

Anritsu envision : ensure

VNA Master™

MS2024B / MS2025B / MS2034B / MS2035B

500 kHz to 4 GHz 500 kHz to 6 GHz 500 kHz to 4 GHz 500 kHz to 6 GHz Vector Network Analyzer
9 kHz to 4 GHz 9 kHz to 6 GHz + Spectrum Analyzer



Portable Powerful Handheld S-Parameters

VNA Master MS202xB/3xB Features

Overview



Introduction

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

Standard features are:

- 2-Port Vector Network Analyzer: 500 kHz to 4 GHz or 6 GHz
- Spectrum Analyzer: 9 kHz to 4 GHz or 6 GHz
- Fast 850 μ s/data point sweep speed, with ultimate flexibility in the number of points from 2 to 4001
- 15 minute warm-up, multi-term polynomial VNA calibration, 16 hour calibration stability
- -162 DANL in 1 Hz RBW (normalized) on MS203xB spectrum analyzer combo models

VNA Master MS202xB/3xB offers many options, including:

- Four models, including two with spectrum analyzer combos and two with extended coverage up to 6 GHz
- Distance Domain for distance-to-fault analysis of antennas, coax runs, connector/splice assemblies
- Vector Voltmeter
- Internal Bias Tee (for both VNA and Spectrum Analyzer applications)
- High Accuracy Power Meter (works with Anritsu external USB power sensors)
- AM/FM/PM Modulation Analyzer
- Interference Analyzer with spectrogram function
- Channel Scanner
- Indoor/Outdoor Coverage Mapping
- GPS Receiver



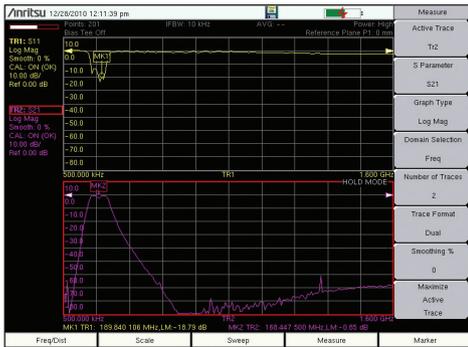
VNA Master MS202xB/3xB

Site engineers can use the MS202xB/3xB to accurately and quickly test and verify the installation and commissioning of base stations, mobiles, and portables. The VNA Master is equally suited for preventative maintenance and troubleshooting to help ensure the operation of wireless network infrastructures, including broadband and microwave backhaul systems.

VNA Master MS202xB/3xB Features



2 Port Vector Network Analyzer



The VNA Master's 2-port analyzer provides simultaneous measurement of S_{21} insertion loss and S_{11} return loss.

2 Port Vector Network Analyzer

VNA Master features a 2-port Vector Network Analyzer to be able to test and verify the performance of feedline, filtering, and antenna components. This includes:

- Connectors
- Cables/Jumpers
- Antenna Isolators
- Multicouplers/Diplexers/Duplexers
- Tower Mounted Amplifiers

2-port Transmission Measurements can help identify poor filter adjustment, antenna isolation, and degraded tower mounted amplifiers. The goal of these measurements is to maximize the system coverage and capacity with problem-free base stations.

Antenna System Failure Mechanisms

Maintenance is an on going requirement as antenna system performance can degrade at any point in time due to:

- Loose connectors
- Improperly weatherized connectors
- Pinched cables
- Poor grounding
- Corroded connectors
- Lightning strikes
- Strong winds misaligning antennas
- Water intrusion into cables
- Bullet holes, nails, or rodent damage to the cable

Making Measurements Easier

The VNA Master provides features for making measurements easier to perform and for analyzing test results such as:

- Fast sweep speed, measurement point selection, and flexible display formats make it easy to view and adjust base station RF system performance
- High RF Immunity mode for testing in harsh RF environments
- Trace Overlay compares reference traces to see changes over time
- Limit Lines and Alarming for providing reference standards
- High and Low Power output selection to test tower-top components without climbing the tower
- Internal Bias-Tee to power up TMAs for testing when off-line
- GPS tagging of data to verify location of tests
- User-selectable menu scheme offers choice of either full VNA capability or simplified cable and antenna user interface.

Measurements

1-port Measurements

- VSWR, Return Loss, Phase, Linear Polar, Log Polar
- Smith Chart
- Log/Mag/2 (1-port Cable Loss)
- Distance-to-Fault (DTF) Return Loss
- Distance-to-Fault (DTF) VSWR

Windowing Functions in Distance Domain

- Rectangular
- Normal Side Lobe
- Low Side Lobe
- Minimum Side Lobe

2-port Measurements

- Log Mag Insertion Loss/Gain, Phase, Linear Polar, Log Polar, Group Delay

Calibration

- User-variable Data Points from 2 to 4001
- Full S_{11} (Open, Short, Load)
- 1P2P, (Open, Short, Load, Through)
- Response S_{11}
- Response S_{21}

Sweep Functions

- Run/Hold, Single/Continuous
- RF Immunity (High/Low)
- Averaging/Smoothing
- Output Power (High/Low)

Trace Functions

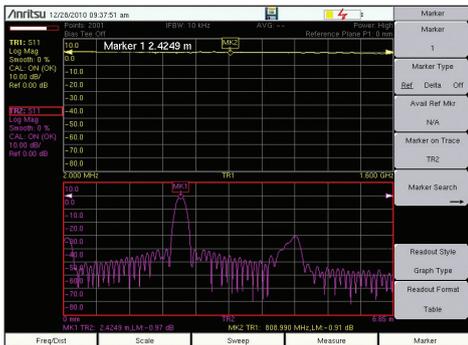
- Save/Recall, Copy to Display Memory
- No Trace Math, Trace \pm Memory
- Trace Overlay

Marker Functions

- 1-8 Markers each with a Delta Marker
- Marker to Peak/Valley
- Marker to/Peak Valley between Markers
- Marker Table

Limit Line Functions

- Limit Lines
 - Single Limit
 - Multi-segment (41)
 - Limit Alarm
- Limit Line Edit
 - Frequency, Amplitude
 - Add/Delete Point
 - Next Point Left/Right
 - Move Limit

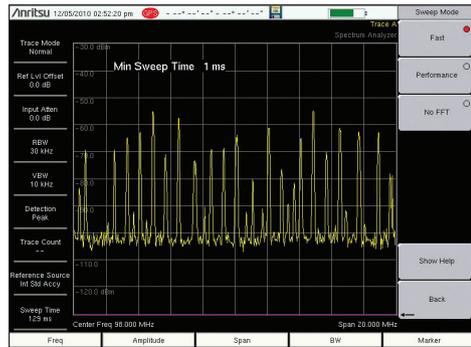


The VNA Mode in the VNA Master with standard Distance Domain allows simultaneous viewing of cable return loss and distance to fault.

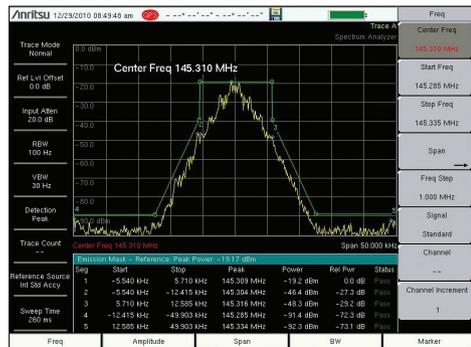
VNA Master MS202xB/3xB Features



Spectrum Analyzer



The spectrum analyzer mode in the VNA Master MS203xB offers fast sweep speeds for interference hunting intermittent signals.



The Spectrum Analyzer mode in the VNA Master MS203xB offers automated measurements including occupied bandwidth, adjacent channel power, and emission mask, as shown above. The mask can be quickly created using the standard limit line editor. The emission mask measurement function automatically moves the trace to match the peak of a modulated signal to conform to common mask standards.

Spectrum Analyzer

The VNA Master MS203xB models feature the most powerful handheld spectrum analyzer in their class with unmatched performance in:

- Sensitivity
- Dynamic Range
- Phase Noise
- Frequency Accuracy
- Sweep Speed

The goal of Spectrum Analyzer measurements is to be able to accurately monitor, measure, and analyze RF signals and their environments. It finds rogue signals, measures carriers and distortion, and verifies base stations' signal performance. It validates carrier frequency and identifies desired and undesired signals.

