# BOONTON

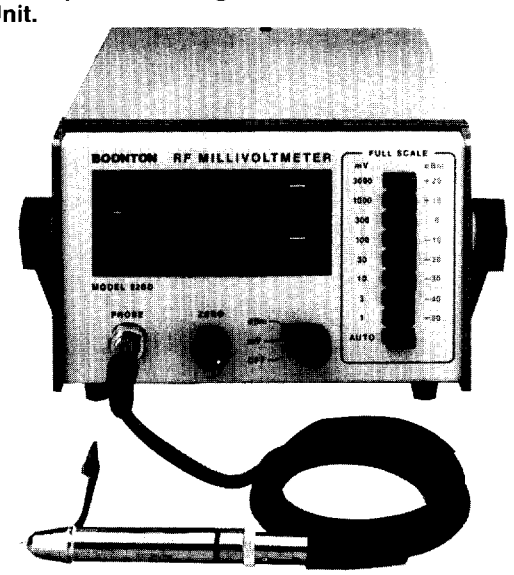
# RF/RMS VOLTMETERS

## RF Millivoltmeter

**Model 92BD**

GPIB

- **Voltage Range: 200 μV to 3 V (to 300 V with optional divider). Indications down to 100 μV.**
- **Frequency Range: 10 kHz to 1.2 GHz.**
- **True RMS response below 30 mV (to 3 V with 100:1 divider).**
- **Basic accuracy of 1% rdg + 1% fs.**
- **GPIB operation using Model 10A-04 Bus Interface Unit.**




### Description

The 92BD RF Millivoltmeter provides voltage measurements from 10 kHz to 1.2 GHz over a range of 200 μV to 3 volts (to 300 V, up to 700 MHz, with accessory 100:1 divider). It is a range programmable instrument of high sensitivity and accuracy, characterized by high imput impedance, excellent stability, and low noise. The 92BD includes an RF probe, 50 Ω BNC adapter, and probe tip. Optional probe accessories with either 50 or 75 Ω characteristic impedance are available for unterminated, terminated and through-line measurements.

#### True RMS Response

The 92BD provides true RMS response for signal inputs below 30 mV (below 3V, and up to 700 MHz, with the 91-7C 100:1 Voltage Divider). As the input level increases, waveform response gradually approaches peak-to-peak, calibrated on the meter scale in RMS of a sinewave. Thus, in addition to making precise sinusoidal voltage measurements at all levels, it measures non-sinusoidal signals within the RMS region without loss of accuracy.

#### Wide Voltage Range

Eight ranges from 1 mV full scale to 3 V full scale are arranged in 1-3-10 sequence. No attenuator attachments are required for measurements up to 3 V. While this range is ample for the majority of RF voltage measurements, voltage capability can be increased to 300 V (up to 700 MHz) by using the accessory Model 91-7C 100:1 Voltage Divider. Use of the 100:1 voltage divider also increases the input resistance of the probe by a factor of greater than 100.

#### Wide Bandwidth

The calibrated frequency range extends from 10 kHz to 1.2 GHz, with uncalibrated response to beyond 8 GHz. Relative accuracy above 1.2 GHz is typically ±0.5 dB.

When the 952016 probe is used with the instrument the frequency range is 10 Hz to 100 MHz.

A Model 91-8B 50 Ω Terminated BNC Adapter is supplied as standard for 50 Ω voltage measurements up to 600 MHz. For measurements above this frequency and for thru-line voltage measurements, the optional accessory Model 91-14A Tee Adapter is recommended. It is designed to compensate for the RF probe capacitance and to present a low VSWR (better than 1.15) up to 1.2 GHz. It may be used in conjunction with the Model 91-15A 50 Ω Load for terminated voltage measurement.

#### dB Display

The 92BD has, as standard a bar graph that provides a convenient readout for peaking or nulling operations, avoiding the necessity of interpreting rapidly changing digits. An optional dB display is available. The dB reference can be ordered as 1 mW into 50 Ω (-09 option) or 75 Ω (-10 option). Resolution is 0.01 dB.

#### Low Noise

Extensive care has been taken throughout the design and construction to hold noise from all sources to a minimum. The probe cable is of special low-noise design and the RF probe is not sensitive to shock or vibration. Amplification takes place at 94 Hz, reducing susceptibility to 50 Hz or 60 Hz line-frequency-related fields.

