Model 835-4 / 6 Specification 2.12

Portable 4 & 6.1 GHz Microwave Signal Generator

BNC Berkeley Nucleonics Corp
Authorized Small Business Partner

NSCA TRA-CAL
SERVICE-DISABLED VETERAN-OWNED SMALL BUSINESS

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Introduction

The BNC 835 is a series of a low-noise and fast-switching analogue signal generator covering a frequency range from 9 kHz up to 4.0 and 6.1 GHz, respectively.

The BNC 835 SERIES provides full RF signal generator capabilities including OCXO-stabilized low phase- noise signal with micro-Hz frequency resolution, wide and accurately levelled output power range, extensive modulation capabilities, and fast switching.

It is targeted for a wide range of applications where a high-quality analogue signal is mandatory, offering an alternative to expensive high-end RF signal generators, where small size and excellent RF performance at an attractive cost is required.

The very compact and rugged design of the BNC 835 SERIES operates at very low DC power consumption (only 12 watts), with minor heat dissipation and not requiring noisy fan. This gives the BNC 835 SERIES a great advantage in laboratories or production test facilities.

The low power design allows the use of optional internal battery modules which make it a truly portable instrument, ideally suited for field testing, installation, and maintenance.

Available Options:

-PE is an optional power level extension to accurately level below -120 dBm.

-RB adds an internal rechargeable battery module

-R 1U 19” rack-mount enclosure

-AVIO adds dedicated avionics modulation like VOR/ILS

The BNC 835 SERIES support various standard interfaces such as USB (USBTMC), LAN (VXI-11), or GPIB and extensive API with programming examples are available.

Signal Specifications

The specifications in the following pages describe the warranted performance of the signal generator for 25 ± 10 °C after a 30 minute warm-up period. Typical specifications describe expected, but not warranted performance. Min and Max specifications are warranted.

Parameter	Min.	Typ.	Max.	Note
Frequency range	9 kHz		4.0 GHz 6.1 GHz	**Model 835-4** **Model 835-6**
resolution		0.001 Hz		
Phase resolution		0.1 deg		
Settling time		20 µs 20 µs	100 µs 200 µs	<= SN xx-xxx2xxxxx-xxxx >= SN xx-xxx3xxxxx-xxxx
Frequency update rate List/Sweep mode		400 µs 400 µs		time from receipt of SCPI command firmware
SSB Phase noise at 1 GHz				
at 20 kHz from carrier		-130 dBc/Hz		See measured phase noise plots
Total jitter		68 fs RMS		10 Hz to 1 MHz BW
Spectral purity Output harmonics Sub-harmonics		 -40 dBc	 -30 dBc -70 dBc	 P_{out} = +10 dBm
Non-harmonic spurious < 1 MHz > 1 MHz		 -70 dBc -75 dBc	 -60 dBc -65 dBc	 P_{out} = +10 dBm
Residual FM @ 1 GHz			3 Hz	0.3 kHz to 3 kHz, weighted (ITU-T)
			12 Hz	0.03 kHz to 23 kHz
Power level				
Range Without Option PE3 With Option PE3	 -30 dBm -120 dBm		 > 18 dBm typically >+17 dBm typically	 See plots on page 8
Resolution		0.01 dB		
Level uncertainty			< 0.9 dB < 1.2 dB	ALC ON, > -20 dBm ALC ON, > -100 dBm
Output impedance VSWR		50 Ω < 2		
Reference frequency input	8 MHz		200 MHz	User programmable
Reference input level	-5 dBm	0 dBm	+13 dBm	
Lock Range			+/- 1.0 ppm	
Reference input impedance		50 s		
Internal reference frequency output		10 MHz		

Parameter	Min.	Typ.	Max.	Note
Initial accuracy of internal reference		±40 ppb		calibrated at 23 ± 3 °C at time of calibration
Temperature stability (0 to 50 degC)			±100 ppb	
Aging 1st year		0.5 ppm		
Aging per day (after 30days operations)			5 ppb	
Warm-Up time		5 min		
Output of internal reference		+0 dBm 50 Ω		
Reverse Power Protection				
DC Voltage		30 V		
RF power			36 dBm	
Dimensions				
Excluding connectors	W x L x H = 172 x 250 x 106 mm			
Including connectors	W x L x H = 172 x 273 x 106 mm			

Notes:

Sweeping Capability

Sweeps can be performed with combined internal or external AM/FM/PM/pulse modulation running. With modulation enabled, the minimum step time increases to 2 ms.