Simple But Powerful

The VNA Master features dedicated routines for one-button measurements. For more in-depth analysis, the technician has control over settings and features that are not found even on lab-grade benchtop spectrum analyzers. For example, the VNA Master MS203xB models offers:

- Multiple sweep detection methods – Peak, Negative, True RMS, Quasi-Peak, Sample
- Advanced marker functions – noise marker, tracking marker, peak search, sequential peak search, delta markers
- Advanced marker functions – noise marker, tracking marker, peak search, sequential peak search, delta markers
- Advanced limit line functions – automatic envelope creation, relative limits, limit mirror, point/segment/line adjustment
- Save-on-Event – automatically saves a sweep when crossing a limit line

The VNA Master offers full control over bandwidth and sweep settings, or can be set to automatically optimize for best possible trade-off between accuracy and speed.

GPS-Assisted Frequency Accuracy

With GPS Option 31 the frequency accuracy is reduced to < 50 ppb (parts per billion). Also all measurements can be GPS tagged for exporting to maps.

Rx Noise Floor Testing

The VNA Master can measure the receive noise floor on a base station's uplink channel using the channel power measurement. An elevated noise floor indicates interference that can lead to call blocking, denial of service, call drops, low data rates, and lowered system capacity.

Measurements

- One Button Measurements
 - Field Strength – in dBm/m² or dBmV/m
 - Occupied Bandwidth - 1% to 99% of power
 - Emission Mask
 - Channel Power - in specified bandwidth
 - ACPR - adjacent channel power ratio
 - AM/FM/SSB Demodulation - audio only
 - C/I - carrier-to-interference ratio

Sweep Functions

- Sweep
 - Single/Continuous, Manual Trigger, Reset, Minimum Sweep Time
- Detection
 - Peak, RMS, Negative, Sample, Quasi-peak
- Triggers
 - Free Run, External, Video, Change Position, Manual

Trace Functions

- Traces
 - 1-3 Traces (A, B, C), View/Blank, Write/Hold
- Trace A Operations
 - Normal, Max Hold, Min Hold, Average, Number of Averages, (always the live trace)
- Trace B Operations
 - A → B, B ← C, Max Hold, Min Hold
- Trace C Operations
 - A → C, B ← C, Max Hold, Min Hold, A - B → C, B - A → C, Relative Reference (dB), Scale

Marker Functions

- Markers
 - 1-6 Markers each with a Delta Marker, or Marker 1 Reference with 6 Delta Markers
- Marker Types
 - Fixed, Tracking, Noise, Frequency Counter
- Marker Auto-Position
 - Peak Search, Next Peak (Right/Left), Peak Threshold %, To Channel, To Center, To Reference Level, Delta Marker to Span
- Marker Table
 - 1-6 markers' frequency & amplitude plus delta markers' frequency offset & amplitude

Limit Line Functions

- Limit Lines
 - Upper/Lower, Limit Alarm, Default Limit
- Limit Line Edit
 - Frequency, Amplitude, Add/Delete Point, Add Vertical, Next Point Left/Right
- Limit Line Move
 - To Current Center Frequency, By dB or Hz, To Marker 1, Offset from Marker 1
- Limit Line Envelope
 - Create, Update Amplitude, Number of Points (41), Offset, Shape Square/Slope
- Limit Line Advanced
 - Absolute/Relative, Mirror, Save/Recall

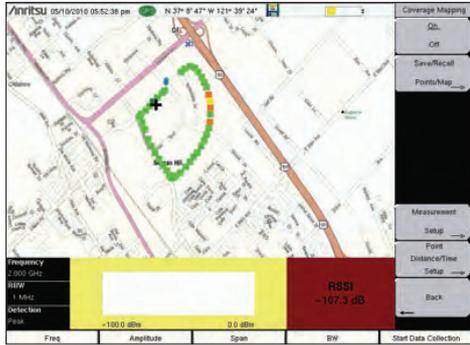
VNA Master MS202xB/3xB Features



AM/FM/PM Modulation Analyzer (Option 509) Coverage Mapping (Option 431)



There is a growing demand for coverage mapping solutions. Anritsu's Coverage Mapping measurements option provides wireless service providers, public safety users, land mobile radio operators, and government officials with indoor and outdoor mapping capabilities

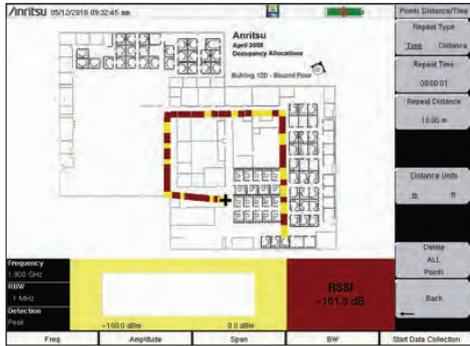


Outdoor Mapping

Outdoor Mapping

With a GPS antenna connected to the instrument and a valid GPS signal, the instrument monitors RSSI and ACPR levels automatically. Using a map created with Map Master, the instrument displays maps, the location of the measurement, and a special color code for the power level. The refresh rate can be set up in time (1 sec, minimum) or distance.

The overall amplitude accuracy coupled with the GPS update rate ensures accurate and reliable mapping results



Indoor Mapping

Indoor Mapping

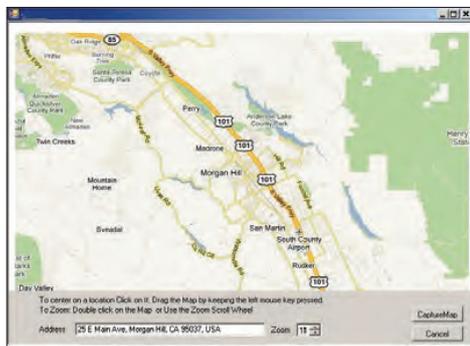
When there is no GPS signal valid, the Spectrum Master uses a start-walk-stop approach to record RSSI and ACPR levels. You can set the update rate, start location, and end location and the interpolated points will be displayed on the map.



Saved KML File

Export KML Files

Save files as KML or JPEG. Open kml files with Google Earth™. When opening up a pin in Google Earth, center frequency, detection method, measurement type, and RBW are shown on screen.



Create maps with Map Master

Map Master

When there is no GPS signal valid, the Spectrum Master uses a start-walk-stop approach to record RSSI and ACPR levels. You can set the update rate, start location, and end location and the interpolated points will be displayed on the map.

VNA Master MS202xB/3xB Features

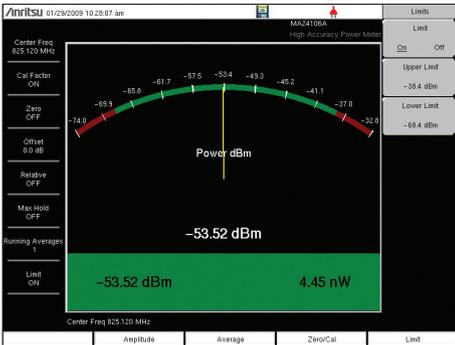


Power Meter

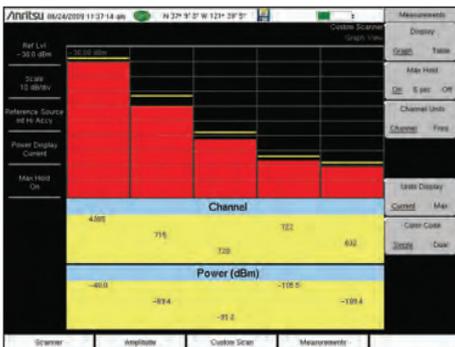
High Accuracy Power Meter (Option 19)



The VNA Master supports many different power measurements, including the channel scanner, high accuracy power meter, and channel power measurement.



High Accuracy Power Meter



Channel Scanner



High Accuracy Power Sensors

PC Power Meter

These power sensors can be used with a PC running Microsoft Windows® via USB. They come with PowerXpert™ application, a data analysis, and control software. The application has abundant features, such as data logging, power versus time graph, big numerical display, and many more, that enable quick and accurate measurements.

