

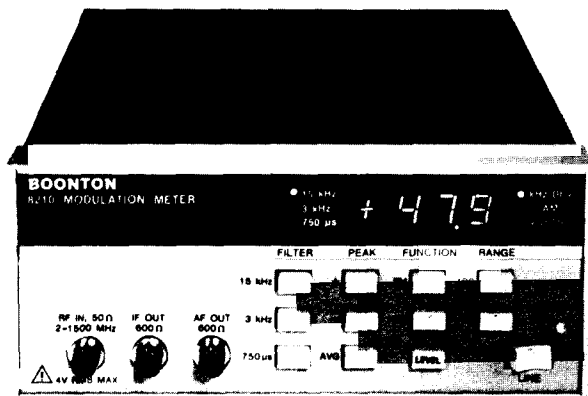
BOONTON

MODULATION METERS & ANALYZER

FM/AM Modulation Meter

Model 8210

- Carrier Frequency Range, 2 MHz to 1.5 GHz.
- Self-Calibrating.
- Automatic Tuning and Leveling.
- Low Residual Modulation.
- True Peak Detection.
- Digital Display.



Description

The 8210 Modulation Meter is a microprocessor based high performance AM and FM modulation measuring instrument. The instrument provides automatic tuning and leveling, low residual modulation, true peak detection, a digital display, and self-calibration.

High Performance and Self Calibration

To create modulation standards, the 8210 automatically generates two crystal-controlled frequencies to internally calibrate the FM channel, and two levels, differing by a precise amount, to calibrate the AM channel. The results are verified mid-range accuracies of 1% of reading for both AM and FM measurements, without the need for expensive external calibration setups.

The 8210 seeks and locks to the strongest carrier in a continuous frequency range from 2 MHz to 1.5 GHz. It then automatically adjusts its gain to produce a standardized 400 kHz replica of the modulated signal. This IF signal is processed by true peak responding detectors and the results are presented on a 3½ digit display. The display is pushbutton selected to read in terms of plus-peak, minus-peak or peak-averaged FM deviation, or peak-crest, peak-trough or peak-averaged % AM. Selectable low-pass and de-emphasis filters are also provided. By the change of one jumper connection, the de-emphasis network can be inserted either before the display, or following the display but before the demodulated output.

The 8210 is ideally suited to the maintenance of mobile communications equipment, where its low cost and automatic operation will be particularly appreciated. In military applications, the self calibration, accuracy and digital display are important benefits. For modulation measurements on low noise sources, the low residual modulation is an attractive feature.

High Resolution Digital Display, With Activity Codes

The 3½ digit LED display provides full scale resolution of 0.1% for both AM and FM measurements, with 50% over-range. Plus or minus signs indicate whether the plus-peak or minus-peak has been selected; absence of sign denotes a peak-averaged display.

The display is also used to provide information on the automatic activity of the 8210. For example, the word CAL appears whenever the instrument is exercising its self calibration routine; two dashes mean that the 8210 is executing a leveling cycle; and a series of dashes indicates an unlocked condition due to a lack of a suitable signal. IFLO appears on the display if the carrier level falls below the sensitivity limit of 10 mV (below 520 MHz), or 30 mV (above 520 MHz). IFHI appears if the level exceeds 1 volt. Code cc 1 is displayed if the AM channel cannot be self-calibrated; code cc 2 indicates that the FM channel cannot be calibrated. Pressing the LEVEL key overrides the malfunction code and allows correct display of the unaffected channel, or a display of the faulty channel with degraded accuracy.

The Importance Of True Peak Detection

Both the AM and FM detectors are true peak-responding at all levels, conforming to the basic definition of modulation depth or deviation. They should not be confused with the quasi-peak detectors found in some modulation meters, which can give erroneous readings in the presence of noise or other low-level, extraneous signals. Because the detectors in the 8210 are true peak-responding, the effect of any system noise will be accurately included in the measured value.

MODULATION METERS & ANALYZER

FM/AM Modulation Meter

Model 8210 (Continued)

Specifications

RF Input

Carrier Frequency Range: 2 MHz - 1.5 GHz.

Tuning: Automatic.

Sensitivity: 10 mV RMS, 2 MHz to 520 MHz.
30 mV RMS, 520 MHz to 1.5 GHz.

Level Set: Automatic for levels up to 1 volt.

Maximum Safe Input: 7V RMS.

Input Impedance: 50 Ω , nominal.

Frequency Modulation

Maximum Deviation: 150 kHz, peak.

Full Scale Ranges: 10 and 100 kHz.

Deviation Accuracy

Standard: 1% of reading for modulation frequencies between 50 Hz and 5 kHz. 2% of reading, 5 kHz to 7.5 kHz.

8210-01: 1% of reading for modulation frequencies between 50 Hz and 10 kHz. 2% of reading, 10 kHz to 15 kHz.

