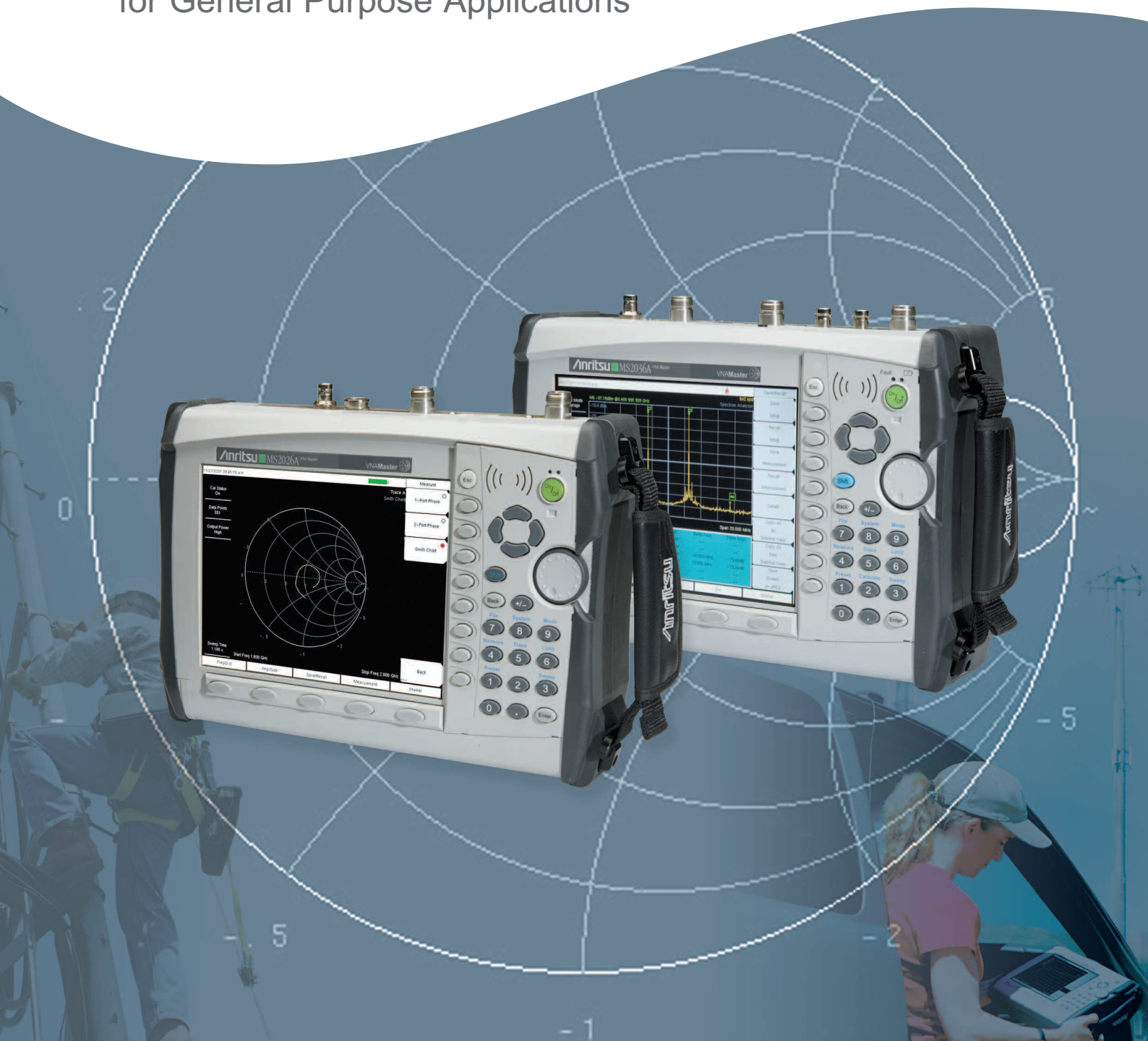
Product Brochure

Anritsu

VNA Master™
MS2024A/MS2026A and MS2034A/MS2036A

Handheld Vector Network and Spectrum Analysis for General Purpose Applications



Introducing VNA Master™ plus Spectrum Analysis

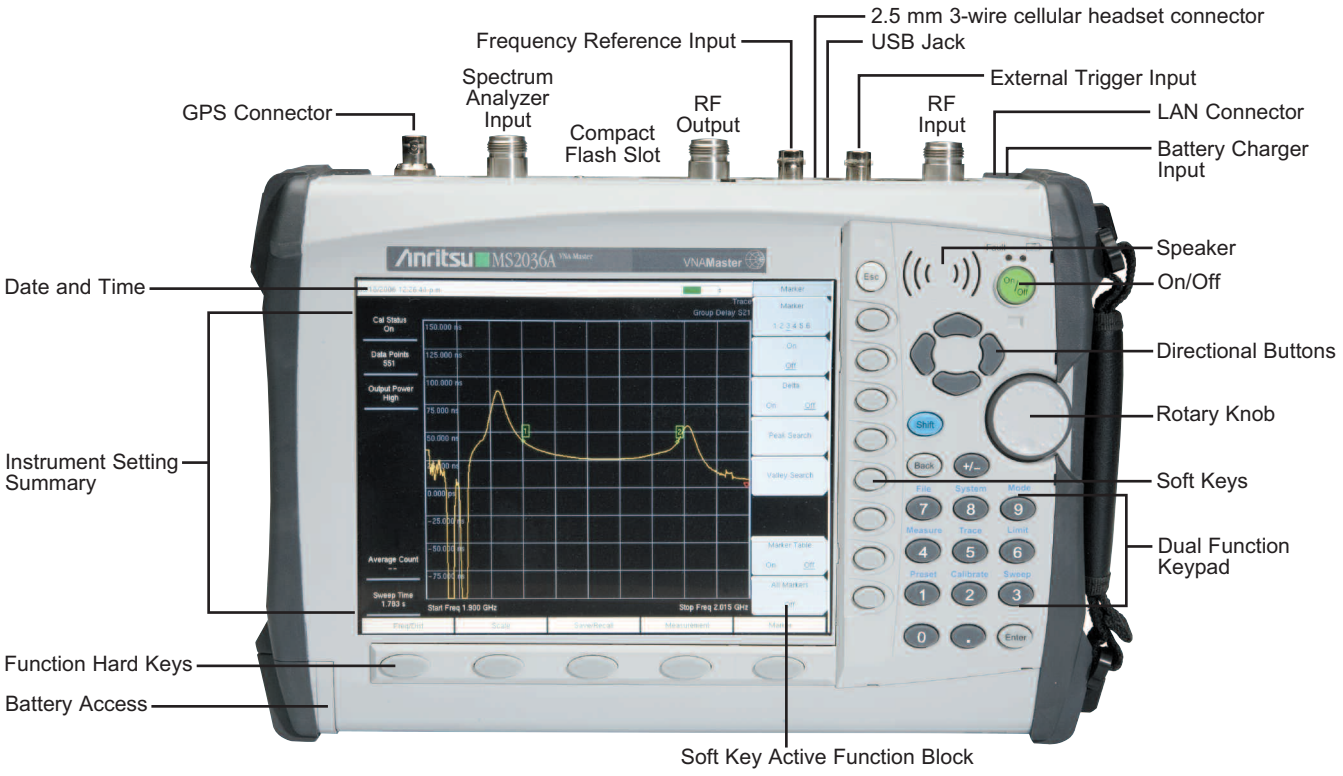
RF engineers and technicians in the field provide a valuable service as they support defense and general purpose communication systems around the world. They ensure radars on Navy ships are operational. They test antennas on Army vehicles. They perform flight-line test on Air Force and commercial jets. They maintain communication systems on Marine expeditionary fighting vehicles. They support VHF Omni-directional Range (VOR) in radio navigational systems throughout the world. They ensure direction finding (DF) reconnaissance systems precisely pinpoint threats.

