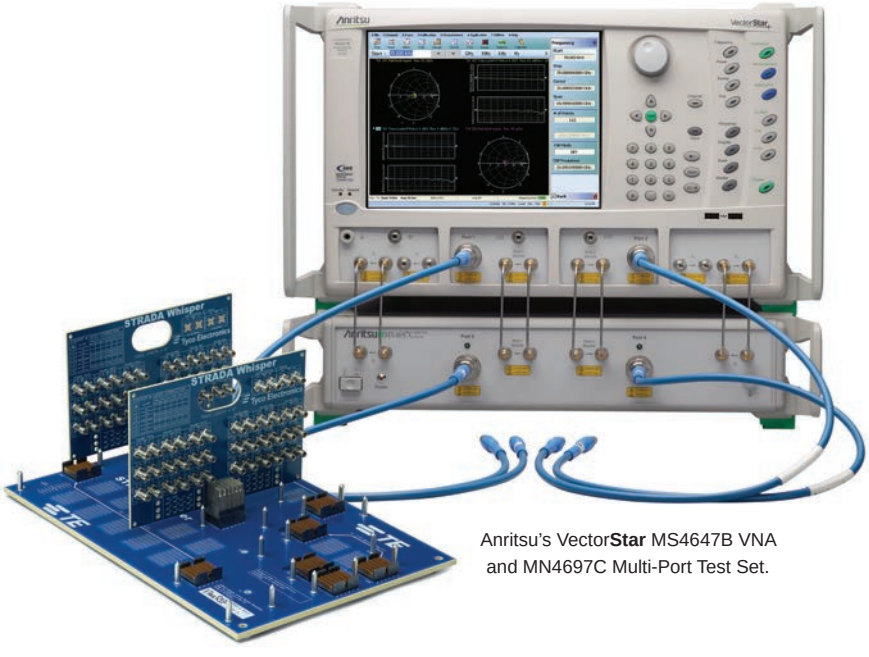
Discover how you can get better measurement confidence with Vector**Star**™ Vector Network Analyzers in both R&D and manufacturing environments. Vector**Star** offers accuracy and precision as well as a variety of features and options to cover a wide range of measurements from S-parameter measurements on microwave filters to pulse distortion or noise figure measurements on mm-wave components for use in high-performance radar systems. Take advantage of the company that has been at the cutting edge of Vector Network Analyzers since 1965 to have measurement confidence on the cutting edge for your own development activities.

Wide Range of Possible Vector**Star** Applications:

- Radar
- Antenna Measurements
- Materials Measurements
- On-Wafer
- Signal Integrity
- Active Components
- Passive Components
- Frequency Conversion Devices



Anritsu's 4-Port ME7838A 70 kHz to 110 GHz Broadband VNA System. 70 kHz to 145 GHz versions are also available.



Anritsu's Vector**Star** MS4647B VNA and MN4697C Multi-Port Test Set.

Radar

Bring your vision into resolution with VectorStar™ MS4640B

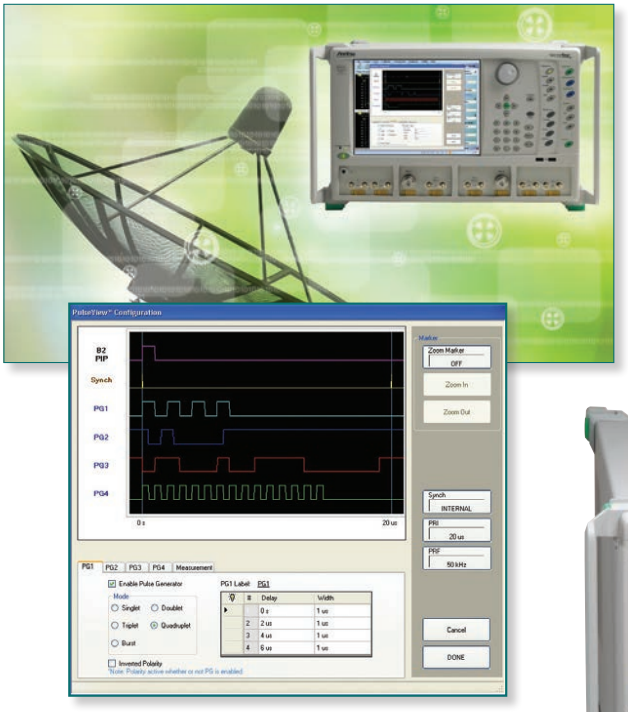
VectorStar now with PulseView™

Anritsu's newest VectorStar VNA gives 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. Meet today's demanding radar pulse measurement requirements with pulse profile, point-in-pulse, and pulse-to-pulse measurements, thanks to PulseView with its industry-leading 2.5 ns VNA pulse measurement resolution. 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 (*greater than 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 — 0.5 seconds at full 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

VectorStar®

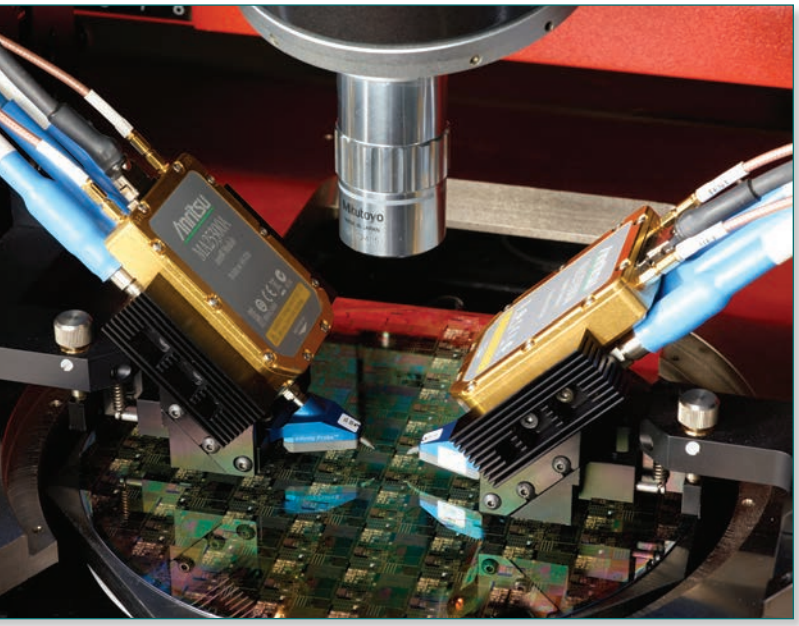
On-Wafer

The answer to your high-stability broadband on-wafer device characterization needs.

Vector**Star**™ ME7838 Series Broadband VNA System — Don't let expired calibrations spoil your data.

The Vector**Star** ME7838 Series VNA 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 mm-wave modules) with 0.1 dB and 0.5 degrees S_{21} stability over 24 hours. 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, Vector**Star** offers the smallest, lightest and easiest to position frequency extension modules which 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 Differential**View**™ 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 mm-wave modules.

Vector**Star** 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 millimeter-wave 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
- Direct-connect to probes further enhances 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 mm-wave bands.
- Real-time power level control of up to 55 dB enables accurate linear gain and 1 dB compression measurements.

Signal Integrity

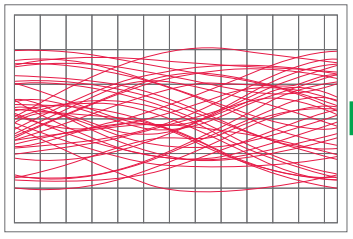
See the signal integrity of your design come through. Vector**Star**™ now with Differential**View**™.

Today's signal integrity engineers are challenged to meet high data rates, minimize costs, and close the loop of simulation and measurement. Vector**Star** MS4640B'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.

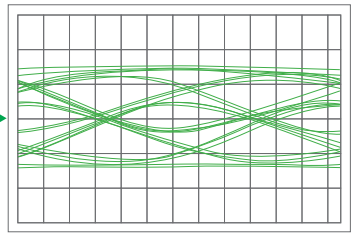
Differential**View** adds True Mode Stimulus (TMS) capability when you need it with non-linear devices. High-accuracy time domain and wide dynamic range frequency domain measurements make Vector**Star** an ideal tool for signal integrity designers. Vector**Star** offers multiport solutions for transmission,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

Vector**Star** MS4640B Features for Signal Integrity Include:

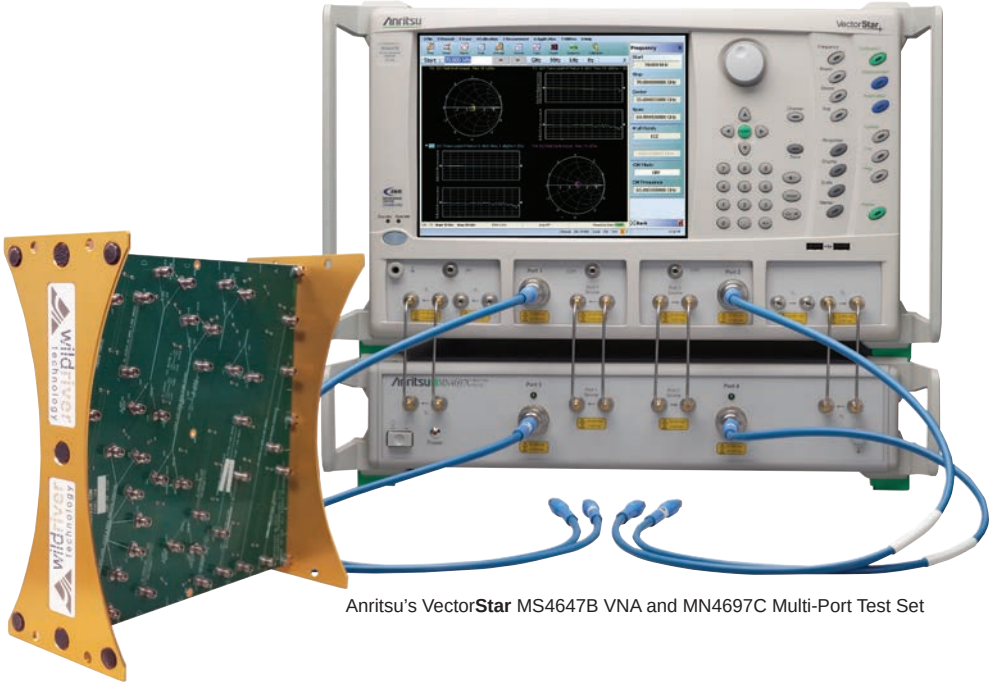
- Broadest frequency span 70 kHz to 20 / 40 / 50 / 70 / 110 / 125 / 145 GHz: Obtains the most thorough and accurate measurements
- Best time domain analysis: Provides the best combination of accuracy and hi-resolution low-pass time domain results
- Best modeling data: 70 kHz start frequency reduces the 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 Vector**Star** MS4647B VNA and MN4697C Multi-Port Test Set

VectorStar®

Components

Confidence in measurement leads to confidence in component design.