High Accuracy Power Meter (Option 19)

Anritsu's high accuracy power meter option enables you to make high accuracy RMS measurements. This capability is perfect for measuring both CW and digitally modulated signals such as CDMA/EV-DO, GSM/EDGE, and W-CDMA/HSPA+. You can select from a wide range of USB sensors delivering better than ± 0.16 dB accuracy. An additional benefit of using the USB connection is that a separate DC supply (or battery) is not needed because the necessary power is supplied by the USB port.

- MA24104A Inline High Power Sensor, 600 MHz to 4 GHz, +3 dBm to +51.76 dBm, True-RMS
- MA24105A Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 dBm to +51.76 dBm, True-RMS
- MA24106A High Accuracy RF Power Sensor, 50 MHz to 6 GHz, -40 dBm to +23 dBm, True-RMS
- MA24108A Microwave USB Power Sensor, 10 MHz to 8 GHz, -40 dBm to +20 dBm, True-RMS
- MA24118A, Microwave USB Power Sensor, 10 MHz to 18 GHz, -40 dBm to +20 dBm, True-RMS
- MA24126A, Microwave USB Power Sensor, 10 MHz to 26 GHz, -40 dBm to +20 dBm, True-RMS

Channel Scanner (Option 27)

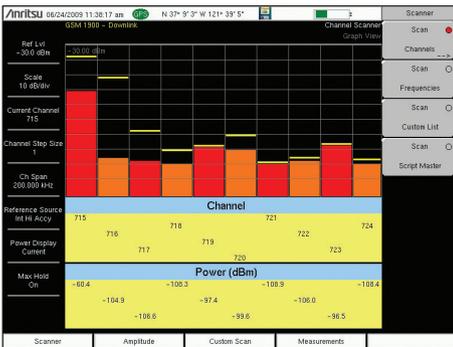
The channel scanner option measures the power of multiple transmitted signals, making it very useful for simultaneously measuring channel power of up to 20 channels in GSM, TDMA, CDMA, W-CDMA, HSDPA, and public safety networks. You can select the frequencies or the scanned data to be displayed, either by frequencies or the channel number. And in the custom setup menu, each channel can be custom built with different frequency bandwidth, or with channels from different signal standards. With Script Master, scans can be automated for up to 1200 channels.

VNA Master MS202xB/3xB Features



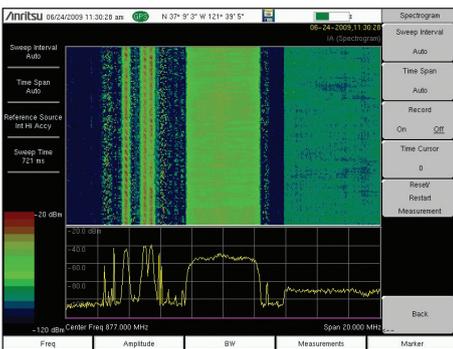
Interference Analyzer (Option 25)

Channel Scanner (Option 27)



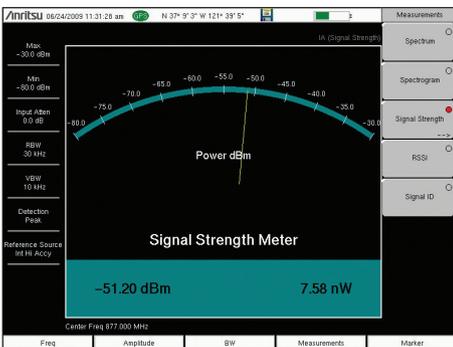
Channel Scanner

Works on any signal and is useful when looking for IM or harmonics. Can help spot signals widely separated in frequency that turn on and off together.



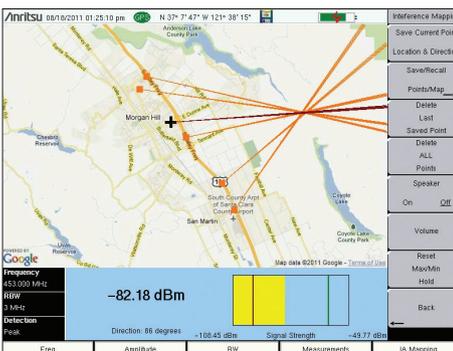
Spectrogram

For identifying intermittent interference and tracking signal levels over time for up to 72 hours with an external USB flash drive.



Signal Strength Meter

Can locate an interfering signal, by using a directional antenna and measuring the signal strength and by an audible beep proportional to its strength.



Interference Mapping

Eliminates the need to use printed maps and draw lines to triangulate location. Use on-screen maps generated with GPS coordinates with Map Master™.

Interference Analyzer (Option 25) Channel Scanner (Option 27)

Interference is a continuously growing problem for wireless network operators. Compounding the problem are the many sources that can generate interference such as:

- Intentional Radiators
- Unintentional Radiators
- Interference

Interference causes Carrier-to-Interference degradation, robbing the network of capacity. In many instances, interference can cause an outage to a sector, a cell, and/or neighboring cells. The goal of these measurements is to resolve interference issues as quickly as possible.

Monitoring Interference

The VNA Master offers many tools for monitoring intermittent interferers over time to determine patterns:

- Spectrogram
- Received Signal Strength Indicator
- Remote Monitoring over the Internet
- Save-on-Event – crossing a limit line

Master Software Tools for your PC features diagnostic tools for efficient analysis of the data collected during interference monitoring. These features include:

- Folder Spectrogram – creates a composite file of multiple traces for quick review
- Movie playback – playback data in the familiar frequency domain view
- Histogram – filter data and search for number of occurrences and time of day
- 3D Spectrogram – for in-depth analysis with 3-axis rotation viewing control

Identifying Interference

The VNA Master provides several tools to identify the interference – either from a neighboring wireless operator, illegal repeater or jammer, or self-interference:

- Signal ID (up to 12 signals at once)
- Signal Analyzer Over-the-Air Scanners
- Channel Scanner (up to 1200 channels, 20 at a time)

Locating Interference

Once interference has been identified, the Signal Strength Meter with its audible output beep coupled with a directional antenna makes finding the interference easier.

Interference Analyzer Measurements

- Spectrogram
- Signal Strength Meter
- Received Signal Strength Indicator (RSSI)
- Signal ID (up to 12 signals)
 - FM
 - GSM/GPRS/EDGE
 - W-CDMA/HSPA+
 - CDMA/EV-DO
 - Wi-Fi
- Spectrum
 - Field Strength – in dBm/m² or dBmV/m
 - Occupied Bandwidth – 1% to 99% of power
 - Channel Power – in specified bandwidth
 - ACPR – adjacent channel power ratio
 - AM/FM/SSB audio monitor
 - C/I – carrier-to-interference ratio

Channel Scanner

- Scan
 - 20 channels at once, by frequency or channel
 - Noncontiguous channels
 - Different channel bandwidths in one scan
- Display
 - Current plus Max hold display
 - Graph View
 - Table View
- Script Master™
 - Up to 1200 Channels
 - Auto-repeat sets of 20 channels and total
 - Auto-save with GPS tagging

Interference Mapping

- Save Current Point with Location and Direction
- Save/Recall Points & Map
- Audible Output of RSSI
- Reset Max/Min Hold

VNA Master MS202xB/3xB Features



Distance Domain Analysis

Distance Domain

Distance-to-Fault Analysis is a powerful field test tool to analyze cables for faults, including minor discontinuities that may occur due to a loose connection, corrosion, or other aging effects. By using Frequency Domain Reflectometry (FDR), the VNA Master sweeps a user-specified band of full power operational frequencies (instead of fast narrow pulses from TDR-type approaches) to more precisely identify discontinuities. The VNA Master converts S-parameters from frequency domain into distance (or time) domain on the horizontal display axis, using a mathematical computation called Inverse Fourier Transform. Connect a reflection at the opposite end of the cable and the discontinuities appear versus distance to reveal any potential maintenance issues. When access to both ends of the cable is convenient, a similar time domain analysis is available on transmission (S_{21}) measurements.

Distance Domain will improve your productivity with displays of the cable in terms of discontinuities versus distance. This readout can then be compared against previous measurements (from stored data) to determine whether any degradations have occurred since installation (or the last maintenance activity). More importantly, you will know precisely where to go to fix the problem and so minimize or prevent downtime of the system.

