

Overview

Electronic calibration (ECal) is a precision, single-connection, one or two-port calibration technique for your Agilent vector network analyzer. Agilent ECal modules use fully traceable and verifiable electronic impedance standards. The modules are state-of-the-art, solid-state devices with programmable and highly repeatable impedance states. ECal modules are transfer standards that provide consistent calibrations and eliminate operator errors while bringing convenience and simplicity to your calibration routine. Consistent calibrations provide consistent measurements.

ECal replaces the traditional calibration technique that uses mechanical standards. With mechanical standards, you are required to make numerous connections to the test ports for a single calibration. These traditional calibrations require intensive operator interaction, which are prone to error. With ECal, a full two-port calibration can be accomplished with a single connection to the ECal module and minimal operator interaction. This results in faster and more repeatable calibrations, and less wear on the connectors—and on you. Calibrations for non-insertable devices are equally convenient and straightforward.



ECal modules and available options^{A, B}

Connector type ¹	Frequency range	ECal module model number	Available options
7 mm	30 kHz to 9 GHz ²	Agilent 85091B	1BN, 1BP, 910, UK6
7 mm	1 GHz to 18 GHz	Agilent 85060B	001, 1BN, 1BP, 910, UK6
Type-N (50 ohm)	30 kHz to 9 GHz ²	Agilent 85092B	00F, 00M, 00A, 1BN, 1BP, 910, UK6
Type-N (50 ohm)	1 GHz to 18 GHz	Agilent 85064B	001, 00F, 00M, 00A, 1BN, 1BP, 910, UK6
3.5 mm	30 kHz to 9 GHz ²	Agilent 85093B	00F, 00M, 00A, 1BN, 1BP, 910, UK6
3.5 mm	1 GHz to 26.5 GHz	Agilent 85062B	001, 00F, 00M, 00A, 1BN, 1BP, 910, UK6

HTB Elektronik
 Im Gewerbepark 11
 27619 Schiffdorf/Germany
 (+49) 4706 750100
 info@htb-elektronik.com

Option	Description
001	Adds a 30 kHz to 9 GHz RF module ²
00F	Replace f/m connectors on ECal module(s) with f/f connectors
00M	Replace f/m connectors on ECal module(s) with m/m connectors
00A	Adds male-to-male and female-to-female adapters (also adds a 5/16" 90 N-cm [8 in-lb] torque wrench to 3.5 mm modules)
1BN	Mil-STD 45662 calibration certificate
1BP	Mil-STD 45662 calibration certificate with measured data
910	Add an extra operating and service manual
UK6	Commercial calibration certificate with measured data

Ordering information

Select an ECal module based on the connector type required and the frequency range of your Agilent vector network analyzer.

Order an Agilent 85097A PC interface module with control software to drive all Agilent ECal modules. If you will be using the Agilent 85097A to control an older Agilent 85060 series module with serial number below 800, the module will require a small modification by an Agilent service center.

The PNA Series network analyzer can control RF ECal modules directly via its USB port and does not require the 85097A.

¹ For ECal modules with sexed (m-f) connectors, the standard modules have one female and one male connector.

² RF ECal modules are specified to operate from 300 kHz to 9 GHz, with typical performance down to 30 kHz.

^A Agilent 85060 series modules cover a frequency range of 1 GHz to either 18 or 26.5 GHz. The upper frequency is limited by the connector cutoff frequency. Each module is supplied with a torque wrench and foam-padded wood storage box.

^B Agilent 85090 series modules cover a frequency range of 30 kHz to 9 GHz. Each module is supplied with a torque wrench and foam-padded wood storage box.

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PC requirements

The Agilent 85097A requires a customer-supplied PC, meeting the following minimum requirements:

- Windows® 95, Windows NT® 4.0 or later operating system
- 486 or later CPU
- 32 MB of RAM
- 10 MB available hard-disk space
- One of the following GPIB interface cards:
Agilent 82340A/B, 82341C/D, National Instruments AT-GPIB/TNT, National Instruments AT-GPIB/TNT (plug-and-play) or National Instruments PCI-GPIB



Agilent 85097A PC interface kit

Ecal module specifications and characteristics

Specifications describe product performance covered by the product warranty over a temperature range of 0° C to +55° C.