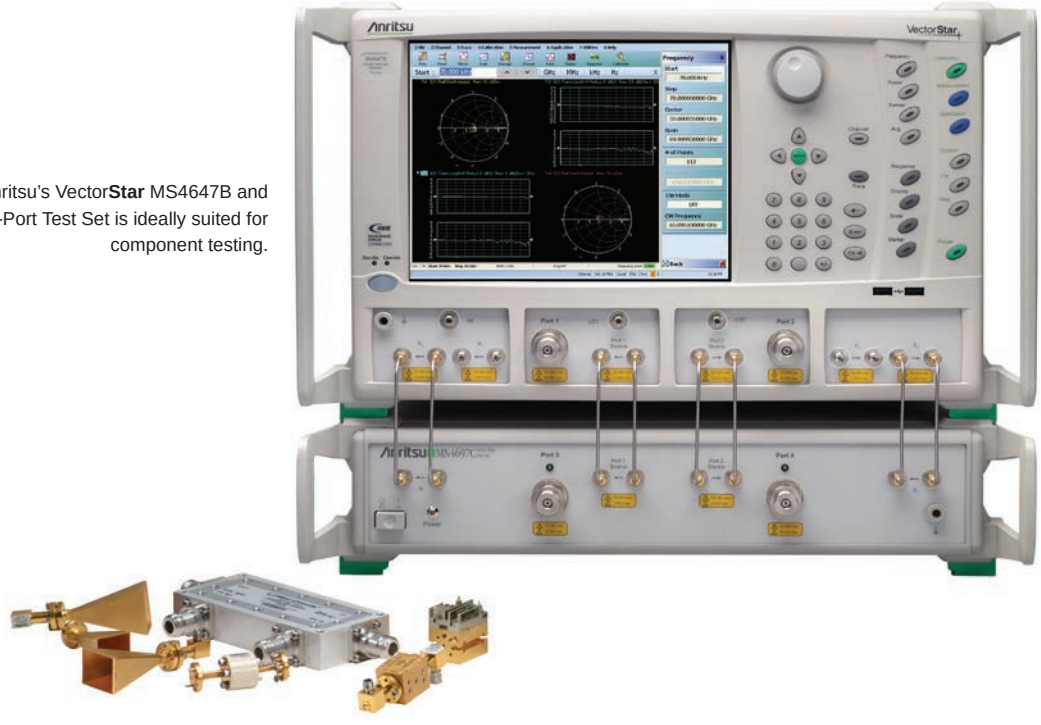
VectorStar for active and passive component applications — VectorStar MS4640B gives you the measurement capabilities you need to develop superior active and passive components.

With the best VNA performance across the widest frequency bandwidth, and the best 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. VectorStar provides full measurement capabilities across RF, microwave, millimeter 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 / 50 / 70 / 110 / 125 / 145 GHz with one system and eliminate 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 by 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.

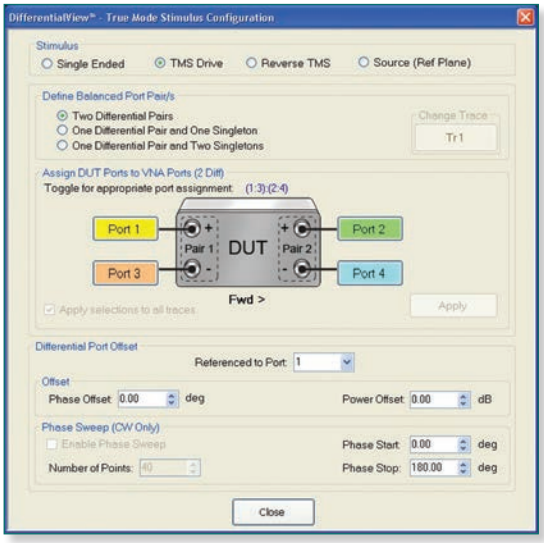
DifferentialView™

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, Vector**Star** is a 4-port Vector Network Analyzer that provides the ability to perform True Mode Stimulus differential analysis from 70 kHz to 145 GHz with industry-leading accuracy and stability. Unlike solutions from other vendors whose products are based on a start frequency of 10 MHz with degraded results beginning below 1 GHz, the 4 port Vector**Star** provides high quality S-parameter results down to 70 kHz and thus ensures more accurate DC term estimation and maximizes the chances of simulation convergence.

When combined with the dual source option (option 031), Differential**View** software provides True Mode Stimulus (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.

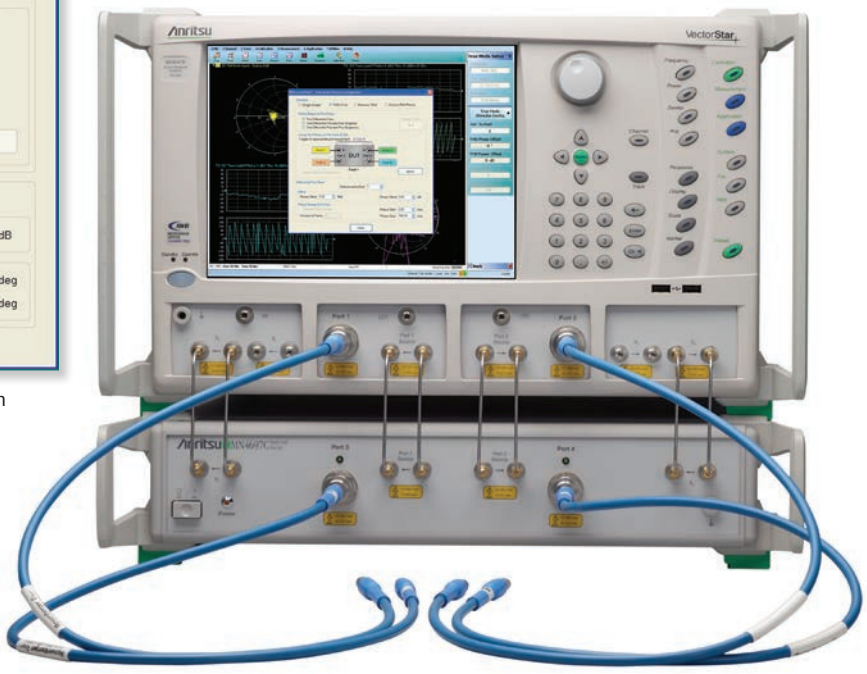
Differential**View** provides continuous measurement display while actively editing key parameters. In contrast, VNAs from other venders hide the measurement with configuration panels during editing of parameters and do not display key parameter settings during the measurement.



Differential**View**™ True Mode Stimulus Configuration

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
  - Differential**View** 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



Anritsu's Vector**Star** MS4640B with MN4697C Multi-Port Test Set

VectorStar®

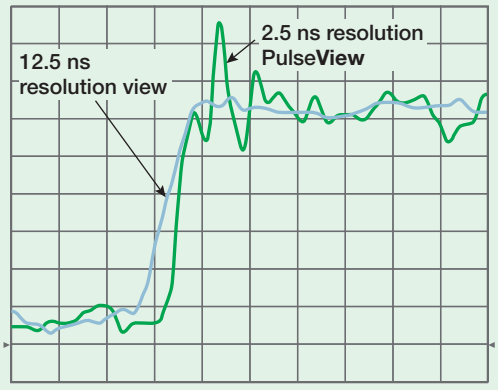
PulseView™

Pulse Measurements

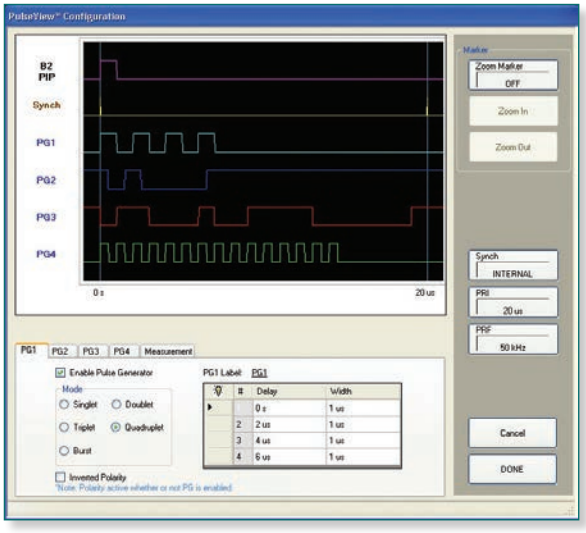
The Anritsu Vector**Star** MS4640B with options 035 and 042 (Pulse**View**) offers the most advanced architecture available in a VNA for radar pulse measurements. It offers industry-leading performance that eliminates the tradeoffs and limitations of prior test methods. Higher resolution, greater timing 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.