8210-S/1: 1% of reading for modulation frequencies between 50 Hz and 15 kHz. 2% of reading, 15 kHz to 25 kHz.

NOTE: Peak residuals must be accounted for to obtain above accuracy.

Modulation Bandwidth

Standard: <30 Hz to 15 kHz.

8210-01: <30 Hz to 30 kHz.

8210-S/1: <30 Hz to 50 kHz.

Residual FM

Standard: <150 Hz RMS at 1.5 GHz decreasing linearly to a floor of <5 Hz RMS, with 3 kHz LP filter.

<200 Hz RMS at 1.5 GHz decreasing linearly to a floor of <15 Hz RMS, with 15 kHz LP filter.

NOTE: RF level > 100 mV.

8210-01: <400 Hz RMS decreasing linearly to a floor of <25 Hz RMS with 30 kHz LP filter.

<150 Hz RMS at 1.5 GHz decreasing linearly to a floor of <5 Hz RMS with 3 kHz LP filter.

8210-S/1: <950 Hz RMS decreasing linearly to a floor of <55 Hz RMS with 50 kHz LP filter.

<150 Hz RMS at 1.5 GHz decreasing linearly to a floor of <5 Hz RMS with 3 kHz LP filter.

AM Rejection: <100 Hz deviation at 50% AM. (f_{MOD} 1 kHz or less), 3 kHz LP filter.

Amplitude Modulation

Modulation Depth Ranges: 10% and 100%, full-scale.

Depth Accuracy:

	Modulation Frequency	Accuracy	
		10% to 90% AM	<10% and >90% AM
Standard:	50 Hz to 5 kHz	1% of reading	3% of reading
	5 kHz to 7.5 kHz	2% of reading	6% of reading
8210-01:	50 Hz to 10 kHz	1% of reading	3% of reading
	10 kHz to 15 kHz	2% of reading	6% of reading
8210-S/1:	50 Hz to 15 kHz	1% of reading	3% of reading
	15 kHz to 25 kHz	2% of reading	6% of reading

NOTE: Peak residuals must be accounted for to obtain above accuracy. Carrier frequency <520 MHz RF level between -10 and +10 dBm.

Modulation Bandwidth

Standard: <30 Hz to 15 kHz.

8210-01: <30 Hz to 30 kHz.

8210-S/1: <30 Hz to 50 kHz.

Residual AM

Standard: <0.15% AM RMS for input levels >100 mV RMS, 3 kHz LP filter.
<0.25% AM RMS for input levels >100 mV RMS, 15 kHz LP filter.

8210-01: <0.35% AM RMS for input levels > 100 mV RMS, 30 kHz LP filter.
<0.15% AM RMS for input levels >100 mV RMS, 3 kHz LP filter.

8210-S/1: <0.5% AM RMS for input levels >100 mV RMS, 50 kHz LP filter.
<0.15% AM RMS for input levels >100 mV RMS, 3 kHz LP filter.

NOTE: Carrier frequency <520 MHz. Above 520 MHz, residuals increase linearly with frequency.

FM Rejection: <1.0% AM peak at 100 kHz peak modulation.

Audio Frequency Response

Filters

Standard: 3 kHz LP, 15 kHz LP, and 750 μ s de-emphasis. De-emphasis can be either before or after the display (jumper selected.)

8210-01: 3 kHz LP, 30 kHz LP, and 750 μ s de-emphasis. De-emphasis can be either before or after the display (jumper selected.)

8210-S/1: 3 kHz LP, 50 kHz LP, and 750 μ s de-emphasis. De-emphasis can be either before or after the display (jumper selected.)

Audio Distortion

Standard & 8210-01: <0.25% THD for 75 kHz peak deviation.
<0.5% THD for 90% AM.

8210-S/1: <0.5% THD for 75 kHz peak deviation.
<0.5% THD for 90% AM.

Output Level: 1 V RMS nominal into 600 ohms at 1000 counts on display for FM, 1 to 1.2 V RMS for AM.

Display

Modulation: LED display; 1000 counts + 50% overrange; true peak, + peak, - peak, or peak average indication.

Annunciators: Display of filter and mode switch settings. Digital display indicates level high, level low and unlock conditions.

IF Output

Frequency: 400 kHz, nominal.

Level: 300 to 360 mV nominal into 600 Ω load.

Power Consumption: 24 VA; 100, 120, 220, or 240 V \pm 10%, 50 to 400 Hz.

Operating Temperature: 0° to 55°C.

Weight: 7 lbs (3.18 kg).

Dimensions: 4.1 in (10.3 cm) high, 8.6 in (21.8 cm) wide, and 11.0 in (27.8 cm) deep.

Options:

8210-01 30 kHz Low Pass Filter Version.

8210-S/1 50 kHz Low Pass Filter Version.

Accessory Available

954015 Rack Mounting Kit. Mounts single unit left or right of center.