Wire Cable Bundle Diagnostics for Aircraft and Shipboard

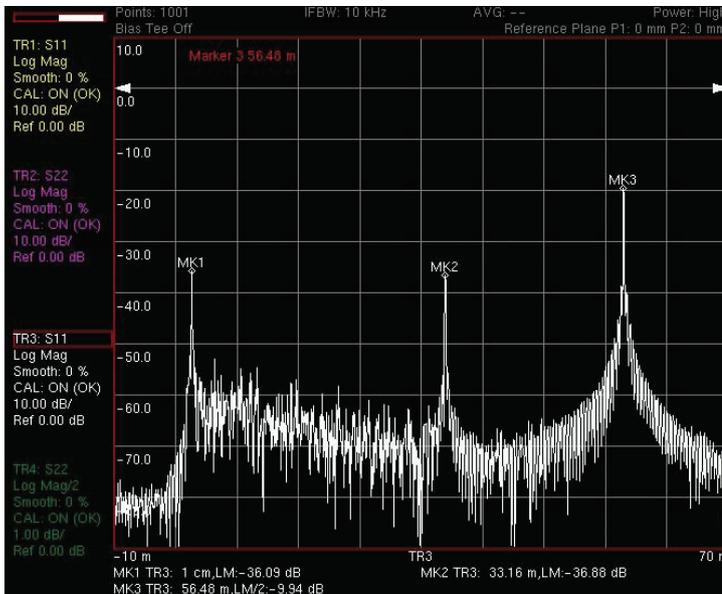
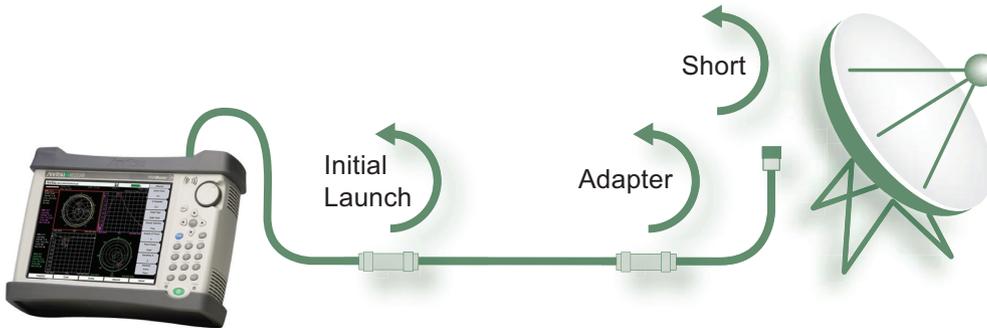
This innovative new Distance-to-Fault technique finds damaged aircraft wire bundles at bulkheads or other points of vulnerability. It uses the Time Domain option and Frequency Domain Reflectometry with special fixtures to launch highfrequency sweep signals into the wiring harnesses. Find out more by downloading Anritsu's Application Note 11410-00565, "Troubleshoot Wire Cable Assemblies with Frequency-Domain-Reflectometry."

Measurements

- DTF Return Loss
- DTF Insertion Loss

Setup Parameters

- Start Distance
- Stop Distance
- Start Frequency (FDR)
- Stop Frequency (FDR)
- Windowing: Rectangular, Nominal Side Lobe, Low Side Lobe, Minimum Side Lobe
- Propagation Velocity
- Cable Loss
- Units: meters or feet
- Distance Info display



This illustration shows a typical cable measurement scenario with an adapter between the near and far end of the cable. With a short on the far end, the VNA Master can convert frequency domain results into corresponding distance-domain readout. Moving left to right, we can see the initial launch (MK1), the intermediate adapter (MK2), and the short at the far end of the cable (MK3). It is easy to interpret the discontinuities as normal or faults by simply looking at the location and amplitude of the peaks. Since the short shows as -20 dB, this means that the one-way cable loss must be 10 dB.

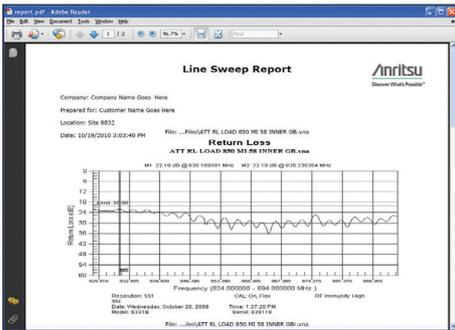
VNA Master MS202xB/3xB Features

Line Sweep Tools and Master Software Tools (for your PC)



Trace Validation

Marker and Limit Line presets allow quick checks of traces for limit violations.



Line Sweep Tools™

Line Sweep Tools increases productivity for people who deal with dozens of Cable and Antenna traces every day.

User Interface

Line Sweep Tools has a user interface that will be familiar to users of Anritsu's Hand Held Software Tools. This will lead to a short learning curve.

Marker and Limit Line Presets

Presets make applying markers and a limit line to similar traces, as well as validating traces, a quick task.

Renaming Grid

A renaming grid makes changing file names, trace titles, and trace subtitles from field values to those required for a report much quicker than manual typing and is less prone to error.

Report Generator

The report generator will generate a professional PDF of all open traces with additional information such as contractor logos and contact information.

Line Sweep Features

Presets

7 sets of 8 markers and 1 limit line
Next trace capability

File Types

Input: HHST DAT, VNA, and some MNA measurements.
Return Loss (VSWR), Cable Loss, DTF-RL, DTF-VSWR, PIM
Output: LS DAT, MNA, VNA, CSV, PNG, BMP, JPG, PDF

Report Generator

Logo, title, company name, customer name, location, date and time, filename, PDF, HTML, all open traces

Tools

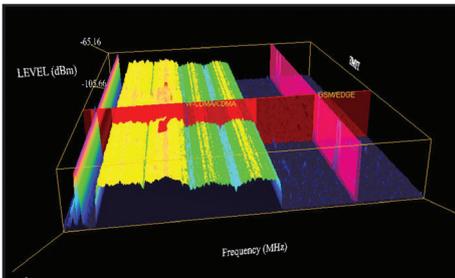
Cable Editor
Distance to Fault
Measurement calculator
Signal Standard Editor
Renaming Grid

Interfaces

Serial, Ethernet, USB

Capture Plots to

Screen, Database, DAT files, JPEG, Instrument



3D Spectrogram

For in-depth analysis with 3-axis rotation viewing, threshold, reference level, and marker control. Turn on Signal ID to see the types of signals.

Master Software Tools™

Master Software Tools (MST) is a powerful PC software post-processing tool designed to enhance the productivity of technicians dealing with spectrum analyzer traces.

Folder Spectrogram

Folder Spectrogram – creates a composite file of up to 15,000 multiple traces for quick review, also create:

- Peak Power, Total Power, and Peak Frequency plotted over time
- Histogram – filter data and plot number of occurrences over time
- Minimum, Maximum, and Average Power plotted over frequency
- Movie playback – playback data in the familiar frequency domain view
- 3D Spectrogram – for in-depth analysis with 3-axis rotation viewing control