Vector**Star** MS4640B Provides:

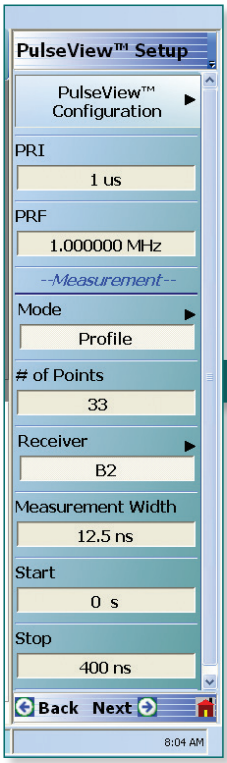
- An innovative high-speed digitizer architecture
- The industry's highest resolution measurements
- The longest record lengths
- Independent receiver measurements
- An intuitive graphical configuration tool
- Instant results on measurement parameter changes

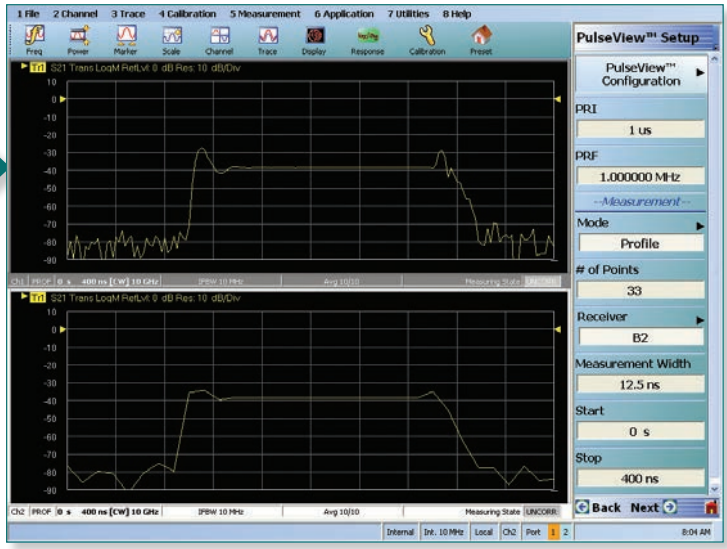


Vector**Star** (with Pulse**View**) enables **industry-leading measurement 2.5 ns resolution**. It enables users to get a true view of their device performance and see behavior they may have been missing. In the example above, the 12.5 ns resolution measurement of a typical competitor's VNAs does not 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.



PulseView™ Configuration screen





Change measurement parameters and see results in real-time.

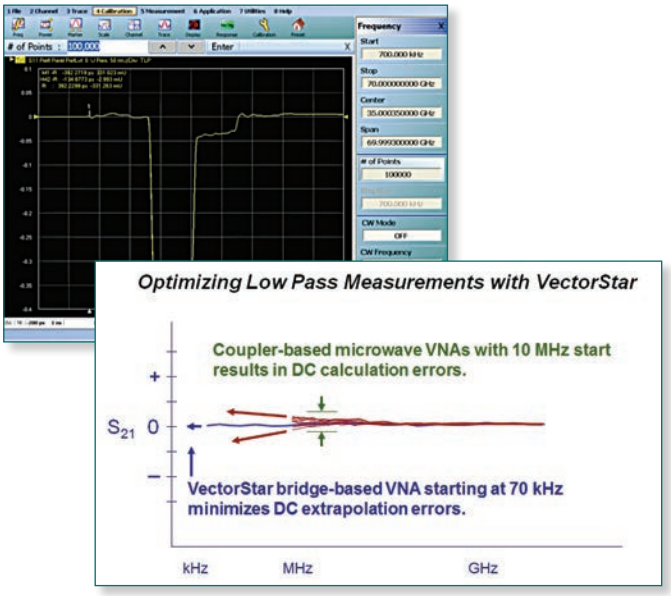
Time Domain Measurements

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 location points of interest. 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 Vector**Star** provides 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 Vector**Star** continues to offer the Anritsu unique benefit of providing both real and imaginary information when measuring narrow band 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

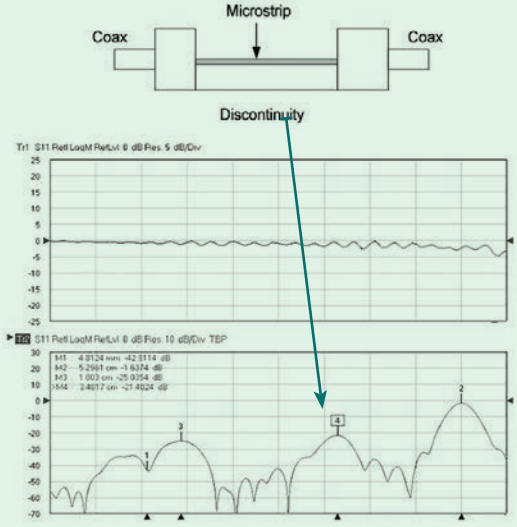
The wider the frequency span, the better the time domain resolution. A wide frequency span provides the resolution needed to resolve discontinuities that are too close together to be analyzed by a narrow-band VNA. With the maximum broadband coverage of 70 GHz or 110 / 125 / 145 GHz, all starting at 70 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, Vector**Star** 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, Vector**Star** provides the longest non-aliasing range and widest harmonic step calibration for low pass time domain processing.



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

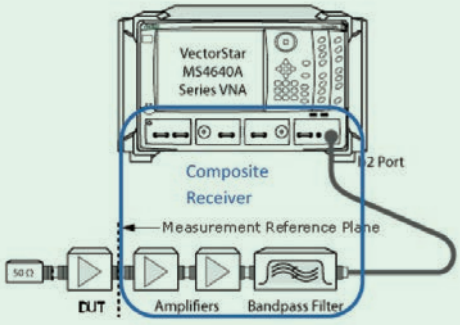
Noise Figure Measurements

The Noise Figure Measurement (option 041) 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. Vector**Star** is the only VNA platform capable of measuring noise figure up to 110 GHz and has a unique receiver optimized for noise figure measurements from 30 to 110 GHz.

Industry-first!

70 kHz to 70 GHz VNA

Noise figure measurement capability

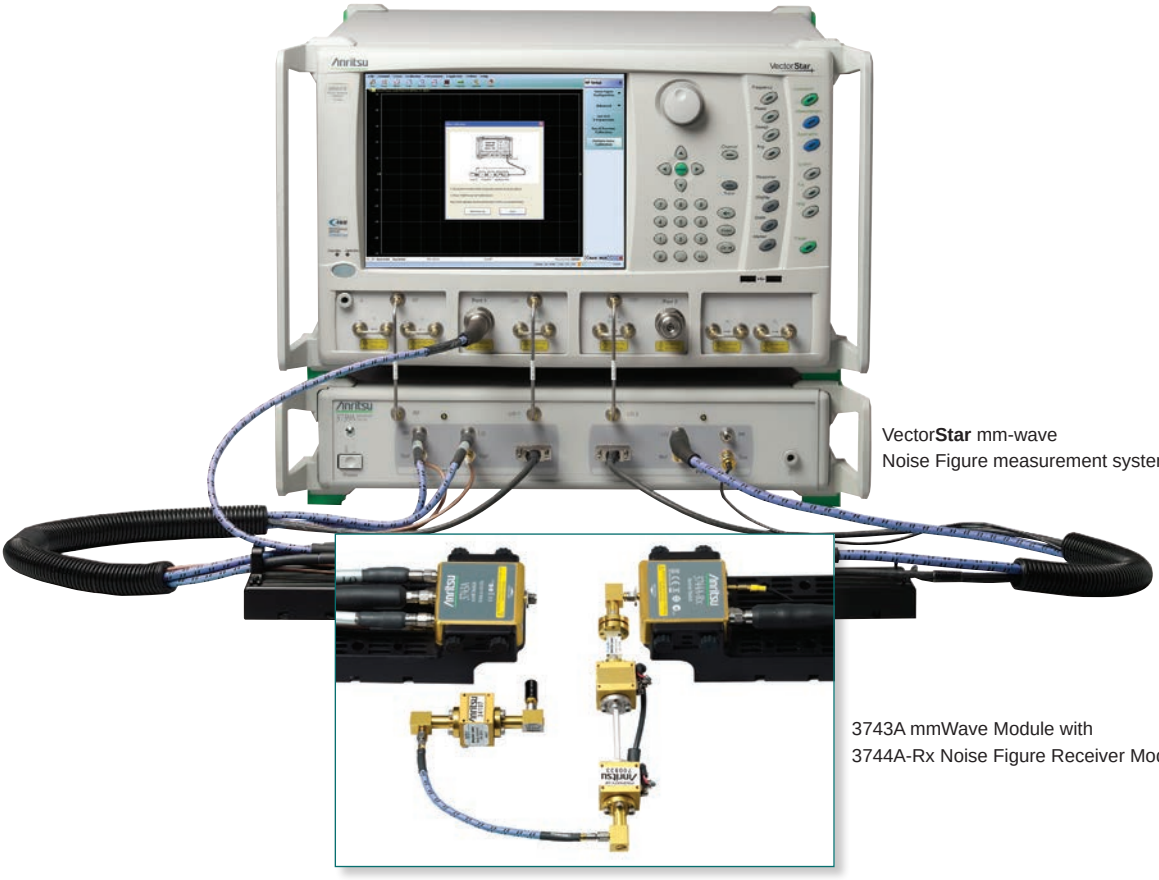


Industry-first!

Optimized noise receiver for mm-wave measurements from 30 to 110 GHz

Gain Compression Analysis

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



Vector**Star** mm-wave
Noise Figure measurement system.

