Boonton

Data Sheet

8201
AM / FM Modulation Meter

Taking performance to a new peak

FM / AM Modulation Meter Model 8201

The Boonton Model 8201 Modulation Analyzer offers a unique combination of measurements including:

- AM, FM and ØM (AM and FM 1%, ØM 3% of readings)
- Carrier level and frequency
  (0.01 dB level and 10 Hz carrier resolution)
- Signal, noise and distortion power (SINAD)

This eliminates the need for several different pieces of equipment.

Modulation is detected using peak, while residuals are measured using RMS and referenced to a specific level. These values are displayed in %, dB or quasi-peak, and the highest values are stored using the peak-hold function.

Signal frequency and level can be acquired automatically or input via the keyboard or remote command. The 8201 is a cost effective measurement tool for an ATE system, signal generator calibration or mobile radio production testing.

Provides Versatile Audio Filters

- 4 Low pass
- 4 High pass
- 4 De-emphasis networks

Specifications

RF Input	
Frequency Range	100 kHz to 2.5 GHz
Tuning Automatic, typical acquisition time one second. Manual, from keyboard or IEEE-488 bus[6]	
Sensitivity	
10 mV	100 kHz to 520 MHz
15 mV	520 MHz to 1.0 GHz
28 mV	1.0 GHz to 1.5 GHz
50 mV	1.5 MHz to 2.0 GHz
Carrier acquisition level is typically -40 dBm (2.3 mV)	
Level Set Automatic, typical acquisition time one second for levels up to 7 V RMS. Manual, from keyboard or IEEE-488 bus[6]	
Maximum Input	1 watt (7 V RMS, +30 dBm)[6]
Maximum Safe Input	40 V dc, 35 V ac (25w for source SWR<4)[6]
Input Impedance	50 Ω nominal, SWR <1.5

Carrier Frequency

Resolution	10 Hz for carriers <1.0 GHz, 100 Hz for carriers >1 GHz
Accuracy	Reference accuracy ± three digits

Reference Oscillator

10 MHz, temperature compensated. Aging rate less than $\pm 1 \times 10^{-6}$/year. Temperature influence less than $\pm 1 \times 10^{-6}$ from 0 to 50 degrees centigrade

Carrier Level

Range	-47.0 to +30.0 dBm (1 mV to 7 V)
Resolution	0.01 dBm or .1 mV

Accuracy

±1 dB from 100 kHz to 520 MHz, ±2 dB from 520 MHz to 1500 MHz, ±3 dB from 1500 MHz to 2500 MHz

FM Modulation

Measurement: + peak, -peak, peak average, quasi-peak and RMS

Carrier Range	0.2 MHz to 0.5 MHz	0.5 MHz to 10 MHz	10 MHz to 2.5 GHz
Deviation Range[7]	0 to C.F./10 kHz	0 to 150 kHz	0 to 500 kHz
Deviation Accuracy[1][2] **At specified mod. rates**	1% of reading, 30 Hz to 5 kHz; 2% of reading, 5 kHz to 7.5 kHz.	1% of reading, 30 Hz to 15 kHz; 2% of reading, 15 kHz to 30 kHz	1% of reading, 30 Hz to 100 kHz; 2% of reading, 100 kHz to 150 kHz
Modulation Frequency Range	20 Hz to 15 kHz	20 Hz to 50 kHz	20 Hz to 220 kHz
AF output distortion	<0.1% @ <30 kHz dev	<0.1% at <75 kHz	<0.1% at <100 kHz dev

Residual FM

<15 Hz RMS at 2.0 GHz decreasing linearly to a floor of <1 Hz RMS at 100 MHz, with 3 kHz low-pass filter. <30 Hz RMS at 2.0 GHz decreasing linearly to a floor of <2 Hz RMS at 100 MHz, with 15 kHz low-pass filter

Incidental FM	<20 Hz peak deviation at 50% AM 30 Hz to 3 kHz filter

Display Resolution[8]

1 Hz for deviations from 0 to 5 kHz. 10Hz for deviations from 5 to 50 kHz. 100 Hz for deviations above 50 kHz

Stereo Separation[3]	>48 dB 50 Hz to 15 kHz modulation rates

AM Modulation

Measurement: + peak, - peak, peak average, quasi-peak, and RMS

Carrier Range	0.1 MHz to 0.5 MHz	0.5 MHz to 10 MHz	10 MHz to 2.5 GHz
Depth Range	0 to 99%	0 to 99%	0 to 99%
Depth Accuracy[1][2] **At specified mod. Rates**	1% of reading 30 Hz to 5 kHz	1% of reading, 30 Hz to 15 kHz	1% of reading, 30 Hz to 100 kHz
Modulation Frequency Range	20 Hz to 15 kHz	20 Hz to 50 kHz	20 Hz to 220 kHz
AF output Distortion	<0.3% for 90% AM	<0.3% for 90% AM	<0.3% for 90% AM

Residual AM

<0.05% RMS for input levels >100 mV, 15 kHz low-pass filter; <0.02% RMS for input levels >100 mV, 3 kHz low-pass filter; carrier frequency <520 MHz. Above 520 MHz, residuals increase linearly with frequency

