

# 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

100 kHz to 4 GHz

100 kHz to 6 GHz + Spectrum Analyzer

## Handheld Vector Network Analyzer + 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 ultra-low noise floor. Based on Anritsu's 9th generation handheld platform, the VNA Master offers unmatched measurement breadth, depth, and precision; reducing the number of different tools needed to analyze modern communication systems in the field, on a tower, on a flightline, or in a vehicle.

Standard features are:

- 2-Port Vector Network Analyzer: 500 kHz to 4 GHz or 6 GHz
- Spectrum Analyzer: 100 kHz to 4 GHz or 6 GHz
- Fast 850  $\mu$ 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
- -152 DANL in 10 Hz RBW 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
- High Voltage Bias Tee (for both VNA and Spectrum Analyzer applications)
- High Accuracy Power Meter (when combined with external USB power sensor)
- AM/FM/PM Modulation Analyzer
- Interference Analyzer
- Channel Scanner
- RSSI/SINAD Coverage Mapping
- GPS Receiver
- Optical Distance-to-Fault for single-mode fiber (when combined with Anritsu ODTF-1 module)

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.

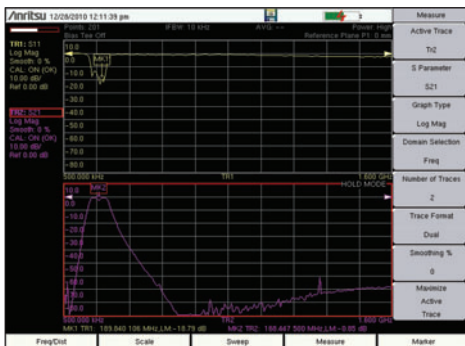


VNA Master MS202xB/3xB

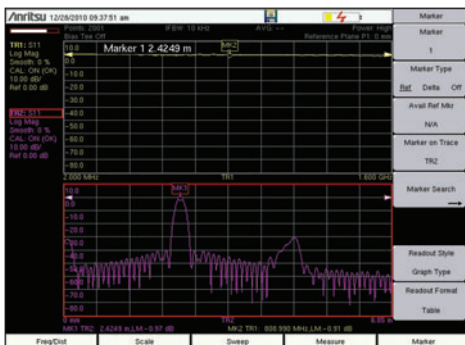
# VNA Master MS202xB/3xB Features



## 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.



The VNA Mode in the VNA Master with Option 501 Domain Domain allows simultaneous viewing of cable return loss and distance to fault.

### 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

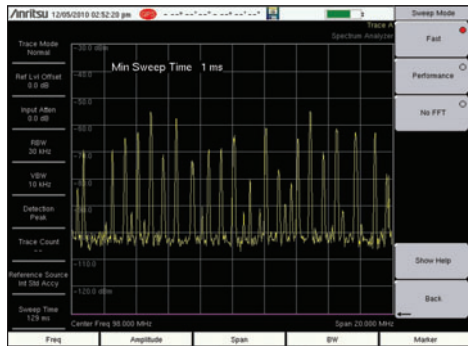
### Limit Line Functions

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

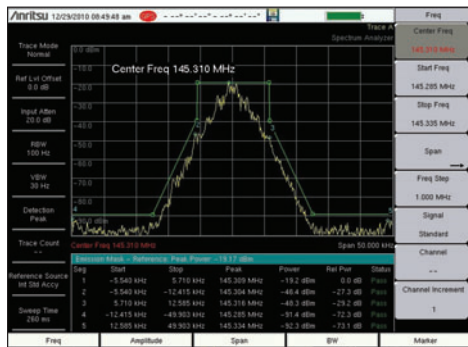
# VNA Master MS202xB/3xB Features



## Spectrum Analyzer



The spectrum analyzer mode in the VNA Master MS203xB offers ultra 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 rouge 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