3743A mmWave Module with
3744A-Rx Noise Figure Receiver Module

Mixer Measurements

Make Frequency Translated Device Measurements with a Vector**Star** VNA

Frequency translated 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 Vector Network Analyzer (VNA) measurements. With the frequency offset capability of the Vector**Star** 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 and absolute phase as well as group delay information.

Mixer Setup

The Mixer Setup application helps to setup 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.

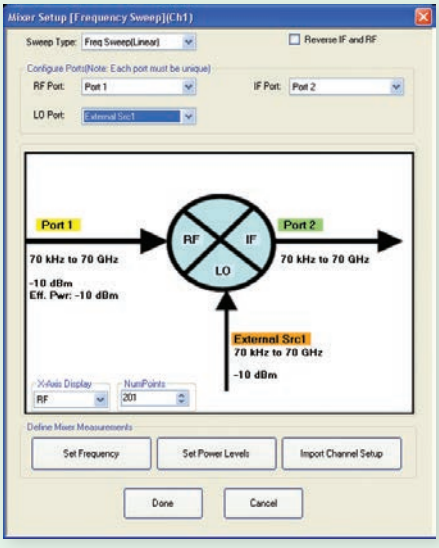
Independent Receiver Offset Control (Option 007)

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 on 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 unique ability to measure absolute phase and group delay. By measuring the response characteristics of device pairs, the Vector**Star** 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 device under test for magnitude and absolute phase.



VectorStar®

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 Vector**Star** ME7838 Series broadband system 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 ME7838 Series Broadband Vector Network Analyzer is a high performance measurement solution offering the best overall performance for on-wafer measurements including:

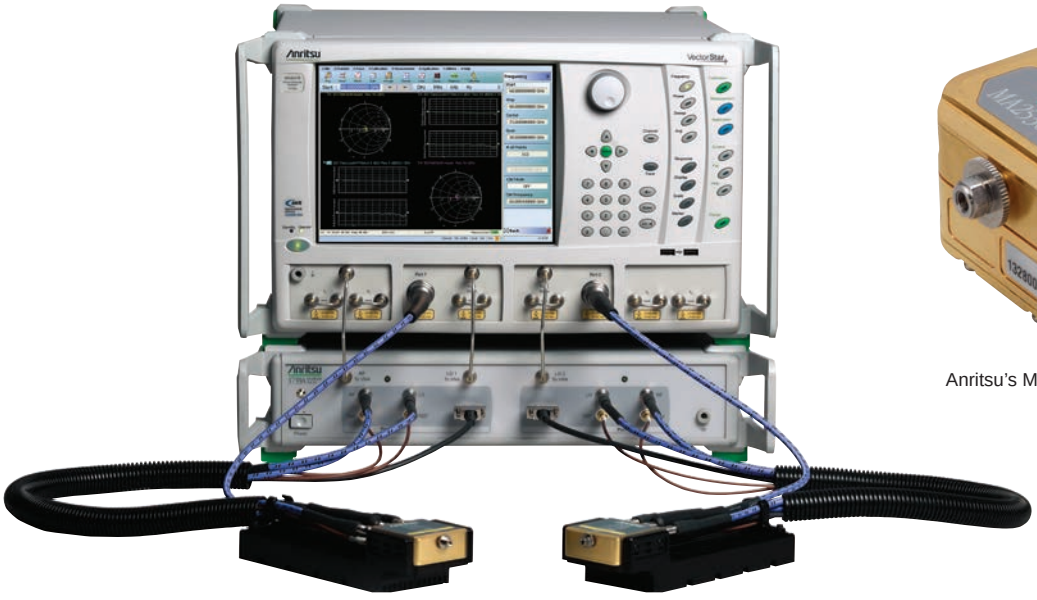
- A wide range of on-wafer optimal calibration choices:
  - SOLT/SOLR, LRL/LRM, A-LRM™
- Embedding/De-embedding including the ability to cascade multiple networks for extracting fixtures or embedding networks.
- Compatibility with WinCal, and IC-CAP
- High port power to overcome insertion losses at the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

Key Features

- Continuous Broadband Frequency Coverage from 70 kHz to 110 / 125 / 145 GHz using a 1 mm or 0.8 mm coaxial test port connector
- Banded Millimeter-wave 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: 0.1 dB over 24 hours, 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
- Millimeter-wave Measurements
- Time Domain Analysis



ME7838 Series Broadband System

Anritsu's MA25300A mmWave 145 GHz Module

On-Wafer Device Characterization Measurement Solutions

Balancing Accuracy and Throughput for Broadband Measurements

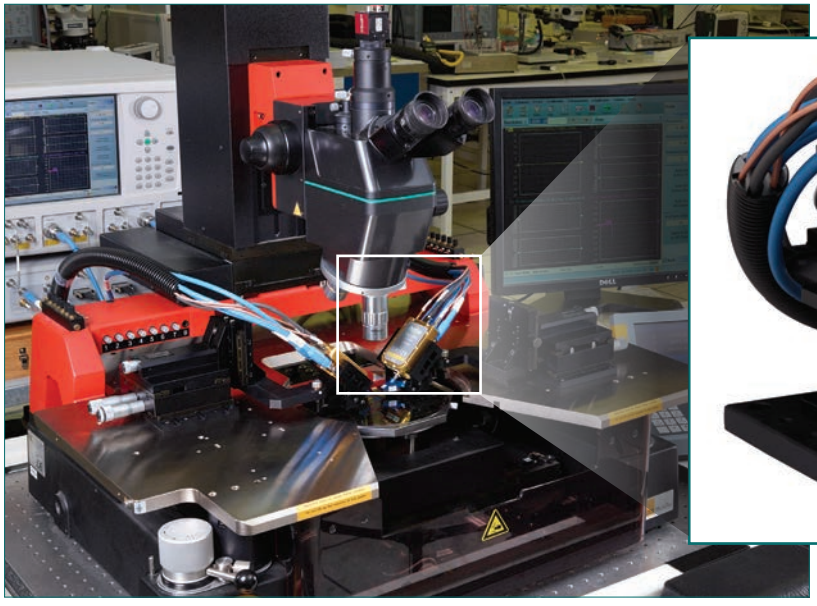
Semiconductor manufacturing test engineers face increased challenges today related to broadband millimeter wave (mm-wave) on-wafer testing. Developing accurate models often requires measuring frequencies that range from near DC up to 100+ GHz. Achieving accurate, stable measurements over extended time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

Achieving Both Accuracy and Throughput for Broadband Measurements

The Anritsu Vector**Star** ME7838 Series Broadband System has been uniquely designed to meet your 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 them 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 Vector**Star** with probe stations from leading probe manufacturers for making accurate on-wafer measurements in both microwave and millimeter-wave 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 the Vector**Star**-based Broadband system provide 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 Vector**Star** 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 Vector**Star** ME7838 Series Broadband System integrated into an on-wafer probe station.

Anritsu's MA25300A mmWave 145 GHz Module

VectorStar®

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

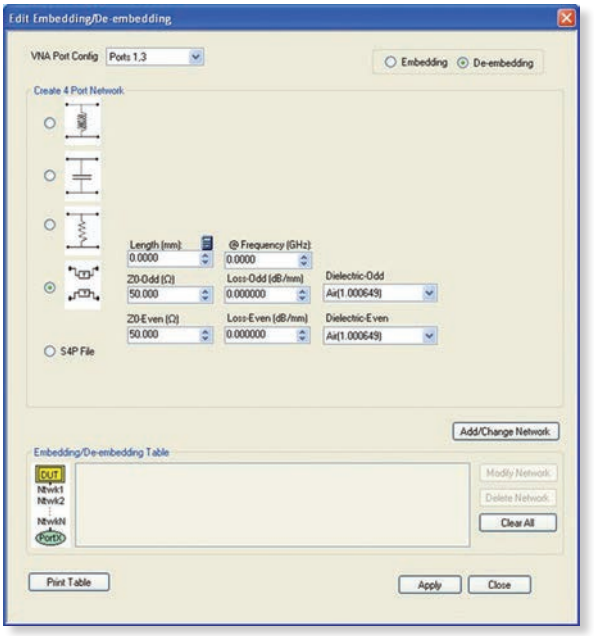
The MS4640B-series Vector**Star** 2-port VNA can be used in conjunction with an external MN469xC-series 4-port Test Set and mm-wave modules, for 70 kHz to 110 / 125/ 145 GHz single-ended, mixed-mode, and true differential mode S-parameter measurements. The Vector**Star** 4-port solution is ideal for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

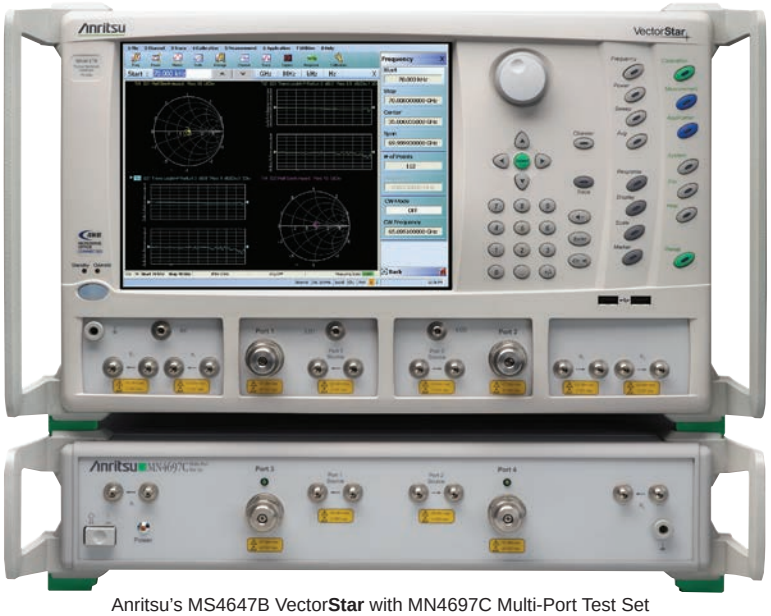
Two models are offered, the MN4694C in K, and the MN4697C in V connector output. The former can be used with the MS4642B or MS4644B for 70 kHz to 20 GHz or 40 GHz coverage respectively. The latter can be used with the MS4645B or MS4647B for 70 kHz to 50 GHz or 70 GHz coverage respectively. The only option 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 Vector**Star** 4-port solution offers an unprecedented 70 kHz low end operation. Direct measurements from practically DC to 110/125/145 GHz, high accuracy time domain, and wide dynamic range frequency domain make the 4-port Vector**Star** 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
- 4-, 3-, 2-, and 1-port Calibrations using AutoCal, SOLT/R, SSLT/R, SSST/R, LRL/M, A-LRM.
- Simultaneous 1-port 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.
- Flex Cal 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.