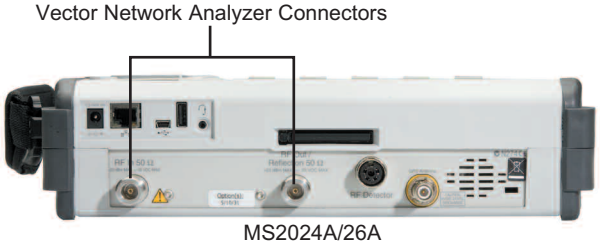
Equally valuable are the primary test instruments that serve these applications: vector network analyzer, spectrum analyzer, power meter, and vector voltmeter. In the factory, these handheld instruments are also especially attractive for lowering cost-of-test and minimizing capital equipment expenditures.

Anritsu introduces the MS202xA VNA Master and the MS203xA VNA Master plus Spectrum Analysis that offers these individual test capabilities in a handheld, battery-operated, rugged multi-function instrument. The VNA Master easily replaces bulky and obsolete bench-top instruments with a more efficient-to-use handheld instrument so technicians can freely roam the sites they service. This freedom increases their productivity as they phase match cables, identify sources of interference, and troubleshoot transmitters. The VNA Master is so ideally suited for cable and antenna measurements in the field that it can also double as a low-cost alternative in manufacturing and R&D.

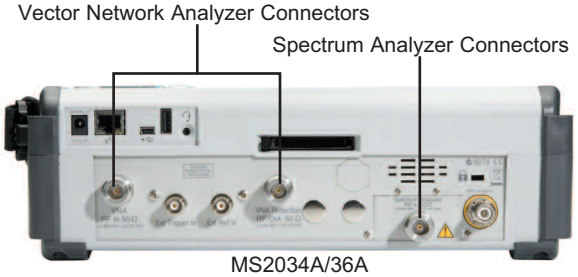
Feature	Models	Benefit
Two-port vector network analysis	ALL	Verify antennas, phase match cables, and find problems using Distance-to-Fault (DTF)
Broad spectrum analysis (9 kHz to 7.1 GHz)	MS2034A/36A	Supports common aerospace, defense, and wireless communications standards
Broad power meter (10 MHz to 7.1 GHz)	MS2034A/36A	Convenient power measurements without using external detector
Optional power monitor measurements (1 MHz to 20 GHz)	ALL	More accurately troubleshoot transmitters in the field using external detector
Optional high accuracy power meter, PSN50 and MA24106A power sensors (50 MHz to 6 GHz)	ALL	Integrated power meter that rivals bench top power meters
Optional Vector Voltmeter (VVM) mode	ALL	Replace obsolete instrument and external accessories with more turnkey solution
Ergonomically designed controls	ALL	Easy-to-learn and easy-to-use for optimizing operator productivity
Handheld battery-operated RF test solution	ALL	Freely roam the site without AC power

Introducing the VNA Masters: MS2024A/MS2026A/MS2034A/MS2036A





MS2024A/26A



MS2034A/36A

Feature (MS202xA, MS203xA)	Benefit
Light weight (less than 4 kg. including battery) and rugged design	Convenient operation anywhere, anytime
Large 8.4 in. full-color TFT display screen	At-a-glance results and instrument settings improves operator productivity
Type N female RF connectors	Easy-to-connect with proven reliability in severe environments
Soft keys, directional buttons, and rotary knob	Tactile feedback enables precise control of instrument settings
LAN and USB 2.0 (full-speed) connections	Latest connections for data transfer, data archival, and firmware upgrades
Rechargeable and field replaceable Li-Ion Battery	Conduct measurements for >2.5 hours on a single charge
256 MB storage	Store and easily access more than 4,000 traces and 4,000 measurements setups
Remote programming via Ethernet	Increase productivity by automating repetitive or operator intensive tasks

Convenient VNA Measurements Anywhere, Anytime

Cables and antennas are a vital part of any communication system that unfortunately can degrade over time due to corrosion, water damage, or excessive deployment time. Phase matched cables are even more susceptible to these kinds of problems. Ideally, one can avoid the fix-after-failure scenario by routinely sweeping these critical components to detect earlier these potentially catastrophic problems. A field-friendly vector network analyzer can simplify this task.

The VNA Master is a 1-port and 2-port handheld vector network analyzer (VNA), which uses the superior Frequency Domain Reflectometry (FDR) approach instead of the DC pulse technique of older Time Domain Reflectomtry (TDR) approaches. Using FDR, the VNA Master provides convenient 1-port measurements of return loss, VSWR, cable loss, Distance-To-Fault (DTF), and Smith Chart measurements in the field. Connect the VNA Master to a 2-port cable to measure cable loss, phase, and group delay. In other words, the VNA Master offers precise measurement capabilities for cables and antennas by simplifying S11 and S21 measurements in the field.

The VNA Master employs vector correction after an open-short-load calibration to ensure accuracy, repeatability, and overall quality of 1-port and 2-port measurements. As an improvement over traditional scalar measurement approaches, the VNA Master removes all the systematic errors associated with the 1-port reflection measurements, including directivity, source match, and reflection tracking. Additionally, the VNA Master removes transmission response errors and transmission source match errors (i.e., a 1-path, 2-port correction) when conducting 2-port transmission measurements. The vector correction of the VNA Master offers superior measurement accuracy for detecting problems or phase matching cables in a convenient handheld product so you can perform VNA measurements anywhere, anytime.

Feature (MS202xA, MS203xA)	Benefit
Two-port vector network analysis (2 MHz to 6 GHz)	Verify antennas, phase match cables, and find problems using Distance-to-Fault (DTF)
>42 dB directivity	Excellent dynamic range for precise 1-port measurements
<±1 dB uncertainty for |S11| <20 dB	Superior 1-port accuracy for return loss, VSWR, and cable loss measurements
<±0.5 dB uncertainty and <±4 degrees uncertainty for |S21| <30 dB	Superior 2-port accuracy for gain, phase, and group delay measurements
>70 dB dynamic range	Ensures sufficient signal to noise ratio for accurate transmission measurements
Smith Charts, Phase, and Group Delay measurements	Convenient measurements for antenna measurements and phase matching cables

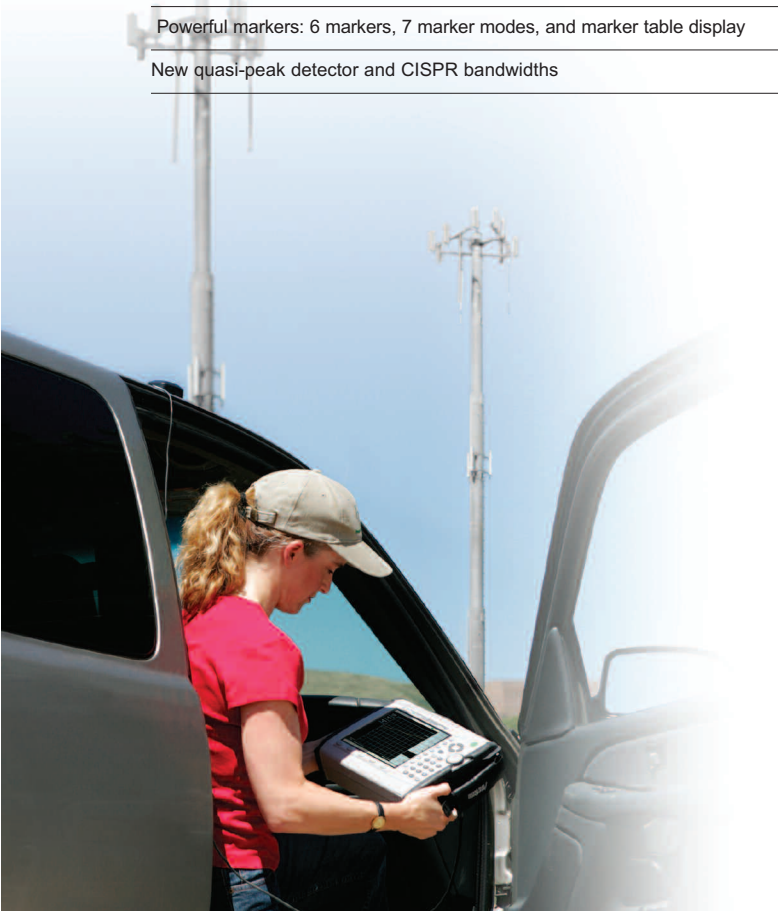
Convenient VNA Master Plus
Spectrum Analysis Anywhere, Anytime

In addition to cables and antennas, the typical communication system also contains more sophisticated transmitters, receivers, and signal separation components. These additional components increase the complexity of the overall system, which becomes especially difficult to maintain when there is an intermittent problem. A field-friendly spectrum analyzer can simplify this task.

