

BOONTON

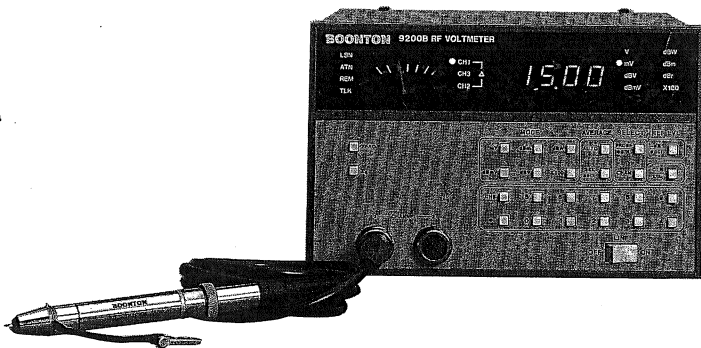
RF/RMS VOLTMETERS

RF Voltmeter

Model 9200B



- **Voltage Range:** 200 μ V to 3 V (to 300 V with optional divider). 8 ranges.
- **Frequency Range:** 10 Hz - 2.5 GHz.
- **Basic accuracy** to 1% of reading with full scale sensitivity.
- **True RMS response** below 30 mV (to 3 V with 100:1 divider).
- **High impedance probe and accessories** for measurements in 50 Ω or 75 Ω systems to 1.2 GHz, terminated or thru-line.
- **Optional 50 Ω terminated sensor** to 2.5 GHz with readout in voltage or power.
- **Optional low frequency probe** for measurements between 10 Hz and 100 MHz.
- **Display** in mV, dBm, dBr, dBmV, dBV, dBW, or x 100.
- **Second input channel and GPIB options.**



Description

The Boonton Model 9200B is a microprocessor based RF voltmeter with unique features which make it useful for systems requirements, as well as for manual operation. The microprocessor, together with a stored program memory and a separate non-volatile memory, results in performance features and operating conveniences not previously available.

Voltage Probe

Boonton RF voltage probes use a full wave rectifying circuit with diodes that have special characteristics, including low capacitance and controlled thermal offsets. When combined with the special low noise input circuitry of the instrument they provide 200 μ V sensitivity over the frequency range of 10 kHz to 1.2 GHz or 10 Hz to 100 MHz when the 95201603B probe is used. Usable indication extends down

to 50 μ V. A full set of probe accessories is available for unterminated, terminated and thru-line measurements at either 50 Ω or 75 Ω characteristic impedance.

Response is true RMS for inputs below 30 mV, allowing accurate voltage measurements with all types of waveforms. As the input voltage increases above 30 mV, the response gradually changes, approaching peak-to-peak at the higher levels. (By using the Model 95200501A 100:1 voltage divider, the true RMS range is extended to 3 V and the total measuring range to 300 V.)

Voltage and Power Sensor

The optional 50 Ω terminated Model 95200901A Sensor is particularly useful in measuring the output of signal sources. Response extends to 2.5 GHz, and, because it is actually measuring the voltage drop across a 50 Ω terminating resistor, the instrument can display power levels if the dBm mode is selected. When the 95201603B probe is used with the instrument the frequency range is 10 Hz to 100 MHz.

Data for up to eight probes and/or sensors is stored in a non-volatile memory. This includes both sensitivity and range linearization requirements. Data for replacement probes and sensors can be entered into the non-volatile memory.

Display

Measurements may be displayed using either a 3 $\frac{1}{2}$ -digit voltage display or a 3 $\frac{1}{2}$ -digit dB display with a resolution of 0.01 dB. The voltage display is in millivolts or volts.

Automatic Zero

A zero correction function stores the zero offsets of each range and then automatically corrects all subsequent readings. When the ZERO key is depressed, a logic transition is provided at a rear-panel output. This output may be used to turn off a source automatically before the 9200B goes through its zeroing sequence.

Two Channel and Differential Voltage Measurements

A second channel input option (option -03) provides a duplicate set of input amplifiers and circuits with a front and rear panel connector for a second voltage probe or sensor. The instrument can then display channel 1 or channel 2, or their instantaneous difference (channel 3) expressed in dB.

DC Recorder Output

A rear-panel DC output supplies 10 volts full scale that is linear with voltage over each decade range in the mV mode, or logarithmic in dB over the entire 80 dB range in any of the dB modes.

GPIB Option

A full function GPIB can be installed in the instrument. This interface allows remote operation of all front panel controls except the line switch. In addition, individual voltage and dB ranges may be selected and selectively zeroed. Listen/talk address and message termination characters are set by a rear panel bit switch.