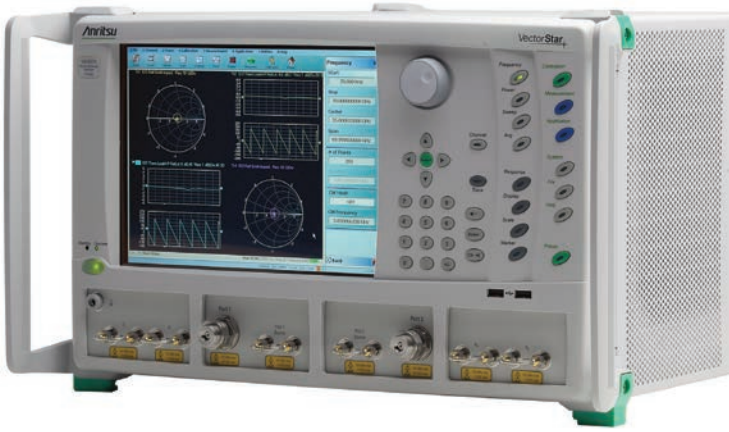
Anritsu's MS4647B Vector**Star** with MN4697C Multi-Port Test Set

Upgradability

Purchase only what you need now and upgrade later when your needs change

The Anritsu Vector**Star** series of performance VNAs is designed with upgradability in mind. Have the peace of mind that you can start with the basic 2-port, 10 MHz to 20 GHz model knowing that you can upgrade frequency coverage (70 kHz to 1.1 THz), 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	10 MHz to 20 GHz
MS4644B	10 MHz to 40 GHz
MS4645B	10 MHz to 50 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



Vector**Star**™ MS4640B series Vector Network Analyzer

Key Options and Accessories

MS4640B-070	70 kHz Low-End Frequency Extension
MS4640B-007	Receiver Offset
MS464xB-051	Direct Access Loops
MS464xB-061	Active Measurement Suite, 2 attenuators
MS464xB-062	Active Measurement Suite, 4 attenuators
MS4640B-002	Time Domain
MN469xC	4-Port Solutions, in K or V, up to 40 or 70 GHz

Precision AutoCal

36585K-2xx	K Precision AutoCal, 70 kHz to 40 GHz
36585V-2xx	V Precision AutoCal, 70 kHz to 70 GHz

xx = MM, FF, MF for connector sex variations

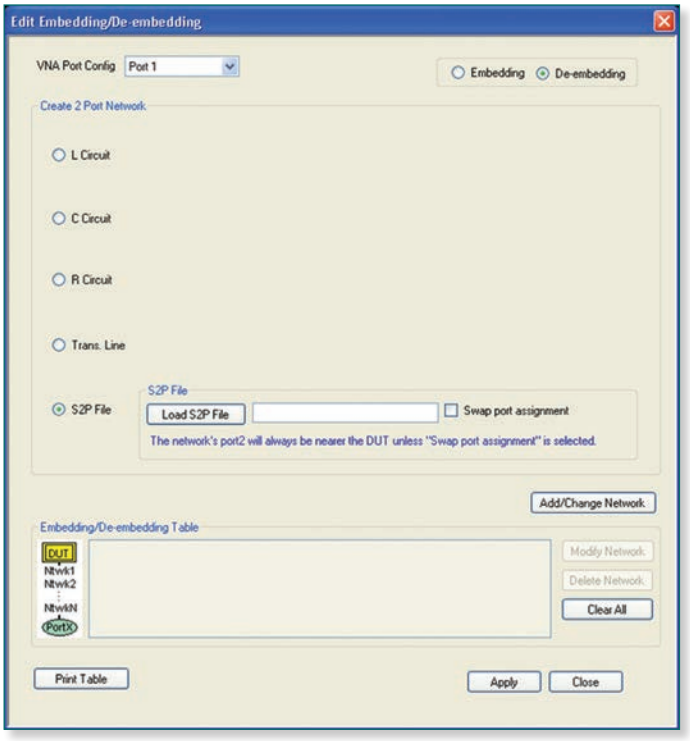
36585V AutoCal™

Anritsu's 4-Port ME7838 series Broadband VNA System

Accuracy Enhancements

Embedding/De-embedding

The de-embedding capabilities of Vector**Star** 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.

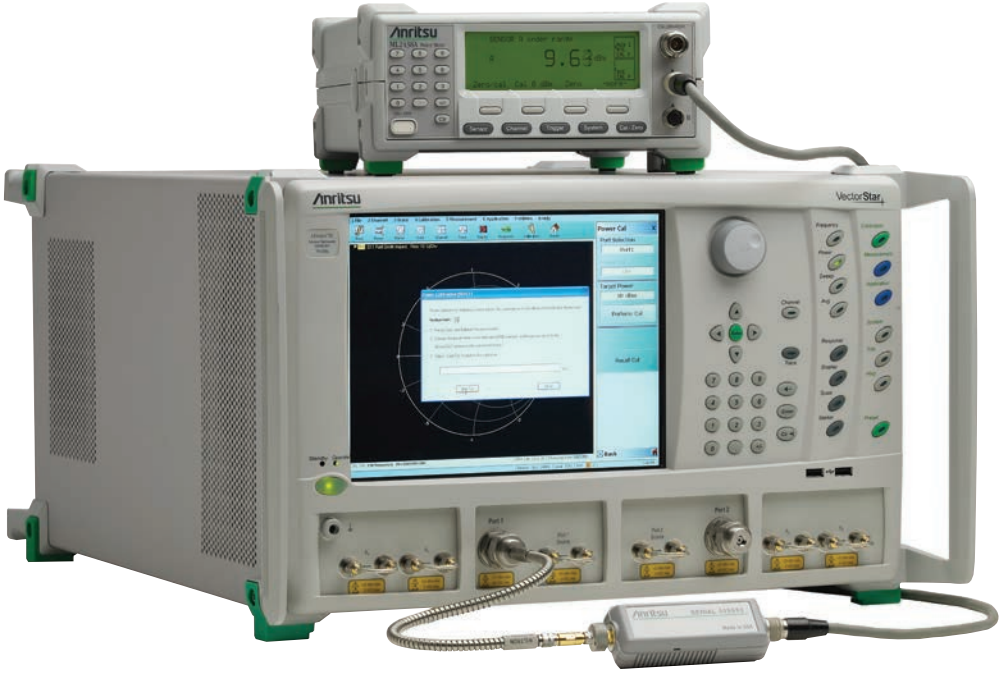


Adapter Removal

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 2 normal insertable SOLT calibrations. Vector**Star** retains both calibrations in internal memory and automatically extracts 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 MS4640B 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.

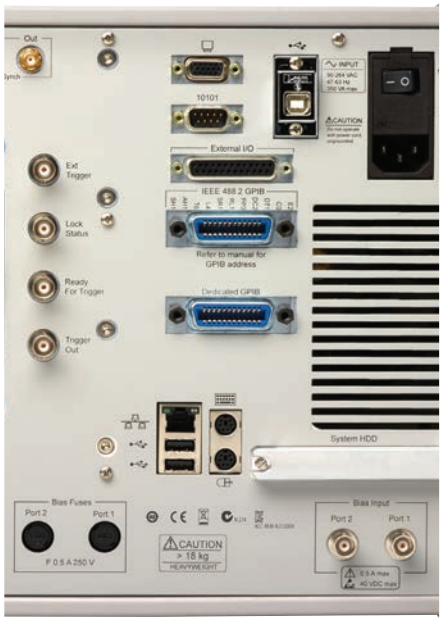


Anritsu’s Vector**Star** MS4647B with ML2438A Power Meter

Connectivity Options

The Vector**Star** 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 Vector**Star** over the LAN via VXI-11 or TCP/IP protocols. 10/100Base T Ethernet.
- USB – Use the TMC class protocol to connect to the VNA using a USB cable. One Type B USB 2.0 port for controlling the Vector**Star** 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 and use your 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 Millimeter-wave modules, antenna testing, and others.
- BNC connectors – Access directly to triggers, lock status, and others.



Class Leading Features

Best Broadband Dynamic Range

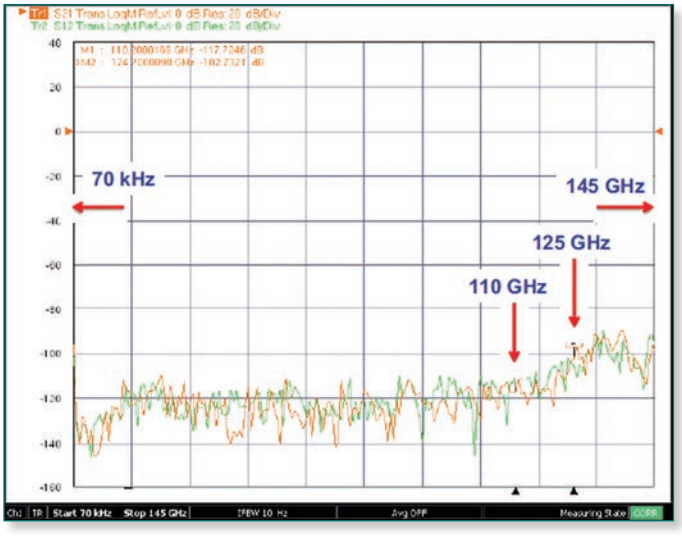
120 dB at 10 MHz

108 dB at 65 GHz

109 dB at 110 GHz

94 dB at 145 GHz

Thanks to incorporating two optimized VNAs in one instrument, the Vector**Star** delivers 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.