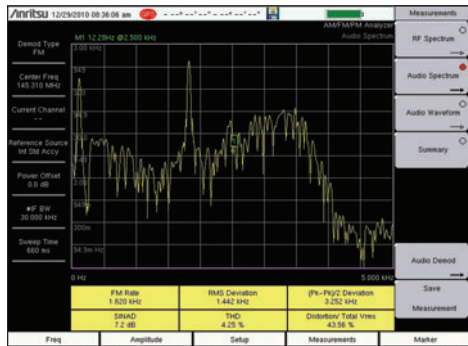
### Limit Line Functions

- 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

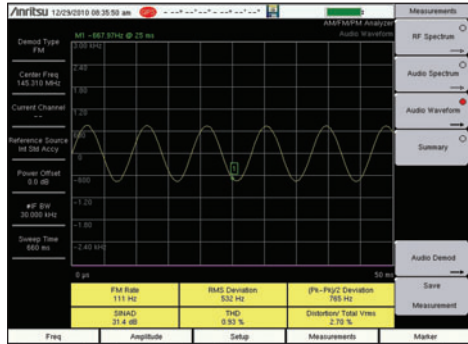
# VNA Master MS202xB/3xB Features



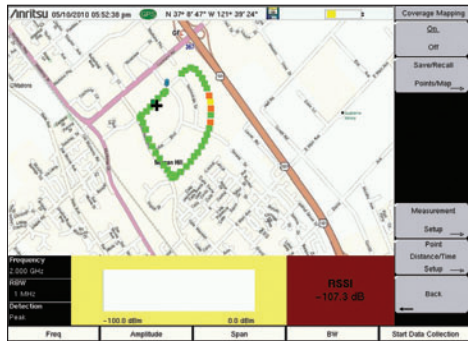
## Spectrum Analyzer



The AM/FM/PM Option 509 displays the demodulated audio spectrum vs. frequency with AM (%), Deviation (kHz) or Deviation (rad) for AM/FM/PM, respectively.



The AM/FM/PM Option 509 can also display the demodulated audio spectrum vs. time with AM (%), Deviation (kHz), or Deviation (rad) for AM/FM/PM, respectively.



The Coverage Mapping Option 431 provides measurement RSSI or SINAD of a single channel along with a user downloaded map and GPS location.

### AM/FM/PM Modulation Measurements

Option 509 AM/FM/PM Modulation Analyzer provides analysis and graphical display of common analog modulations. The RF Spectrum View displays the RF spectrum with carrier power (power in dB vs. frequency) along with center frequency, and occupied BW. Audio Spectrum shows the demodulated audio spectrum along with the audio rate, RMS deviation, Pk-Pk deviation (FM/PM) or depth (AM), SINAD, Total Harmonic Distortion (THD), and Total Distortion. Each demodulation also includes an Audio Waveform display that shows the time-domain demodulated waveform. A summary table shows a tabular list of all the RF and Demod measurement results.

### RSSI Coverage Measurements

Coverage Mapping Option 431 provides on screen map displays of RSSI and ACPR. Users can convert existing map images to a format compatible with the VNA Master using the included Map Master PC software. RSSI and SINAD measurements can then be superimposed on the maps. Maps with GPS coordinates can take advantage of the optional GPS receiver to place measurements appropriately. For indoor measurements, without GPS, the user just touches the VNA Master display to place measurements at the proper location. The maps with measurements can be exported through the built-in USB port to as JPEG or Google Earth™ KML files.

### Measurements

- One Button Measurements
  - Field Strength – in dBm/m<sup>2</sup> or dBmV/m
  - Occupied Bandwidth - 1% to 99% of power
  - Channel Power - in specified bandwidth
  - ACPR - adjacent channel power ratio
  - AM/FM/SSB Demodulation - audio out 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

# VNA Master MS202xB/3xB Features



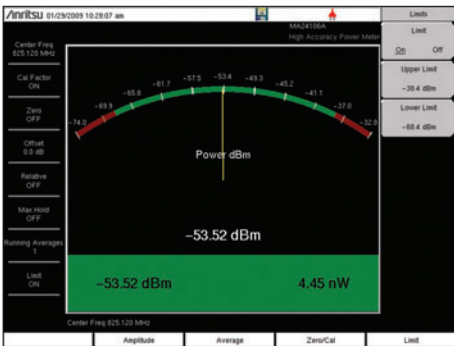
## Power Meter

## High Accuracy Power Meter (Option 19)



### Power Meter Built-in

Power is displayed in an analog type display and, supports both watts and dBm. RMS averaging can be set to low, medium, or high.



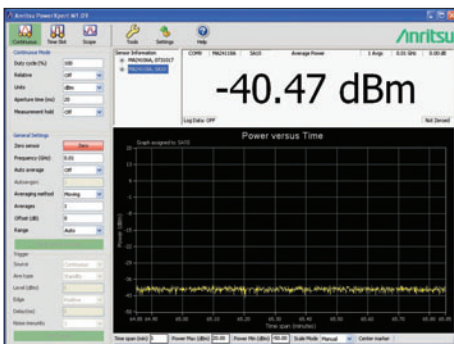
### High Accuracy Power Meter

Requires external power sensor with convenient connection via a USB A/mini-B cable. Use upper/lower limit activation during pass/fail measurements.



### USB Power Sensor

Anritsu offers a family of Power Sensors for your power measurement requirements. They are compact enough to fit in your shirt pocket.



