BOONTON

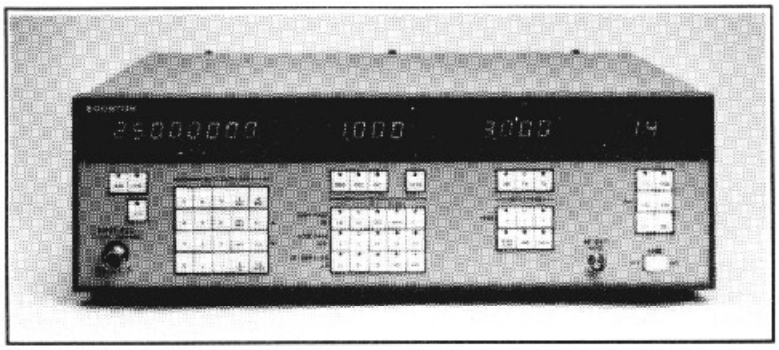
MODULATION METERS AND ANALYZERS

FM/AM Modulation Meter

Model 8201

GPIB

- Carrier Frequency Range, 100 kHz to 2.5 GHz
- Measures AM/FM/ØM
- Provides Versatile Audio Filters
- Peak, RMS, Quasi-Peak Detection
- Measures Carrier Frequency, Level, Audio Frequency, and Distortion/SINAD
- GPIB Programmable
- Internal Calibrators (AM/FM/ØM) Standard



Description

The Boonton Model 8201 Modulation Analyzer offers a unique combination of measurement capabilities. Not only does it measure AM/FM/ØM with unprecedented accuracy, it also measures carrier frequency and level. In addition, the unit measures audio frequency and distortion/SINAD. This combination can eliminate the need for several additional pieces of test equipment by putting them all together in one convenient package, at the price of a modulation meter alone.

The 8201 measures AM and FM to 1% of reading and phase modulation to 3%, carrier frequencies with 10 Hz resolution and levels to 0.01 dB, audio frequencies between 10 Hz and 220 kHz, audio distortion at any modulation frequency from 20 Hz to 20 kHz in % THD or dB SINAD, and selects from 4 low-pass filters, Butterworth or Bessel, 4 high-pass filters, and 4 de-emphasis networks.

Modulation measurements are made with: true peak detectors (plus, minus, or peak-to-peak divided by 2), residuals measured with true rms detection and displayed as a ratio to a selected reference level, in either % or dB and quasi-peak detection. A peak HOLD function allows a running display of the highest measurement.

Operation can be completely automatic with internal frequency and level acquisition, or the carrier frequency and level can be entered through the keyboard or over the bus.

The 8201 is especially useful for ATE applications because of its high measurement speed and ease of use over the included GPIB.

The 8201 is a cost effective measurement tool that can be used for signal generator calibration or mobile radio production testing.

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)[5]

Maximum Safe Input: 40 V dc, 35 V ac (25 w for source SWR <4)[5]

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 ±1x10-6/year. Temperature influence less than ±1x10-6 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 $\frac{C.F._{kHz}}{10}$	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% at <30 kHz dev.	<0.1% at <75 kHz dev.	<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.
10 Hz 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.

BOONTON ELECTRONICS CORPORATION 25 Eastmans Road, PO Box 465, Parsippany, NJ 07054-0465
Tel: 201-386-9696 • Fax: 201-386-9191 • E-Mail: boonton@boonton.com

MODULATION METERS AND ANALYZERS

FM/AM Modulation Meter
Model 8201 (continued)

GPIB

ØM 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[4]	0 to $\frac{C.F.}{10}$ 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	100 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 rad.
0.01 rad for deviations from 5 to 50 rad.
0.1 rad for deviations above 50 rad.

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]	1% of reading, 30 Hz to 5 kHz	1% of reading, 30 Hz to 15 kHz	1% of reading, 30 Hz to 100 kHz.
at specified mod. rates	2% of reading, 30 Hz to 7.5 kHz	2% of reading, 30 Hz to 30 kHz	2% of reading, 30 Hz to 150 kHz.
Modulation Frequency Range	20 Hz to 15 kHz	20 Hz to 50 kHz.	20 Hz to 220 kHz.
AF output distortion	<0.3% 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%

Audio Frequency Display
Range: 10 Hz to 220 kHz

Resolution: 100 Hz for frequencies >100 kHz.
10 Hz for frequencies between 10 kHz and 100 kHz.
1 Hz for frequencies between 1 kHz and 10 kHz.
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: <10 Hz, 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 and 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 ohms.

Power Requirements: 65 VA; 100, 120, 220, or 240 V ± 10%, 50 to 400 Hz.

Operating Temperature: 0° to 55°C.

Weight: 28 lbs (12.7 kg).

Dimensions: 17.25 in (43.8 cm) wide, 5.75 in (14.6 cm) high, and 18.75 in (47.6 cm) deep.

Accessories Included:
Spare input fuses, fuse replacement wrench.

Accessories Available:
Rack Mount Kit (Ears & Handles) P/N 95004492A
Test Modulator, P/N 96400501A

GPIB: IEEE-488-1978 is standard. Implements SH1, AH1, T6, L4, SR1, RL1, DC1, DT1, TE0, LE0, PP0, C0 and E1.

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

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.

CE Mark: Declares Conformity to European Community (EC) Council Directives: 89/336/EEC//93/68/EEC, 73/23/EEC//93/68/EEC & Standards: EN55011, EN50082-1, EN61010-1.

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