VECTOR REFLECTOMETER

PLANAR R54

DATA SHEET

COPPER MOUNTAIN TECHNOLOGIES

- Frequency range: 85 MHz to 4.2 GHz
- Reflection coefficient magnitude and phase, cable loss, DTF
- Measurement time per point: 200 µs
- Frequency setting resolution: 10 Hz
- Powered and operated via USB interface
- Compact size: 4.6 x 1.5 x 0.75 in, lightweight: 8.8 oz

PLANAR R54 Vector Reflectometer 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. The Reflectometer is a virtual instrument, which is controlled by external PC (not supplied with Reflectometer). USB 2.0 interface provides power and connection to PC.

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, male
Frequency range	85 MHz to 4.2 GHz (5.4 GHz, typ.) [1]
Full CW frequency accuracy	$\pm 6 \times 10^{-6}$
Frequency setting resolution	10 Hz
Number of measurement points	User selected from 51, 101, 201, 401, 801, 1601, 10,001
Measurement bandwidths	100 Hz to 30 kHz (with 1/3 step)
Cable loss measurement range	35 dB

[1] The specifications within the frequency range from 4.2 GHz to 5.4 GHz are not guaranteed.

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MEASUREMENT ACCURACY

Accuracy of reflection measurements (magnitude / phase) [2]	
-15 dB to 0 dB	0.4 dB / 4°
-25 dB to -15 dB	1.5 dB / 7°
-35 dB to -25 dB	4.0 dB / 22°
Trace stability	
Trace noise magnitude (high output power, IF bandwidth 1 kHz)	0.015 dB rms
Temperature dependence (per one degree of temperature variation)	0.02 dB

EFFECTIVE SYSTEM DATA

Effective directivity	
85 MHz to 4 GHz	45 dB
4 GHz to 4.2 GHz	40 dB
Effective source match	
85 MHz to 4 GHz	40 dB
4 GHz to 4.2 GHz	35 dB

[2] Applies over the temperature range of 23°C ± 5°C after 5 minutes of warming-up, with less than 1°C deviation from the full one-port calibration temperature at high output power and 100 Hz IF bandwidth.

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FACTORY-CALIBRATED SYSTEM DATA

Effective directivity	
85 MHz to 4 GHz	36 dB
4 GHz to 4.2 GHz	32 dB

TEST PORT

Match (without system error correction)	18 dB
Directivity (without system error correction)	18 dB
Output power:	
High level	-10 dBm, typ.
Low level	-30 dBm, typ.
Damage level	+23 dBm
Damage DC voltage	50 V

MEASUREMENT SPEED

Measurement time per point	200 μs

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GENERAL DATA

Interference immunity	+17 dBm
Operating temperature range	-10°C to +50°C
Storage temperature range	-40°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
Connection to PC:	
- connector type	mini USB B
- interface	USB 2.0
Power consumption	2 W
Dimensions (L x W x H)	4.6 x 1.5 x 0.75 in
Weight	8.8 oz

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MEASUREMENT CAPABILITIES

Measured parameters	S_{11}, cable loss
Number of measurement channels	Up to 4 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, etc.
Data traces	Up to 4 data traces can be displayed in each channel window. A data trace represents one of such parameters of the DUT as magnitude and phase of S_{11}, DTF, cable loss.
Memory traces	Each of the 4 data traces can be saved into memory for further comparison with the current values.
Data display formats	SWR, Return loss, Cable loss, Phase, Expanded phase, Smith chart diagram, DTF SWR, DTF return loss, Group delay.

SWEEP FEATURES

Sweep type	Linear frequency sweep, logarithmic frequency sweep, and segment frequency sweep.
Segment sweep features	A frequency sweep within several independent user-defined segments. Frequency range, number of sweep points and IF bandwidth should be set for each segment.
Measured points per sweep	User selected from 51, 101, 201, 401, 801, 1601, 10,001.
Output power	High: -10 dBm and low: -30 dBm.
Sweep trigger	Trigger modes: continuous, single, hold.

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.
Phase offset	Phase offset defined in degrees.

