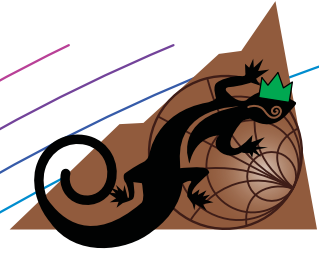VECTOR NETWORK ANALYZER

PLANAR 804/1

DATA SHEET

COPPER MOUNTAIN
TECHNOLOGIES

▶ Frequency range: 300 kHz to 8.0 GHz

▶ Measured parameters: S_{11}, S_{21}, S_{12}, S_{22}

▶ Dynamic range of transmission measurement magnitude: 145 dB

▶ Measurement time per point: 100 μs

▶ Output power adjustment range: -60 dBm to +10 dBm

PLANAR 804/1 Network Analyzer is designed for use in the process of development, adjustment and testing of various electronic devices in industrial and laboratory facilities, including operation as a component of an automated measurement system. PLANAR 804/1 is designed for operation with external PC, which is not supplied with the Analyzer.

To learn more about the software functions, please download the demo software from our website and install it on your PC.

MEASUREMENT RANGE

Impedance	50 Ω (75 Ω connectors via adapters)
Test port connector	N-type, female
Number of test ports	2
Frequency range	300 kHz to 8.0 GHz
Full CW frequency accuracy	$\pm 5 \times 10^{-6}$
Frequency setting resolution	1 Hz
Number of measurement points	2 to 500,001
Measurement bandwidths	1 Hz to 30 kHz (with 1/1.5/2/3/5/7 steps)
Dynamic range (IF bandwidth 10 Hz)	135 dB, typ. 140 dB

MEASUREMENT ACCURACY

Accuracy of transmission measurements (magnitude / phase)[1]

+5 dB to +15 dB	0.2 dB / 2°
-50 dB to +5 dB	0.1 dB / 1°
-70 dB to -50 dB	0.2 dB / 2°
-90 dB to -70 dB	1.0 dB / 6°

Accuracy of reflection measurements (magnitude / phase)[1]

-15 dB to 0 dB	0.4 dB / 3°
-25 dB to -15 dB	1.0 dB / 6°
-35 dB to -25 dB	3.0 dB / 20°

Trace stability

Trace noise magnitude	
(IF bandwidth 3 kHz)	1 mdB rms
Temperature dependence	
(per one degree of temperature variation)	0.02 dB

EFFECTIVE SYSTEM DATA[1]

Effective directivity	45 dB
Effective source match	40 dB
Effective load match	45 dB

TEST PORT

Directivity (without system error correction)	18 dB

[1] Applies over the temperature range of 23°C ± 5°C after 40 minutes of warming-up, with less than 1°C deviation from full two-port calibration temperature, at -5 dBm output power and 10 Hz IF bandwidth.

TEST PORT OUTPUT

Match (without system error correction)	18 dB
Power range	
300 kHz to 6.0 GHz	-60 dBm to +10 dBm
6.0 GHz to 8.0 GHz	-60 dBm to +5 dBm
Power accuracy	±1.5 dB
Power resolution	0.05 dB
Harmonics distortion	-25 dBc
Non-harmonic spurious	-30 dBc

TEST PORT INPUT

Match (without system error correction)	18 dB
Damage level	+26 dBm
Damage DC voltage	35 V
Noise level (defined as the rms value of the specified noise floor, IF bandwidth 10 Hz)	-125 dBm

MEASUREMENT SPEED

Measurement time per point	100 µs			
Source to receiver port switchover time	10 ms			
Typical cycle time versus number of measurement points				
Number of points	51	201	401	1601
Start 300 kHz, stop 10 MHz, IF bandwidth 30 kHz				
Uncorrected	13.1 ms	51.3 ms	102.3 ms	408.3 ms
Full two-port calibration	45.5 ms	122.0 ms	230.5 ms	840.5 ms
Start 10 MHz, stop 8.0 GHz, IF bandwidth 30 kHz				
Uncorrected	6.5 ms	21.1 ms	40.5 ms	157.7 ms
Full two-port calibration	32.4 ms	61.7 ms	100.3 ms	333.0 ms

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GENERAL DATA

External reference frequency	10 MHz
Input level	2 dBm ± 2 dB
Input impedance at «10 MHz» input	50 Ω
Connector type	BNC female
Output reference signal level at 50 Ω impedance	3 dBm ± 2 dB
«OUT 10 MHz» connector type	BNC female
Operating temperature range	+5°C to +40°C
Storage temperature range	-45°C to +55°C
Humidity	90% at 25°C
Atmospheric pressure	84 to 106.7 kPa
Calibration interval	3 years
External PC system requirements:	
- Operating system	WINDOWS XP / VISTA / 7
- CPU frequency	1 GHz
- RAM	512 MB
Power supply	110 – 240 V, 50/60 Hz
Power consumption	40 W
Dimensions (L x W x H)	12.8 x 16.4 x 3.8 in
Weight	15.4 lb