Master Software Tools Features

Spectrum Analyzer Database Management

Full Trace Retrieval
Trace Catalog
Group Edit
Trace Editor

Data Analysis

Trace Math and Smoothing
Data Converter
Measurement Calculator

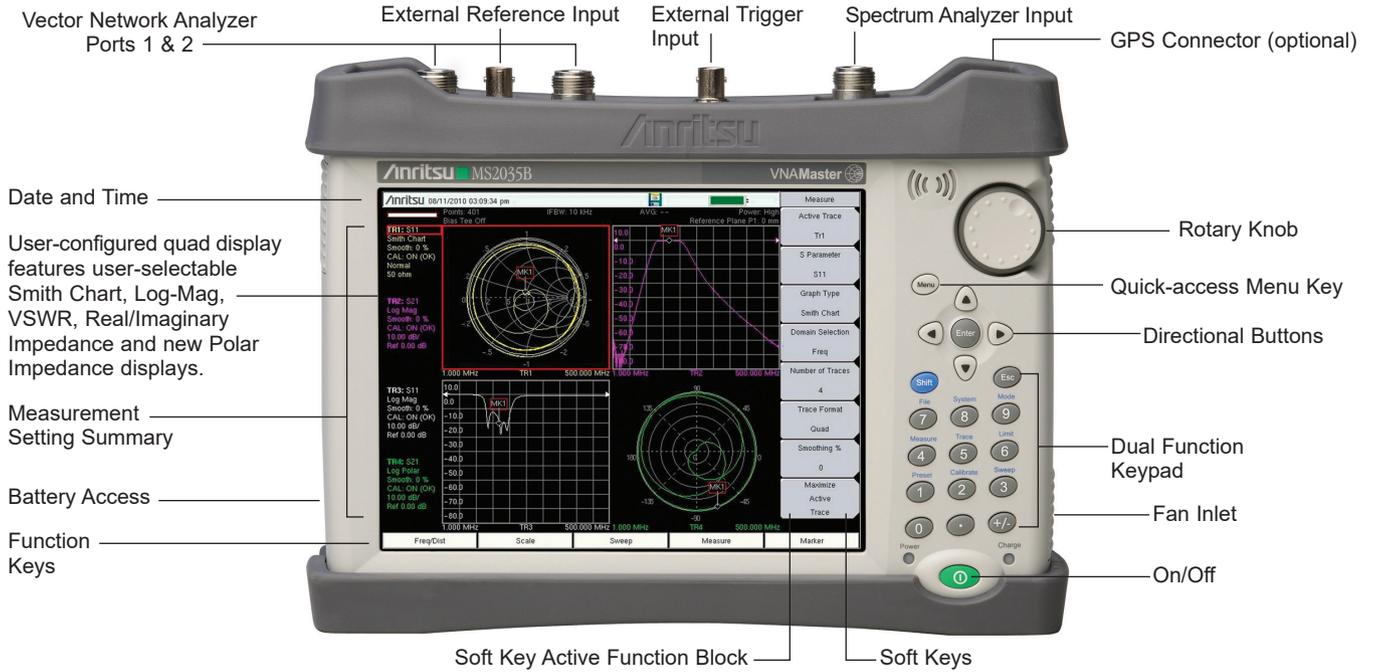
Folder Spectrogram

Folder Spectrogram – 2D View
Video Folder Spectrogram – 2D View
Folder Spectrogram – 3D View

List/Parameter Editors

Traces
Antennas, Cables, Signal Standards
Pass/Fail
Languages

VNA Master MS202xB/3xB Features

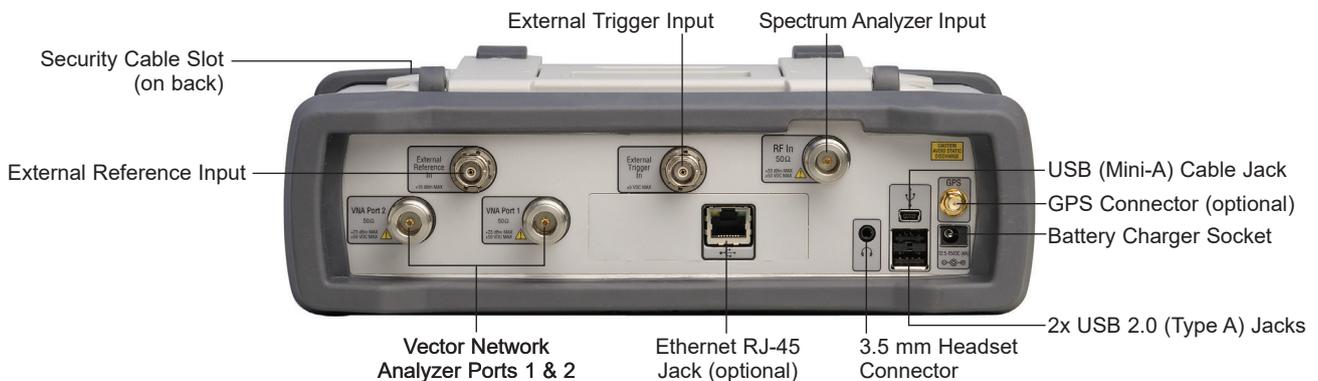


Size: 273 (W) x 199 (H) x 91 (D) mm (10.7 x 7.8 x 3.6 in.). Weight: 3.5 kg (7.6 lbs)

MS2024/25B VNA Master

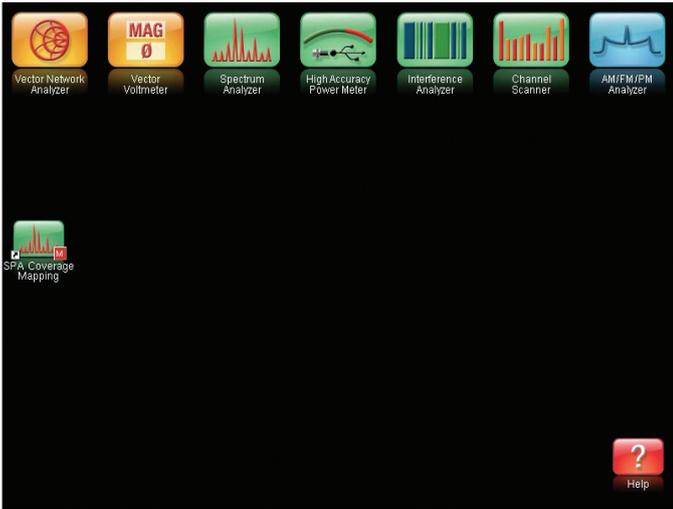


MS2034/35B VNA Master + Spectrum Analyzer



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

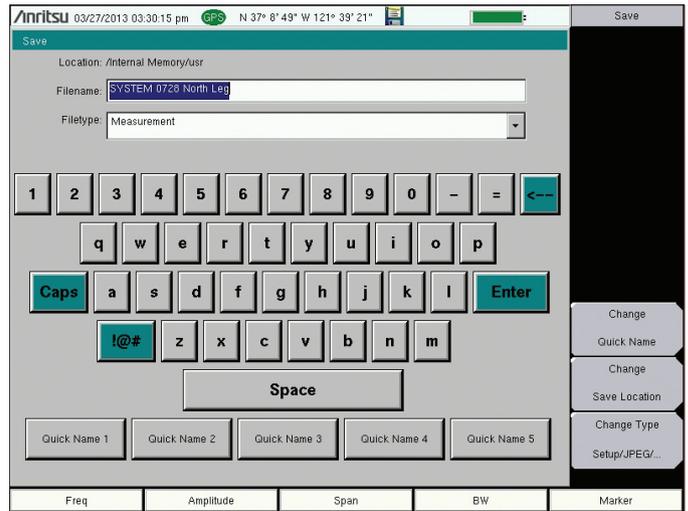
VNA Master MS202xB/3xB Features



TOUCHSCREEN MENU

The Menu Key activates the touchscreen menu for one button access to all of the Analyzers.

User defined shortcuts can be created for one-button access to commonly used functions.



TOUCHSCREEN KEYBOARD

A built-in touchscreen keyboard saves valuable time in the field when entering trace names.

For Cable and Antenna Analysis, a Quick Name Matrix can be customized for quickly naming your line sweeps.



TILT BAIL IS INTEGRATED INTO THE CASE FOR USER CONVENIENCE AND BETTER SCREEN VIEWING.