The VNA Master plus Spectrum Analysis (i.e., MS203xA) adds the capability to conduct spectrum analysis in the field to the already powerful MS202xA! Don't let the small footprint fool you, this instrument offers performance and features that rivals bench-top alternatives for simplifying spectrum monitoring, interference analysis, and other general purpose signal measurements in the field. The VNA Master offers broad spectrum analysis frequency coverage, impressive dynamic range, and excellent phase noise performance from 9 kHz to 7.1 GHz.

The VNA Master plus Spectrum Analysis includes many standard measurements. These measurements include field strength, occupied bandwidth, channel power, adjacent channel power ratio, and carrier to interference (C/I) ratio. In addition, the built-in AM/FM/SSB demodulator simplifies the task of identifying interfering signals. Overall, the VNA Master is a powerful handheld tool for general purpose spectrum analysis anywhere, anytime.

Feature (MS203xA)	Benefit
Broad spectrum analysis (9 kHz to 7.1 GHz)	Embraces a large number of wireless and defense communications standards
Wide dynamic range (100 dB typical)	Easily observe low-level spurious or interfering sources near sites
Excellent DANL (with preamp): –163 dBm in 1 Hz RBW	Reveals problematic signals near sites
Superior Single Side Band (SSB) Phase Noise of <–100 dBc/Hz at 10 kHz offsets	Evaluate local oscillators and observe close-in performance of transmitters
Fast sweep speed of 200 ms in 10 MHz span	Real-time sweeps to detect intermittent signals
Powerful markers: 6 markers, 7 marker modes, and marker table display	Sophisticated marker functions to quickly extract measurement results
New quasi-peak detector and CISPR bandwidths	Economy EMC pre-compliance solution



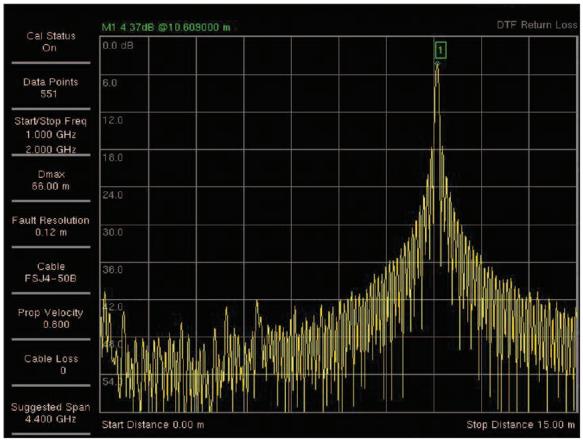
Typical Vector Network Analyzer Measurements at a Glance

VNA Master performs a variety of RF measurements aimed at simplifying the task for the technician and engineer. VNA Master is the first handheld VNA to display 1-port and 2-port S-parameter measurements. A single key selection on the bottom hard keys brings up all the RF measurements you need, whether you are performing flight-line test, cable and antenna maintenance, or S-parameters in the lab.

S11 Smith Chart

S11 Log Magnitude/Return Loss/VSWR/Smith Chart

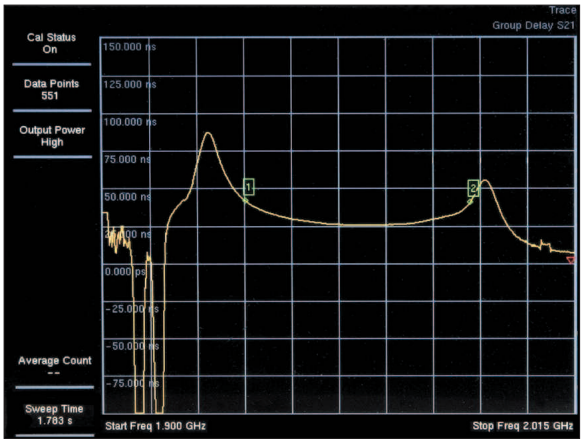
VNA Master's S11 measurements can be used in the lab or in manufacturing to measure the match of attenuators, antennas, cables, filters, amplifiers, or any other passive and active components. In the field, Return Loss is used to characterize cable and antenna systems to ensure conformance to system specifications. Select VSWR display and view results in dB or linear scales. Choose Smith Chart to simplify impedance matching of transmission lines or to tune antennas.



Distance-To-Fault

Distance-To-Fault (DTF)

VNA Master's Distance-To-Fault (DTF) measurement is used in the field to precisely locate faults within cable and feedline systems by displaying magnitude discontinuities in dB or VSWR over distance in meters or feet. The DTF display is obtained by performing a sweep in the frequency domain and then, by using the inverse Fast Fourier Transform, the data is converted to the time domain. Different windowing types (frequency filters) give the user the flexibility to trade off sidelobes for pulse width.



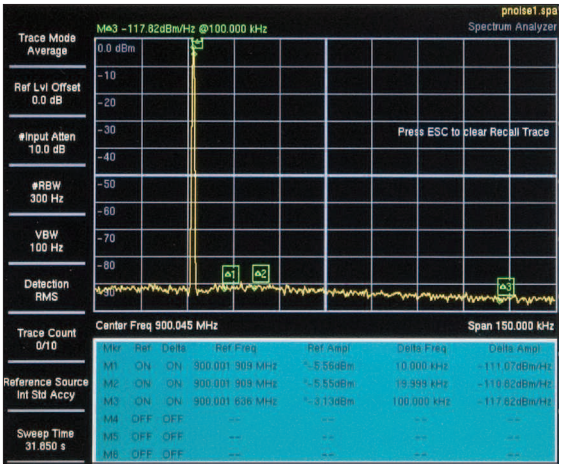
S21 Log Magnitude / Group Delay

S21 Log Magnitude / Group Delay

VNA Master's 2-Port measurements feature different output power levels: "High" (0 dBm) and "Low" (–35 dBm). Use the "High" power setting to precisely measure the insertion loss of passive devices such as cables, filters, and attenuators. Alternatively, use the "Low" power setting to avoid saturating amplifiers during measurements. In addition to log magnitude measurements, display types of phase and group delay simplifies phase matching cables and overall system measurements.

Typical Spectrum Analyzer Measurements at a Glance

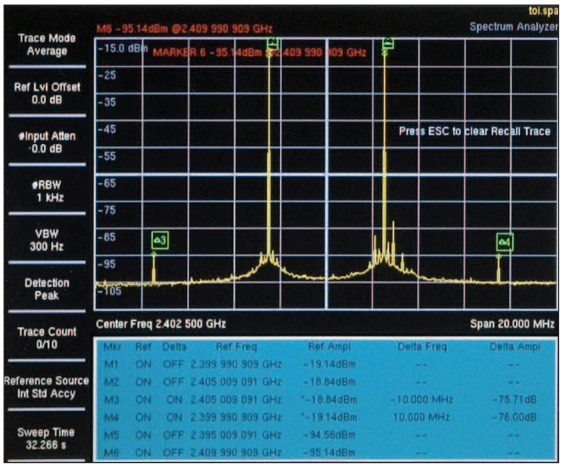
VNA Master plus Spectrum Analysis, the MS203xA series, performs a variety of RF measurements aimed at simplifying the task for the technician and engineer. A single key selection on the bottom hard keys brings up all the RF measurements you need, whether you are performing spectrum monitoring, interference analysis, or other general purpose signal measurements in the field.