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ACCURACY ENHANCEMENT

Calibration	Calibration of a test setup (which includes the Reflectometer, adapter and cable) significantly increases the accuracy of measurements. Calibration allows for correction of the errors caused by imperfections in the measurement system: system directivity, source match and tracking.
Calibration methods	The following calibration methods are available: - reflection normalization; - full one-port calibration.
Reflection normalization	The simplest calibration method.
Full one-port calibration	Method of calibration that ensures high accuracy.
Factory calibration	The factory calibration of the Reflectometer allows performing measurement without additional calibration and reduces the measurement error after reflection normalization.
Mechanical Calibration Kits	The user can select one of the predefined calibration kits from various manufacturers or define own calibration kits.
Electronic Calibration Modules	Electronic calibration modules offered by Copper Mountain Technologies make the Reflectometer calibration faster and easier than traditional mechanical calibration.
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.

MARKER FUNCTIONS

Data markers	Up to 16 markers for each trace. Reference marker available for delta marker operation.
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.
Statistics	Calculation and display of mean, standard deviation and peak-to-peak in a frequency range limited by two markers on a trace.

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.
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. 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. Measurement units can be set to meters/feet/seconds. Parameters of common brands of cables are preset in the program.
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.

OTHER FEATURES

Reflectometer control	Using external personal computer, which runs the Reflectometer software.
Familiar graphical user interface	Graphical user interface based on Windows operating system ensures fast and easy Reflectometer operation by the user. The software interface of PLANAR R54 is compatible with modern tablet PCs and laptops.
Saving trace data	Features saving trace data in *.csv and *.s1p 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.

REMOTE CONTROL AND DATA EXCHANGE

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

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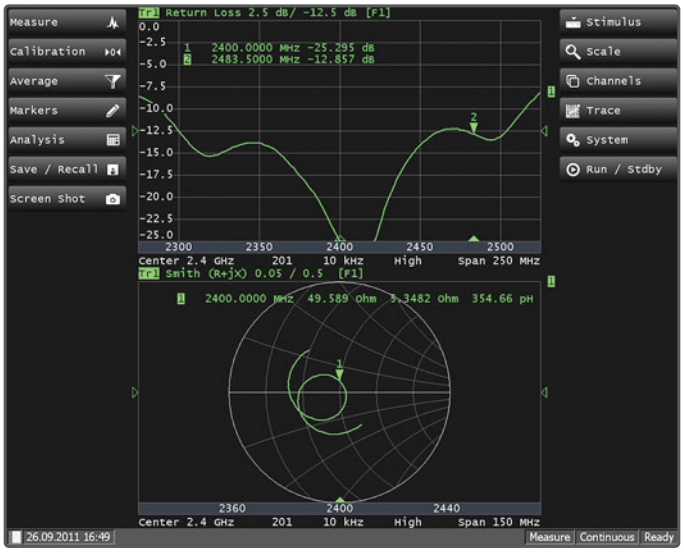
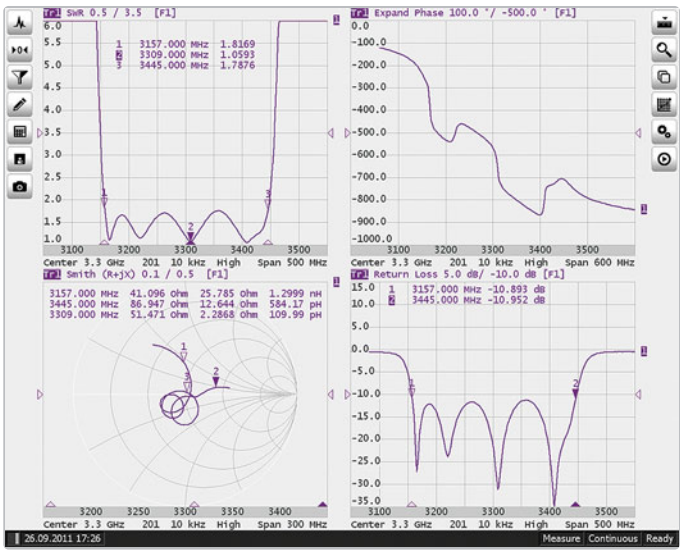
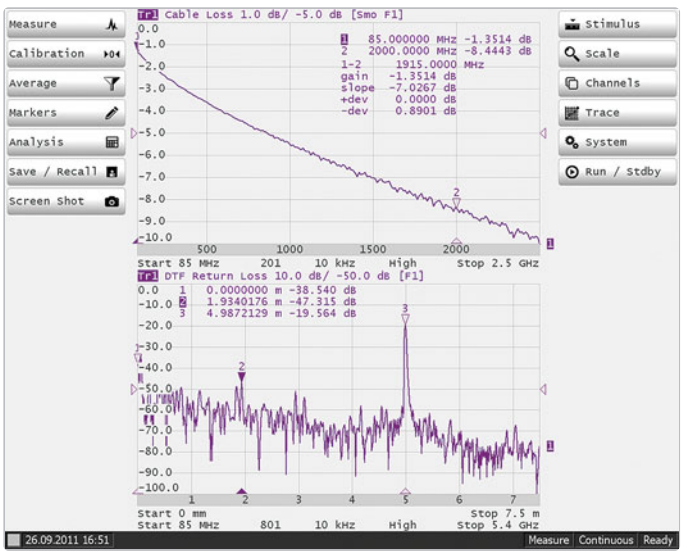