#### Low Zero Drift

Zero adjustment is not required on the upper five voltage ranges. For measurements on the lower three ranges, the ZERO control is set on the most sensitive range prior to operation. This control balances out small thermal voltages in the probe elements and, once adjusted, requires only infrequent checking during the course of subsequent measurements.

#### System and GPIB Operation

Panel functions and ranges (including options) can be actuated by remote TTL inputs. The instrument also has serial BCD data outputs.

Model 92BD may be adapted to the IEEE-488 Standard Data Bus by use of our Model 10A-04 Bus Interface Unit. The 10A-04 plugs directly into the rear programming connector of the 92BD.

# RF/RMS VOLTMETERS

## RF Millivoltmeter

## Model 92BD (Continued)

GPIB

## Specifications

**Voltage Range:** 200 μV to 3 V (300 V to 700 MHz with 91-7C 100:1 Divider) in 8 ranges of 10 dB each.

**Optional dB Display:** Measurement range 80 dB; Resolution 0.01 dB.

**Ranging Modes:** Manual and remote, optional autoranging.

**Frequency Range:** 10 kHz to 1.2 GHz, (uncalibrated to 8 GHz).
10 Hz to 100 MHz with 952016 probe.

**Response:** RMS to 30 mV, calibrated in RMS of a sinewave above 30 mV (RMS to 3 V and 700 MHz with 91-7C 100:1 Divider).

**Crest Factor Tolerance:**

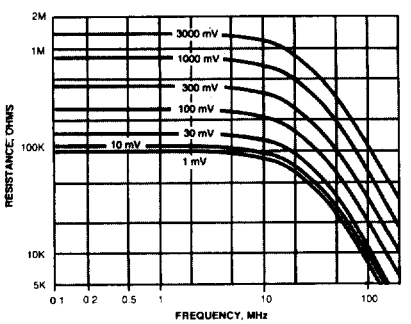
| FS Range | 1 mV | 3 mV | 10 mV | 30 mV | 0.1 V* | 0.3 V* | 1 V* | 3 V* |
|---|---|---|---|---|---|---|---|---|
| Crest Factor | 140 to 42 | 42 to 14 | 14 to 4.2 | 4.2 to 1.4 | 140 to 42 | 42 to 14 | 14 to 4.2 | 4.2 to 1.4 |

*with 91-7C 100:1 Divider.

**Input Impedance:** ~100 kΩ ~3 pF.

**Input SWR:** <1.2.

**Input Characteristics**




**Accuracy:** at 100 mV test level.

| Voltage Range | ±1% fs plus | | |
|---|---|---|---|
| 300 mV to 3 V (0 to +20 dBm) | ±1% ind. (±0.3 dB) | ±3% ind. (±0.5 dB) | ±10% ind. (±1.0 dB) |
| 200 μV to 300 mV* (−60 to 0 dBm)* | | | ±7% ind. (±0.8 dB) |
| | 10 KHz | 150 MHz | 700 MHz 1.2 GHz |

*Below 1 mV (−50 dBm) add ±1% fs (±0.2 dB). dB specifications in parenthesis apply to the dB option only and replace the ±1% fs ±% of indication specifications.

**Stability:**

| Reference Conditions | Stability |
|---|---|
| Line voltage, 115V-120V<br>Line frequency, 50 Hz-400 Hz<br>Warm up time, usable after 5 min. | <0.2% of ind.<br>for <10% line<br>voltage change |

**Accuracy:** At reference conditions.

**Temperature Effect:**

| Temperature Range | | Effect | |
|---|---|---|---|
| | | Instrument | Probe |
| reference | 21°C to 25°C | 0 | 0 |
| normal | 18°C to 30°C | 0 | ±2% ind. |
| severe | 0°C to 40°C | ±1% ind. | ±4% ind. |

**Frequency Effect:**
75Ω measurement using Model 91-12F Probe with Models 952006 BNC Adapter or 952007 Tee Adapter.

| Frequency | Model 952006 | Model 952007 |
|---|---|---|
| 1 MHz (cal freq.) | 0% rdg | 0% rdg |
| 10 kHz - 100 MHz | 1% rdg | 1% rdg |
| 100 MHz - 300 MHz | 3% rdg | 3% rdg |
| 300 MHz - 500 MHz | — | 5% rdg |
| 500 MHz - 750 MHz | — | 7% rdg |
| 750 MHz - 1 GHz | — | 10% rdg |
| **952006 SWR:** <1.10 to 100 MHz, <1.25 to 300 MHz | | |
| **952007 SWR:** <1.05 to 100 MHz, <1.25 to 300 MHz, <1.5 to 1 GHz | | |