Phase Noise

Phase Noise

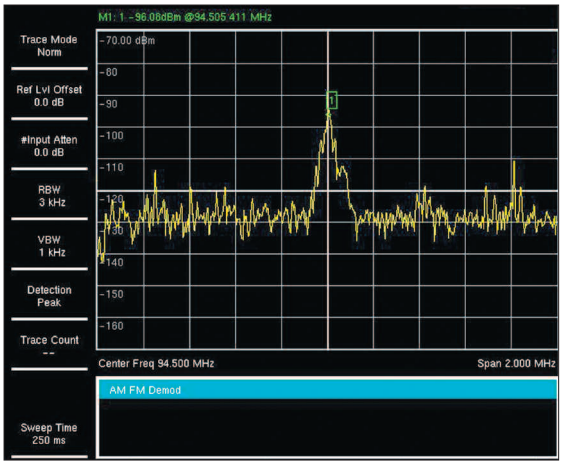
Connect to the MS203xA and observe the true spectral purity of your local oscillators and signals. The VNA Master, with typical phase noise of –110 dBc/Hz at 10 kHz offset, conveniently verifies your most demanding phase noise specifications. Use flexible phase noise markers and convenient marker table features to further optimize, observe, and archive measurement results.



Signal Measurements

Signal Measurements

The MS203xA's typical dynamic range of 100 dB allows the measurement of very small signals in the presence of much larger signals. Wide dynamic range also means you can use wider resolution bandwidths to increase the sweep speed of this normally time-consuming measurement. With six markers and an easy-to-read marker table, the VNA Master provides powerful measurement capabilities in the field.



AM, FM and SSB Demodulation

AM/FM/SSB Demodulation

A built-in demodulator for AM, narrowband FM, wideband FM and single sideband (selectable USB and LSB) allows a technician to easily identify interfering signals. The demodulated audio can be heard either through the built-in speaker or through a standard 3-wire headset. A demodulation marker is provided for easy tuning.

Extend the Capabilities with Valuable Network Analysis Options

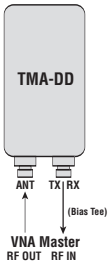
Power Monitor (Option 5)

With the Anritsu 560 series detectors, technicians can accurately measure broadband power up to 50 GHz. These high precision detectors significantly help minimize mismatch uncertainty with detector flatness better than 0.5 dB up to 18 GHz.

The Power Monitor also features:

- Measurement range (–50 to +20 dBm)
- Display range (–80 to +80 dBm)
- Display formats: absolute power (dBm or Watts) and relative power (dB or %).
- Built-in auto averaging automatically reduces noise effects.
- Zeroing allows optimum measurement accuracy at low power levels.

The easy-to-view Power Monitor display minimizes keystrokes when testing in the field.



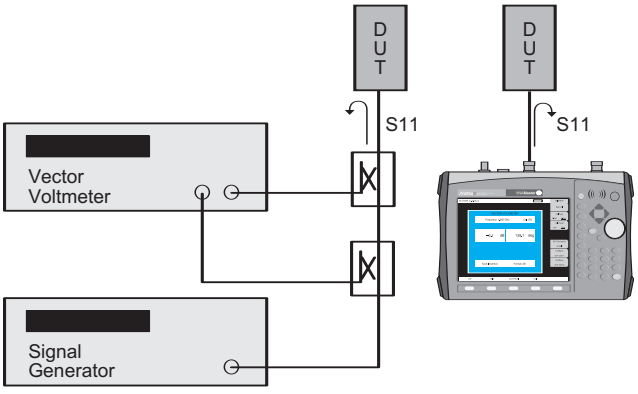
Bias Tee (Option 10)

The integrated, variable Bias Tee is designed to supply bias to a tower mount amplifier (TMA) or other active device. This bias is supplied from the center conductor of the RF In port on the VNA Master, delivering a variable +12 to +24V in 3V steps.

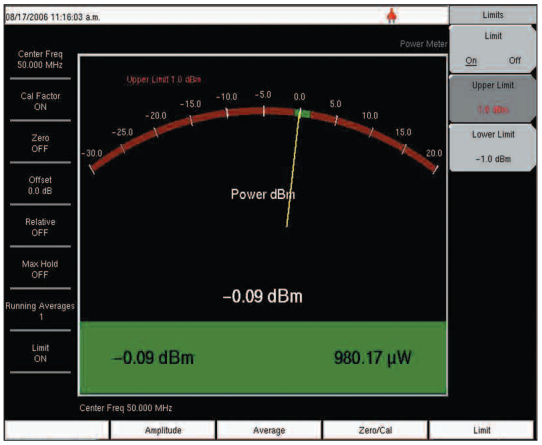
Vector Voltmeter (Option 15)

The VNA Master offers a field-friendly version of the popular vector voltmeter for phase matching cables. In this approach, the VNA Master provides an optional user interface with display types of impedance, dB, and VSWR for 1- and 2-port measurements.

The VNA Master contains the signal generator, couplers, phase measurement receiver, and now the user interface of this popular approach. Field engineers can now upgrade their tools without impacting existing maintenance procedures by adding this popular user interface to the already easy-to-learn VNA Master.



A side-by-side comparison shows how the VNA Master is a more convenient instrument for phase matching cables in the



High Accuracy Power Meter offers precise power measurements when using an external USB power sensor.

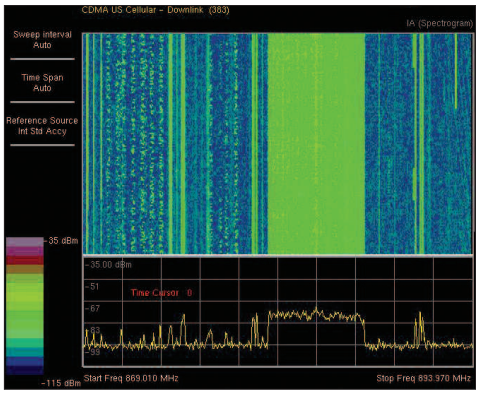
High Accuracy Power Meter (Option 19)

Anritsu's USB power sensors, either the PSN50 or MA24106A, offers high accuracy power measurements from 50 MHz to 6 GHz. This enables users to make precise measurements of CW and digitally modulated signals in the field. Users will also find:

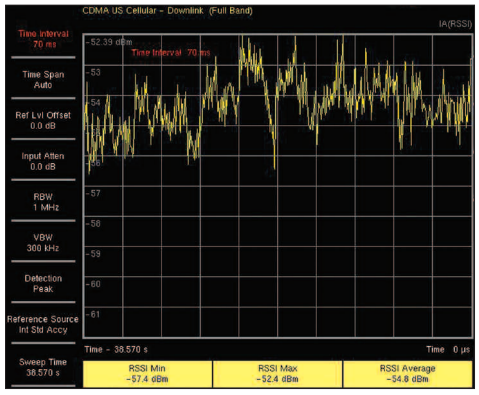
- Convenient connection via a USB A/mini-B cable
- Power displayed in both dBm and Watts
- Optional upper/lower limit activation during Pass/Fail measurements

Option 19 adds support for either the PSN50 or MA24106A USB Power Sensors, which must be purchased separately.

