# 3 GHz SPECTRUM ANALYSER WITH TRACKING GENERATOR



## AE-166 / AE-167


**8" EXTRA-LARGE COLOR DISPLAY**

**UP TO 1 Hz RESOLUTION**

***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 µS.*

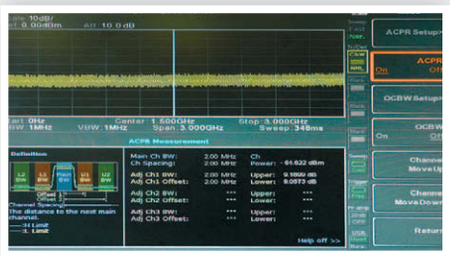
***AE-166/167*** *spectrum analyser, with the built-in preamplifier and the highest sensitivity of -149 dBm/Hz, is capable of measuring very feeble signals. To obtain the accurate results, the low power measurement uncertainty of* ***AE-166/167*** *is less than 1.5 dB.*

*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** | **microSD™** | **3GHz BAND WIDTH**

- ✓ **Frequency range up to 3 GHz**
- ✓ **Resolution bandwidth from 1 Hz to 1 MHz**
- ✓ **Sensitivity: -149 dBm/Hz (@PreAmp on)**
- ✓ **0.025 ppm frequency stability**
- ✓ **Fastest sweep time: 307 µs**
- ✓ **Remote Control via LAN, USB, RS-232**
- ✓ **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**

# AE-166 / AE-167



## 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.

## 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.

## 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.

## 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 | ± (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 | ± (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 | ± (marker frequency indication X frequency reference accuracy + counter resolution) |
| Frequency span | 0 Hz (zero span), 100 Hz to 3 GHz |
| Resolution | 1 Hz |
| Accuracy | ± frequency resolution |
| Phase noise | |
| Offset from carrier | Fc = 1GHz; RBW = 1 kHz, VBW = 10 Hz; Average ≥ 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 | ±8 % (RBW = 1 MHz)<br>±5 % (RBW < 1 MHz) |
| Shape factor | < 4.5:1 |
| Video bandwidth (VBW) filter bandwidth | From 1 Hz to 1 MHz in 1-3-10 sequence (-3 dB bandwidth) |

# AE-166 / AE-167

| SPECIFICATIONS | AE-166 / AE-167 - 3 GHz SPECTRUM ANALYSERS WITH TRACKING GENERATOR |
|---|---|
| **AMPLITUDE** | |
| Amplitude measurement range | |
| 100 kHz to 1 MHz | Displayed average noise level (DANL) to 18 dBm |
| 1 MHz to 10 MHz | DANL to 21 dBm |
| 10 MHz to 3 GHz | 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 | ≤ +33 dBm (input attenuator ≥ 10 dB) |
| DC voltage | ± 50 V |
| 1 dB gain compression | |
| Total power at 1st mixer | > 0 dBm (typ., Fc ≥ 50 MHz; preamp. off) |
| Total power at the preamp | > -22 dBm (typ.; Fc ≥ 50 MHz; preamp. on) |
| Preamp | Mixer power level (dBm) = input power (dBm) - attenuation (dB) |
| Displayed average noise level (DANL) | |
| Preamp off | 0 dB attenuation; RF input is terminated with a 50 Ω load.<br>RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60 dBm; trace average ≥ 40 |
| 9 kHz to 100 kHz | < -93 dBm |
| 100 kHz to 1 MHz | < -90 dBm - 3 x (f/100 kHz) dB nominal |
| 1 MHz to 2.7 GHz | < -122 dBm |
| 2.7 GHz to 3 GHz | < -116 dBm |
| Preamp On | 0 dB attenuation; RF input is terminated with a 50 Ω load;<br>RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60 dBm; trace average ≥ 40 |
| 100 kHz to 1 MHz | < -108 dBm - 3 x (f/100 kHz) dB nominal |
| 1 MHz to 10 MHz | < -142 dBm |
| 10 MHz to 3 GHz | < -142 dBm + 3 x (f/1 GHz) dB |
| Level display range | |
| Scales | Log, linear |
| Units | dBm, dBmV, dBµV, V, W |
| Marker level readout | 0.01 dB (log scale)<br>0.01 % of reference level (linear scale) |
| Level display modes | Trace, topographic, spectrogram (single / Split windows) |
| Number of traces | 4 |
| Detector | Positive-peak, negative-peak, sample, normal, RMS (not Video).<br>Can be setup for each trace separately |
| Trace functions | Clear & Write, Max/Min Hold, View, Blank, Average |
| Absolute amplitude accuracy | |
| Absolute point | Center=160 MHz; RBW 10 kHz; VBW 1 kHz; span 100 kHz; log scale;<br>1 dB/div; peak detector; 23ºC ±1ºC; Signal at reference level |
| Preamp off | ± 0.3 dB (ref level 0 dBm; 10 dB RF attenuation) |
| Preamp on | ± 0.4 dB (ref level -30 dBm; 0 dB RF attenuation) |
| Frequency response | |
| Preamp off | Attenuation 10 dB; Reference 160 MHz; 20 to 30ºC |
| 100 kHz to 2 GHz | ±0.5 dB |
| 2 GHz to 3 GHz | ±0.7 dB |
| Preamp on | Attenuation 0 dB; Reference 160 MHz; 20 to 30 ºC |
| 1 MHz to 2 GHz | ±0.6 dB |
| 2 GHz to 3 GHz | ±0.8 dB |
| Attenuation switching uncertainty | |
| Attenuator setting | 0 to 50 dB in 1 dB step |
| Uncertainty | ±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 30ºC; 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)<br>±0.5 dB typ. |
| Spurious response | (Preamp off; Signal input -30 dBm; 0 dB attenuation) |
| Second harmonic intercept | +35 dBm (typ. 10 MHz < fc < 775 MHz)<br>+60 dBm (typ. 775 MHz ≤ fc < 1.625 GHz) |
| Third-Order intercept | > 1 dBm (Preamp off; Signal input -30 dBm; 0 dB attenuation; 300 MHz to 3 GHz) |
| Input related spurious | < -60 dBc (Input signal level -30 dBm; Att. Mode; Att = 0 dB; 20-30ºC) |
| Residual response (inherent) | <-90 dBm (Input terminated; 0 dB attenuation; Preamp off) |

PROMAX

# 3 GHz SPECTRUM ANALYSER WITH TRACKING GENERATOR

## AE-166 / AE-167

| SPECIFICATIONS | AE-166 / AE-167 - 3 GHz SPECTRUM ANALYSERS WITH TRACKING GENERATOR |
|---|---|
| **SWEEP** | |
| Range | 307 µs to 1000 s (Span > 0 Hz)<br>50 µs to 1000 s (Span = 0 Hz; Min resolution = 10 µs) |
| 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 ≥ 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 ±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 ºC (operating), -20 to +70ºC (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)** | N-type female connector, 50 Ω nominal |
| Frequency range | From 100 kHz to 3 GHz |
| Output power | -50 dBm to 0 dBm in 0.5 dB steps |
| Absolute accuracy | ±0.5 dB (@ 160 MHz; -10 dBm; Source attenuation 10 dB; 20 to 30ºC) |
| Output flatness | Referenced to 160 MHz; -10 dBm |
| 100 kHz to 2 GHz | ±1.5 dB |
| 2 GHz to 3 GHz | ±2 dB |
| Output level switching | ±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 ≥ 12 dB) |



PROMAX

*Note: The specifications apply when the AE-166/167 are powered on for at least 30 minutes to warm-up to a temperature of 20 ºC to 30 ºC, unless specified otherwise.*