Characteristics describe performance that is useful in the application of the product, but not warranted. Typical values describe non-warranted performance that most units will exhibit.

Characteristics and typical values are shown in italics.

	Agilent 85091B ¹	Agilent 85092B ¹	Agilent 85093B ¹	Agilent 85060B	Agilent 85062B	Agilent 85064B
Frequency range						
Standard	30 kHz - 9 GHz	30 kHz - 9 GHz	30 kHz - 9 GHz	1 - 18 GHz	1 - 26.5 GHz	1 - 18 GHz
Option 001^{1,2}	N/A	N/A	N/A	30 kHz - 18 GHz	30 kHz - 26.5 Hz	30 kHz - 18 GHz
Maximum power	+20 dBm	+20 dBm	+20 dBm	+20 dBm	+20 dBm	+20 dBm
Minimum power	-45 dBm	-45 dBm	-45 dBm	-45 dBm	-45 dBm	-45 dBm
Connectors						
Standard	7 mm	Type-N (m-f)	3.5 mm (m-f) ³	7 mm	3.5 mm (m-f) ³	Type-N (m-f)
Option 00F	N/A	Type-N (f-f)	3.5 mm (f-f)	N/A	3.5 mm (f-f)	Type-N (f-f)
Option 00M	N/A	Type-N (m-m)	3.5 mm (m-m)	N/A	3.5 mm (m-m)	Type-N (m-m)

Additional coaxial electronic calibrations kits

Connector	Frequency range	Agilent model	Available options
Type-N (75 ohm)	30 kHz to 3 GHz	85096B	00F, 00M, 00A, 1BN, 1BP, 910, UK6
7-16	30 kHz to 7.5 GHz	85098B	00F, 00M, 00A, 1BN, 1BP, 910, UK6
Type-F	30 kHz to 3 GHz	85099B	00F, 00M, 00A, 1BN, 1BP, 910, UK6

¹ Performance is specified from 300 kHz to 9 GHz and typical from 30 kHz to 300 kHz.

² Option 001 adds an RF Ecal module (30 kHz - 9 GHz)

³ 3.5 mm modules have precision slotless connectors that guarantee the best calibration accuracy is transferred to your system.

⁴ Specifications include the effects of the following environmental conditions: sine vibration, random vibration, storage survival, operating temperature stability, shock, and humidity.

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Measurement port specifications¹ (Residual e-terms)

7 mm ECal modules

RF ECal module

Agilent 85091B	Frequency range				
	30 kHz to 300 kHz (typical)	300 kHz to 1.3 GHz	1.3 GHz to 3 GHz	3 GHz to 6 GHz	6 GHz to 9 GHz
Directivity (dB)	-52	-52	-56	-55	-47
Source match (dB)	-45	-45	-44	-41	-34
Reflection tracking (±dB)	0.05	0.038	0.038	0.068	0.1
Transmission tracking (±dB)	0.14	.060	0.055	0.13	0.23
Load match (dB)	-41	-47	-47	-46	-39

Microwave ECal module

Agilent 85060B	Frequency range (GHz)		
	1 to 2	2 to 8	8 to 18
Directivity (dB)	-50	-49	-46
Source match (dB)	-46	-45	-40
Reflection tracking (±dB)	.032	.046	.065
Transmission tracking (±dB)	.043	.050	0.14
Load match (dB)	-46	-44	-40
Option 001	Add RF ECal module (30 kHz to 9 GHz)	See Agilent 85091B specifications	