**Annunciators:** mV, V, dB, and polarity for dB.

**Digital Indicators:** LED type, full scale counts of 3000 and 1000 (4 digits for dB option), 5% overrange, blanked for overrange and below 20% fs.

**Indicator Unrest:** 1 mV fs range only.

| Indicated Voltage | Unrest |
|---|---|
| >600 μV | ±1% fs |
| 300 μV to 600 μV | ±2% fs |
| <300 μV | ±5% fs |

**Response Time:** Less than 100 ms at recorder output on 30 mV to 3 V fs ranges, increasing to 1 s on 1 mV fs range, for fs input step function.

**Display Update Time:** 200 ms, free running; 80 ms, triggered.

**Overload Recovery:** Recovers to within 10% of final indication in 1 minute after removal of 3 V (RMS), 15 second overload on 1 mV range.

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

**Maximum DC Input:** 200 V all ranges.

**Recorder Output:**
+10 V fs on "10" ranges.
+9.5 V fs on "3" ranges (+ 10 V for 3.16).

**Remote Operation**

**Commands:**

| | |
|---|---|
| Manual disable | Encode hold |
| Range enable | Encode trigger |
| dB enable | Autorange enable |

**Data Outputs:**

| | |
|---|---|
| Range | -dBm |
| Data | Encode complete |
| Digit | Overrange |
| mV Mode | Underrange |

**Power Consumption:** 15 VA; 115 or 230 V ±10%, 50 to 400 Hz.

**Operating Temperature:** 0° to 55°C.

**Weight:** 9.2 lbs (4.4 kg).

**Dimensions:** 5.2 in (13.2 cm) high, (without rubber feet), 8.3 in (21.1 cm) wide, and 11.5 in (29.2 cm) deep.

**Accessories Included:**
91-8B 50 Ω BNC Adapter (F).
91-12F RF Probe.
91-13B Probe Tip.

**Options:**

**-01** Autoranging

**-08** Rear signal input.

**-09** 50 Ω dBm display. In addition to the standard mV display.

**-10** 75Ω dBm display (75 Ω 91-8B/1 BNC adapter replaces 91-8B). In addition to the standard mV display.

**-12** 75 Ω dBmV display (75 Ω 91-8B/1 replaces 91-8B).

**-21** Buffered serial to parallel data output converter.

**Bus Interface Unit:** Model 10A-04 adapts 92BD to IEEE-488 Data Bus Operation.

**Accessories Available:**
**91-6C** Unterminated BNC Adapter (F).
**91-7C** 100:1 Voltage Divider.
**91-14A** 50 Ω Tee Adapter N (F/F).
**91-15A** 50 Ω Termination N (M).
**91-16A** Unterminated N Adapter (F).
**91-18B** Accessory Case.
**91-24A** Set of Accessories, 50 Ω.
**91-24A/1** Set of Accessories, 75 Ω.
**950030** Rack Mtg. Kit, Dual.
**950032** Rack Mtg. Kit, Single.
**952016-1** Low Frequency Probe. 10 Hz to 100 MHz.
**91-6G** Unterminated BNC Adapter (M).
**91-8B** 50 Ω BNC Adapter (F).
**91-8B/1** 75 Ω BNC Adapter (F).
**91-8B/1A** 75 Ω Type F Adapter (F).
**91-12F-2** RF Probe.
**91-13B** Probe Tip.
**91-14A/1** 75 Ω Tee Adapter N (F/F).
**91-15A/1** 75 Ω Termination N (M).
**950031** Transit Case.
**950033** Rack mtg. kit, single.
**950034** Rack mtg. kit, dual.
**950035** Rack mtg. kit, single (10A to side main unit).
**950049** Bulkhead Adapter F/F.
**952058** 100:1 divider, 10 Hz to 20 MHz (952016 compatible).
**960000** Extender Card
**960002** Replacement Chopper Kit.