MEASUREMENT CAPABILITIES

Measured parameters	S_{11}, S_{21}, S_{12}, S_{22} Absolute power of the reference and received signals at the port.
Number of measurement channels	Up to 16 independent logical channels. Each logical channel is represented on the screen as an individual channel window. A logical channel is defined by such stimulus signal settings as frequency range, number of test points, power level, etc.
Data traces	Up to 16 data traces can be displayed in each channel window. A data trace represents one of such parameters of the DUT as S-parameters, response in time domain, input power response.
Memory traces	Each of the 16 data traces can be saved into memory for further comparison with the current values.
Data display formats	Logarithmic magnitude, linear magnitude, phase, expanded phase, group delay, SWR, real part, imaginary part, Smith chart diagram and polar diagram.

SWEEP FEATURES

Sweep type	Fixed stimulus power value: linear frequency sweep, logarithmic frequency sweep, segment frequency sweep. Fixed frequency value: linear power sweep.
Measured points per sweep	Set by the user from 2 to 500,001.
Segment sweep features	A frequency sweep within several independent user-defined segments. Frequency range, number of sweep points, source power, and IF bandwidth should be set for each segment.
Power	Source power from –60 dBm to +10 dBm with resolution of 0.05 dB. In frequency sweep mode the power slope can be set to up to 2 dB/GHz for compensation of high frequency attenuation in connection wires.
Sweep trigger	Trigger modes: continuous, single, hold. Trigger sources: internal, manual, external, bus.

TRACE FUNCTIONS

Trace display	Data trace, memory trace, or simultaneous display of data and memory traces.
Trace math	Data trace modification by math operations: addition, subtraction, multiplication or division of measured complex values and memory data.
Autoscaling	Automatic selection of scale division and reference level value for the most effective display of the trace.
Electrical delay	Moving of the calibration plane to compensate for the delay in the test setup. Compensation for electrical delay in a DUT during measurements of phase deviation from linearity.
Phase offset	Phase offset defined in degrees.

ACCURACY ENHANCEMENT

Calibration	Calibration of a test setup (which includes the Analyzer, cables, and adapters) significantly increases the accuracy of measurements. Calibration allows for correction of the errors caused by imperfections in the measurement system: system directivity, source and load match, tracking and isolation.
Calibration methods	The following calibration methods of various sophistication and accuracy enhancement level are available: - reflection and transmission normalization; - full one-port calibration; - one-path two-port calibration; - full two-port calibration; - TRL calibration.
Reflection and transmission normalization	The simplest calibration method. It provides low accuracy.
Full one-port calibration	Method of calibration performed for one-port reflection measurements. It ensures high accuracy.
One-path two-port calibration	Method of calibration performed for reflection and one-way transmission measurements, for example for measuring S_{11} and S_{21} only. It ensures high accuracy for reflection measurements and average accuracy for transmission measurements.
Full two-port calibration	Method of calibration performed for full S-parameter matrix measurement of a two-port DUT. It ensures high accuracy.
TRL calibration	Method of calibration performed for full S-parameter matrix measurement of a two-port DUT. It ensures higher accuracy than two-port calibration. LRL and LRM modifications of this calibration method are available.

Mechanical Calibration Kits	The user can select one of the predefined calibration kits of various manufacturers or define own calibration kits.
Electronic Calibration Modules	Electronic calibration modules offered by Copper Mountain Technologies make the Analyzer calibration faster and easier than traditional mechanical calibration.
Sliding load calibration standard	The use of sliding load calibration standard allows significant increase in calibration accuracy at high frequencies compared to the fixed load calibration standard.
"Unknown" Thru calibration standard	The use of generic two-port reciprocal network instead of a thru in full two-port calibration allows to calibrate the Analyzer for measurement of non-insertable devices.
Defining of calibration standards	Different methods of calibration standard defining are available: - standard defining by polynomial model; - standard defining by data (S-parameters).
Error correction interpolation	When the user changes such settings as start/stop frequencies and number of sweep points, compared to the settings at the moment of calibration, interpolation or extrapolation of the calibration coefficients will be applied.

SUPPLEMENTAL CALIBRATION METHODS

Power calibration	Method of calibration, which allows more stable maintenance of the power level setting at the DUT input. An external power meter should be connected directly, or via a USB/GPIB adapter, to a USB port of the computer running the Analyzer software.
Receiver calibration	Method of calibration, which calibrates the receiver gain at absolute signal power measurement.