Type-N ECal modules

RF ECal module

Agilent 85092B	Frequency range				
	30 kHz to 300 kHz (typical)	300 kHz to 1.3 GHz	1.3 GHz to 3 GHz	3 GHz to 6 GHz	6 GHz to 9 GHz
Directivity (dB)	-52	-52	-54	-52	-47
Source match (dB)	-45	-45	-45	-41	-34
Reflection tracking (±dB)	0.05	0.038	0.038	0.068	0.1
Transmission tracking (±dB)	0.14	0.060	0.055	0.13	0.23
Load match (dB)	-41	-47	-47	-44	-39

Microwave ECal module

Agilent 85064B	Frequency range (GHz)		
	1 to 2	2 to 8	8 to 18
Directivity (dB)	-50	-49	-46
Source match (dB)	-46	-45	-40
Reflection tracking (±dB)	0.034	0.046	0.065
Transmission tracking (±dB)	0.043	0.050	0.14
Load match (dB)	-46	-44	-40
Option 001	Add RF ECal Module (30 kHz to 9 GHz)	See Agilent 85029B specifications	

¹ Specifications include the effects of the following environmental conditions: sine vibration, random vibration, storage survival, operating temperature stability, and shock. Based on 28% humidity. Higher humidity levels may degrade performance.

3.5 mm ECal modules¹**RF ECal module**

Agilent 85093B	Frequency range				
	30 kHz to 300 kHz (typical)	300 kHz to 300 MHz	300 MHz to 3 GHz	3 GHz to 6 GHz	6 GHz to 9 GHz
Directivity (dB)	-50	-50	-52	-50.5	-47
Source match (dB)	-43	-43	-42	-39	-34
Reflection tracking (\pm dB)	0.05	0.043	0.043	0.055	0.1
Transmission tracking (\pm dB)	0.14	0.050	0.045	0.13	0.23
Load match (dB)	-41	-47	-47	-44	-39

Microwave ECal module

Agilent 85062B	Frequency range (GHz)			
	1 to 2	2 to 8	8 to 20	20 to 26.5
Directivity (dB)	-48	-49	-46	-44
Source match (dB)	-45	-43	-40	-37
Reflection tracking (\pm dB)	0.041	0.041	0.064	0.088
Transmission tracking (\pm dB)	0.048	0.068	0.13	0.17
Load match (dB)	-45	-43	-40	-38
Option 001	Add RF ECal Module (30 kHz to 9 GHz)	See Agilent 85093B specifications		

¹3.5 mm modules have precision slotless connectors that guarantee the best calibration accuracy is transferred to your system.

Parts for Type-N 50 ohm ECal modules

Description	Qty	Agilent part number
Agilent 85064B, 1 GHz to 18 GHz microwave ECal modules		
Insertable (standard)	1	85064-60002
Non-insertable male (Option 00M)	1	85064-60004
Non-insertable female (Option 00F)	1	85064-60006
Agilent 85092B, 30 kHz to 9 GHz RF ECal modules		
Insertable (85064B Option 001 or 85092A)	1	85092-60005
Non-insertable male (85064B Option 001 and Option 00M or 85092A Option 00M)	1	85092-60006
Non-insertable female (85064B Option 001 and Option 00F or 85092A Option 00F)	1	85092-60007
Adapters (added with option 00A)		
Type-N female-to-female	1	85054-60037
Type-N male-to-male	1	85054-60038

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Parts for 3.5mm ECal modules

Description	Qty	Agilent part number
Agilent 85062B, 1 GHz to 26.5 GHz microwave ECal modules		
Module with male/female connectors (standard)	1	85062-60002
Module with male/male connectors (Option 00M)	1	85062-60004
Module with female/female connectors (Option 00F)	1	85062-60006
Agilent 85093B, 30 kHz to 9 GHz RF ECal modules		
Module with male/female connectors (85062B Option 001 or 85093A)	1	85093-60005
Module with male/male connectors (85062B Option 001 and 00M, or 85093A Option 00M)	1	85093-60006
Module with female/female connectors (85062B Option 001 and 00F, or 85093A Option 00F)	1	85093-60007
Adapters (added with Option 00A)		
3.5 mm female/female	1	85052-60012
3.5 mm male/male	1	85052-60014