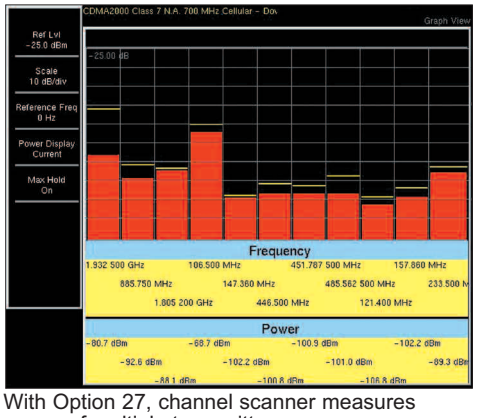
Extend the Capabilities with More Valuable Spectrum Analysis Options



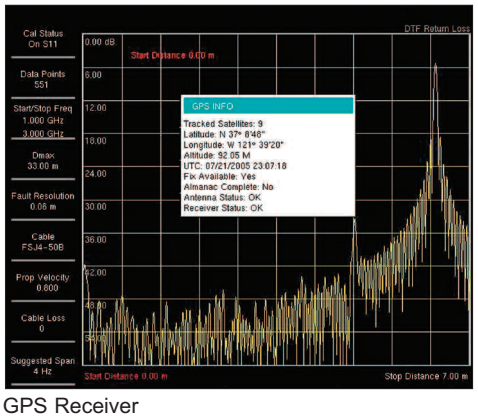
With Option 25, spectrogram measurements identifies intermittent interference.



With Option 25, RSSI measurement analyzes signal strength of a signal over time.



With Option 27, channel scanner measures power of multiple transmitters.



GPS Receiver

Interference Analyzer (Option 25)

With its built-in low-noise preamplifier, the MS203xA with interference analyzer option provides the ability to identify and locate interfering signals down to the noise floor, allowing technicians to better address the quality issues that affect user service.

Spectrogram

The Spectrogram display is a three dimensional display of frequency, power, and time of the spectrum. It is applicable for identifying intermittent interference and tracking signal levels over time. The MS203xA can save data for up to 72 hours.

RSSI

The received signal strength indicator (RSSI) can be used to observe the signal strength of a single frequency over time. Data can be collected for up to 72 hours.

Channel Scanner (Option 27)

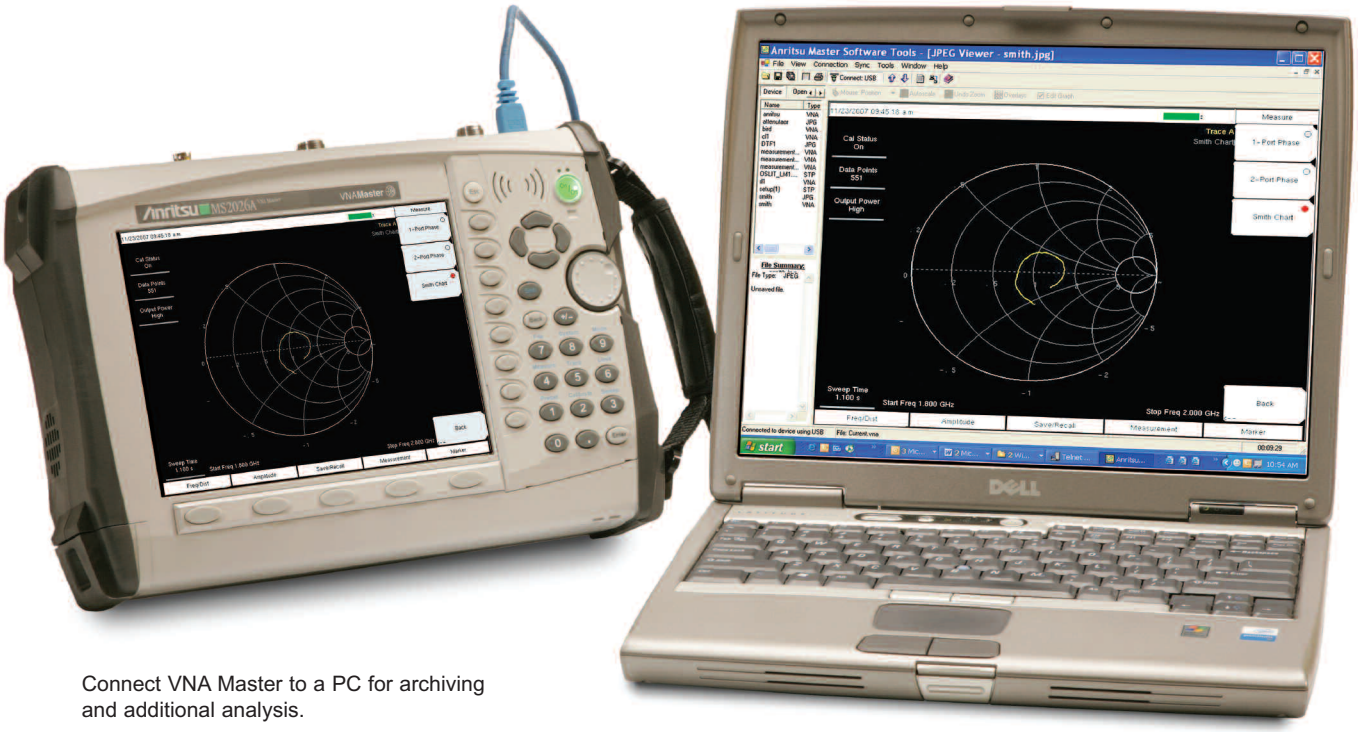
The channel scanner option measures the power of multiple transmitted signals and is very useful for measuring channel power in up to 20 channels at the same time. Display data in graph or table format. In the custom setup menu each channel can be custom built with different frequency, bandwidth, or channels for convenient simultaneous analysis of a variety of different signal standards.

GPS Receiver (Option 31)

Built-in GPS provides precise location (latitude, longitude, and altitude) and Universal Time (UT) information to help the user verify that measurements are taken at the right location. The VNA Master then stamps each trace and stores the GPS location information. The GPS option also includes a convenient magnet-mount antenna with a 15-foot (5m) cable for the car, truck or any other useful surface.

Master Software Tools and Remote Programming

Each VNA Master ships with a test assistant: a copy of Anritsu's Master Software Tools for Windows® 2000/XP/Vista. This allows an operator to add the processing capabilities of a PC and this software utility to the VNA Master to form a powerful and flexible measurement solution for both network and spectrum analysis. For automation, the VNA Master also supports remote programming via the Ethernet interface.



Connect VNA Master to a PC for archiving and additional analysis.

Benefits of Master Software Tools (MST) and Remote Programming with VNA Master:

Feature	Benefit
Powerful data management tool for storing and organizing measurement results	MST simplifies transfers, printing, and archival of displays and setups
Connect to a PC using USB2.0 (full-speed), Ethernet LAN, or Direct Ethernet	Unleash powerful MST capabilities by using a variety of popular interfaces
Store an unlimited number of setups, traces, and JPEGs (limited only by PC memory)	Develop libraries of frequently used setups and typical results
Overlay traces and further optimize displays	Versatility to further optimize results without re-taking measurements
Add, edit, and manage limit lines using Master Software Tools	Powerful Pass/Fail assistant
Update VNA Master with the latest firmware	Easily access and upgrade to newest features from www.us.anritsu.com
Remote programming via Ethernet	Increase throughput by automating repetitive or operator intensive tasks

Specifications

Vector Network Analyzer Specifications

Frequency Range	2 MHz to 4 GHz (with MS2024A, MS2034A, operational down to 610 kHz) 2 MHz to 6 GHz (with MS2026A, MS2036A, operational down to 610 kHz)	
Frequency Accuracy	25 ppm	
Frequency Resolution	10 Hz	
Data Points	Low, Medium, High (137/275/551)	
Interference Immunity	On-Channel On-Frequency	+17 dBm 0 dBm (RF Out), +30 dBc (RF In)
1-Port Power	High:	0 dBm (typical)
2-Port Power	High Low:	0 dBm (typical) –35 dBm (typical)
Corrected Directivity	42 dB (2 MHz to 6 GHz)	
1-Port Accuracy	= <0.44 + |20 log(1 ±$10^{-E\Delta/20}$)| dB, typical; EΔ = Directivity – Measured Return Loss	
Dynamic Range	70 dB, 2 MHz to 10 MHz 80 dB, 10 MHz to 3 GHz 70 dB, >3 GHz to 5.5 GHz 65 dB, >5.5 GHz to 6 GHz	
Return Loss	Range: Resolution	0 to 60 dB 0.01 dB
VSWR	Range: Resolution	1 to 65 0.01
Cable Loss	Range: Resolution	0 to 30 dB 0.01 dB
1-Port Phase	Range: Resolution:	–180° to +180° 0.01°
Smith Chart	Resolution:	0.01
2-Port Gain	Range: Resolution:	–120 to 100 dB 0.01 dB
2-Port Phase	Range: Resolution:	–180° to +180° 0.01°
Distance-To-Fault	Fault Resolution (meters): Horizontal Range (meters): Vertical Range (Return Loss): Vertical Range (VSWR):	(1.5 x 10^8 x vp)/ΔF; vp is the propagation constant and ΔF is F2–F1 in Hz 0 to (data points–1) x Fault Resolution to a maximum of 1500m (4921 ft.) where datapoints = 137/275/551 0 to 60 dB 1 to 65