MARKER FUNCTIONS

Data markers	Up to 16 markers for each trace. Reference marker available for delta marker operation. Smith chart diagram supports 5 marker formats: linear magnitude/phase, log magnitude/phase, real/imaginary, R + jX and G + jB. Polar diagram supports 3 marker formats: linear magnitude/phase, log magnitude/phase, and real/imaginary.
Reference marker	Enables display of any marker values relative to the reference marker.
Marker search	Search for max, min, peak, or target values on a trace.
Marker search additional features	User-definable search range. Switching between one-time search or tracking modes.
Setting parameters by markers	Setting of start, stop and center frequencies by the stimulus value of the marker and setting of reference level by the response value of the marker.
Marker math functions	Statistics, bandwidth, flatness, RF filter.
Statistics	Calculation and display of mean, standard deviation and peak-to-peak in a frequency range limited by two markers on a trace.
Bandwidth	Determines bandwidth between cutoff frequency points for an active marker or absolute maximum. The bandwidth value, center frequency, lower frequency, higher frequency, Q value, and insertion loss are displayed.
Flatness	Displays gain, slope, and flatness between two markers on a trace.
RF filter	Displays insertion loss and peak-to-peak ripple of the passband and the maximum signal magnitude in the stopband. The passband and stopband are defined by two pairs of markers.

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DATA ANALYSIS

Port impedance conversion	The function of conversion of the S-parameters measured at 50 Ω port into the values, which could be determined if measured at a test port with arbitrary impedance.
De-embedding	The function allows to mathematically exclude the effect of the fixture circuit, connected between the calibration plane and the DUT, from the measurement result. This circuit should be described by an S-parameter matrix in a Touchstone file.
Embedding	The function allows to mathematically simulate the DUT parameters after virtual integration of a fixture circuit between the calibration plane and the DUT. This circuit should be described by an S-parameter matrix in a Touchstone file.
S-parameter conversion	The function allows conversion of the measured S-parameters to the following parameters: - reflection impedance and admittance; - transmission impedance and admittance; - inverse S-parameters.
Time domain transformation	The function performs data transformation from frequency domain into response of the DUT to various stimulus types in time domain. Modeled stimulus types: bandpass, lowpass impulse, and lowpass step. Time domain span is set by the user arbitrarily from zero to maximum, which is determined by the frequency step. Windows of various forms are used for better tradeoff between resolution and level of spurious sidelobes.
Time domain gating	The function mathematically removes unwanted responses in time domain, which allows to obtain frequency response without influence from the fixture elements. The function applies reverse transformation back to frequency domain after cutting out the user-defined span in time domain. Gating filter types: bandpass or notch. For better tradeoff between gate resolution and level of spurious sidelobes the following filter shapes are available: maximum, wide, normal, and minimum.