VNA Master MS202xB/3xB Ordering Information

Ordering Information – Options

MS2024B	MS2025B	MS2034B	MS2035B	
VNA Master™ 500 kHz to 4 GHz	VNA Master™ 500 kHz to 6 GHz	VNA Master™ 500 kHz to 4 GHz 9 kHz to 4 GHz	VNA Master™ 500 kHz to 6 GHz 9 kHz to 6 GHz	Vector Network Analyzer Spectrum Analyzer
Options				Description
MS2024B-0010	MS2025B-0010	MS2034B-0010	MS2035B-0010	Built-in Bias-Tee, +12 to +32 V variable
MS2024B-0015	MS2025B-0015	MS2034B-0015	MS2035B-0015	Vector Voltmeter
MS2024B-0019	MS2025B-0019	MS2034B-0019	MS2035B-0019	High-Accuracy Power Meter (requires external USB sensor, sold separately)
-	-	MS2034B-0025	MS2035B-0025	Interference Analysis, 9 kHz to 4 GHz ¹
-	-	MS2034B-0027	MS2035B-0027	Channel Scanner, 9 kHz to 4 GHz ¹
MS2024B-0031	MS2025B-0031	MS2034B-0031	MS2035B-0031	GPS Receiver ²
MS2024B-0098	MS2025B-0098	MS2034B-0098	MS2035B-0098	Z-540 Calibration
MS2024B-0099	MS2025B-0099	MS2034B-0099	MS2035B-0099	Premium Calibration
MS2024B-0411	MS2025B-0411	MS2034B-0411	MS2035B-0411	Ethernet Connectivity
-	-	MS2034B-0431	MS2035B-0431	Coverage Mapping ³
-	-	MS2034B-0509	MS2035B-0509	AM/FM/PM Demodulation Analyzer

Notes:

- 1) GPS Option 31 recommended.
- 2) Requires external GPS antenna (sold separately).
- 3) Requires GPS Option 31

Standard Accessories (Included with instrument)



Part Number	Description
2000-1654-R	Soft Carrying Case
2000-1691-R	Stylus with Coiled Tether
2000-1797-R	Screen Protector Film (x2, one factory installed, one spare)
633-75	Rechargeable Li-Ion Battery, 7500 mAh
40-187-R	AC-DC Adapter
806-141-R	Automotive Power Adapter, 12 VDC, 60 W
3-2000-1498	USB A/5-pin mini-B Cable, 10 ft/305 cm

Optional Accessories

Miscellaneous Accessories



Part Number	Description
MA2700A	Handheld Interference Hunter (For full specifications, refer to the MA2700A Technical Data Sheet 11410-00692)
2000-1371-R	Ethernet Cable, 2.1 m (7 ft)
3-806-152	Cat 5e Crossover Patch Cable, 2.1 m (7 ft)
633-75	Rechargeable Li-Ion Battery, 7500 mAh
2000-1374	External Dual Charger for Li-Ion Batteries
2000-1689	EMI Near Field Probe Kit
6864	Rack Mount Kit

VNA Master MS202xB/3xB Ordering Information

Optional Accessories (continued)

Backpack and Transit Case



Part Number	Description
67135	Anritsu Backpack (For Handheld Instrument and PC)
760-243-R	Transit Case with Wheels and Handle 56 cm x 45.5 cm x 26.5 cm (22.07" x 17.92" x 10.42")
760-261-R	Large Transit Case with Wheels and Handle 63.1 cm x 50 cm x 30 cm (24.83" x 19.69" x 11.88"), space for MA2700A, antennas, filters, instrument inside soft case, and other interference hunting accessories/tools
760-271-R	Transit Case for Portable Directional Antennas and Port Extender 52.4 cm x 42.8 cm x 20.6 cm (20.62" x 16.87" x 8.12") (for 2000-1777-R, 2000-1778-R, 2000-1779-R, 2000-1798-R)

GPS Antennas (active)



Part Number	Description
2000-1652-R	Magnet Mount, SMA(m), 3 VDC to 5 VDC with 1 ft cable
2000-1528-R	Magnet Mount, SMA(m), 3 VDC to 5 VDC with 4.6 m (15 ft) extension cable
2000-1760-R	Mini GPS Antenna, SMA(m), 25 dB gain, 2.5 VDC to 3.7 VDC

Power Sensors (For complete ordering information see the respective datasheets of each sensor)



Model Number	Description
MA24105A	Inline Peak Power Sensor, 350 MHz to 4 GHz, +3 dBm to +51.76 dBm
MA24106A	RF USB Power Sensor, 50 MHz to 6 GHz, +23 dBm
MA24108A	Microwave USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
MA24118A	Microwave USB Power Sensor, 10 MHz to 18 GHz, +20 dBm
MA24126A	Microwave USB Power Sensor, 10 MHz to 26 GHz, +20 dBm
MA24208A	Microwave Universal USB Power Sensor, 10 MHz to 8 GHz, +20 dBm
MA24218A	Microwave Universal USB Power Sensor, 10 MHz to 18 GHz, +20 dBm
MA24330A	Microwave CW USB Power Sensor, 10 MHz to 33 GHz, +20 dBm
MA24340A	Microwave CW USB Power Sensor, 10 MHz to 40 GHz, +20 dBm
MA24350A	Microwave CW USB Power Sensor, 10 MHz to 50 GHz, +20 dBm
MA25100A	RF Power Indicator

Full Temperature Coaxial Calibration Kits (-10 °C to +55 °C, K Type is compatible with 3.5 mm and SMA connectors see individual data sheets on www.anritsu.com)



Part Number	Description
OSLN50A-8	High Performance Type N(m), DC to 8 GHz, 50 Ω
OSLNF50A-8	High Performance Type N(f), DC to 8 GHz, 50 Ω
TOSLN50A-8	High Performance with Through, Type N(m), DC to 8 GHz, 50 Ω
TOSLNF50A-8	High Performance with Through Type N(f), DC to 8 GHz, 50 Ω
OSLN50A-18	High Performance Type N(m), DC to 18 GHz, 50 Ω
OSLNF50A-18	High Performance Type N(f), DC to 18 GHz, 50 Ω
TOSLN50A-18	High Performance with Through Type N(m), DC to 18 GHz, 50 Ω
TOSLNF50A-18	High Performance with Through Type N(f), DC to 18 GHz, 50 Ω
TOSLK50A-20	High Performance with Through Type K(m), DC to 20 GHz, 50 Ω
TOSLKF50A-20	High Performance with Through Type K(f), DC to 20 GHz, 50 Ω
TOSLK50A-40	High Performance with Through Type K(m), DC to 40 GHz, 50 Ω
TOSLKF50A-40	High Performance with Through Type K(f), DC to 40 GHz, 50 Ω

Coaxial Calibration Components, N Type 50 Ω, K Type 50 Ω (K Type is compatible with 3.5 mm and SMA connectors)



Part Number	Description
22N50	Precision Open/Short, N(m), DC to 18 GHz, 50 Ω
22NF50	Precision Open/Short, N(f), DC to 18 GHz, 50 Ω
28N50-2	Precision Load, N(m), DC to 18 GHz, 50 Ω
28NF50-2	Precision Load, N(f), DC to 18 GHz, 50 Ω
22K50	Precision Open/Short, K(m), DC to 40 GHz, 50 Ω
22KF50	Precision Open/Short, K(f), DC to 40 GHz, 50 Ω
28K50	Precision Load, K(m), DC to 40 GHz, 50 Ω
28KF50	Precision Load, K(f), DC to 40 GHz, 50 Ω

VNA Master MS202xB/3xB Ordering Information

Optional Accessories (continued)

Phase-Stable Test Port Cables, Armored



Part Number	Description
15N43M50-1.5C	Test Port Extension Cable, Armored, 1.5 meters, DC to 6GHz, N(m) to 4.3-10(m)
15N43F50-1.5C	Test Port Extension Cable, Armored, 1.5 meter, DC to 6GHz, N(m) to 4.3-10(f)
15N43M50-3.0C	Test Port Extension Cable, Armored, 3 meters, DC to 6 GHz, N(m) to 4.3-10(m)
15N43F50-3.0C	Test Port Extension Cable, Armored, 3 meters, DC to 6 GHz, N(m) to 4.3-10(f)
15NF43M50-1.5C	Test Port Extension Cable, Armored, 1.5 meters, DC to 6 GHz, N(f) to 4.3-10(m)
15NF43F50-1.5C	Test Port Extension Cable, Armored, 1.5 meters, DC to 6 GHz, N(f) to 4.3-10(f)
15NF43M50-3.0C	Test Port Extension Cable, Armored, 3 meters, DC to 6 GHz, N(f) to 4.3-10(m)
15NF43F50-3.0C	Test Port Extension Cable, Armored, 3 meters, DC to 6 GHz, N(f) to 4.3-10(f)
15NNF50-1.5C	1.5 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15NN50-1.5C	1.5 m, DC to 6 GHz, N(m) to N(m), 50 Ω
15NDF50-1.5C	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 Ω
15ND50-1.5C	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 Ω
15NNF50-3.0C	3.0 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15NN50-3.0C	3.0 m, DC to 6 GHz, N(m) to N(m), 50 Ω