Spectrum Analyzer Specifications

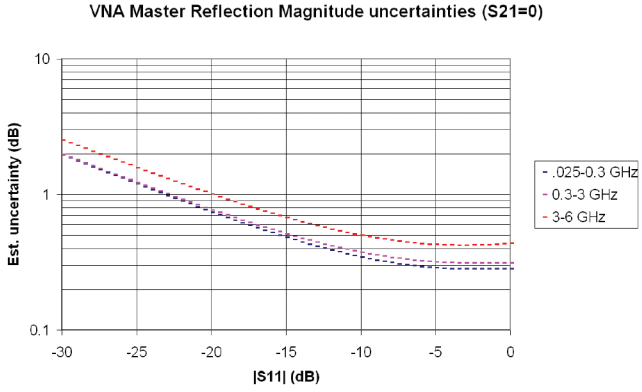
Frequency Range	9 kHz to 4 GHz (with MS2034A) 9 kHz to 7.1 GHz (with MS2036A)		
Maximum Continuous Input	+30 dBm		
Tuning Resolution	1 Hz		
Frequency Reference	Aging: ±1 ppm/10 years Accuracy: ±0.3 ppm (25° C ± 25° C) + aging		
Frequency Span	10 Hz to 7.1 GHz plus 0 Hz (zero span)		
Sweep Time	Minimum 100 ms, 10 µs in zero span		
Sweep Trigger	Free run, Single, Video, External		
Resolution Bandwidth	(–3 dB width) 1 Hz to 3 MHz in 1-3 sequence ±10%; 0-span, 1 Hz to 1 MHz 8 MHz demodulation bandwidth		
Video Bandwidth	(–3 dB width) 1 Hz to 3 MHz in 1-3 sequence		
SSB Phase Noise	–100 dBc/Hz max at 10, 20, and 30 kHz offset from carrier –102 dBc/Hz max at 100 kHz offset from carrier		
Amplitude Measurement Range	DANL to +30 dBm		
Absolute amplitude accuracy Power Levels ≥–50 dBm, ≤35 dB input attenuation, Preamplifier Off, –10° C to 55° C	9 kHz to ≤10 MHz, ±1.5 dB >10 MHz to 4 GHz, ±1.25 dB >4 GHz to 7.1 GHz, ±1.75 dB		
Displayed Average Noise Level (DANL in 1 Hz RBW, 0 dB attenuation, Reference level –50 dBm, preamp on)	Frequency 10 MHz to 1 GHz >1 GHz to 2.2 GHz >2.2 GHz to 2.8 GHz >2.8 GHz to 4.0 GHz >4.0 GHz to 7.1 GHz	Max (Preamp On) –161 dBm –159 dBm –143 dBm –159 dBm –154 dBm	Max (Preamp Off) –137 dBm –133 dBm –126 dBm –136 dBm –127 dBm
Display Range	1 to 15 dB/div in 1 dB steps. Ten divisions displayed		
Amplitude Units Log Scale Modes	dBm, dBV, dBmv, dBµV		
Attenuator Range	0 to 65 dB		
Attenuator Resolution	5 dB steps		

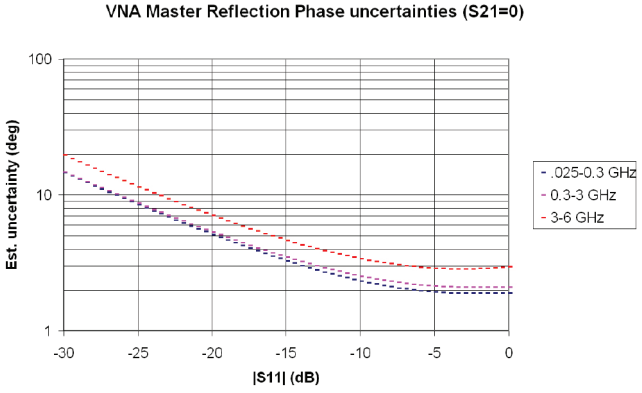
Specifications

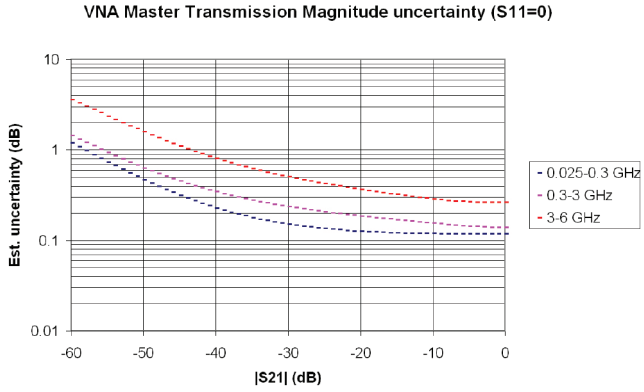
Power Meter Specifications

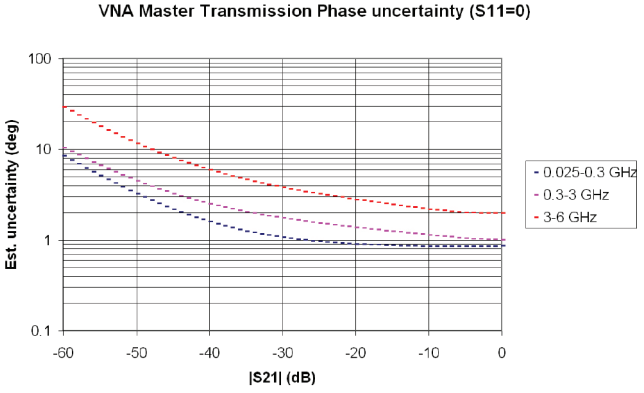
Frequency Range	10 MHz to 4 GHz (with MS2034A) 10 MHz to 7.1 GHz (with MS2036A)
Display Range	–80 dBm to +80 dBm
Measurement Range	–60 dBm to +30 dBm
Offset Range	0 to +60 dB
Accuracy	–40 dBm <Max <=+15 dBm 10 MHz –4 GHz: ±1.25 dB 4 GHz –7.1 GHZ: ±1.75 dB Max > +15 dBm 10 MHz –6.5 GHz: ±1.75 dB 6.5 GHz –7 GHz ±2 dB Max <–40 dBm 10 MHz –4 GHz: ±1.5 dB 4 GHz –7.1 GHz: ±1.75 dB
VSWR	1.5:1 typical
Maximum Power	+30 dBm (1W) without external attenuator

Vector Network Analyzer Uncertainty Curves









The uncertainty graphs above provide measurement uncertainty at 23° C after vector correction for the standard N connector type. Errors are worse-case contributions of residual directivity, source match, frequency response, network analyzer dynamic range, and connector repeatability. For the 1-path 2-port measurements, transmission tracking, crosstalk and physical load match termination was added. OSLN50-1 calibration components were used.

