

AE-166 / AE-167

AE-166 and AE-167 are light, compact and high value 3 GHz spectrum analysers. The **AE-167** includes a **tracking generator**.

The **AE-166/167** frequency range stretches from 9 kHz to 3 GHz and features many functions such as radio frequency and power measurement, active component P1dB point measurement, Harmonic measurement, etc. It can support the fast sweep speed up to 307 μ S.

AE-166/167 spectrum analyser, with the built-in preamplifier and the highest sensitivity of -149 dBm/Hz, is capable of measuring very feeble signals. To obtain the accurate results, the low power measurement uncertainty of **AE-166/167** is less than 1.5 dB.

They are the ideal instruments for various application fields such as the basic operation of R&D, research and school lecture, engineering maintenance, and test for mass production. These light and compact spectrum analysers are also suitable for automatic test systems and vehicle mounted operation.



**TRACKING
GENERATOR**

**USB
USB**

**Micro
SD**

**3GHz
BAND
WIDTH**

- ✓ Frequency range up to 3 GHz
- ✓ Resolution bandwidth from 1 Hz to 1 MHz
- ✓ Sensitivity: -149 dBm/Hz (@PreAmp on)
- ✓ Built-in preamplifier, 50 dB Attenuator, and Sequence Function, AM/FM Demodulation & Analysis
- ✓ Built-in P1dB point, Harmonic, Channel Power, N-dB bandwidth, OCBW, ACPR, SEM, TOI, CNR, CTB, CSO, Noise Marker, Frequency Counter, Time Domain Power, Gated Sweep
- ✓ Built-in Spectrogram, Topographic and Dual-View Display Modes
- ✓ 0.025 ppm frequency stability
- ✓ Fastest sweep time: 307 μ s
- ✓ Remote Control via LAN, USB, RS-232



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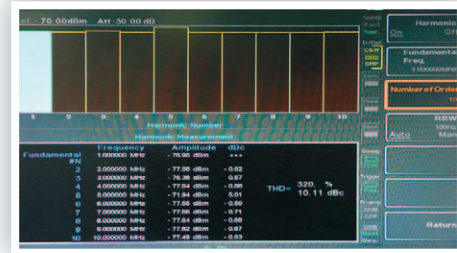


ACPR (Adjacent Channel Power Ratio)

Telecommunications and broadcasting service carriers must reduce interference to the minimum. This interference is caused by power leakage to adjacent transmission channels. The ACPR measurement can examine the leakage status that is conducive to identifying interference source.

OCBW (Occupied Bandwidth)

The OCBW measurement can simultaneously display OCBW, channel power and PSD. OCBW's unit is shown by percentage. A measurement area containing bandwidth will be shown when OCBW is in use.



Harmonic

Harmonic can easily measure the amplitude of fundamental frequency and as high as ten orders of harmonic frequency. This function can also measure amplitude (dBc) which is the ratio of harmonic and corresponding fundamental carrier. Total harmonic distortion (THD) can also be calculated by this function.

Sequence function

The sequence function allows users to edit a sequence formulated by a series of steps directly from the instrument. Pause and delay can be inserted in the sequence to observe the test results. There are five sets of sequence for selection. Each sequence allows editing of 20 steps. Different sequence can be interactive and support each other. This function provides automatic editing without using the PC that is very convenient for assembly lines in which execute routine test procedures.

SPECIFICATIONS	AE-166 / AE-167 - 3 GHz SPECTRUM ANALYSERS WITH TRACKING GENERATOR
FREQUENCY	
Frequency range	From 9 kHz to 3 GHz
Resolution	1 Hz
Frequency reference	
Accuracy	\pm (period since last adjustment X aging rate) + stability over temperature + supply voltage stability
Aging rate	± 1 ppm max.
Frequency stability	± 0.025 ppm
Over temperature supply voltage stability	± 0.02 ppm
Frequency readout accuracy	
Start, stop, center marker	\pm (marker frequency indication X frequency reference accuracy + 10% RBW + frequency resolution)
Trace points	Max 601 points, min 6 points
Marker frequency counter resolution	1 Hz, 10 Hz, 100 Hz, 1 kHz
Accuracy	\pm (marker frequency indication X frequency reference accuracy + counter resolution)
Frequency span	0 Hz (zero span), 100 Hz to 3 GHz
Resolution	1 Hz
Accuracy	\pm frequency resolution
Phase noise	
Offset from carrier	$F_c = 1\text{GHz}; \text{RBW} = 1\text{kHz}, \text{VBW} = 10\text{Hz}; \text{Average} \geq 40$
10 kHz	< -88 dBc/Hz typ.
100 kHz	< -95 dBc/Hz typ.
1 MHz	< -113 dBc/Hz typ.
Resolution bandwidth (RBW) filter	From 1 Hz to 1 MHz in 1-3-10 sequence
Accuracy	$\pm 8\%$ (RBW = 1 MHz) $\pm 5\%$ (RBW < 1 MHz) < 4.5:1
Shape factor	
Video bandwidth (VBW) filter bandwidth	From 1 Hz to 1 MHz in 1-3-10 sequence (-3 dB bandwidth)