Directional Antennas



Part Number	Description
2000-1777-R	Portable Directional Antenna, 9 kHz to 20 MHz, N(f)
2000-1778-R	Portable Directional Antenna, 20 MHz to 200 MHz, N(f)
2000-1779-R	Portable Directional Antenna, 200 MHz to 500 MHz, N(f)
2000-1812-R	Portable Yagi Antenna, 450 MHz to 512 MHz, N(f), 7.1 dBi
2000-1659-R	698 MHz to 787 MHz, N(f), 10.1 dBi, Yagi
2000-1411-R	824 MHz to 896 MHz, N(f), 12.3 dBi, Yagi
2000-1412-R	885 MHz to 975 MHz, N(f), 12.3 dBi, Yagi
2000-1660-R	1425 MHz to 1535 MHz, N(f), 14.3 dBi, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N(f), 12.3 dBi, Yagi
2000-1414-R	1850 MHz to 1990 MHz, N(f), 11.4 dBi, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N(f), 14.3 dBi, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N(f), 14.1 dBi, Yagi
2000-1726-R	Antenna, 2500 MHz to 2700 MHz, N(f), 14.1 dBi, Yagi
2000-1715-R	Directional Antenna, 698 MHz to 2500 MHz, N(f), gain of 2 dBi to 10 dBi, typical
2000-1747-R	Antenna, Log Periodic, 300 MHz to 7000 MHz, N(f), 5.1 dBi, typical
2000-1748-R	Antenna, Log Periodic, 1 GHz to 18 GHz, N(f), 6 dBi, typical
2000-1812-R	Portable Yagi Antenna, 450 MHz to 512 MHz, N(f), 7.1 dBi
2000-1825-R	Portable Yagi Antenna, 380 MHz to 430 MHz, N(f), 7.1 dBi

Portable Antennas



Part Number	Description
2000-1200-R	806 MHz to 866 MHz, SMA(m), 50 Ω
2000-1473-R	870 MHz to 960 MHz, SMA(m), 50 Ω
2000-1035-R	896 MHz to 941 MHz, SMA (m), 50 Ω (1/4 wave)
2000-1030-R	1710 MHz to 1880 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1474-R	1710 MHz to 1880 MHz with knuckle elbow (1/2 wave)
2000-1031-R	1850 MHz to 1990 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1475-R	1920 MHz to 1980 MHz and 2110 MHz to 2170 MHz, SMA(m), 50 Ω
2000-1032-R	2400 MHz to 2500 MHz, SMA(m), 50 Ω (1/2 wave)
2000-1361-R	2400 MHz to 2500 MHz, 5000 MHz to 6000 MHz, SMA(m), 50 Ω
2000-1636-R	Antenna Kit (Consists of: 2000-1030-R, 2000-1031-R, 2000-1032-R, 2000-1200-R, 2000-1035-R, 2000-1361-R, and carrying pouch)
2000-1751-R	698 MHz to 960 MHz, 1710 MHz to 2100 MHz, 2500 MHz to 2700 MHz, SMA(m), 2 dB typical, 50 Ω
2000-1487-R	VHF/UHF, Telescopic Whip antenna, straight or 90°, BNC(m), 50 Ω

Precision Adapters



Part Number	Description
34NN50A	Precision Adapter, N(m) to N(m), DC to 18 GHz, 50 Ω
34NFF50	Precision Adapter, N(f) to N(f), DC to 18 GHz, 50 Ω
34NK50	Precision Adapter, DC to 18 GHz, N(m) to K(m), 50 Ω
34NFKF50	Precision Adapter, DC to 18 GHz, N(m) to K(f), 50 Ω
K220B	Precision Adapter, DC to 40 GHz, K(m) to K(m), 50 Ω
K222B	Precision Adapter, DC to 40 GHz, K(f) to K(f), 50 Ω
K224B	Precision Adapter, DC to 40 GHz, K(m) to K(f), 50 Ω

VNA Master MS202xB/3xB Ordering Information

Optional Accessories (continued)

Miscellaneous Adapters



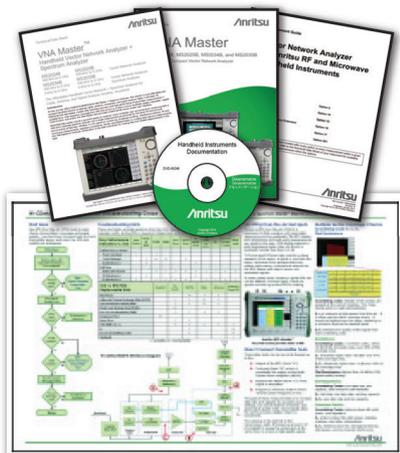
Part Number	Description
1091-26-R	SMA(m) to N(m), DC to 18 GHz, 50 Ω
1091-27-R	SMA(f) to N(m), DC to 18 GHz, 50 Ω
1091-80-R	SMA(m) to N(f), DC to 18 GHz, 50 Ω
1091-81-R	SMA(f) to N(f), DC to 18 GHz, 50 Ω
1091-172-R	BNC(f) to N(m), DC to 1.3 GHz, 50 Ω
510-90-R	7/16 DIN(f) to N(m), DC to 7.5 GHz, 50 Ω
510-91-R	7/16 DIN(f) to N(f), DC to 7.5 GHz, 50 Ω
510-92-R	7/16 DIN(m) to N(m), DC to 7.5 GHz, 50 Ω
510-93-R	7/16 DIN(m) to N(f), DC to 7.5 GHz, 50 Ω
510-96-R	7/16 DIN(m) to 7/16 DIN (m), DC to 7.5 GHz, 50 Ω
510-97-R	7/16 DIN(f) to 7/16 DIN (f), DC to 7.5 GHz, 50 Ω
513-62	Adapter, DC to 18 GHz, TNC(f) to N(f), 50 Ω
1091-315	Adapter, DC to 18 GHz, TNC(m) to N(f), 50 Ω
1091-324	Adapter, DC to 18 GHz, TNC(f) to N(m), 50 Ω
1091-325	Adapter, DC to 18 GHz, TNC(m) to N(m), 50 Ω
1091-317	Adapter, DC to 18 GHz, TNC(m) to SMA(f), 50 Ω
1091-318	Adapter, DC to 18 GHz, TNC(m) to SMA(m), 50 Ω
1091-323	Adapter, DC to 18 GHz, TNC(m) to TNC(f), 50 Ω
1091-326	Adapter, DC to 18 GHz, TNC(m) to TNC(m), 50 Ω
1091-465-R	Adapter, DC to 6 GHz, 4.3-10(f) to N(f), 50 Ω
1091-467-R	Adapter, DC to 6 GHz, 4.3-10(m) to N(f), 50 Ω
510-102-R	N(m) to N(m), DC to 11 GHz, 50 Ω, 90 degrees right angle
34NFN50	Ruggedized K(m) to N(f), DC to 18 GHz, 50 Ω

Attenuators N Type (up to 18 GHz)



Part Number	Description
3-1010-122	20 dB, 5 W, DC to 12.4 GHz, N(m) to N(f)
42N50-20	20 dB, 5 W, DC to 18 GHz, N(m) to N(f)
42N50A-30	30 dB, 50 W, DC to 18 GHz, N(m) to N(f)
3-1010-123	30 dB, 50 W, DC to 8.5 GHz, N(m) to N(f)
1010-127-R	30 dB, 150 W, DC to 3 GHz, N(m) to N(f)
3-1010-124	40 dB, 100 W, DC to 8.5 GHz, N(f) to N(m), Uni-directional
1010-121-R	40 dB, 100 W, DC to 18 GHz, N(f) to N(m), Uni-directional
1010-128-R	40 dB, 150 W, DC to 3 GHz, N(m) to N(f)