### PC Power Meter

These power sensors can be used with a PC running Microsoft Windows® via USB. A front panel display makes the PC appear like a traditional power meter.

## Power Meters

The VNA Master offers a standard built-in Power Meter utilizing the Spectrum Analyzer and an optional High Accuracy Power Meter when used with optional external power sensors.

Properly setting the transmitter output power of a base station is critical to the overall operation of a wireless network. A 1.5 dB change in power levels indicates a 15% change in coverage area.

Too much power means overlapping coverage that translates into cell-to-cell self interference. Too little power, or too little coverage, creates island cells with non-overlapping cell sites and reduced in-building coverage. High or low values will cause dead zones/dropped calls, lower data rates/reduced capacity near cell edges, and cell loading imbalances/blocked calls.

### High Accuracy Power Meter (Option 19)

To address the most accurate power measurement requirements, select the high accuracy measurement option and a choice of sensors with:

- Frequency ranges: 10 MHz to 18 GHz
- Power ranges: -40 dBm to +51.76 dBm
- Measurement uncertainties:  $\leq \pm 0.18$  dB

These sensors enable users to make accurate measurements for CW and digitally modulated signals for VNA and cellular wireless networks.

The power sensor easily connects to the VNA Master via a USB A/Mini-B cable. 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 VNA Master's USB host port.

### PC Power Meter

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

### Remote Power Monitoring via LAN

A USB-to-LAN hub converter enables remote power monitoring via the Internet, if desired.

## Power Sensors

### PSN50

- High Accuracy RF Power Sensor
  - 50 MHz to 6 GHz
  - Type N(m), 50 Ω
  - -30 to +20 dBm
  - (.001 to 100 mW)
  - 100 Hz
  - True-RMS

### MA24104A

- Inline High Power Sensor
  - 600 MHz to 4 GHz
  - +3 to +51.76 dBm
  - (2 mW to 150 W)
  - True-RMS

### MA24106A

- High Accuracy RF Power Sensor
  - 50 MHz to 6 GHz
  - -40 to +23 dBm
  - (0.1 μW to 200 mW)
  - True-RMS

### MA24108A

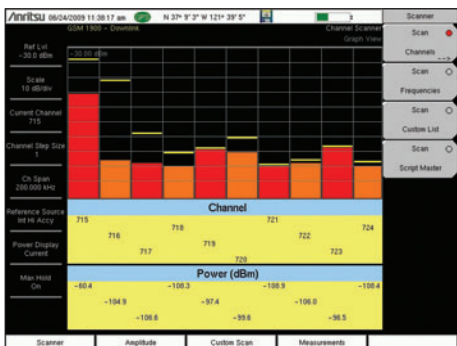
- Microwave USB Power Sensor
  - 10 MHz to 8 GHz
  - -40 to +20 dBm
  - (0.1 μW to 100 mW)
  - True-RMS
  - Slot Power
  - Burst Average Power

### MA24118A

- Microwave USB Power Sensor
  - 10 MHz to 18 GHz,
  - -40 to +20 dBm
  - (0.1 μW to 100 mW)
  - True-RMS
  - Slot Power
  - Burst Average Power

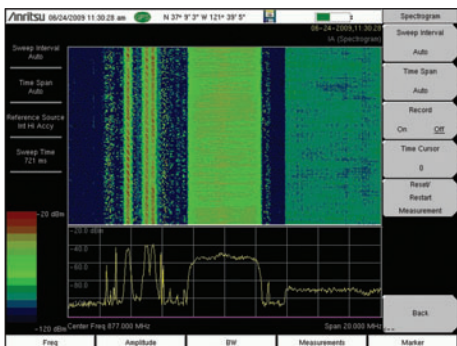
### MA24126A

- Microwave USB Power Sensor
  - 10 MHz to 26 GHz
  - -40 to +20 dBm
  - (0.1 μW to 100 mW)
  - True-RMS
  - Slot Power
  - Burst Average Power



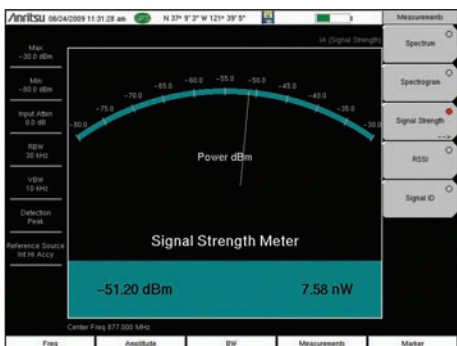
### Channel Scanner

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.