RF/RMS VOLTMETERS

RF Voltmeter

Model 9200B (Continued)



Specifications

Voltage Range: 200 μ V to 3 V in 8 ranges (300 V to 700 MHz with a 100:1 Divider). Indications down to 50 μ V.

Voltage Display: 1 mV to 300 V fs.

dB Range: 80 dB in 8 ranges, 0.01 dB resolution.

dB Display: dBmV (0 dB equivalent to 1 mV), dBV (0 dB equivalent to 1 V), dBW (0 dB equivalent to 1 W), dBm (0 dB equivalent to voltage drop generated when 1 mW is dissipated in selectable Z_0 reference, 5 to 2000 Ω) or dB (0 dB equivalent to any desired reference level. Reference level can be panel selected to 0.01 dB resolution provided available display range of ± 99.99 dB is not exceeded.)

Frequency Range: 10 kHz to 1.2 GHz. 100 kHz to 2.5 GHz when the optional Model 95200901A Sensor is used and 10 Hz to 100 MHz when the optional Model 9520103B Probe is used.

Waveform Response: RMS to 30 mV, calibrated in RMS of a sinewave above 30 mV (RMS to 3 V and 700 MHz with a 100:1 Divider).

Crest Factor:

Direct Input:	Level	300 μ V	1 mV	3 mV	10 mV	30 mV
	C.F.	140	42	14	4.2	1.4
With Divider:	Level	30 mV	100 mV	300 mV	1 V	3 V
	C.F.	140	42	14	4.2	1.4

Input Capacitance: < 1.5 pF.

Maximum AC Input: 10 V, all frequencies and ranges.

Maximum DC Input: 200 V, all ranges.

Recorder Output: 10 V fs proportional to indicated voltage (mV mode) over each range; 8 V equivalent to 0 dBm regardless of Z_0 (dB mode) with a sensitivity of 1 V per 10 dB change over the entire range.

Basic Uncertainty:

Voltage Level	mV
3 mV - 3000 mV	1% rdg \pm 1 count
1 mV - 3 mV	2% rdg \pm 2 counts
0.2 mV - 1 mV	3% rdg \pm 3 counts

Frequency Effect:

50 Ω measurements using the Model 95200101D Probe with Model 95200201B BNC Adapter.

Frequency	mV	dBV, dBmV, dBm, dBW
1 MHz (cal freq)	0	0
10 kHz - 100 MHz	1% rdg	0.09 dB
100 MHz - 1 GHz	3% rdg	0.26 dB
1 GHz - 1.2 GHz	7% rdg	0.63 dB

SWR: < 1.05 to 300 MHz, < 1.10 to 1 GHz, < 1.15 to 1.2 GHz.

50 Ω measurements using the Model 95201603B Probe with Model 95200201B BNC Adapter.

Frequency	mV	dBV, dBmV, dBm, dBW
1 MHz (cal freq)	0 rdg	0
20 MHz - 100 MHz	3% rdg	0.26 dB
50 Hz - 20 MHz	1% rdg	0.09 dB
20 Hz - 50 Hz	2% rdg	0.18 dB
10 Hz - 20 Hz	5% rdg	0.45 dB

SWR: < 1.05 to 100 MHz.

50 Ω measurements using Model 95201603B Probe with 95205801A 100:1 Divider.

Frequency	mV	dBV, dBmV, dBm, dBW
1 MHz (cal freq)	1% rdg	0.09 dB
1 MHz - 20 MHz	5% rdg	0.45 dB
50 Hz - 1 MHz	3.5% rdg	0.31 dB
20 Hz - 50 Hz	4.5% rdg	0.40 dB
10 Hz - 20 Hz	7.5% rdg	0.68 dB

SWR: < 1.05 to 100 MHz.

75 Ω measurements using the Model 95200101D Probe with Model 95200601B BNC Adapter.

Frequency	mV	dBV, dBmV, dBm, dBW
1 MHz (cal freq)	0	0
10 kHz - 100 MHz	1% rdg	0.09 dB
100 MHz - 300 MHz	3% rdg	0.26 dB
300 MHz - 500 MHz	6% rdg	0.54 dB

SWR: < 1.05 to 100 MHz, < 1.10 to 300 MHz, < 1.20 to 500 MHz.

50 Ω measurements using Model 95200901A Terminated Voltage Sensor.