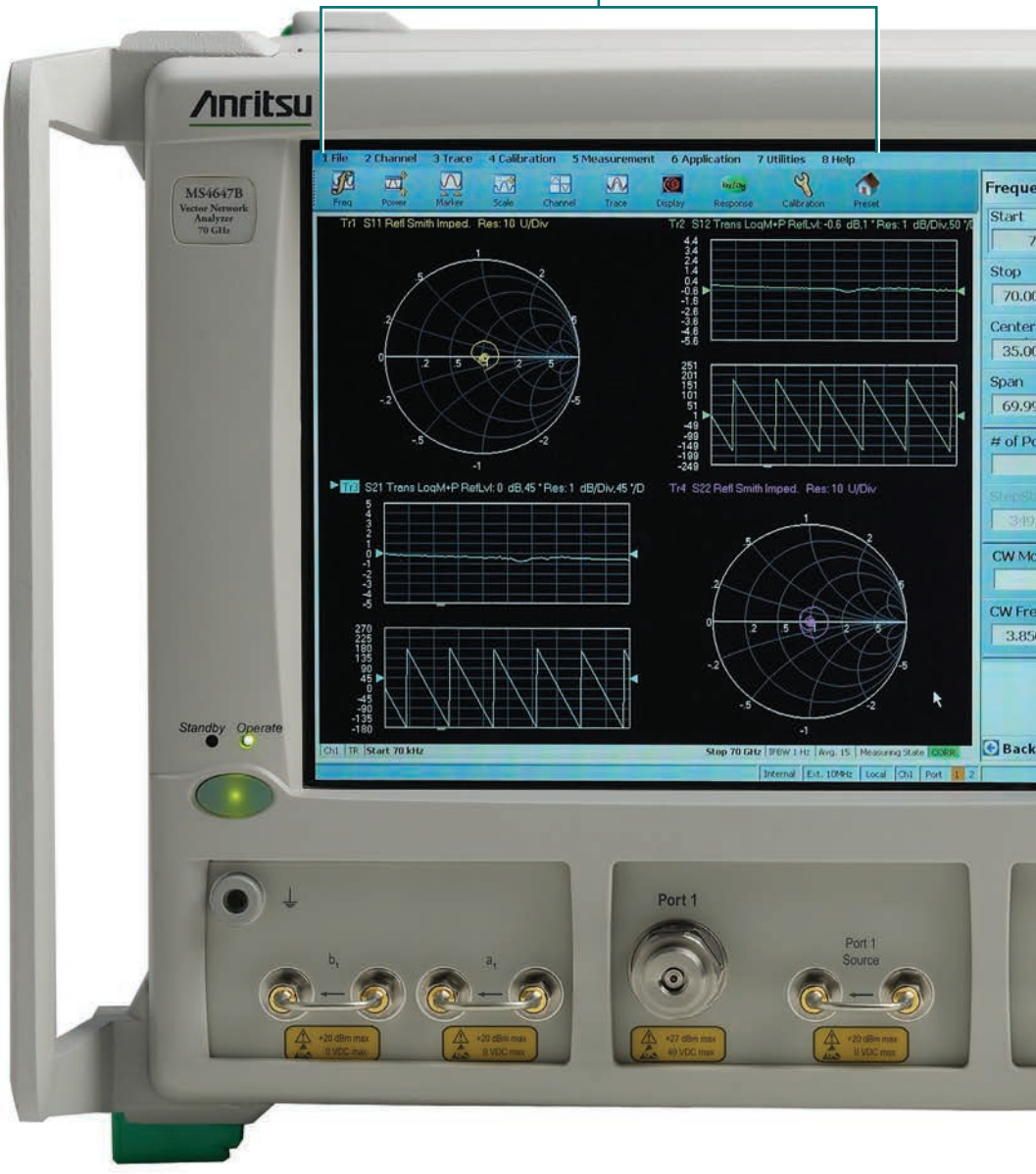


Dynamic range of ME7838D system at the 0.8 mm coaxial test port from 70 kHz to 145 GHz.

Full-Featured Front Panel

Minimize menus and tool bars for optimum viewing of data.

- Access the features and functions of the Vector**Star** VNA through dedicated keys, touch screen, and mouse driven selections
- Input extensive data via your external keyboard
- Custom toolbars provide easy setup 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 Band Pass)



for easy access to powerful functionality

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

One to 16 independent channels for maximum flexibility.

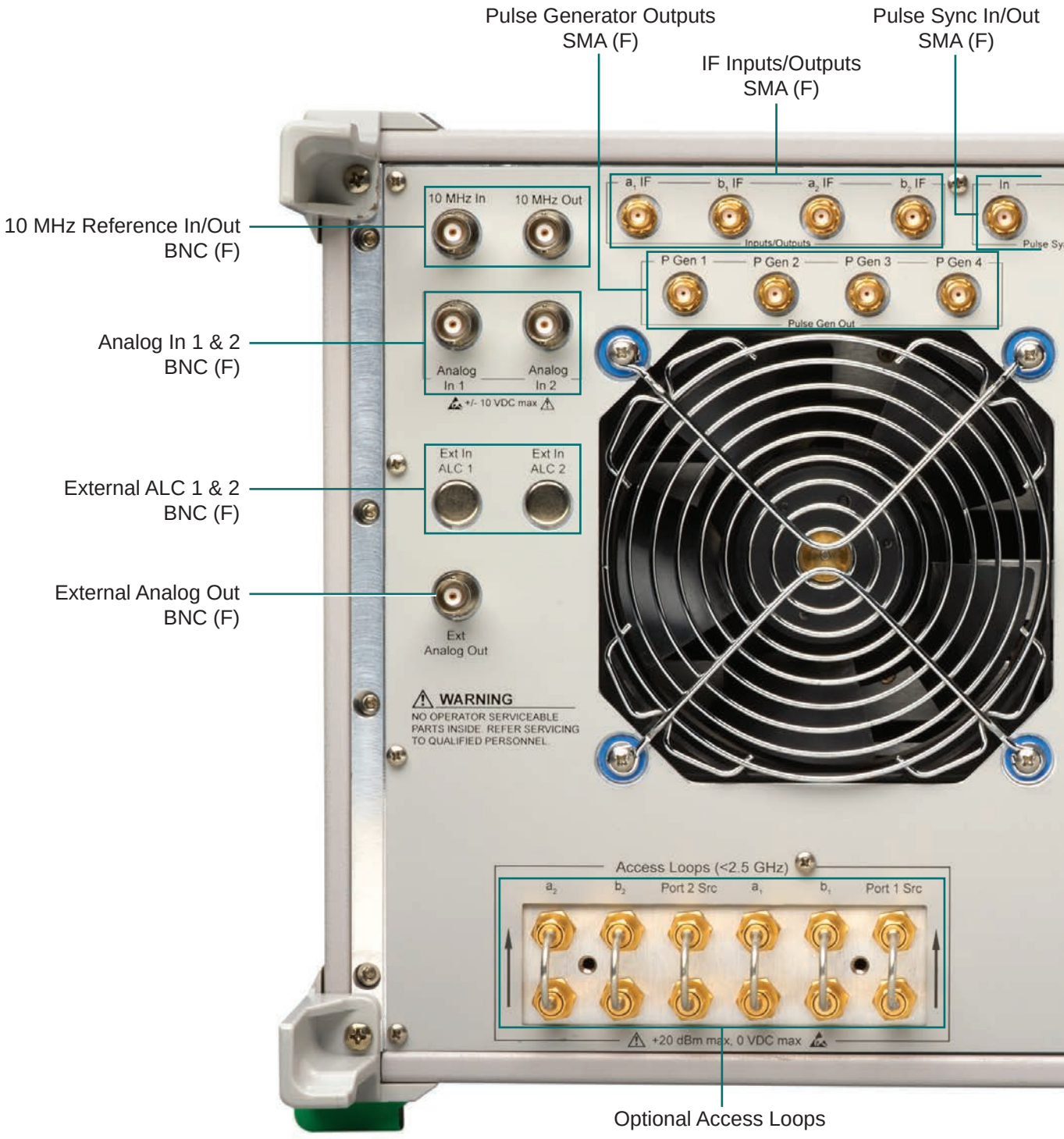
Add up to 16 traces to each channel for optimum data display.