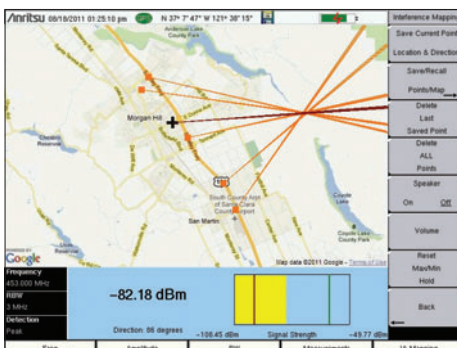
### Spectrogram

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
- Self 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/m<sup>2</sup> 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 (Option 501)

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 (S21) measurements.

Option 501 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

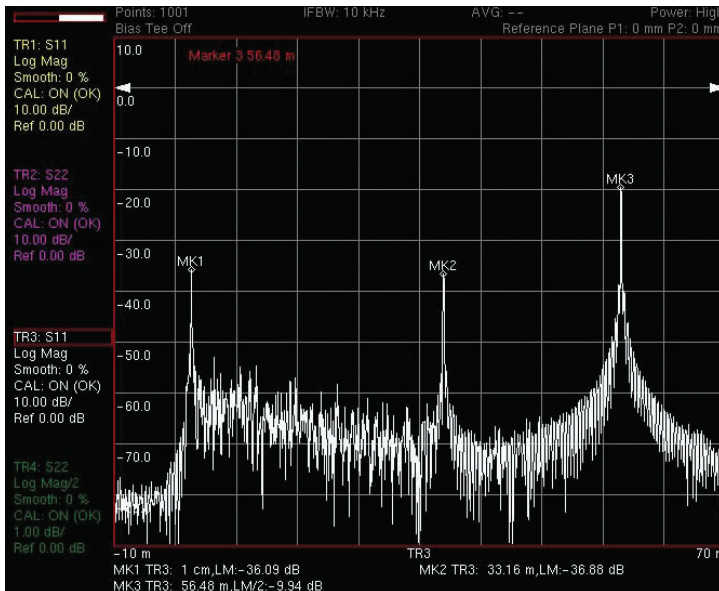
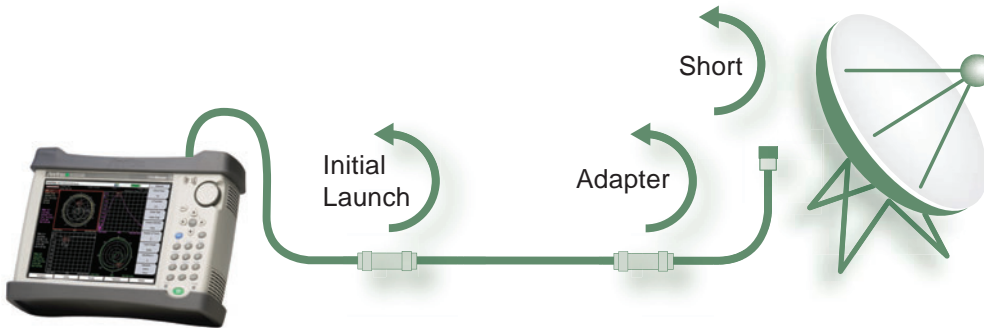
This innovative new Distance-to-Fault technique finds damaged aircraft wire bundles at bulkheads or other points of vulnerability. It uses the Time Domain option and Frequency Domain Reflectometry with special fixtures to launch highfrequency sweep signals into the wiring harnesses. Find out more by 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

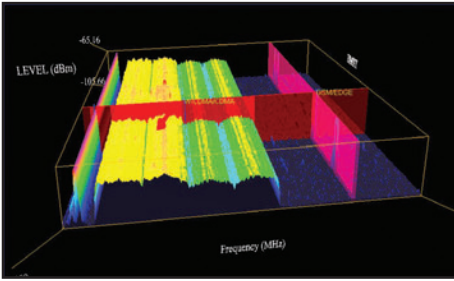


This illustration shows a typical cable measurement scenario with an adapter between the near and far end of the cable. With a short on the far end, the VNA Master can convert frequency domain results into corresponding distance-domain readout. Moving left to right, we can see the initial launch (MK1), 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

## Master Software Tools (for your PC)



### 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 in report generation, data analysis, and testing automation.

### Folder Spectrogram

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

- 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

### Script Master™

Script Master is an automation tool that allows the user to embed the operator's test procedure inside the VNA Master. This feature is available for Channel Scanner applications.

Using Channel Scanner Script Master, the user can create a list of up to 1200 channels and let the VNA Master sequence through the channels 20 at a time and automatically make measurements.

