8201A
AM / FM Modulation Meter

Taking performance to a new peak
The Boonton Model 8201A 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 8201A 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**

<table>
<thead>
<tr>
<th>RF Input</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>100 kHz to 2.5 GHz</td>
</tr>
<tr>
<td>Tuning</td>
<td>Automatic, typical acquisition time one second. Manual, from keyboard or IEEE-488 bus(6)</td>
</tr>
<tr>
<td>Sensitivity</td>
<td></td>
</tr>
<tr>
<td>10 mV</td>
<td>100 kHz to 520 MHz</td>
</tr>
<tr>
<td>15 mV</td>
<td>520 MHz to 1.0 GHz</td>
</tr>
<tr>
<td>28 mV</td>
<td>1.0 GHz to 1.5 GHz</td>
</tr>
<tr>
<td>50 mV</td>
<td>1.5 MHz to 2.0 GHz</td>
</tr>
<tr>
<td>Carrier acquisition level is typically -40 dBm (2.3 mV)</td>
<td></td>
</tr>
<tr>
<td>Level Set</td>
<td></td>
</tr>
<tr>
<td>Automatic, typical acquisition time one second for levels up to 7 V RMS. Manual, from keyboard or IEEE-488 bus(6)</td>
<td></td>
</tr>
<tr>
<td>Maximum Input</td>
<td>1 watt (7 V RMS, +30 dBm)(6)</td>
</tr>
<tr>
<td>Maximum Safe Input</td>
<td>40 V dc, 35 V ac</td>
</tr>
<tr>
<td></td>
<td>(25w for source SWR&lt;4)(6)</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>50 Ω nominal, SWR &lt;1.5</td>
</tr>
</tbody>
</table>
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 ±1×10⁻⁶/year. Temperature influence less than ±1×10⁻⁶ from 0 to 50 degrees centigrade

Carrier Level
Range: 0.2 MHz to 0.5 MHz, 0.5 MHz to 10 MHz, 10 MHz to 2.5 GHz
Resolution: ±0.01 dBm or ±0.1 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: 0 to 10 kHz, 10 kHz to 15 kHz
Deviation Accuracy: 1% of reading, 30 Hz to 5 kHz, 2% of reading, 5 kHz to 7.5 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 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: 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: >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% 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 depths up to 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, <10 MHz <0.2% AM
Display Resolution: 0.001% for depths from 0 to 5%, 0.01% for depths from 5 to 50%, 0.1% for depths above 50%

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: 0 to 10 rad, 0 to 150 rad, 0 to 500 rad
Deviation Accuracy: 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 kHz dev., <0.1% at <75 kHz dev., <0.1% at <100 kHz 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: 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

Audio Frequency Display
Range: 10 Hz to 220 kHz
Resolution: 100 Hz for frequencies >100 kHz, 10 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 & time constant accuracy, ±4%
Square Wave Response: <10 Hz High-Pass, <10% droop with 5 Hz square wave

Internal Calibrator
The 8201A 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
28 lbs (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

## Options

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

## Accessories Available

- Rack Mount Kit (Ears Only Gray) PIN 95004493A
- Rack Mount Kit (Ears and Handles Gray) PIN 95004494A

## 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.