Related Literature, Application Notes, Manuals



Part Number	Description
10580-00244	Spectrum Analyzer Measurement Guide
10580-00240	Power Meter Measurement Guide
10580-00289	VNA Measurement Guide
10580-00301	VNA Master User Guide
10580-00302	VNA Master Programming Manual
10580-00303	VNA Master Maintenance Manual
11410-00206	Time Domain for Vector Network Analyzers
11410-00214	Reflectometer Measurements – Revisited
11410-00270	What is Your Measurement Accuracy?
11410-00373	Distance-to-Fault
11410-00387	Primer on Vector Network Analysis
11410-00424	USB Power Sensor MA24106A
11410-00504	Microwave USB Power Sensor MA241x8A
11410-00531	Practical Tips on Making “Vector Voltmeter (VVM)” Phase Measurements using VNA Master (Option 15)
11410-00545	VNA Master + Spectrum Analyzer Brochure
11410-00549	VNA Master + Spectrum Analyzer Technical Data Sheet
11410-00472	Measuring Interference
11410-00476	Essentials of Vector Network Analysis
11410-00565	Troubleshoot Wire Cable Assemblies with Frequency-Domain Reflectometry
11410-00700	Evaluation of RF Network Testing
11410-00601	Effectively Testing 700 MHz Public Safety LTE Broadband and P25 Narrowband Networks
11410-00608	Finding Radio Frequency Interferers
11410-00818	High Q Notch Filter Measurements

VNA Master MS202xB/3xB Ordering Information

Optional Accessories (continued)

Bandpass Filters



Part Number	Description
1030-114-R	806 MHz to 869 MHz, N(m) to SMA(f), 50 Ω
1030-109-R	824 MHz to 849 MHz, N(m) to SMA (f), 50 Ω
1030-110-R	880 MHz to 915 MHz, N(m) to SMA (f), 50 Ω
1030-105-R	890 MHz to 915 MHz, N(m) to N(f), 50 Ω
1030-111-R	1850 MHz to 1910 MHz, N(m) to SMA (f), 50 Ω
1030-106-R	1710 MHz to 1790 MHz, N(m) to N(f), 50 Ω
1030-112-R	2400 MHz to 2484 MHz, N(m) to SMA (f), 50 Ω
1030-107-R	1910 MHz to 1990 MHz, N(m) to N(f), 50 Ω
1030-149-R	High Pass, 150 MHz, N(m) to N(f), 50 Ω
1030-150-R	High Pass, 400 MHz, N(m) to N(f), 50 Ω
1030-151-R	High Pass, 700 MHz, N(m) to N(f), 50 Ω
1030-152-R	Low Pass, 200 MHz, N(m) to N(f), 50 Ω
1030-153-R	Low Pass, 550 MHz, N(m) to N(f), 50 Ω
1030-155-R	2500 MHz to 2700 MHz, N(m) to N(f), 50 Ω
1030-178-R	1920 MHz to 1980 MHz, N(m) to N(f), 50 Ω
1030-179-R	777 MHz to 798 MHz, N(m) to N(f), 50 Ω
1030-180-R	2500 MHz to 2570 MHz, N(m) to N(f), 50 Ω
2000-1684-R	791 MHz to 821 MHz, N(m) to N(f), 50 Ω
2000-1734-R	Bandpass Filter, 699 MHz to 715 MHz, N(m) and N(f), 50 Ω
2000-1735-R	Bandpass Filter, 776 MHz to 788 MHz, N(m) and N(f), 50 Ω
2000-1736-R	Bandpass Filter, 815 MHz to 850 MHz, N(m) and N(f), 50 Ω
2000-1737-R	Bandpass Filter, 1711 MHz to 1756 MHz, N(m) and N(f), 50 Ω
2000-1738-R	Bandpass Filter, 1850 MHz to 1910 MHz, N(m) and N(f), 50 Ω
2000-1739-R	Bandpass Filter, 880 MHz to 915 MHz, N(m) and N(f), 50 Ω
2000-1740-R	Bandpass Filter, 1710 MHz to 1785 MHz, N(m) and N(f), 50 Ω
2000-1741-R	Bandpass Filter, 1920 MHz to 1980 MHz, N(m) and N(f), 50 Ω
2000-1742-R	Bandpass Filter, 832 MHz to 862 MHz, N(m) and N(f), 50 Ω
2000-1743-R	Bandpass Filter, 2500 MHz to 2570 MHz, N(m) and N(f), 50 Ω
2000-1799-R	Bandpass Filter, 2305 MHz to 2320 MHz, N(m) and N(f), 50 Ω

Mag Mount and Broadband Antennas



Part Number	Description
2000-1616-R	20 MHz to 21000 MHz, N(f), 50 Ω
2000-1645-R	694 MHz to 894 MHz, 3 dBi peak gain 1700 MHz to 2700 MHz, 3 dBi peak gain, N(m), 50 Ω, 10 ft
2000-1646-R	750 MHz to 1250 MHz, 3 dBi peak gain, 1650 MHz to 2000 MHz, 5 dBi peak gain, 2100 MHz to 2700 MHz, 5 dBi peak gain, N(m), 50 Ω, 10 ft
2000-1647-R	Cable 1: 698 MHz to 1200 MHz, 2 dBi peak gain, 1700 MHz to 2700 MHz, 5 dBi peak gain, N(m), 50 Ω, 10 ft Cable 2: 3000 MHz to 6000 MHz, 5 dBi peak gain, N(m), 50 Ω, 10 ft Cable 3: GPS 26 dB gain, SMA(m), 50 Ω, 10 ft
2000-1648-R	1700 MHz to 6000 MHz, 3 dBi peak gain, N(m), 50 Ω, 10 ft

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



Part Number	Description
14KFKF50-0.6	0.6 m (24 in), DC to 40 GHz, K(f) to K(f), 50 Ω
14KFKF50-1.0	1.0 m (39 in), DC to 40 GHz, K(f) to K(f), 50 Ω
14KFK50-0.6	0.6 m (24 in), DC to 40 GHz, K(f) to K(m), 50 Ω
14KFK50-1.0	1.0 m (39 in), DC to 40 GHz, K(f) to K(m), 50 Ω
15N50-1.0B	1.0 m (39 in), DC to 18 GHz, N(m) to N(m), 50 Ω
15N50-1.0B	1.0 m (39 in), DC to 18 GHz, N(m) to N(f), 50 Ω
15LL50-1.0A	1.0 m (39 in), DC to 20 GHz, 3.5 mm(m) to 3.5 mm(m), 50 Ω
15LLF50-1.0A	1.0 m (39 in), DC to 20 GHz, 3.5 mm(m) to 3.5 mm(f), 50 Ω
15KK50-1.0A	1.0 m (39 in), DC to 26.5 GHz, K(m) to K(m), 50 Ω
15KKF50-1.0A	1.0 m (39 in), DC to 26.5 GHz, K(m) to K(f), 50 Ω

Phase-Stable 18 GHz and 40 GHz Semi-Rigid Cables (Armored)



Part Number	Description
3670K50-1	0.6 m (24 in), DC to 40 GHz, K(f) to K(f), 50 Ω
3670K50-2	1.0 m (39 in), DC to 40 GHz, K(f) to K(f), 50 Ω
3670N50-1	0.3 m (12 in), DC to 18 GHz, N(f) to N(m), 50 Ω
3670NN50-1	0.3 m (12 in), DC to 18 GHz, N(m) to N(m), 50 Ω
3670N50-2	0.6 m (24 in), DC to 18 GHz, N(f) to N(m), 50 Ω
3670NN50-2	0.6 m (24 in), DC to 18 GHz, N(m) to N(m), 50 Ω

VNA Master MS202xB/3xB Ordering Information

Optional Accessories (continued)

Attenuators K Type (up to 40 GHz)



Part Number	Description
41KB-3	Precision Fixed Attenuator, K(m) to K(f), 3 dB, DC to 26.5 GHz, 50 Ω
41KB-6	Precision Fixed Attenuator, K(m) to K(f), 6 dB, DC to 26.5 GHz, 50 Ω
41KB-10	Precision Fixed Attenuator, K(m) to K(f), 10 dB, DC to 26.5 GHz, 50 Ω
41KB-20	Precision Fixed Attenuator, K(m) to K(f), 20 dB, DC to 26.5 GHz, 50 Ω
41KC-3	Precision Fixed Attenuator, K(m) to K(f), 3 dB, DC to 40 GHz, 50 Ω
41KC-6	Precision Fixed Attenuator, K(m) to K(f), 6 dB, DC to 40 GHz, 50 Ω
41KC-10	Precision Fixed Attenuator, K(m) to K(f), 10 dB, DC to 40 GHz, 50 Ω
41KC-20	Precision Fixed Attenuator, K(m) to K(f), 20 dB, DC to 40 GHz, 50 Ω

Notes

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