### Mapping (GPS Required)

- Spectrum Analyzer Mode

### Folder Spectrogram

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

### List/Parameter Editors

- Traces
- Antennas, Cables, Signal Standards
- Product Updates
- Firmware Upload
- Pass/Fail
- Languages
- Display

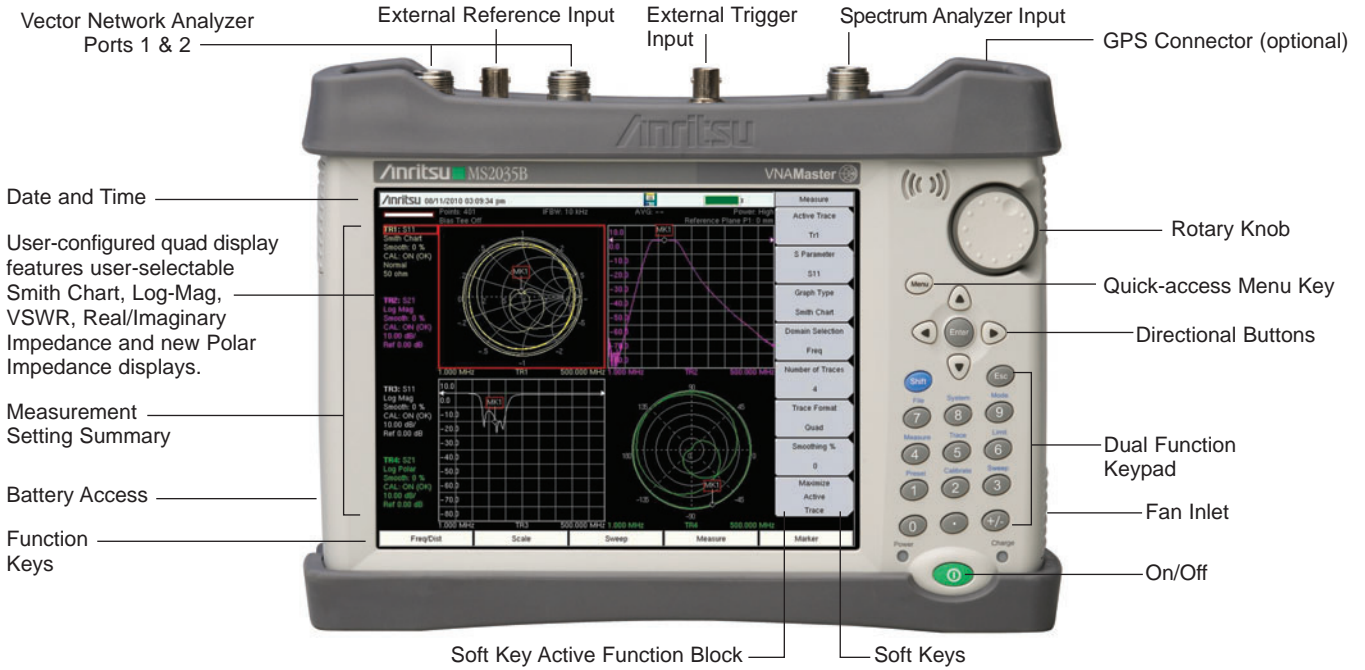
### Script Master™

- Channel Scanner Mode

### Connectivity

- Connect PC using USB
- Download measurements and live traces
- Firmware Updates

# VNA Master MS202xB/3xB Features

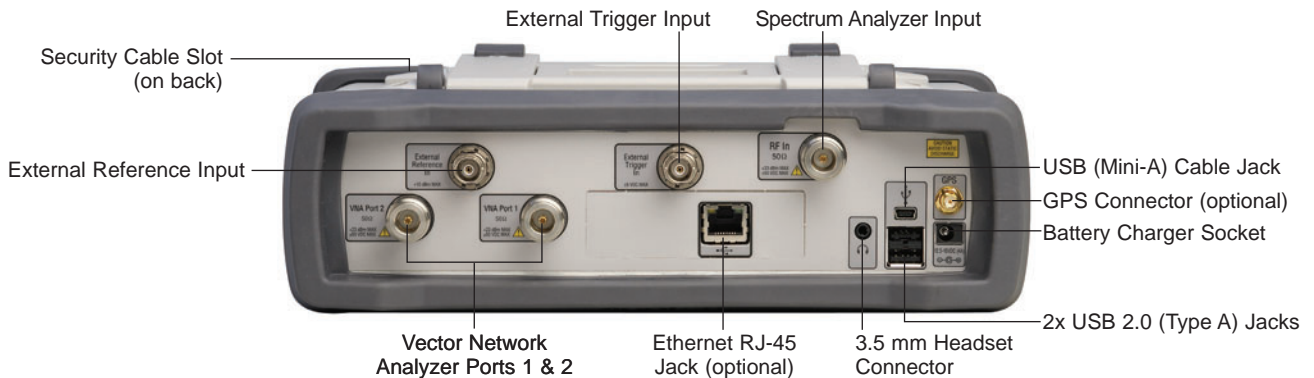


Size: 273 (W) x 199 (H) x 91 (D) mm (10.7 x 7.8 x 3.6 in.). Weight: 3.5 kg (7.6 lbs)