Frequency	mV	dBV, dBmV, dBm, dBW
1 MHz (cal freq)	0	0
100 kHz - 1 GHz	1% rdg	0.09 dB
1 GHz - 2 GHz	3% rdg	0.26 dB
2 GHz - 2.5 GHz	5% rdg	0.45 dB

SWR: < 1.05 to 2 GHz, < 1.10 to 2.5 GHz.

75 Ω measurements using Model 95200101D Probe with Model 95200701A Tee Adapter.

Frequency	mV	dBV, dBmV, dBm, dBW
1 MHz (cal freq)	0	0
10 kHz - 100 MHz	1% rdg	0.09 dB
100 MHz - 750 MHz	3% rdg	0.26 dB
750 MHz - 1 GHz	7% rdg	0.63 dB

SWR: < 1.05 to 100 MHz, < 1.10 to 750 MHz, < 1.25 to 1 GHz.

Line Stability: Less than 0.2% rdg with $\pm 10\%$ line voltage change at reference line conditions of 115 to 120 V, 50 to 400 Hz. Usable after 5 min. warmup.

Zero: Automatic, operated by panel key switch.

Display: 3 1/2 digit LED display of voltage or dB. Auxiliary display, uncalibrated, proportional to voltage (voltage mode) or dB (dB modes).

Annunciators: LEDs indicate V, mV, dBmV, dBV, dBm, dBW, and dBm and x 100. Also show use of channel 1 (CH1), channel 2 (CH2) or channel 3 (CH3) with option -03 where CH3 = CH 1 - CH2 in dB. Indicate IEEE-488 bus activity (LSN, ATN, REM and TLK) with option -01.

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

Operating Temperature: 0° to 55°C.

Storage Temperature: -55° to +75°C.

Environmental Characteristics: Conforms to the requirements of MIL-T-28000D for type III, Class 5, Style E equipment.

Weight: 10 lbs (4.54 kg).

Dimensions: 8.3 in (21.1 cm) wide, 5.85 in (14.9 cm) high, and 13.75 in (34.9 cm) deep.

Accessories Included:

- 95200101D RF Probe.
- 95200201B 50 Ω BNC Adapter (F).
- 95200401A Probe Tip.
- 95200501A 100:1 Divider.

Options:

-01B IEEE-488 Bus Interface. Duplicates all front panel functions except line on/off power switch. In addition, individual power and dB ranges may be selected and selectively zeroed. Address and termination characters set by rear panel bit switch. Complies with IEEE-488 and implements: SH1, AH1, T6, L4, SR1, RL1, DC1, and DT1.

-03 Input Channel 2. Allows display of either Channel 1 or Channel 2, or Channel 3 which is CH1 minus CH2 expressed in dB. Includes second Model 95200101D RF Probe, with Model 95200401A Probe Tip, Model 95200201B 50 Ω BNC Adapter, and 95200501A 100:1 Divider.

-11 Low Frequency Version. 10 Hz to 100 MHz. (replaces 95200101D, 95200501A with 95201603B, 95205801A).

-12 Dual Channel Low Frequency Version. (replaces two each 95200101D, 95200501A with two each 95201603A, 95205801A).

Accessories Available:

- 95000002B Rack Mtg. Kit, Single.
- 95000102B Rack Mtg. Kit, Dual.
- 95000202B Rack Mtg. Kit, Dual. For older 1/2 Rack Instrument.
- 95002901A Transit Case.
- 95003702B Rack Mtg. Kit, Dual, w/slides.
- 95003802B Rack Mtg. Kit, Single, w/slides and drawer.
- 95004102B Rack Mtg. Kit, Single, w/slides.
- 95004901A Bulkhead Adapter F/F.
- 95200101D RF Probe.
- 95200201B 50 Ω BNC Adapter (F).
- 95200301A 50 Ω Tee Adapter N (F/F).
- 95200401A Probe Tip.
- 95200501A 100:1 Voltage Divider.
- 95200601B 75 Ω BNC Adapter (F).
- 95200701A 75 Ω Tee Adapter N (F).
- 95200801B Underterminated BNC Adapter (F).
- 95200901A 50 Ω Voltage Sensor.
- 95201102A 50 Ω Accessory Kit.
- 95201202A 75 Ω Accessory Kit.
- 95201301A Accessory Case.
- 91-6G Underterminated BNC (M).
- 91-15A 50 Ω Termination N (M).
- 91-15/1 75 Ω Termination N (M).
- 95201603B Low Frequency Probe. 10 Hz to 100 MHz.
- 95205801A 100:1 Divider (10 Hz to 20 MHz).