Incidental AM (3 kHz low-pass)

Carrier	
>10 MHz <0.2% AM	peak at 50 kHz peak deviation
<10 MHz <0.2% AM	peak at 5 kHz peak deviation
Display Resolution	.001 % for depths from 0 to 5% .01 % for depths from 5 to 50% .1 % for depths above 50%

ØM Modulation

Measurement: + peak, - peak, peak average, quasi-peak, and RMS

Carrier Range	0.2 MHz to 0.5MHz	0.5 MHz to 10 MHz	10 MHz to 2.5 GHz
Deviation Range[4]	0 to C.F./10 rad	0 to 150 rad	0 to 500 rad
Deviation Accuracy[1][2] **At specified mod. Rates**	3% of reading 200 Hz to 30 kHz rates.	3% of reading. 200 Hz to 30 kHz rates.	3% of reading, 200 Hz to 30 kHz rates.
Modulation Frequency Range	1000 Hz to 15 kHz	20 Hz to 50 kHz	20 Hz to 100 kHz
AF Output Distortion	<0.1% at <30 rad dev.	<0.1% at <75 rad dev.	<0.1% at <100 rad dev.

Residual PM

<0.1 rad RMS at 2.0 GHz decreasing linearly to a floor of less than 0.005 rad RMS at 100 MHz

Incidental PM	<0.02 rad deviation at 50% AM, 30 Hz to 3 kHz filter

Display Resolution[5]

0.001 rad for deviations from 0 to 5 radww
0.01 rad for deviations from 5 to 50 rad
0.1 rad for deviations above 50 rad

Audio Frequency Display

Range	10Hz to 220 kHz

Resolution

100 Hz for frequencies >100 kHz. 10Hz for frequencies between 10kHz and 100 kHz. 1 Hz for frequencies between 1 kHz and 10kHz. 0.1 Hz for frequencies <1 kHz

Accuracy:	Reference accuracy ± one count

Audio Distortion/SINAD

Distortion Range	0.01 % to 100% THD or 0 to 80 dB SINAD

Distortion Accuracy

± 10% of reading or ± 1 dB SINAD. (The residual AM/FM or ØM must be accounted for in distortion measurements)

Frequency Range

20 Hz to 20 kHz. Automatic operation when modulation frequency is within this range

Residual Noise and Distortion	Less than 0.1 % (60 dB SINAD) distortion
Resolution	
0.01 %, range	0.01 to 9.99%
0.1 %, range	10.0 to 99.9%
0.01 dB, range	0 to 80 dB SINAD

Audio Filters

High-pass

<10Hz, Gaussian response and 30, 300 and 3000 Hz, three pole Butterworth response

Low-pass

220 kHz and 50 kHz, seven pole Butterworth response, 20 kHz, three pole Bessel response and 3 and 15 kHz three pole Butterworth response

De-emphasis	25, 50, 75, and 750 µS
Filter Response	3 dB corner & time constant accuracy, ±4%
Square Wave Response	<10 Hz High-Pass <10% droop with 5 Hz square wave

Internal Calibrator

The 8201 may be calibrated to its full accuracy for AM/FM/ØM through the use of internal calibrators that are actuated via front panel or over the IEEE Bus.

Calibrator Accuracy

AM, 50.0% depth, 0.1 %; FM, 125.0 kHz deviation, 0.1 %; PM, 136.3 RAD deviation, 1.0%

Audio Frequency Output	
Range Uncalibrated, approximately 1 V RMS into 600 Ω at 5000 counts on display. Source impedance 600 Ω	
Power Requirements	65 VA; 100, 120,220, or 240 V ±10%, 50 to 400 Hz
Operating Temperature	0° to 55°C
Weight	281bs (12.7 kg)
Dimensions	17.25 in (43.8 cm) wide 5.75 in (14.6 cm) high 18.75 in (47.6 cm) deep
Accessories Included	Spare input fuses Fuse replacement wrench

Remote Control	
GPIB	Standard

Notes

(1) Peak residuals must be accounted for to obtain above accuracy
(2) For RMS detector, add ±1% of reading. For quasi-peak add ±6.0% of reading, 20 Hz to 20 kHz
(3) <10 Hz -220 kHz filters
(4) Up to 1 kHz modulation rate. Above 1 kHz range, decreases linearly with modulation frequency.
(5) Up to 1 kHz modulation rate. Above 1 kHz, resolution is determined by product of deviation and modulation rate.
(6) These specifications are for application purposes and although typical are not guaranteed.
(7) With 750 µs de-emphasis and pre-display selected the deviation is limited to 50 kHz peak.
(8) Resolution is ten times greater with 750 µs de-emphasis and pre-display selected.

Options

01	Avionics Specification Certification
02	Rear Panel RF Input
03	CCITT Filter
05	Amplitude Calibrator (0 dBm 50 MHz)
07	Audio Loop-through. Used with external filters to allow user-defined filtering. Option 07 excludes Option 03 and vice versa .
08	CCIR Filter
09	C-MSG Filter

Accessories Available	
Rack Mount Kit (Ears & Handles)	PIN 95004492A

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Note: Specifications, terms and conditions are subject to change without prior notice.

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