## MS2024/25B VNA Master

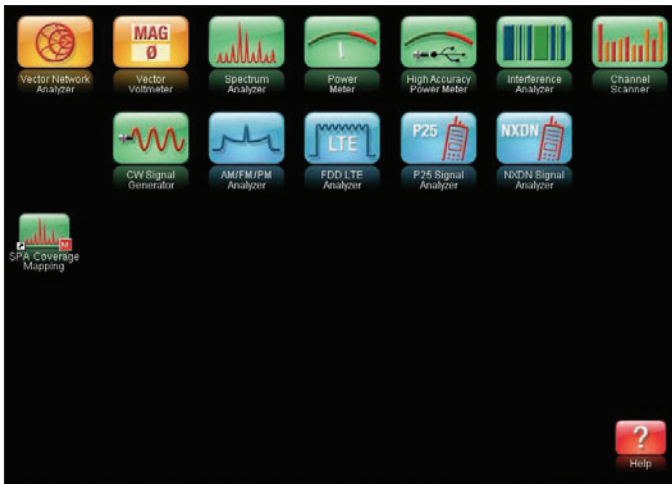


## MS2034/35B VNA Master + Spectrum Analyzer



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

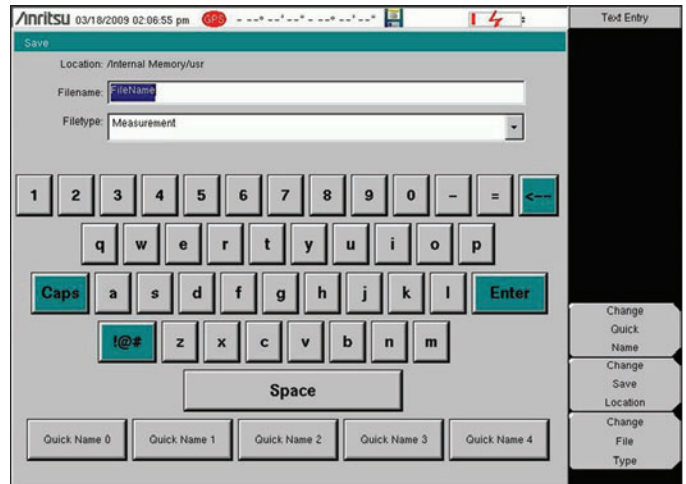
# VNA Master MS202xB/3xB Features



### 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

<b>MS2024B<sup>1</sup></b>	<b>MS2025B<sup>1</sup></b>	<b>MS2034B<sup>1</sup></b>	<b>MS2035B<sup>1</sup></b>	
VNA Master™ 2-port, 1-path, VNA: 500 kHz to 4 GHz	VNA Master™ 2-port, 1-path, VNA: 500 kHz to 6 GHz	VNA Master™ + Spectrum Analyzer, S/A: 100 kHz to 4 GHz	VNA Master™ + Spectrum Analyzer, S/A: 100 kHz to 6 GHz	
<b>Options</b>				<b>Description</b>
MS2024B-0010	MS2025B-0010	MS2034B-0010	MS2035B-0010	Built-in Bias-Tee, +12 to +24 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)
-	-	MS2034B-0025	-	Interference Analysis, 100 kHz to 4 GHz <sup>2</sup>
-	-	-	MS2035B-0025	Interference Analysis, 100 kHz to 6 GHz <sup>2</sup>
-	-	MS2034B-0027	-	Channel Scanner, 100 kHz to 4 GHz <sup>2</sup>
-	-	-	MS2035B-0027	Channel Scanner, 100 kHz to 6 GHz <sup>2</sup>
MS2024B-0031	MS2025B-0031	MS2034B-0031	MS2035B-0031	GPS Receiver (requires GPS antenna, 2000-1528-R) <sup>2</sup>
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 <sup>3</sup>
MS2024B-0501	MS2025B-0501	MS2034B-0501	MS2035B-0501	Distance Domain
-	-	MS2034B-0509	MS2035B-0509	AM/FM/PM Demodulation Analyzer

Notes:

1) Includes standard one-year warranty and Certificate of Calibration and Conformance.

2) Requires external antenna (Series 2000-xxxx Antenna, or 2000-1636-R Antenna Kit), Recommend Option 0031 GPS.