Parameter	Min.	Typ.	Max.	Note
Frequency sweep Sweep type: linear, logarithmic, random				
Step time (t_{step})	400 µs		19998 s	
Dwell time (t_{dwell})	50 µs		9999 s	
Off-time (incl. transient time) (t_{off})	0 / 50 µs		9999 s	
Timing accuracy per point		1 µs		
Generalized list sweep allows individual setting of frequency, power, dwell-time, and off-time for each point				
List size	2		20.000	
Step time (t_{step})	200 µs		19998 s	
Dwell time ($t_{dwell(}$)	50 µs		9999 s	
Off-time (incl. transient time) (t_{off})	0 / 50 µs		9999 *s*	
Time resolution		0.1 µs		
Timing accuracy per point		1 µs		
Frequency Chirps (linear ramp, up/down)				
Bandwidth			10%	
Dwell time (tdwell)	10 ns		100 µs	
Number of frequencies			20’000	

Modulation Capabilities

All modulation types (FM, PM, AM, and pulse modulation) may be simultaneously enabled except: FM and phase modulation can not be combined. For example, AM and FM can run concurrently and will modulate the output RF.

Parameter	Min.	Typ.	Max.	Note
Multifunction Generator Output is Sync Out at rear panel	sine, triangle, square wave			
Frequency range	1 Hz 1 Hz		3 MHz 1 MHz 50 kHz	sine triangle square
Frequency resolution		0.1 Hz		
Output voltage amplitude peak-peak	10 mV	 5 V	2 V	Sine, triangle Square (CMOS output)
Sine Harmonic Distortion		1 %		< 100 kHz, 1 Vpp
Output impedance		50 Ohms CMOS		Sine, triangle square wave
Pulse modulation On/off ratio		70 dB		
Repetition frequency	DC		5 MHz	
Pulse width	30 ns 50 µs			ALC hold ALC on
Pulse rise/fall time		5 ns		
Pulse trains length (pulses)	2		4192	
Pulse width	30 ns		100 µs	
Video crosstalk		-40 dB		
External input amplitude		1 V TTL		AC DC
Frequency modulation Maximum Frequency deviation (peak)	> 2 MHz N x 100 MHz			*< 0.37 GHz* *0.37 GHz to 0.75 GHz (N=0.125)* *0.75 GHz to 1.5 GHz (N=0.25)* *1.5 GHz to 3 GHz (N=0.5)* *> 3 GHz to 6.1 GHz (N=1)*
Modulation waveforms	Sine, triangle, FSK			
Modulation rate	1 Hz/DC		800 kHz	-3dB frequency response
External input sensitivity	< N · 100 MHz for 1 Vpp			settable in AC mode discrete values in DC mode
Total harmonic distortion	< 1%			1 kHz rate & N · 100 kHz deviation
Phase modulation Phase deviation (peak)	0		N·80 rad	
Modulation rate	1 Hz		800 kHz	> -3dB frequency response
Modulation waveforms	Sine, triangle, FSK			
External Input sensitivity	N · 40 rad for 1 Vpp			
Total harmonic distortion	< 1%			1 kHz rate & N ·20 rad deviation

Parameter	Min.	Typ.	Max.	Note
Amplitude modulation				
Modulation rate	10 Hz 10 Hz		20 kHz 50 kHz	applies for internal and external >= SN xx-xxx5xxxxx-xxxx
Modulation depth	0 %		95 %	
Modulation waveforms	Sine, triangle, square			
Distortion		2 %		
Accuracy		3 %		
External input sensitivity	X % per 1 Vpp			settable

Notes:

Multi Purpose Output (FUNC OUT)

Output is FUNC OUT at rear panel

Parameter	Min.	Typ.	Max.	Note
MULTIFUNCTION GENERATOR	sine, triangle, square wave			
Frequency range	1 Hz 1 Hz		3 MHz 1 MHz 50 kHz	sine triangle square
Frequency resolution		0.1 Hz		
Output voltage amplitude peak-peak	10 mV	 5V	2 V	Sine, triangle Square (CMOS output)
Harmonic Distortion		1 %		< 100 kHz, 1 Vpp
Output impedance		50 Ohms CMOS		Sine, triangle square wave
VIDEO OUTPUT (of internal pulse modulator)				
Output		CMOS		
Period	30 ns		50 s	
Pulse Width	15 ns		50 s	
RF delay		10 ns		
TRIGGER OUT	**Synchronization mode for multiple sources**			
Modes	Trigger on sweep start Trigger on each point			
Trigger waveform pulse width		100 ns		