Measure
Calibration
Average
Markers
Analysis
Save / Recall
Screen Shot
Stimulus
Scale
Channels
Trace
System
Run / Stdby
Tr1 Return Loss 2.5 dB/ -12.5 dB [F1]
1 2400.0000 MHz -25.295 dB
2 2483.5000 MHz -12.857 dB
Center 2.4 GHz 201 10 kHz High Span 250 MHz
Tr1 Smith (R+jX) 0.05 / 0.5 [F1]
1 2400.0000 MHz 49.589 Ohm 3.3482 Ohm 354.66 pH
Center 2.4 GHz 201 10 kHz High Span 150 MHz
26.09.2011 16:49
Measure
Continuous
Ready


Tr2 SWR 0.5 / 3.5 [F1]
1 3157.000 MHz 1.8169
2 3309.000 MHz 1.0593
3 3445.000 MHz 1.7876
Center 3.3 GHz 201 10 kHz High Span 500 MHz
Tr2 Expand Phase 100.0 °/ -500.0 ° [F1]
Center 3.3 GHz 201 10 kHz High Span 600 MHz
Tr2 Smith (R+jX) 0.1 / 0.5 [F1]
3157.000 MHz 41.096 Ohm 25.785 Ohm 1.2999 nH
3445.000 MHz 86.947 Ohm 12.644 Ohm 584.17 pH
3309.000 MHz 51.471 Ohm 2.2868 Ohm 109.99 pH
Center 3.3 GHz 201 10 kHz High Span 300 MHz
Tr2 Return Loss 5.0 dB/ -10.0 dB [F1]
1 3157.000 MHz -10.893 dB
2 3445.000 MHz -10.952 dB
Center 3.3 GHz 201 10 kHz High Span 500 MHz
26.09.2011 17:26
Measure
Continuous
Ready


Measure
Calibration
Average
Markers
Analysis
Save / Recall
Screen Shot
Stimulus
Scale
Channels
Trace
System
Run / Stdby
Tr2 Cable Loss 1.0 dB/ -5.0 dB [Smo F1]
1 85.000000 MHz -1.3514 dB
2 2000.0000 MHz -8.4443 dB
1-2 1915.0000 MHz
gain -1.3514 dB
slope -7.0267 dB
+dev 0.0000 dB
-dev 0.8901 dB
Start 85 MHz 201 10 kHz High Stop 2.5 GHz
Tr1 DTF Return Loss 10.0 dB/ -50.0 dB [F1]
1 0.0000000 m -38.540 dB
2 1.9340176 m -47.315 dB
3 4.9872129 m -19.564 dB
Start 0 mm Stop 7.5 m
Start 85 MHz 801 10 kHz High Stop 5.4 GHz
26.09.2011 16:51
Measure
Continuous
Ready

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please visit www.coppermountaintech.com/sales/