200–MHz Vector Network Analyzer

Features

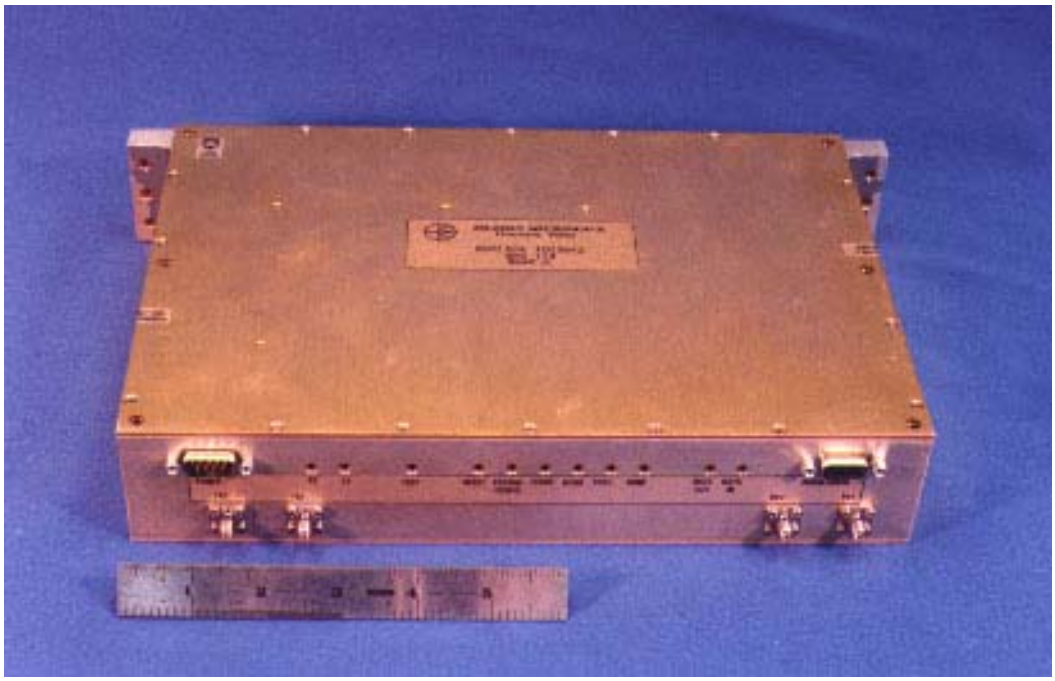
* Time gating: 100-μs time window, 5-ns resolution
* Frequency Response: 300-kHz to 200-MHz in 10-kHz steps
* Temperature Range: -10°C to +40°C
* Fast DSP–based firmware algorithms
* Low Cost; Small Size
* Rapid Acquisition Time
* Ideal for in–process applications
* IBM–PC Compatible RS232 or RS422 Control Interface

Description

The VNA300K–200M is a ruggedized low-cost small-size vector network analyzer designed for in–process applications. System control is supported through either an RS232 or RS422 interface to an IBM–PC compatible computer.

A numerically–controlled internal frequency synthesizer provides accurate 10-kHz frequency steps from 300 kHz to 200 MHz. Up to 2048 points may be taken across the band to yield time resolution to 5 ns and a range window as large as 100 μs.

Front–panel lights provide instant operator system–state feedback.



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Application Notes

The VNA300K–200M supports any application that needs to measure transfer functions. The scattering parameter (S21) magnitude and phase is measured over a user–defined frequency range. A Texas Instruments TMS320C31 floating–point Digital Signal Processor (DSP) is used to perform extremely fast frequency–to–time and time–to–frequency FFT calculations.

In many applications multipath signals cause unwanted distortion of the CW frequency response. Multiple–transit signals in Surface Acoustic Wave (SAW) devices are one such application. Time gating allows the system to de–embed the effects of multipath signals.

Multipath signals in a transmission system manifest themselves in the time domain as packets of energy arriving at different times. The concept of time gating is to isolate and maintain the packet of interest while deleting the unwanted ones.

The following steps are involved in the time gating process: 1) acquire CW magnitude and phase response of the system; 2) weight data to optimize FFT sidelobe performance; 3) transform data to the time domain; 4) maintain packet in time window of interest while deleting all other time elements; 5) transform data back to the frequency domain; and 6) unweight data. This yields a corrected S21 frequency response which has eliminated the effects of multipath distortion.

Data is acquired and weighted to minimize transform sidelobes. The following six windowing options are available: Rectangular, Hanning, Hamming, Blackman, Gaussian, and Triangular. The frequency– and time–response data are transformed using a Chirp–Z transform to maximize acquisition speed.

Two application interfaces are available. A Visual Basic graphical user interface has been created that allows the system to be controlled directly from an IBM–PC compatible computer. This could be useful for laboratory use.

The intended in–process control paradigm is for the user to embed the system into a more complex instrumentation package. Standard subroutines are available that support communication with the analyzer, or the user can facilitate direct control using logical command strings.

The analyzer is designed to operate over a temperature range of -10°C to +40°C. The sealed enclosure is designed to withstand “dirty” plant environments.

An RS422 communication interface allows the analyzer to be controlled from a remote location hundreds of feet away. An RS232 communication interface allows convenient connection directly to a standard PC serial port. The mode of operation is selectable via slide switches.

Although the VNA300K–200M is designed to support a frequency range of 300 kHz to 200 MHz, the internal synthesizers operate at 700 MHz to 900 MHz. The RF section could easily be modified to support a variety of frequency ranges in the microwave– and millimeter–wave bands.

Potential applications include: particle–size analysis, gas and oil analysis, process flow–control, etc.. Any application that requires mitigation of multipath signals to attain corrected transfer information can leverage this technology.

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