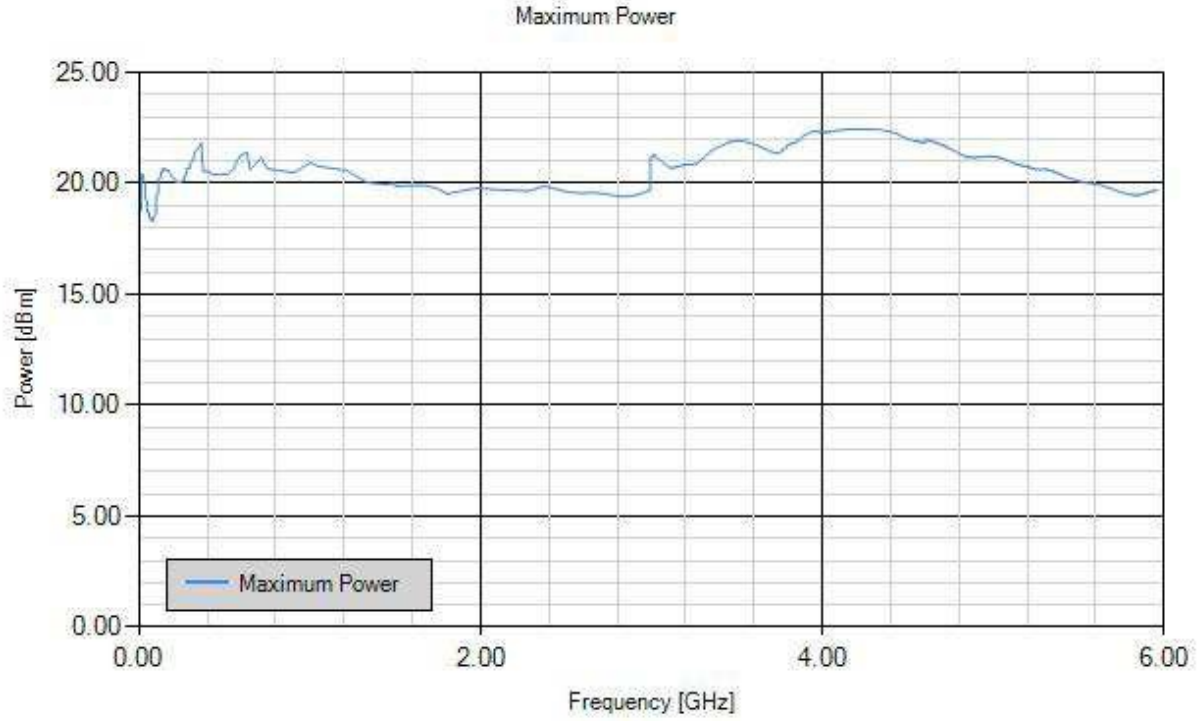
Trigger (TRIG IN)