Specifications

Power Monitor (Option 5) requires external detector

Display Range: –80 to +80 dBm (10 pW to 100 kW)
Measurement Range: –50 to +20 dBm (10 nW to 40 mW)
Offset Range: 0 to +60 dB
Resolution: 0.1 dB, 0.1 xW (x = n, µ, m based on detector power)
Accuracy: ±1 dB maximum for >–40 dBm using 560-7N50B detector
Power Monitor: Detectors (see www.anritsu.com for additional detectors)

560-7N50B:
Frequency Range: 0.01 to 20 GHz
Impedance: 50 Ω
Return Loss: 15 dB, <0.04 GHz
22 dB, <8 GHz
17 dB, <18 GHz
14 dB, <20 GHz
Input Connector: N(m)
Frequency Response: ±0.5 dB, <18 GHz
±1.25 dB, <20 GHz

560-7S50B:
Frequency Range: 0.01 to 20 GHz
Impedance: 50 Ω
Return Loss: 15 dB, <0.04 GHz
22 dB, <8 GHz
17 dB, <18 GHz
14 dB, <20 GHz
Input Connector: N(m)
Frequency Response: ±0.5 dB, <18 GHz
±1.25 dB, <20 GHz

Bias Tee (Option 10)

Voltage/Current: +12V, 250, or 500 mA steady rate
+15V, 250, or 500 mA steady rate
+18V, 350 mA steady rate
+21V, 300 mA steady rate
+24V, 250 mA steady rate

Vector Voltmeter (Option 15)

CW Frequency Range:
2 MHz to 4 GHz (with MS2024A, MS2034A)
2 MHz to 6 GHz (with MS2026A, MS2036A)
Measurement Display: CW, Table (Five Entries, Plus Reference)
Measurement Types: Return Loss, Insertion
Measurement Format: dB/VSWR/Impedance

High Accuracy Power Meter (Option 19)[1]

Option 19 supports both economy PSN50 and performance MA24106A USB Sensors. Refer to the following datasheets for more detailed performance specifications.
PSN50 datasheet is 11410-00414
MA24106A datasheet is 11410-00424

Frequency Range: 50 MHz to 6 GHz
Input Connector: Type N, male, 50 Ω
Max Input without Damage: +33 dBm, ±25 VDC
Measurand: True-RMS/Average Power
Dynamic Range:
PSN50 supports –30 dBm to +20 dBm
MA24106A supports –40 dBm to +23 dBm
Measurement Speed, Typical:
PSN50 offers 1 measurement per second
MA24106A offers 10 measurements per second[2]
Input Return Loss: 50 MHz to 2 GHz; ≥26 dB
2 GHz to 6 GHz; ≥20 dB
System Measurement Resolution: 0.01 dB
System Offset Range: ±60 dB
Total RSS Measurement Uncertainty (0° C to 50° C): ±0.16 dB[3]
Continuous Digital Modulation Uncertainty:
PSN50: ±0.06 dB (+17 to +20 dBm)[4]
MA24106A: ±0.02 dB, <+18 dBm[4]
±0.10 dB, ≥+18 dBm[4]

Interference Analyzer (Option 25)

Frequency Range:
9 kHz to 4 GHz (with MS2034A)
9 kHz to 7.1 GHz (with MS2036A)
Strength of the Interferer: Gives visual and aural indication of signal strength
RSSI, Spectrogram: Collect data up to 72 hours

Channel Scanner (Option 27)

Frequency Range: 9 kHz to 4 GHz (with MS2034A)
9 kHz to 7.1 GHz (with MS2036A)
Number of Channels: 1 to 20 Channels

GPS (Option 31) includes GPS antenna

GPS Location Indicator:
Latitude, Longitude, Altitude, and Universal Time on display
Latitude, Longitude, Altitude, and Universal Time with trace storage
GPS High Frequency Accuracy when GPS antenna is connected:
±25 ppb with GPS ON, three minutes after satellite lock
Internal High Accuracy when GPS antenna is not connected:
Better than ±50 ppb for three days from a High Accuracy GPS Lock and within 0 to 50 degrees centigrade ambient temperature

General Specifications

Maximum Input (Damage Level) into Vector Network Analyzer:
Test Port, Type N: +23 dBm, ±50 VDC
Maximum Continuous Input into Spectrum Analyzer:
10 dB attenuation, +30 dBm, ±50 VDC
RF Input VSWR into Spectrum Analyzer:
2.0:1 maximum, 1.5:1 typical (≥10 dB attenuation)
Interfaces:
Type N female RF Connector
Type N female RF Out Port and RF In Port (50 Ω)
BNC female connectors for external references and external trigger
Reverse BNC connector for GPS antenna
RF Detector: Type N(m) 50 Ω
RJ45 connector for Ethernet 10/100-Base T
2.5 mm 3-wire cellular headset connector
USB mini-A connector
Enviromental:
MIL-PRF-28800F Class 2
Operating: –10º C to 55º C, humidity 85%
Storing: –51º C to 71º C
Altitude: 4600 meters, operating and non-operating
Safety: Conforms to EN 61010-1 for Class 1 portable equipment
Electromagnetic Compatibility:
Meets European Community requirements for CE marking
Size: 315 x 211 x 78 mm (12.4 x 8.3 x 3.1 in.) for MS202xA
315 x 211 x 97 mm (12.4 x 8.3 x 3.8 in.) for MS203xA
Weight: <2.9 kg (6.4 lbs) for MS202xA; 4 kg (9 lbs) for MS203xA

[1] Specifications apply after 30 minute warm-up
[2] One measurement per second is typical in high aperture time mode
[3] Excludes mismatch errors
Excludes noise, zero set, zero drift for levels <–20 dBm
Excludes digital modulation uncertainty between +17 and +20 dBm
[4] Measurement error with reference to a CW signal of equal power and frequency at 25° C

Ordering Information

VNA Master™ Models[1]

MS2024A	2-port VNA Master, 2 MHz to 4 GHz
MS2026A	2-port VNA Master, 2 MHz to 6 GHz
MS2034A	2-port VNA Master, 2 MHz to 4 GHz Spectrum Analysis, 9 kHz to 4 GHz
MS2036A	2-port VNA Master, 2 MHz to 6 GHz Spectrum Analysis, 9 kHz to 7.1 GHz

[1]Each instrument includes standard one-year warranty and Certificate of Calibration and Conformance

MS2024A VNA Master Options

MS2024A-005	Power Monitor (requires external detector)
MS2024A-010	Built-in Bias-Tee
MS2024A-015	Vector Voltmeter
MS2024A-019	High Accuracy Power Meter (requires PSN50 or MA24106A, sold separately)
MS2024A-031	GPS Receiver (includes GPS antenna)

MS2026A VNA Master Options

MS2026A-005	Power Monitor (requires external detector)
MS2026A-010	Built-in Bias-Tee
MS2026A-015	Vector Voltmeter
MS2026A-019	High Accuracy Power Meter (requires PSN50 or MA24106A, sold separately)
MS2026A-031	GPS Receiver (includes GPS antenna)

MS2034A VNA Master + Spectrum Analysis Options

MS2034A-005	Power Monitor (requires external detector)
MS2034A-010	Built-in Bias-Tee
MS2034A-015	Vector Voltmeter
MS2034A-019	High Accuracy Power Meter (requires PSN50 or MA24106A, sold separately)
MS2034A-025	Interference Analysis, 9 kHz to 4 GHz (requires external antenna)
MS2034A-027	Channel Scanner, 9 kHz to 4 GHz (requires external antenna)
MS2034A-031	GPS Receiver (includes GPS antenna)

MS2036A VNA Master + Spectrum Analysis Options

MS2036A-005	Power Monitor (requires external detector)
MS2036A-010	Built-in Bias-Tee
MS2036A-015	Vector Voltmeter
MS2036A-019	High Accuracy Power Meter (requires PSN50 or MA24106A, sold separately)
MS2036A-025	Interference Analysis, 9 kHz to 7.1 GHz (requires external antenna)
MS2036A-027	Channel Scanner, 9 kHz to 7.1 GHz (requires external antenna)
MS2036A-031	GPS Receiver (includes GPS antenna)

MS2024A/26A Standard Accessories

10580-00166	User's Guide
65729	Soft Carrying Case
64343	Tilt Bail
3-2000-1500	Compact Flash Card (256 MB)
2300-498	Master Software Tools CD ROM
633-44	Rechargeable Li-Ion
40-168	AC-DC Adapter
806-141	Automotive cigarette lighter 12V DC adapter
3-2000-1498	USB A-to mini B cable, 3.05 m (10 ft.)
2000-1371	Ethernet cable, 2.13 m (7 ft.)
2000-1501-R	256 MB USB Flash Drive
3-806-152	Ethernet Crossover Cable, 2.13 m (7 ft.)

