Boonton

Data Sheet

92EA Series

RF Millivoltmeter

Taking performance to a new peak

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RF Millivoltmeter Model 92EA

The 92EA RF Millivoltmeter provides voltage measurements from the low radio frequencies to the gigahertz region, 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 input impedance, excellent stability and low noise. The 92EA includes an RF probe, 50n BNC adapter and probe tip.

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 952005 100:1 Voltage Divider. Use of the 100:1 voltage divider also increases the input resistance of the probe by a factor of more than 100.

Frequency Range
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.

A 952002 50Ω Terminated BNC Adapter is supplied as standard for voltage measurements in a 50Ω system up to 1.2 GHz. For through-line voltage measurements, the optional accessory 952003 Tee Adapter is required. It is designed to compensate for the RF probe capacitance and to present a low insertion loss up to 1.2 GHz. It may be used in conjunction with the 952014 50Ω Load for terminated voltage measurements. Both adapters exhibit a low SWR up to 1.2 GHz.

When the instrument is ordered with option 16 the standard probe is replaced with a 952016 probe, which changes the specified frequency range to 10 Hz to 100 MHz.

True RMS Response
Boonton RF probes use a full-wave rectifying circuit with diodes that have special characteristics, including low capacitance and controlled thermal offsets. 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.

Readings, however, are shaped to indicate RMS voltage, provided that the input is reasonably sinusoidal, as would be the case with CW or FM signals. By using the 952005 100:1 voltage divider, the true RMS range can be extended to 3 V.

- Voltage Range: 200 µV to 3 V
  (to 300 V with optional divider) Indicates down to 100 µV
- Frequency Range: Standard, 10 kHz to 1.2 GHz
  Option 16: 10 Hz to 100 MHz
- True RMS response below 30 mV (to 3 V with 100:1 divider)
- Solid-state electronic chopper, high-level DC output, and TTL programmable ranges
- Complete series of probes and adapters for 50Ω and 75Ω systems, terminated or through-line

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 any 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 infrequent checking during the course of subsequent measurements.

Voltage and dB Scales
The 92EA has a large mirrored meter with two linear 0-3 and 0-10 voltage scales and a dBm scale referred to 1 mW in 50Ω.

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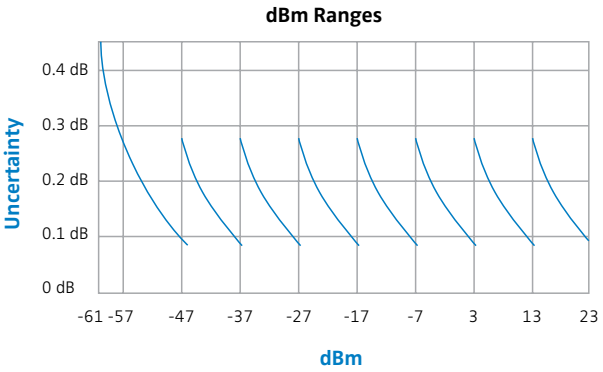
Specifications

Voltage Range
200 µV to 3 V (300 V up to 700 MHz with accessory 100:1 voltage divider), lowest detectable voltage is approximately 100 µV, full scale ranges are 1, 3, 10, 30, 100, 300, 1000 and 3000 mV

dB Range
-61 to +23 dBm in eight ranges (+63 dBm up to 700 MHz with optional accessory 100:1 voltage divider)

Frequency Range
10kHz to 1.2 GHz (uncalibrated response to approximately 8 GHz)
10Hz to 100 MHz with 952016-1 probe



Basic Uncertainty (Voltage Ranges)	Level; 200 µV -3000 MV Uncertainty; 1% fs

Frequency Effect (952001A Probe): 50Ω measurements using the 952001 Probe with the 952002 BNC Adapter or terminated 952003 Type-N Tee Adapter at 100 mV level

Frequency	mV	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

Frequency Effect (952016 Probe Option 16): 50Ω measurements using the 952016 Probe with the 952002 BNC Adapter

Frequency	mV	dBm
1 MHz (Cal Freq)	0	0
50 Hz - 20 MHz	1% rdg	0.09 dB
20 Hz - 50 Hz	2% rdg	0.18 dB
10 Hz - 100 MHz	5% rdg	0.45 dB

SWR: <1.05 to 100 MHz

Frequency Effect (952016 Probe) with 952058 100:1 Divider

Frequency	mV	dBm
1 MHz (Cal Freq)	1% rdg	0.09 dB
50 Hz - 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

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

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	300µV	1mV	3mV	10mV	30mV
C.F.	140	42	14	4.2	1.4

With Divider

Level	30µV	100mV	300mV	1V	3V
C.F.	140	42	14	4.2	1.4

Maximum AC Input	10 V, all frequencies and ranges
Maximum DC Input	200 V, all ranges

Meter
4 1/2 inch taut-band. Two linear voltage scales, 0 to 3; resolution 0.05/division, 0 to 10; resolution 0.1/division

One logarithmic dBm scale	-10 to +3; resolution 0.2/division, max

Power Sensitivity
800 pW, minimum measurable power into 50Ω. Minimum detectable power into 50Ω is 200 pW

DC Output
0 to 10 VDC, proportional to RF input voltage, source resistance of 9 kΩ; will deliver 1 mA into 1 kΩ load, full scale input step-function response time less than 100 ms on 30 mV fs to 3 V fs ranges, increasing to 1 s on the 1 mV fs range

Other Specifications

Remote Operation
Ranges are selected via rear card-edge connector using logic low (or shorting to common), one line for manual disable; one line for each of the eight ranges

Power Consumption	100, 120,220,240 V ±10% 50 to 400 Hz
Operating Temperature	0° to 55°C
Storage Temperature	-55° to +75°C

Environmental Characteristics
Conforms to the requirements of Mil-T-28800D for type III, Class 5 style E equipment

Weight	7 lbs (3.2 kg)
Dimensions	5.85 in (14.9 cm) high 8.3 in (21.1 cm) wide 13.75 in (34.9 cm) deep

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Accessories

Included	
952001-2	RF Probe
952002	50Ω BNC Adapter (F)
952004	Probe Tip

Available	
950000	Rack Mtg. Kit, Single
950001	Rack Mtg. Kit, Dual
952002	Rack Mtg. Kit, Dual For older 1/2 Rack Inst
952003	50Ω Tee Adapter N (F/F)
952005	100:1 Voltage Divider
952006	75Ω BNC Adapter (N)
952007	75Ω Tee Adapter N (F)
952008	Unterminated BNC Adapter (F)
952011-1	50Ω Accessory Kit
952012-1	75Ω Accessory Kit
952013	Accessory Case
952016-1	Low Frequency Probe 10 Hz to 100 MHz
952058	100: 1 Divider (10Hz to 20 MHz)
952001-2	RF Probe
952002	50Ω BNC Adapter (F)
952004	Probe Tip

CE Mark

Declares Conformity to European Community (EC) Council Directives: 89/336/EEC//93/68/EEC, 73/23/EEC//93/68/EEC & Standards: EN55011, EN50082-1, EN61010-1

Options

08	RF probe input connector duplicated on rear of unit
16	10 Hz to 100 MHz frequency range The 952016 Probe replaces 952001A

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