3) Requires Option 0031 GPS

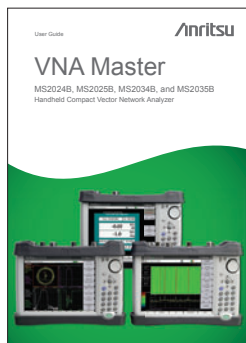
## VNA Master MS202xB/3xB Ordering Information

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



Part Number	Description
PSN50	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, +20 dBm
MA24104A	Inline High Power Sensor, 600 MHz to 4 GHz, True RMS, +51.76 dBm
MA24106A	High Accuracy RF Power Sensor, 50 MHz to 6 GHz, True RMS, +23 dBm
MA24108A	Microwave USB Power Sensor, 10 MHz to 8 GHz, True RMS, +20 dBm
MA24118A	Microwave USB Power Sensor, 10 MHz to 18 GHz, True RMS, +20 dBm
MA24126A	Microwave USB Power Sensor, 10 MHz to 26 GHz, True RMS, +20 dBm

### Manuals (soft copy included on Handheld Document Disc and at [www.anritsu.com](http://www.anritsu.com))



Part Number	Description
10920-00060	Handheld Instruments Documentation Disc
10580-00301	VNA Master User Guide (Hard copy included)
10580-00215	ODTF-1 Optical Distance-To-Fault Module Quick Start Guide
10580-00289	Vector Network Analyzer Measurement Guide
10580-00231	Spectrum Analyzer Measurement Guide
10580-00244	Spectrum Analyzer Measurement Guide - Interference Analyzer, Channel Scanner, Gated Sweep, CW Signal Generator, AM/FM/PM Analyzer, Interference Mapping, Coverage Mapping
10580-00234	3GPP Signal Analyzer Measurement Guide - GSM/EDGE, W-CDMA/HSPA+, TD-SCDMA/HSPA+, LTE, TD-LTE
10580-00240	Power Meter Measurement Guide - High Accuracy Power Meter
10580-00302	Programming Manual

### Standard Accessories (included with instrument)



Part Number	Description
10920-00060	Handheld Instruments Documentation Disc
10580-00220	VNA Master User Guide
65729	Soft Carrying Case
2300-498	Master Software Tools (MST) CD Disc
633-44	Rechargeable Li-Ion Battery
40-168-R	AC-DC Adapter
806-141-R	Automotive Cigarette Lighter Adapter
3-2000-1498	USB A/5-pin mini-B Cable, 10 feet/305 cm
11410-00549	VNA Master Technical Data Sheet One Year Warranty (Including battery, firmware, and software) Certificate of Calibration and Conformance

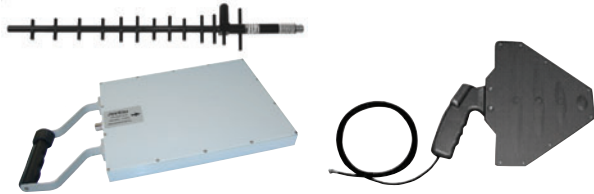
# VNA Master MS202xB/3xB Ordering Information

## Optional Accessories

### Ancillary Equipment

Part Number	Description
ODTF-1	Optical Time Domain Module
2300-517	Phase Noise Measurement Software
3-806-152	Ethernet Crossover Cable
2000-1371-R	Ethernet Cable (7 ft.)
2000-1653	Protective Screen Cover (Package of 2)
2000-1652-R	GPS Antenna – Magnet mount (active 3-5V) with SMA connector and 1 foot cable
2000-1528-R	GPS Antenna – Magnet Mount (active 3-5V) with SMA connector and 4.6 m (15 ft) extension cable

### Directional Antennas



Part Number	Description
2000-1411-R	824 MHz to 896 MHz, N(f), 10 dBd, Yagi
2000-1412-R	885 MHz to 975 MHz, N(f), 10 dBd, Yagi
2000-1413-R	1710 MHz to 1880 MHz, N(f), 10 dBd, Yagi
2000-1414-R	1850 MHz to 1990 MHz, N(f), 9.3 dBd, Yagi
2000-1415-R	2400 MHz to 2500 MHz, N(f), 10 dBd, Yagi
2000-1416-R	1920 MHz to 2170 MHz, N(f), 10 dBd, Yagi
2000-1519-R	500 MHz to 3 GHz, log periodic
2000-1617	600 MHz to 21 GHz, N(f), 5-8 dBi to 12 GHz, 0-6 dBi to 21 GHz, log periodic
2000-1677-R	300 MHz to 3 GHz, SMA(m), log periodic