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AMPLITUDE	
Amplitude measurement range 100 kHz to 1 MHz 1 MHz to 10 MHz 10 MHz to 3 GHz	Displayed average noise level (DANL) to 18 dBm DANL to 21 dBm DANL to 30 dBm
Input attenuator range	From 0 to 50 dB, in 1 dB step (auto or manual setup)
Maximum safe input level Average total power DC voltage	$\leq +33$ dBm (input attenuator ≥ 10 dB) ± 50 V
1 dB gain compression Total power at 1st mixer Total power at the preamp Preamp	> 0 dBm (typ., $F_c \geq 50$ MHz; preamp. off) > -22 dBm (typ.; $F_c \geq 50$ MHz; preamp. on) Mixer power level (dBm) = input power (dBm) - attenuation (dB)
Displayed average noise level (DANL) Preamp off 9 kHz to 100 kHz 100 kHz to 1 MHz 1 MHz to 2.7 GHz 2.7 GHz to 3 GHz Preamp On 100 kHz to 1 MHz 1 MHz to 10 MHz 10 MHz to 3 GHz	0 dB attenuation; RF input is terminated with a 50 Ω load. RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60 dBm; trace average ≥ 40 < -93 dBm < -90 dBm - 3 x (f/100 kHz) dB nominal < -122 dBm < -116 dBm 0 dB attenuation; RF input is terminated with a 50 Ω load; RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60 dBm; trace average ≥ 40 < -108 dBm - 3 x (f/100 kHz) dB nominal < -142 dBm < -142 dBm + 3 x (f/1 GHz) dB
Level display range Scales Units Marker level readout Level display modes Number of traces Detector Trace functions	Log, linear dBm, dBmV, dB μ V, V, W 0.01 dB (log scale) 0.01 % of reference level (linear scale) Trace, topographic, spectrogram (single / Split windows) 4 Positive-peak, negative-peak, sample, normal, RMS (not Video). Can be setup for each trace separately Clear & Write, Max/Min Hold, View, Blank, Average
Absolute amplitude accuracy Absolute point Preamp off Preamp on	Center=160 MHz; RBW 10 kHz; VBW 1 kHz; span 100 kHz; log scale; 1 dB/div; peak detector; 23°C ± 1 °C; Signal at reference level ± 0.3 dB (ref level 0 dBm; 10 dB RF attenuation) ± 0.4 dB (ref level -30 dBm; 0 dB RF attenuation)
Frequency response Preamp off 100 kHz to 2 GHz 2 GHz to 3 GHz Preamp on 1 MHz to 2 GHz 2 GHz to 3 GHz	Attenuation 10 dB; Reference 160 MHz; 20 to 30°C ± 0.5 dB ± 0.7 dB Attenuation 0 dB; Reference 160 MHz; 20 to 30 °C ± 0.6 dB ± 0.8 dB
Attenuation switching uncertainty Attenuator setting Uncertainty	0 to 50 dB in 1 dB step ± 0.25 dB (reference 160 MHz; 10 dB attenuation)
RBW filter switching uncertainty 1 Hz to 1 MHz	± 0.25 dB (reference 10 kHz RBW)
Level measurement uncertainty Overall amplitude accuracy	± 1.5 dB (20 to 30°C; frequency > 1 MHz; Signal input 0 to -50 dBm; Reference level 0 to -50 dBm; Input attenuation 10 dB; RBW 1 kHz; VBW 1 kHz; after cal; Preamp off) ± 0.5 dB typ.
Spurious response Second harmonic intercept Third-Order intercept Input related spurious Residual response (inherent)	(Preamp off; Signal input -30 dBm; 0 dB attenuation) +35 dBm (typ. 10 MHz $< f_c < 775$ MHz) +60 dBm (typ. 775 MHz $\leq f_c < 1.625$ GHz) > 1 dBm (Preamp off; Signal input -30 dBm; 0 dB attenuation; 300 MHz to 3 GHz) < -60 dBc (Input signal level -30 dBm; Att. Mode; Att = 0 dB; 20-30°C) < -90 dBm (Input terminated; 0 dB attenuation; Preamp off)