MIXER / CONVERTER MEASUREMENTS

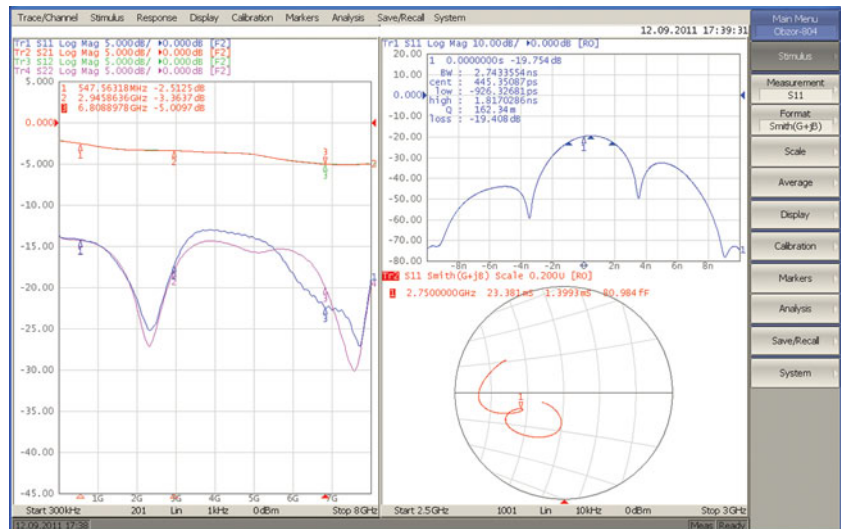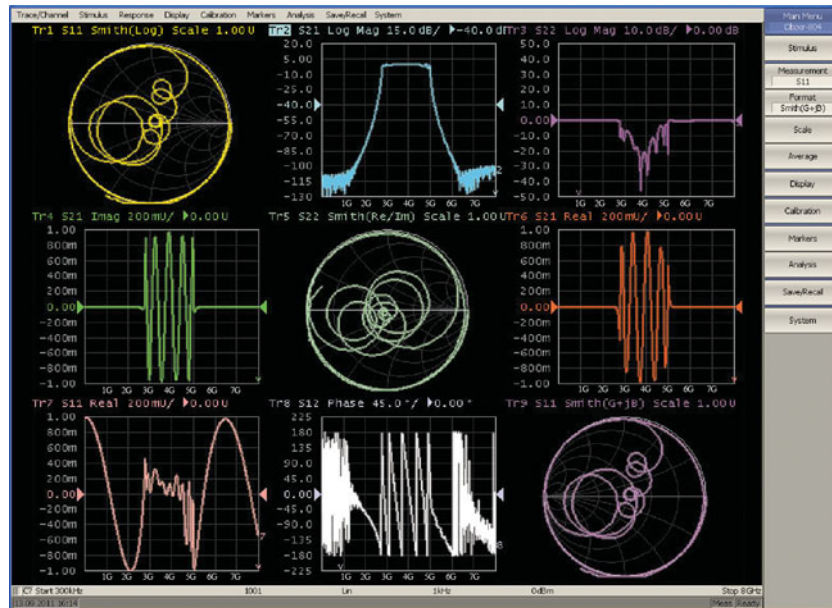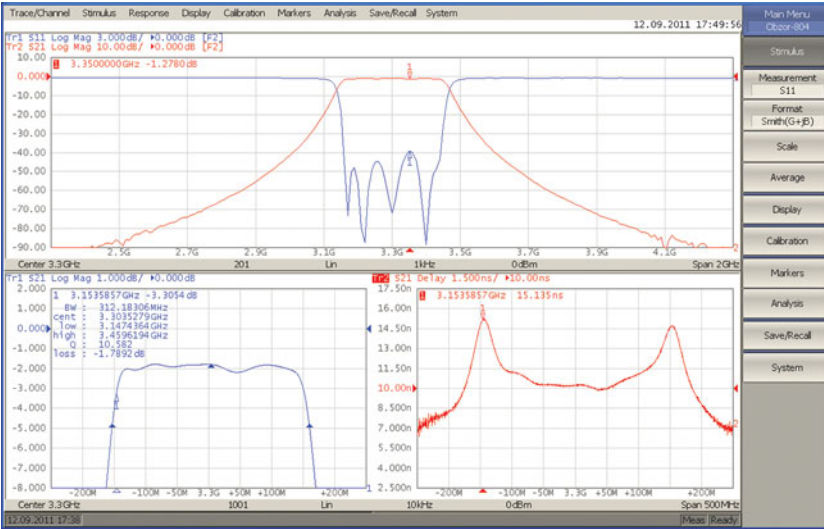|	
Scalar mixer / converter measurements	The scalar method allows measurement of the transmission coefficient (magnitude only) of mixers and other frequency translating devices. The scalar method employs port frequency offset when there is a difference between source port frequency and receiver port frequency.
Vector mixer / converter measurements	The vector method allows measuring both magnitude and phase of the mixer transmission coefficient. The method requires an external mixer and a LO common for both the external mixer and the mixer under test.
Scalar mixer / converter calibration	The most accurate calibration method applicable to mixer measurements in frequency offset mode. The OPEN, SHORT, and LOAD calibration standards are used. An external power meter should be connected directly, or via a USB/GPIB adapter, to a USB port of the computer running the Analyzer software.
Vector mixer / converter calibration	Method of calibration applied for vector mixer measurements. OPEN, SHORT, and LOAD calibration standards are used.
Automatic frequency offset adjustment	The function performs automatic frequency offset adjustment when the scalar mixer / converter measurements are performed to compensate for internal LO setting inaccuracy in the DUT.

OTHER FEATURES

Analyzer control	Using external personal computer, which runs the Analyzer software.
Familiar graphical user interface	Graphical user interface based on Windows operating system ensures fast and easy Analyzer operation by the user.
Saving trace data	Features saving trace data in *.csv, *.s1p and *.s2p formats; and saving the screen captures in *.png format.
State save/recall	The program allows to save the current state configuration for further recall. A state configuration includes signal source parameters, data traces, memory traces, markers, calibration, etc.
Diagram printout/saving	The diagram and data printout function has preview feature. The preview, saving and printout can be performed using MS Word, Image Viewer for Windows, or Analyzer Print Wizard.

REMOTE CONTROL AND DATA EXCHANGE

COM/DCOM	COM/DCOM automation is used for remote control and data exchange with the user software. The Analyzer program runs as COM/DCOM server. The user program runs as COM/DCOM client. The COM client runs on Analyzer PC. The DCOM client runs on a separate PC connected via LAN.

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