Input is TRIG IN at rear panel

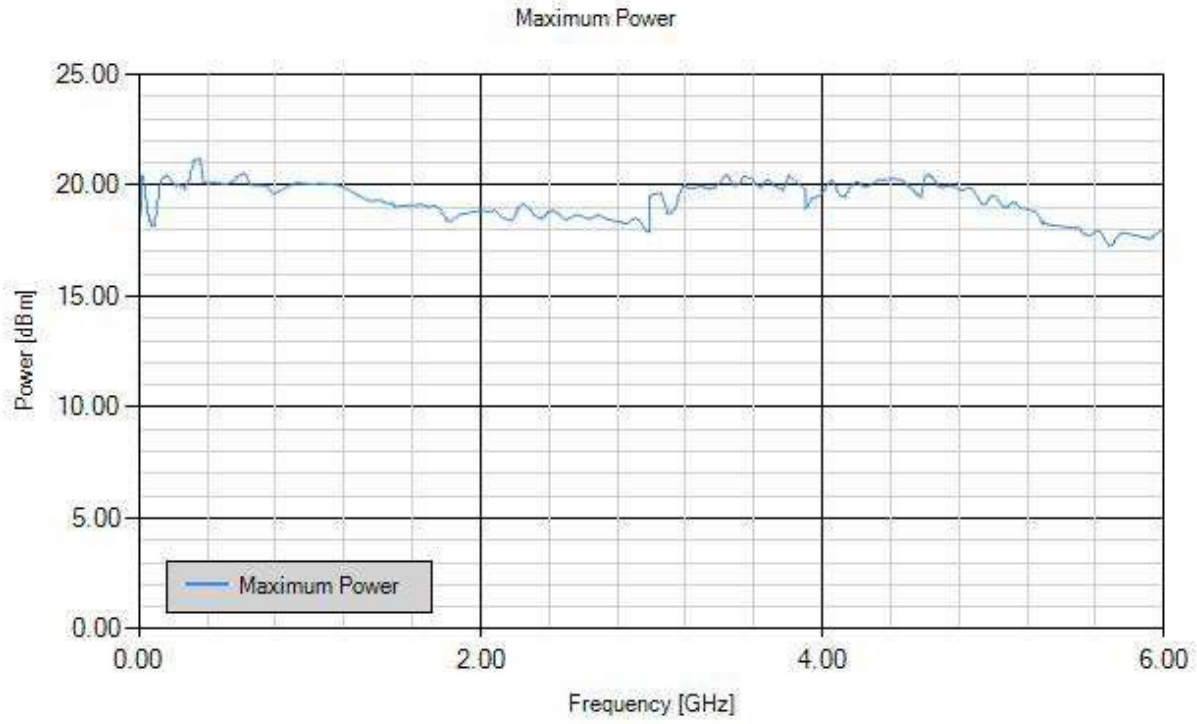
Parameter	Min.	Typ.	Max.	Note
Trigger Types	**Continuous, single, gated, gated direction**			
Trigger Source	**RF key, external, bus (GPIB, LAN, USB)**			
Trigger Modes	**Continuous free run, trigger and run, reset and run**			
Trigger latency		tbd		
Trigger uncertainty		5 µs		
External Trigger delay	50 µs		40 s	
External Delay Resolution		15 ns		
Trigger Modulo	1		255	Execute only on Nth trigger event
Trigger Polarity	Rising, falling			

Typical performance curves

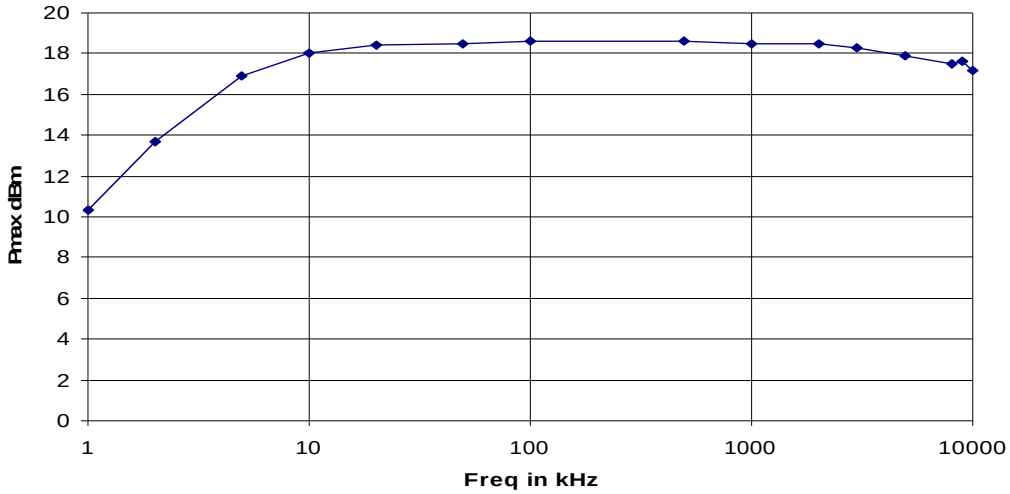
Typical Maximum Output Power (without option PE3)