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SWEEP	
Range	307 μ s to 1000 s (Span > 0 Hz) 50 μ s to 1000 s (Span = 0 Hz; Min resolution = 10 μ s)
Sweep mode	Continuous; Single
Trigger mode	Free run; Video; External
Trigger slope	Positive or negative edge
RF PREAMPLIFIER	
Frequency range	1 MHz to 3 GHz
Gain	18 dB (nominal, installed as standard)
FRONT PANEL INPUT/OUTPUT	
RF input	N-type female, 50 Ω (nominal)
VSWR	< 1.6:1 (300 kHz to 3 GHz; Input attenuator \geq 10 dB)
Power for option	SMB male connector, DC +7V / 500 mA max (with short-circuit protection)
USB 2.0 host	A plug, supports Full/High/Low speed
MicroSD socket	Supports microSD, microSDHC cards (up to 32 GB capacity)
REAR PANEL INPUT/OUTPUT	
Reference output	BNC female, 50 Ω
Output frequency	10 MHz (nominal)
Output amplitude	3.3 V CMOS
Reference input	BNC female
Input frequency	10 MHz
Input amplitude	-5 dBm to +10 dBm
Frequency lock range	Within \pm 5 ppm of the input reference frequency
Alarm output	BNC female
Trigger input / Gated sweep input	BNC female
Input amplitude	3.3V CMOS
Switch	Auto selection by function
LAN TCP/IP interface	RJ-45 connector (10Base-T / 100Base-Tx / Auto-MDIX)
USB 2.0 device (for remote control only)	B-plug. Supports USB TMC. Supports Full/High/Low speed
IF output	SMA female, 50 Ω (nominal)
Frequency and level	886 MHz (nominal), -25 dBm (10 dB attenuation; RF input: 0 dBm @ 1 GHz)
Earphone output	3.5 mm stereo jack, wired for mono operation
Video output	DVI-I (integrated analog or digital), Single Link. Compatible with VGA or HDMI through adapter
RS-232 interface	D-sub 9-pic female (Tx, Rx, RTS, CTS)
AC power input	AC 100 V to 240 V, 50/60 Hz (auto range selection). Power consumption < 65 W
GENERAL	
Internal data storage	16 MB nominal
Screen	8" color LCD
Warm-Up time	< 30 minutes
Temperature range	+5 to +45 $^{\circ}$ C (operating), -20 to +70 $^{\circ}$ C (storage)
Weight	Less than 4.1 kg
Dimensions	350 (W) x 210 (H) x 100 (D) mm approx
Optional accessories	Soft carrying case, 6U rack mount kit
BATTERY PACK (OPTIONAL)	6 cells, Li-Ion rechargeable (with UN38.3 certification) DC 10.8 V, 5200 mAh / 56 Wh
TRACKING GENERATOR (AE-167 ONLY)	
Frequency range	N-type female connector, 50 Ω nominal From 100 kHz to 3 GHz
Output power	-50 dBm to 0 dBm in 0.5 dB steps
Absolute accuracy	\pm 0.5 dB (@ 160 MHz; -10 dBm; Source attenuation 10 dB; 20 to 30 $^{\circ}$ C)
Output flatness	Referenced to 160 MHz; -10 dBm
100 kHz to 2 GHz	\pm 1.5 dB
2 GHz to 3 GHz	\pm 2 dB
Output level switching	\pm 0.8 dB (referenced to -10 dBm)
Uncertainty Harmonics	< -30 dBc (typ., output level = -10 dBm)
Reverse power	+30 dBm max.
Output VSWR	< 1.6:1 (300 kHz to 3 GHz; Source attenuation \geq 12 dB)