

# BOONTON

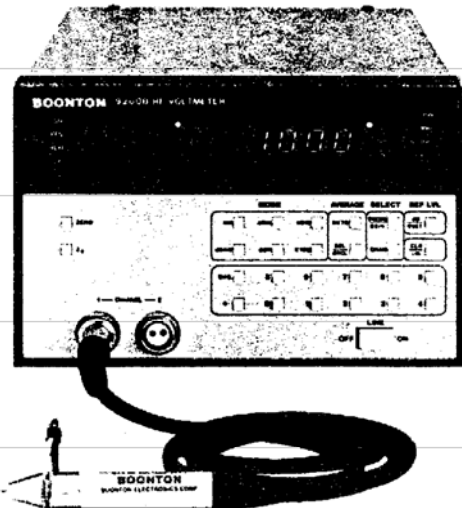
## RF/RMS VOLTMETERS

### RF Voltmeter

#### Model 9200B



- Voltage Range: 200  $\mu$ 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  $\Omega$  or 75  $\Omega$  systems to 1.2 GHz, terminated or thru-line.
- Optional 50  $\Omega$  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 dBr x 100.
- Second input channel and GPIB options.
- MATE Compatible.



#### 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  $\mu$ V sensitivity over the frequency range of 10 kHz to 1.2 GHz or 10 Hz to 100 MHz when the 952016 probe is used. Usable indication extends down to 50

$\mu$ V. A full set of probe accessories is available for unterminated, terminated and thru-line measurements at either 50  $\Omega$  or 75  $\Omega$  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 952005 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  $\Omega$  terminated Model 952009 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  $\Omega$  terminating resistor, the instrument can display power levels if the dBm mode is selected. When the 952016 probe is used with the instrument the frequency range is 10 Hz to 100 MHz.

Data for all probes and 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 4-digit voltage display or a 4-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 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.

#### Mate Option

An internal TMA is available that allows the 9200B to respond to CII commands.

## RF/RMS VOLTMETERS

### RF Voltmeter

Model 9200B (Continued)



### Specifications

**Voltage Range:** 200  $\mu$ V to 3 V in 8 ranges (300 V to 700 MHz with Divider). Indications down to 50  $\mu$ 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), dBm (0 dB equivalent to voltage drop generated when 1 mW is dissipated in selectable  $Z_0$  reference. 50 to 600  $\Omega$ s) or dB<sub>r</sub> (0 dB equivalent to any desired reference level. Reference level can be panel selected to 0.01 dB resolution provided available display range of  $\pm 99.99$  dB is not exceeded.)

**Frequency Range:** 10 kHz to 1.2 GHz. 100 kHz to 2.5 GHz when the optional Model 952001 Probe and Model 952009 Sensor are used and 10 Hz to 100 MHz when the optional Model 952016 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 Divider).

**Crest Factor:**

| Direct Input: | Level | 300 $\mu$ 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 Impedance:** <1.5 pF.

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

**Maximum DC Input:** 400 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  $\Omega$  measurements using the Model 952001 Probe with Model 952002 BNC Adapter.

| Frequency   | mV     | dBV, dBmV, dBm |
|---|--------|----------------|
| 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  $\Omega$  measurements using the Model 952016 Probe with Model 952002 BNC Adapter.

| Frequency             | mV     | dBV, dBmV, dBm |
|-----------------------|--------|----------------|
| 1 MHz (cal freq)      | 0 rdg  | 0              |
| 50 Hz - 20 MHz        | 1% rdg | 0.09 dB        |
| 20 Hz - 50 Hz         | 2% rdg | 0.10 dB        |
| 10 Hz - 100 MHz       | 5% rdg | 0.45 dB        |
| SWR: 1.05 to 100 MHz. |        |                |

50  $\Omega$  Measurements using Model 952016 Probe with 952058 100:1 Divider.

| Frequency             | mV       | dBV, dBmV, dBm |
|-----------------------|----------|----------------|
| 1 MHz (cal freq)      | 0        | 0              |
| 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. |          |                |

50  $\Omega$  Measurements using Model 952009 Terminated Voltage Sensor.

| Frequency                            | mV     | dBV, dBmV, dBm |
|--------------------------------------|--------|----------------|
| 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. |        |                |

**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:** 4 digit LED display of voltage or dB. Auxiliary analog display, uncalibrated, proportional to voltage (voltage mode) or dB (dB modes).

**Annunciators:** LEDs indicate V, mV, dBmV, dBV, dBm, dBW, and dB<sub>r</sub> x 100. Also show use of channel 1 (CH1), channel 2 (CH2) or channel 3 (CH3) with option -03 where CH3 = CH1 - 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-28000C 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:**

952001-2 RF Probe.  
952002 50  $\Omega$  BNC Adapter (F).  
952004 Probe Tip.  
952005 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 952001 RF Probe, with Model 952004 Probe Tip, Model 952002 50  $\Omega$  BNC Adapter, and 952005 100:1 Divider.

**-06 MATE.** Internal TMA (MATE) requires -01B.

**-11 Low Frequency Version.** 10 Hz to 100 MHz.

**-12 Dual Channel Low Frequency Version.**

**Accessories Available:**

950000 Rack Mtg. Kit, Single.  
950001 Rack Mtg. Kit, Dual.  
950002 Rack Mtg. Kit, Dual. For older 1/2 Rack Inst.  
950029 Transit Case.  
952003 50  $\Omega$  Tee Adapter N (F:F).  
952005 100:1 Voltage Divider.  
952006 75  $\Omega$  BNC Adapter (F).  
952007 75  $\Omega$  Tee Adapter N (F).  
952008 Underterminated BNC Adapter (F).  
952009 50  $\Omega$  Voltage Sensor.  
952011-2 50  $\Omega$  Accessory Kit.  
952012-2 75  $\Omega$  Accessory Kit.  
952013 Accessory Case.  
952016-3 Low Frequency Probe. 10 Hz to 100 MHz.  
952058 100:1 Divider (10 Hz to 20 MHz).