COPPER MOUNTAIN® TECHNOLOGIES

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ACM2202 Automatic Calibration Module Specifications

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Automatic Calibration Modules

Copper Mountain Technologies' Automatic Calibration Modules (ACMs) are designed for n-port calibrations of vector network analyzers (VNA) produced by Copper Mountain Technologies.

Copper Mountain Technologies' VNAs have a built-in function of one-touch automatic calibration performed with these ACMs. The ACM calibrates the VNA in fully automatic mode through the built-in functions of the analyzer software. The ACM switches to each of the Short, Open, Load and Thru calibration standards automatically. During the calibration process, the VNA is loaded with temperature corrected, data-based characterizations of all four standards.

The ACM2202 includes two precision RF connectors for connection to the VNA test ports or cables and a USB port for instrument control. Open, Short, Load calibration standards, and a port-to-port Thru are presented to the VNA during calibration using internal changeover switches. All calibration states are characterized at the factory, stored in non-volatile memory, and loaded into the VNA with temperature correction at the beginning of the calibration process.

Advantages of Automatic Calibration

The ACM calibration offers the following advantages over traditional mechanical SOLT calibration:

- reduced number of connections (for example, full two-port calibration requires only one connection of the ACM to a VNA instead of 7 connections of mechanical standards)
- faster calibration procedure
- reduced risk of human error
- higher accuracy
- reduced wear on test port connectors

User-Defined Characterization

Besides factory characterization, the ACM memory can store up to three user characterizations. The user characterization allows use of the ACM with adapters and other fixtures connected.

Attenuator State

The ACM includes a Confidence Check mode that inserts a 20 dB attenuator between its ports and recalls a reference (“golden”) measurement of that attenuator into the memory trace. This enables quick verification of the calibration and helps confirm the stability of the test cables.

Thermal Compensation

Thermal compensation is employed to maintain ACM calibration accuracy across the full operating temperature range of 64°F to 82°F (18°C to 28°C). This software function corrects the ACM’s characterization data for ambient temperature variations. The temperature dependence of the S-parameters for each ACM is determined at the factory and stored in the device memory.

Hardware Specifications

ACM2202

All specifications subject to change without notice.

Measurement Range

Impedance	50 Ohm
Number of ports	2
Frequency range	100 kHz to 22 GHz*
Number of characterization points	up to 1601

[*] All type N models are only operational up to 18 GHz instead of 22 GHz.

Hardware Configurations

Model	Connector type	
	Port A	Port B
ACM2202-011	type N, female	type N, female
ACM2202-012	type N, male	type N, female
ACM2202-111	3.5 mm, female	3.5 mm, female
ACM2202-112	3.5 mm, male	3.5 mm, female

Effective System Data[2][3]

100 kHz to 1 MHz	
Directivity	36 dB
Source match	32 dB
Load match	32 dB
Reflection tracking	0.15 dB
Transmission tracking	0.15 dB
1 MHz to 8 GHz	
Directivity	46 dB
Source match	40 dB
Load match	40 dB
Reflection tracking	0.1 dB
Transmission tracking	0.1 dB
8 GHz to 22 GHz	
Directivity	40 dB
Source match	36 dB
Load match	36 dB
Reflection tracking	0.15 dB
Transmission tracking	0.15 dB

[2] VNA maximum effective parameters after calibration.

[3] All parameters are determined in the temperature range of 23±5 °C with the temperature variation after calibration of no more than ±1 °C and output power of -5 dBm output.

Receiver Input

Max power	0 dBm
Max DC voltage[4]	6 V
Damage level[5]	+18 dBm
Damage DC voltage[5]	10 V

[4] Exceeding max values reduces VNA measurement accuracy.

[5] Exceeding limit values results in ACM failure.

Interface and Power

Interface	USB 2.0
Connector type	USB B
Support standard	USBTMC-USB488
Power consumption	0.25 W

Dimensions[6]

Module dimensions (length x width x height)	
ACM2202-011 (type N, female-female)	102 mm x 57 mm x 27 mm
ACM2202-012 (type N, male-female)	100 mm x 57 mm x 27 mm
ACM2202-111 (3.5 mm, female-female)	94 mm x 57 mm x 27 mm
ACM2202-112 (3.5 mm, male-female)	90 mm x 57 mm x 27 mm
Protective housing dimensions	87 mm x 119 mm x 32 mm
Weight	0.435 kg (15 oz)
Weight of protective housing	0.14 kg (5 oz)

[6] Dimensions are provided as reference information. Details are specified in the product's STEP files.

Environmental Specifications

Operating condition	
Temperature	+5 °C to +40 °C (41 °F to 104 °F)
Humidity	90% at 25 °C (77 °F)
Storage	
Temperature	+0 °C to +40 °C (32 °F to 104 °F)
Humidity	80% at 35 °C (95 °F)
Non-operating temperature	-50 °C to +70 °C (-58 °F to 158 °F)
Atmospheric pressure	70.0 kPa to 106.7 kPa