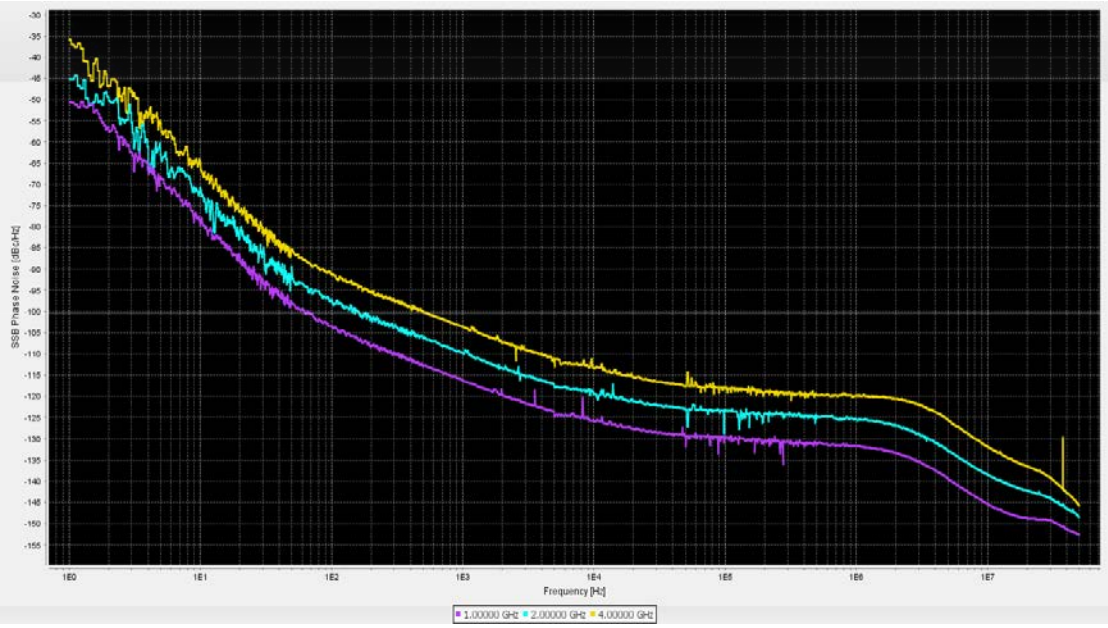
Typical Maximum Output Power (WITH option PE3)



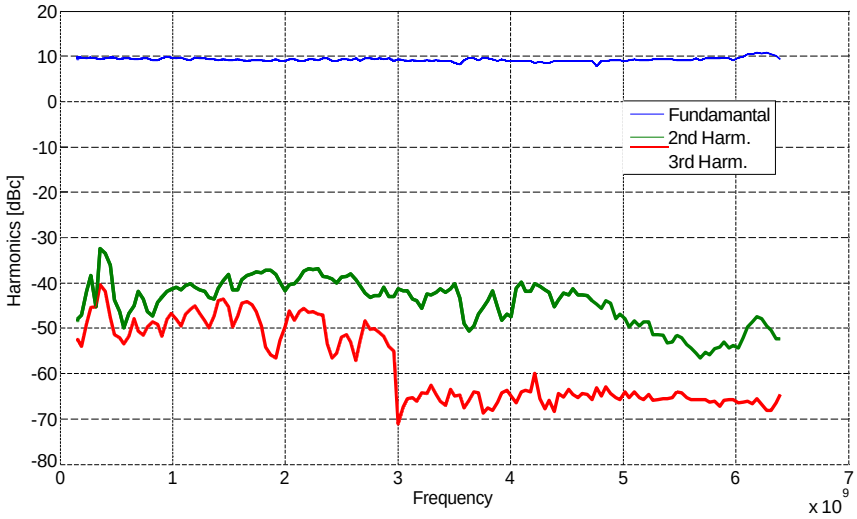
Maximum Output Power (1 kHz to 10 MHz)



Phase Noise Performance (1,2 and 4 GHz)