MS2034A/36A Standard Accessories

10580-00166	User's Guide
65729	Soft Carrying Case
3-2000-1500	Compact Flash Card (256 MB)
2300-498	Master Software Tools CD ROM
633-44	Rechargeable Li-Ion
40-168	AC-DC Adapter
806-141	Automotive cigarette lighter 12V DC adapter
3-2000-1498	USB A-to mini B cable, 3.05 m (10 ft.)
2000-1371	Ethernet cable, 2.13 m (7 ft.)
2000-1501-R	256 MB USB Flash Drive
3-806-152	Ethernet Crossover Cable, 2.13 m (7 ft.)

Manuals

10580-00166	VNA Master User's Guide
10580-00167	VNA Master Programming Manual

Related Literature, Application Notes

11410-00214	Reflectometer Measurements - Revisited
11410-00206	Time Domain
11410-00270	What is Your Measurement Accuracy?
11410-00185	Distance-To-Fault
11410-00414	High Accuracy Power Meter, PSN50
11410-00424	USB Power Sensor MA24106A

Ordering Information

Optional Accessories

High Accuracy Power Sensor

PSN50	High Accuracy Power Sensor, 50 MHz to 6 GHz
MA24106A	High Accuracy Power Sensor, 50 MHz to 6 GHz, True RMS

Power Monitor Detectors

560-7N50B	0.01 to 20 GHz
560-7S50B	0.01 to 20 GHz

Detector Extender Cables

800-109	7.6 m (25 ft)
800-110	15.2 m (50 ft)
800-111	30.5 m (100 ft)
800-112	61.0 m (200 ft)

Coaxial Calibration Components

OSLN50-1	Precision N(m) Open/Short/Load, 42 dB, 6 GHz
OSLNF50-1	Precision N(f) Open/Short/Load, 42 dB, 6 GHz
22N50	Precision N(m) Short/Open, 18 GHz
22NF50	Precision N(f) Short/Open, 18 GHz
SM/PL-1	Precison N(m) Load, 42 dB, 6.0 GHz
SM/PLNF-1	Precision N(f) Load, 42 dB, 6.0 GHz
1091-53	Precision TNC(m) Open, 18 GHz, 50 Ω
1091-54	Precision TNC(m) Short, 18 GHz,50 Ω
1015-55	Precision TNC(m) Load, 18 GHz, 50 Ω
1091-55	Precision TNC(f) Open, 18 GHz, 50 Ω
1091-56	Precision TNC(f) Short, 18 GHz, 50 Ω
1015-54	Precision TNC(f) Load, 18 GHz, 50 Ω
23L50	Precision 3.5 mm(m) Short, 9 GHz
23LF50	Precision 3.5 mm(f) Short, 9 GHz
24L50	Precision 3.5 mm(m) Open, 9 GHz
24LF50	Precision 3.5 mm(f) Open, 9 GHz
28L50R	Precision 3.5 mm(m) Load, 9 GHz
28LF50R	Precision 3.5 mm(f) Load, 9 GHz
2000-767	Precision Open/Short/Load, 7/16(m), 4.0 GHz
2000-768	Precision Open/Short/Load, 7/16(f), 4.0 GHz

Precision Adapters

34NN50A	N(m)-N(m), DC to 18 GHz,50 Ω
34NFNF50	N(f)-N(f), DC to 18 GHz, 50 Ω

Adapters

1091-26	N(m)-SMA(m), DC to 18 GHz,50 Ω
1091-27	N(m)-SMA(f), DC to 18 GHz, 50 Ω
1091-80	N(f)-SMA(m), DC to 18 GHz, 50 Ω
1091-81	N(f)-SMA(f), DC to 18 GHz,50 Ω
510-102	N(m)-N(m), 90º right angle, DC to 11 GHz, 50 Ω
510-90	7/16 DIN(f)-N(m), DC to 7.5 GHz,50 Ω
510-91	7/16 DIN(f)-N(f), DC to 7.5 GHz,50 Ω
510-92	7/16 DIN(m)-N(m), DC to 7.5 GHz, 50 Ω
510-93	7/16 DIN(m)-N(f), DC to 7.5 GHz, 50 Ω
510-96	7/16 DIN(m)-7/16 DIN(m), DC to 7.5 GHz, 50 Ω
510-97	7/16 DIN(f)-7/16 DIN(f), DC to 7.5 GHz, 50 Ω
513-62	Adapter, TNC(f) to N(f), 18 GHz, 50 Ω
1091-315	Adapter, TNC(m) to N(f), 18 GHz, 50 Ω
1091-324	Adapter, TNC(f) to N(m), 18 GHz, 50 Ω
1091-325	Adapter, TNC(m) to N(m), 18 GHz,50 Ω
1091-317	Adapter, TNC(m) to SMA(f), 18 GHz, 50 Ω
1091-318	Adapter, TNC(m) to SMA(m), 18 GHz, 50 Ω
1091-323	Adapter, TNC(f) to TNC(f), 18 GHz, 50 Ω
1091-326	Adapter, TNC(m) to TNC(m), 18 GHz, 50 Ω

Test Port Cables Armored

15NN50-1.5C	1.5 m, N(m)-N(m), 6 GHz, 50 Ω
15NN50-3.0C	3.0 m, N(m)-N(m), 6 GHz, 50 Ω
15NN50-5.0C	5.0 m, N(m)-N(m), 6 GHz, 50 Ω
15NNF50-1.5C	1.5 m, N(m)-N(f), 6 GHz, 50 Ω
15NNF50-3.0C	3.0 m, N(m)-N(f), 6 GHz, 50 Ω
15NNF50-5.0C	5.0 m, N(m)-N(f), 6 GHz,50 Ω
15ND50-1.5C	5.0 m, N(m)-7/16 DIN(m), 6 GHz, 50 Ω
15NDF50-1.5C	5.0 m, N(m)-7/16 DIN(f), 6 GHz, 50 Ω

Port Antennas

2000-1030	SMA(m), 1.71 to 1.88 GHz, 50 Ω
2000-1031	SMA(m), 1.85 to 1.99 GHz, 50 Ω
2000-1032	SMA(m), 2.4 to 2.5 GHz, 50 Ω
2000-1035	SMA(m), 896 to 941 MHz, 50 Ω
2000-1200	SMA(m), 806 to 869 MHz, 50 Ω
2000-1361	SMA(m), 5725 to 5825 MHz, 50 Ω
2000-1473	SMA(m), 870 to 960 MHz, 50 Ω
2000-1474	SMA(m), 1.71 to 1.88 GHz, 50 Ω
2000-1475	SMA(m), 1920 to 1980, 2.11 to 2.17 GHz, 50 Ω
61532	Antenna Kit: 2000-1030, 2000-1031, 2000-1032, 2000-1035, 2000-1200, and 2000-1361

Limiter

1N50C	Limiter, N(m) to N(f), 50 Ω, 0.01 to 50 GHz

Attenuator

42N50-20	Attenuator, 20 dB, 50 W, DC to 18 GHz, N(m)-N(f)
42N50A-30	Attenuator, 30 dB, 50 W, DC to 18 GHz, N(m)-N(f)

GPS Antenna

2000-1410	Magnet Mount GPS Antenna with 15 ft (4.6 m) cable

Hard Transit Case

760-243-R	Hard Transit Case with wheels and retractive handle for Anritsu Handheld Master products

Rack Mount Kit

66864	Rack Mount Kit, Master Platform (MS2024A, MS2026A only)

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