A single channel can provide as many as 100,000 data points. Multiple channels can provide up to 25,000 points per channel

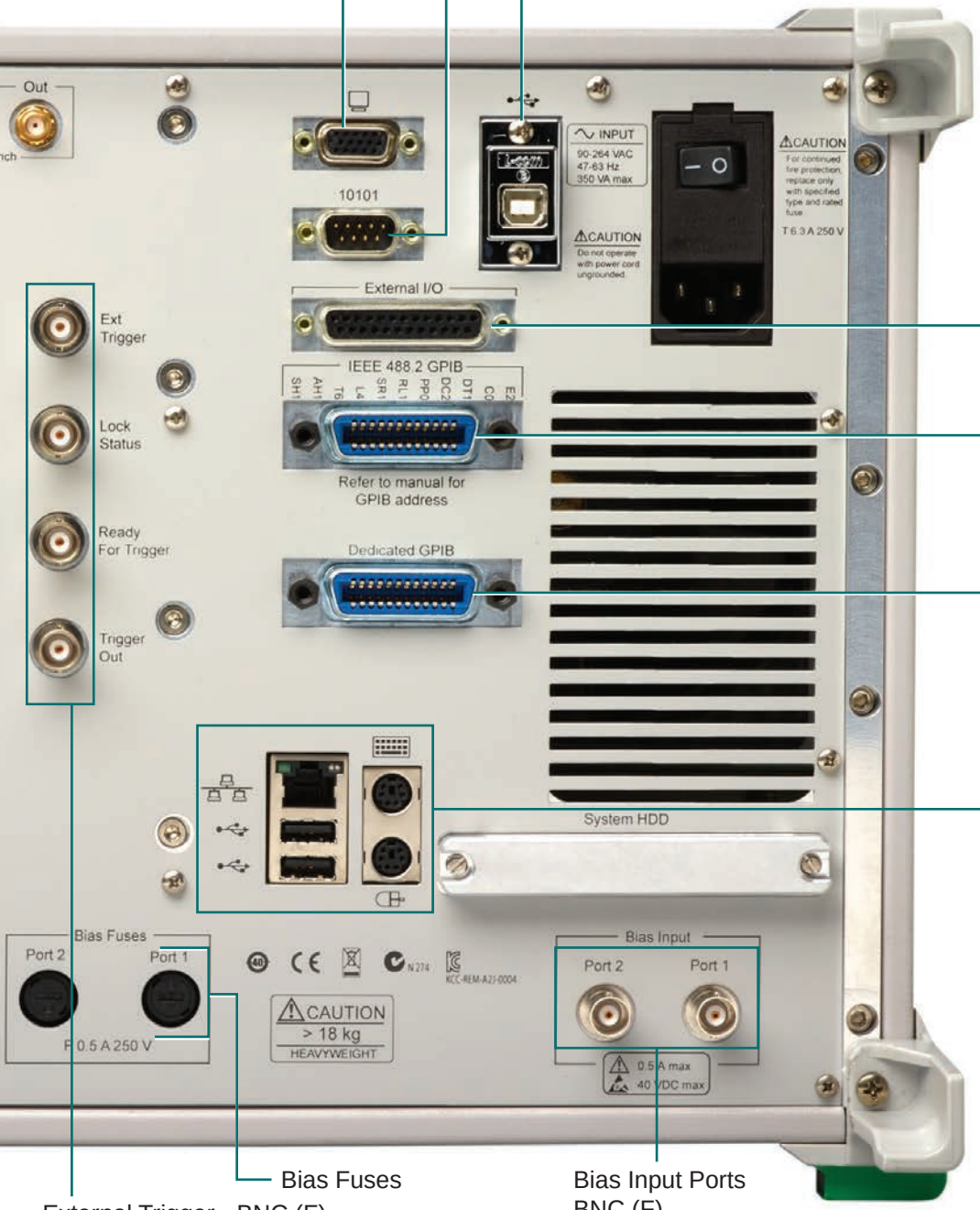
Click and drag up to 13 decoupled markers per trace across the display with continuous updated readout.

Two USB ports on the front panel provide convenient access for flash drives, keyboards, and mouse operations.

Customizable Rear Panel



with Connectivity Options



Calibration Choices

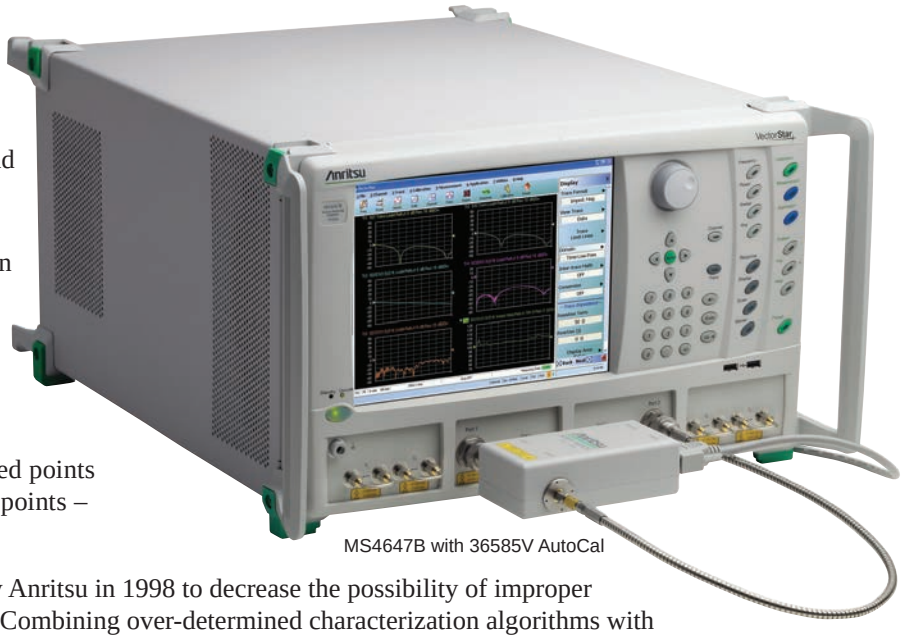
Optimum Measurement Accuracy for a Wide Range of Application Environments

- 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.



MS4647B with 36585V AutoCal

The concept of AutoCal was first introduced by Anritsu in 1998 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, Vector**Star** provides 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 re-connections during the calibration procedure).

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, 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 Vector**Star** 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 Vector**Star** are unsurpassed, whether compared to traditional SOLT calibration kits or automated calibration methods. For example, note the significant advantage in accuracy of the Vector**Star** 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 Vector**Star** provide the most accurate measurements, it is also easy to calibrate and operate.

LRL/LRM Multiple Line Calibration Kits

Utilizing the Model 3657 Series Multiple Line Calibration Kits from Anritsu, the Vector**Star** 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 Vector**Star** 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 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 1.85 mm airlines, calibration and specifications covering the entire 70 kHz to 70 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 Vector**Star** analyzer 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 Vector**Star** 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 your system's performance. All verification kits contain precision components with characteristics traceable to NIST. Verification kits can be kept in your 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.

Ordering Information

Instrument Models	The Vector**Star™** MS4640B series VNAs are available in four models to meet different frequency range requirements. Refer to “Standard Capabilities” for extended operational frequency ranges.
MS4642B	Vector Network Analyzer 10 MHz to 20 GHz
MS4644B	Vector Network Analyzer 10 MHz to 40 GHz
MS4645B	Vector Network Analyzer 10 MHz to 50 GHz
MS4647B	Vector Network Analyzer 10 MHz to 70 GHz
Included Accessories	Each VNA comes with a set of included accessories
User Documentation CD	The user documentation CD includes PDF files for the Vector**Star** Operation Manual, User Interface Reference Manual, Programming Manual, Programming Manual Supplement, Calibration and Measurement Guide, Technical Data Sheet and Configuration Guide, and Maintenance Manual.
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

Part Number	Description
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-031	Dual Source Architecture
MS4640B-035	IF Digitizer
MS4640B-041	Noise Figure, requires Option 051, 061, or 062
MS4640B-042	Pulse**View**™, requires Option 035
MS4640B-043	Differential**View**™
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.

Part Number	Description
MS4642B-051	Direct Access Loops for MS4642B, not available with Options 061 or 062
MS4644B-051	Direct Access Loops for MS4644B, not available with Options 061 or 062
MS4645B-051	Direct Access Loops for MS4645B, 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

Part Number	Description
MS4642B-061	Active Measurements Suite, for MS4642B, with 2 Step Attenuators
MS4642B-062	Active Measurements Suite, for MS4642B, 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
MS4645B-061	Active Measurements Suite, for MS4645B, with 2 Step Attenuators
MS4645B-062	Active Measurements Suite, for MS4645B, 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)

Part Number	Description
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 MS4645B or MS4647B
SM6631	Pulse Modulator Test Set, 70 kHz to 70 GHz, for source and receiver modulation with an MS4645B or MS4647B

Multiport VNA Options — The multiport VNA option provides four test ports for all Vector**Star** 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.

Part Number	Description
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 MS4645B and MS4647B VNAs
Documentation	For detailed MN4690C specifications, refer to the Vector**Star** MN4690C Series Multiport VNA Technical Data Sheet pn: 11410-00528

Ordering Information

Broadband / Millimeter-Wave Options

Provides the MS4647B VNA with the capability to connect with the ME7838 Series Modular Broadband/Millimeter-Wave VNA System. Option 007 Receiver Offset is also required.

Part Number	Description
MS4647B-080	Modular Broadband/Millimeter-Wave Capability. For MS4647B VNAs without Option 051, 061, or 062. If equipped on a MS4647B VNA, Option 082 cannot be added.
MS4647B-081	Modular Broadband/Millimeter-Wave Capability. For MS4647B VNAs with Option 051, 061, or 062. If equipped on a MS4647B VNA, Option 083 cannot be added.
Documentation	For detailed ME7838 Series Broadband VNA specifications, see appropriate ME7838 Series Broadband VNA Technical Data Sheet pn: 11410-00593 and 11410-00778.

Millimeter-Wave Options

Provides millimeter-wave capability for MS4642B, MS4644B, and MS4645B VNAs to connect with the ME7838 Series Modular/Broadband/Millimeter-Wave VNA System. Option 007 Receiver Offset is also required.

Part Number	Description
MS464xB-082	Millimeter-Wave capability for MS4642B, MS4644B, and MS4645B VNAs not equipped with Option 051, 061, or 062. If equipped, Option 080 cannot be added.
MS464xB-083	Millimeter-Wave capability for MS4642B, MS4644B, and MS4645B VNAs equipped with Option 051, 061, or 062. If equipped, Option 081 cannot be added.
Documentation	For detailed ME7838 Series Broadband VNA specifications, see appropriate ME7838 Series Broadband VNA Technical Data Sheet pn: 11410-00593 and 11410-00778.