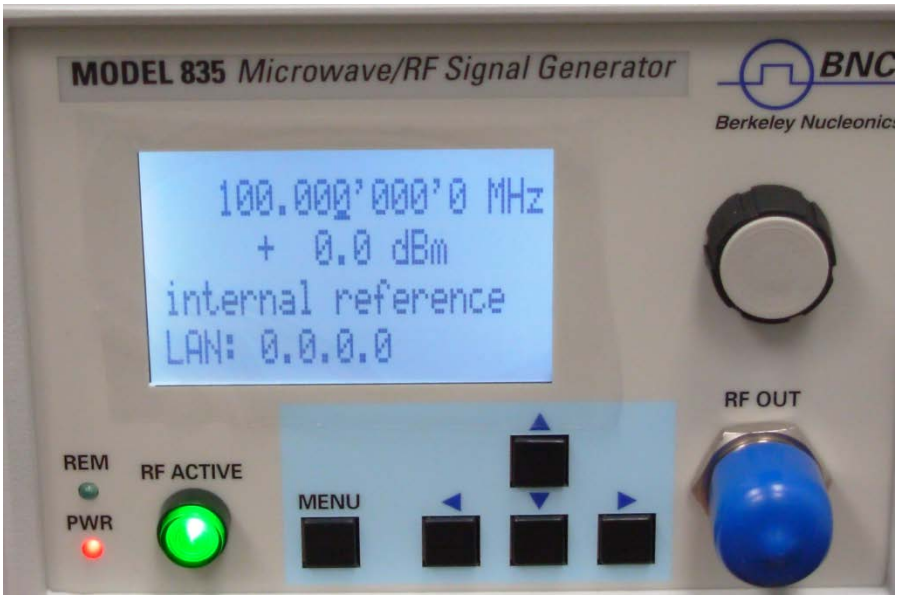


Harmonic performance at + 10 dBm



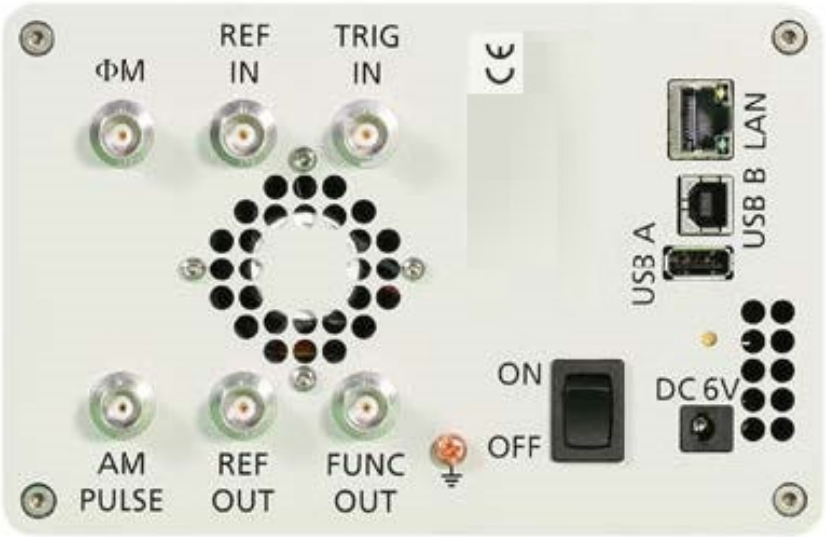
Connectors

Front panel:



1. RF output: N female
2. RF on/off button
3. Rotary knob
4. Menu and ↓ ↑ ← → arrow keys

Rear panel:



1. Trigger input: BNC female
2. Function output: BNC female
3. External reference input: BNC female
4. Internal reference output: BNC female
5. FM/PM modulation input: BNC female
6. AM and Pulse modulation: BNC female

7. LAN connection: RJ-45
8. USB 2.0 host and device
9. GPIB: IEEE-488.2, 1987 with listen and talk (optional)
10. DC Power plug (6V, 6 A)
11. DC power switch

General Characteristics

Remote programming interfaces
Ethernet 100BaseT LAN interface,
USB 2.0 host & device
GPIB (IEEE-488.2,1987) with listen and talk (optional) Control language SCPI Version 1999.0

Power requirements 6 VDC; 20 W maximum
Mains adapter supplied: 100-240 VAC in/ 6 V 6.0 A DC out
Operating temperature range 0 to 45 °C **Storage temperature range** –40 to 70 °C **Operating and storage altitude** up to 15,000 feet

CE **notice**
Safety/EMC complies with applicable Safety and EMC regulations and directives.

Weight ≤ 2.5 kg (6 lbs) net, ≤ 4 kg (8 lb.) shipping
Dimensions 106 mm H without bezels (111 mm H with bezels) x 172 mm W x 270 mm L (incl. connectors) [4.21 in H without bezels (4.40 in H with bezels) x 6.77 in W x 10.63 in L]
Recommended calibration cycle 24 months

Compatibility languages supporting commonly used commands
Agilent Technologies N5181A MXG, Aeroflex
Rohde & Schwarz SMA and SML models

- ***-RB***: Rechargeable battery pack (internal, up to 2.5 hours operation)
- ***-PE***: Extended power range (leveled down to -120 dBm)
- ***-AVIO***: VOR/ILS test signals
- ***-G***: IEEE-488.2,1987 programming interface

- RM: 19'' rackmount enclosure

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