### 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
2000-1616	20 MHz to 21 GHz, N(f) 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)

### 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 Band, 0.41 dB loss, N(m) to SMA(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 Band, 0.34 dB loss, N(m) to SMA(f), 50 Ω
1030-107-R	1910 MHz to 1990 MHz Band, 0.41 dB loss, N(m) to SMA(f), 50 Ω
1030-112-R	2400 MHz to 2484 MHz, N(m) to SMA(f), 50 Ω
1030-155-R	2500 MHz to 2700 MHz, N(m) to N(f), 50 Ω

### Attenuators



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(m) to N(f), Uni-directional
1010-121	40 dB, 100 W, DC to 18 GHz, N(m) to N(f), Uni-directional
1010-128-R	40 dB, 150 W, DC to 3 GHz, N(m) to N(f)

### Phase-Stable Test Port Cables, Armored w/ Reinforced Grip (recommended for cable & antenna line sweep applications)



Part Number	Description
15RNFN50-1.5-R	1.5 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15RDFN50-1.5-R	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 Ω
15RDN50-1.5-R	1.5 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 Ω
15RNFN50-3.0-R	3.0 m, DC to 6 GHz, N(m) to N(f), 50 Ω
15RDFN50-3.0-R	3.0 m, DC to 6 GHz, N(m) to 7/16 DIN(f), 50 Ω
15RDN50-3.0-R	3.0 m, DC to 6 GHz, N(m) to 7/16 DIN(m), 50 Ω

# VNA Master MS202xB/3xB Ordering Information

## Optional Accessories (continued)

**Phase-Stable Test Port Cables, Armored** (recommended for use with tightly spaced connectors and other general purpose applications)



Part Number	Description
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

### 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	BNC(f) to N(m), DC to 1.3 GHz, 50 Ω
510-90	7/16 DIN(f) to N(m), DC to 7.5 GHz, 50 Ω
510-91	7/16 DIN(f) to N(f), DC to 7.5 GHz, 50 Ω
510-92	7/16 DIN(m) to N(m), DC to 7.5 GHz, 50 Ω
510-93	7/16 DIN(m) to N(f), DC to 7.5 GHz, 50 Ω
510-96	7/16 DIN(m) to 7/16 DIN (m), DC to 7.5 GHz, 50 Ω
510-97	7/16 DIN(f) to 7/16 DIN (f), DC to 7.5 GHz, 50 Ω
1091-379-R	7/16 DIN(f) to 7/16 DIN(f), DC to 6 GHz, 50 Ω, w/ Reinforced Grip
510-102-R	N(m) to N(m), DC to 11 GHz, 50 Ω, 90 degrees right angle

### Precision Adapters

Part Number	Description
34NN50A	Precision Adapter, N(m) to N(m), DC to 18 GHz, 50 Ω
34NFnF50	Precision Adapter, N(f) to N(f), DC to 18 GHz, 50 Ω

### Connector Components

Part Number	Description
OSLN50	Precision Integrated Open/Short/Load N(m), DC to 18 GHz, 50 Ω
OSLNF50	Precision Integrated Open/Short/Load N(f), DC to 18 GHz, 50 Ω
22N50	Precision N(m) Short/Open, 18 GHz
22NF50	Precision N(f) Short/Open, 18 GHz
28N50-2	Precision Termination, DC to 18 GHz, 50 Ω, N(m)
28NF50-2	Precision Termination, DC to 18 GHz, 50 Ω, N(f)
OSLN50-1	Precision N(m) Open/Short/Load, 42 dB, 6 GHz
OSLNF50-1	Precision N(f) Open/Short/Load, 42 dB, 6 GHz
SM/PL-1	Precision N(m) Load, 42 dB, 6 GHz
SM/PLNF-1	Precision N(f) Load, 42 dB, 6 GHz
1091-53-R	Precision TNC(m) Open, 18 GHz, 50 Ω
1091-54-R	Precision TNC(m) Short, 18 GHz, 50 Ω
1015-55-R	Precision TNC(m) Load, 18 GHz, 50 Ω
1091-55-R	Precision TNC(f) Open, 18 GHz, 50 Ω
1091-56-R	Precision TNC(f) Short, 18 GHz, 50 Ω
1015-54-R	Precision TNC(f) Load, 18 GHz, 50 Ω
2000-1618-R	Precision Open/Short/Load, 7/16(m), 6.0 GHz
2000-1619-R	Precision Open/Short/Load, 7/16(f), 6.0 GHz

### Backpack and Transit Case



Part Number	Description
67135	Anritsu Backpack (For Handheld Instrument and PC)
760-243-R	Large Transit Case with Wheels and Handle

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