Broadband / Banded / Millimeter-Wave Options

Provides millimeter-wave capability for MS4642B, MS4644B, MS4645B, and MS4647B VNAs with Option 031 to connect with the ME7838 Series Modular/Broadband/Banded/Millimeter-Wave VNA System. Option 007 Receiver Offset is also required.

Part Number	Description
MS464xB-084	Millimeter-Wave capability for MS4642B, MS4644B, MS4645B, and MS4647B VNAs not equipped with Option 051, 061, or 062
MS464xB-085	Millimeter-Wave capability for MS4642B, MS4644B, MS4645B, and MS4647B VNAs equipped with Option051, 061, or 062
Documentation	For detailed ME7838 Series Broadband VNA specifications, see appropriate ME7838 Series Broadband VNA Technical Data Sheet pn: 11410-00593 and 11410-00778.

Calibration Options

Part Number	Description
MS4640B-098	Z540/Guide 25 Calibration, no Data
MS4640B-099	Premium Calibration, with Data

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)

Calibration / Verification Kits

Part Number	Description
3659	0.8 mm Calibration/Verification Kit
3656B	1.0 mm Calibration/Verification Kit
3655V	WR-15 Waveguide Calibration Kit, without Sliding Loads
3655V-1	WR-15 Waveguide Calibration Kit, with Sliding Loads
3655E	WR-12 Waveguide Calibration Kit, without Sliding Loads
3655E-1	WR-12 Waveguide Calibration Kit, with Sliding Loads
3655W	WR-10 Waveguide Calibration Kit, without Sliding Loads
3655W-1	WR-10 Waveguide Calibration Kit, with Sliding Loads
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, without Sliding Loads
3652A-1	K Calibration Kit, with Sliding Loads
3654D	V Calibration Kit, without Sliding Loads
3654D-1	V Calibration Kit, with Sliding Loads
3657	V Multi-Line Calibration Kit, without Shorts
3657-1	V Multi-Line Calibration Kit, with Shorts

Ordering Information (continued)

Test Port Cables, Flexible, High Performance

Part Number	Description
3671W1-50-1	1.0 mm (male) to 1.0 mm (female), 1 each, 10.0 cm (3.9 in)
3671W1-50-2	1.0 mm (male) to 1.0 mm (female), 1 each, 13.0 cm (5.1 in)
3671W1-50-3	1.0 mm (male) to 1.0 mm (female), 1 each, 16.0 cm (6.3 in)
3671KFS50-60	K (female) to 3.5 mm (male) cable, 60 cm (one cable)
3671KFK50-60	K (female) to K (male) cable, 60 cm (one cable)
3671KFK50-100	K (female) to K (male) cable, 1 each, 100 cm (one cable)
3671KFKF50-60	K (female) to K (female) cable, 1 each, 60 cm (once cable)
3671VFV50-60	V (female) to V (male) cable, 1 each, 60 cm (one cable)
3671VFV50-100	V (female) to V (male) cable, 1 each, 100 cm (one cable)
3671KFSF50-60	K (female) to 3.5 mm (female) cable, 1 each, 60 cm (one cable)
3671VFVF50-60	V (female) to V (female) cable, 1 each, 60 cm (one cable)
3671VFV50-100	V (female) to V (male) cable, 1 each, 60 cm (one cable)
3670.850-1	0.8 mm (male) to 0.8 mm (female), 1 each, 10.0 cm (3.9 in)
3670.850-2	0.8 mm (male) to 0.8 mm (female), 1 each, 16.0 cm (6.3 in)

Test Port Converters

Part Number	Description
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)
34YN50	Universal Test Port Connector to N (male), installation requires wrench 01-202 (not included)
34YS50A	Universal Test Port Connector to 3.5mm (male), installation requires wrench 01-202 (not included)
34YQ50A	Universal Test Port Connector to 2.4mm (male), installation requires wrench 01-202 (not included)

Adapters and More

Part Number	Description
0.8-105F	0.8 mm (female) Sparkplug Launcher Connector, DC to 145 GHz
0.8-105M	0.8 mm (male) Sparkplug Launcher Connector, DC to 145 GHz
34WV50	1.0 mm (male) to V (male) Adapter, 1.0 mm to V, Coaxial
34WVF50	1.0 mm (male) to V (female) Adapter, 1.0 mm to V, Coaxial
34WFV50	1.0 mm (female) to V (male) Adapter, 1.0 mm to V, Coaxial
34WFVF50	1.0 mm (female) to V (female) Adapter, 1.0 mm to V, Coaxial
33WW50	1.0 mm (male) to 1.0 mm (male) Adapter, 1.0 mm in-series, Coaxial
3WWF50	1.0 mm (male) to 1.0 mm (female) Adapter, 1.0 mm in-series, Coaxial
33WFWF50	1.0 mm (female) to 1.0 mm (female) Adapter, 1.0 mm in-series, Coaxial
35WR10W	WR10 to 1.0 mm (male) Adapter, 1.0 mm to WR10 Waveguide
35WR10WF	WR10 to 1.0 mm (female) Adapter, 1.0 mm to WR10 Waveguide
SC7260	WR12 to 1.0 mm (male) Adapter, 1.0 mm to WR12 Waveguide
SC7442	WR12 to 1.0 mm (female) Adapter, 1.0 mm to WR12 Waveguide
35WR15V	WR15 to V (male) Adapter, V (1.85 mm) to WR15 Waveguide
35WR15VF	WR15 to V (female) Adapter, V (1.85 mm) to WR15 Waveguide
For More Information	Refer to our **Precision RF & Microwave Components Catalog** for descriptions of adapters and other components.

Additional Accessories

	0.8 mm to Waveguide adapters available from Flann Microwave Ltd
	0.8 mm Picoprobe probes available from GGB Industries.
	0.8 mm Infinity probes available from Cascade Microtech

Universal Test Fixture (UTF)

Part Number	Description
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

Ordering Information (continued)

Precision Fixed Attenuators, Adapters (in and out of series, waveguide to coaxial), and more:
refer to our extensive Precision RF & Microwave Components Catalog pn: 11410-00235

GPIB Cables

Part Number	Description
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

Part Number	Description
760-247	Transit Case, for all MS4640B series VNAs, hard plastic with wheels, 85 cm x 70 cm x 45 cm

Tools

Part Number	Description
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	Open End Wrench, 6 mm × 7 mm, 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

Documentation

User Documentation Disc — Soft copies of the manuals as Adobe PDF files are included on the User Documentation CD 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.

Part Number	Description
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

Extended Service Options

Extended Service Options	Use the table below to select the service location, service period, type of service, and the Vector**Star**™ instrument model number			
Service Location	**Service Period**	**Type of Service**	**VNA Model**	**Part Number**
On-Site	3 Years	Repair Only	MS4642B	MS4642B-ES311
			MS4644B	MS4644B-ES311
			MS4645B	MS4645B-ES311
			MS4647B	MS4647B-ES311
Service Location	**Service Period**	**Type of Service**	**VNA Model**	**Part Number**
On-Site	3 Years	Standard Calibration	MS4642B	MS4642B-ES314
			MS4644B	MS4644B-ES314
			MS4645B	MS4645B-ES314
			MS4647B	MS4647B-ES314
Service Location	**Service Period**	**Type of Service**	**VNA Model**	**Part Number**
On-Site	3 Years	Premium Calibration	MS4642B	MS4642B-ES318
			MS4644B	MS4644B-ES318
			MS4645B	MS4645B-ES318
			MS4647B	MS4647B-ES318
Service Location	**Service Period**	**Type of Service**	**VNA Model**	**Part Number**
Service Center	3 Years	Standard Calibration	MS4642B	MS4642B-ES312
			MS4644B	MS4644B-ES312
			MS4645B	MS4645B-ES312
			MS4647B	MS4647B-ES312
Service Location	**Service Period**	**Type of Service**	**VNA Model**	**Part Number**
Service Center	3 Years	Premium Calibration	MS4642B	MS4642B-ES315
			MS4644B	MS4644B-ES315
			MS4645B	MS4645B-ES315
			MS4647B	MS4647B-ES315
Service Location	**Service Period**	**Type of Service**	**VNA Model**	**Part Number**
Service Center	5 Years	Repair Only	MS4642B	MS4642B-ES510
			MS4644B	MS4644B-ES510
			MS4645B	MS4645B-ES510
			MS4647B	MS4647B-ES510
Service Location	**Service Period**	**Type of Service**	**VNA Model**	**Part Number**
Service Center	5 Years	Standard Calibration	MS4642B	MS4642B-ES512
			MS4644B	MS4644B-ES512
			MS4645B	MS4645B-ES512
			MS4647B	MS4647B-ES512
Service Location	**Service Period**	**Type of Service**	**VNA Model**	**Part Number**
Service Center	5 Years	Standard Calibration	MS4642B	MS4642B-ES515
			MS4644B	MS4644B-ES515
			MS4645B	MS4645B-ES515
			MS4647B	MS4647B-ES515
Service Location	**Service Period**	**Type of Service**	**VNA Model**	**Part Number**
Service Center	5 Years	Repair & Standard Calibration	MS4642B	MS4642B-ES513
			MS4644B	MS4644B-ES513
			MS4645B	MS4645B-ES513
			MS4647B	MS4647B-ES513
Service Location	**Service Period**	**Type of Service**	**VNA Model**	**Part Number**
Service Center	5 Years	Repair & Premium Calibration	MS4642B	MS4642B-ES516
			MS4644B	MS4644B-ES516
			MS4645B	MS4645B-ES516
			MS4647B	MS4647B-ES516

Post-Delivery Upgrade Options

If your needs change, it's reassuring to know that your Anritsu product can grow with you. Contact your local Anritsu service center for adding internal options or increasing the frequency coverage of your existing MS4640B Series VNA.

Anritsu envision : ensure

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