

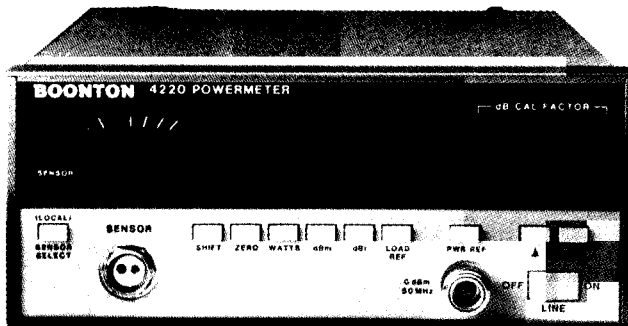
# BOONTON

## POWER METERS

Power Meter  
Model 4220

GPIB

- Frequency range, 100 kHz to 100 GHz
- Power range, -70 dBm to +37 dBm
- Stored calibration data for up to 4 sensors, including high frequency calibration factors
- Optional GPIB interface



### Description

The new single channel Boonton 4220 Power Meter offers excellent performance at an unbeatable price. A built-in power reference, coupled with low instrument noise and excellent linearity, allows levels from -70 dBm to +37 dBm to be accurately measured with confidence. A wide choice of power sensors, both coaxial and waveguide, accept frequencies from 100 kHz to 100 GHz. The ability to store complete calibration information for up to four interchangeable sensors means that a variety of applications involving different levels and frequencies can be met without the need for recalibration.

The 4220 is an excellent choice for production requirements because of easy-to-understand, easy-to-operate controls and low cost. By adding an optional GPIB, the 4220 can be equally at home in an ATE environment. Its wide level and frequency coverage and selectable filtering speed measurement times, while its 3½ inch, half-rack panel saves valuable space.

### Simple Operation

Setup of the 4220 is clear and concise. Simple key strokes activate an internal 50 MHz power reference and an automatic calibration routine that certifies both sensor and instrument to specified tolerances. Another keystroke provides automatic digital zeroing on all ranges, eliminating zero carryover. Your

4220 is now ready to make measurements with confidence. Measurements are displayed on a 4½ digit readout in either dBm or watts. Readings may be offset by a reference value. The reference value may be the last displayed value or an arbitrary value selected to correct for external gain or loss. An analog display is also provided for easy visual interpretation of rapidly changing levels associated with nulling or peaking operations.

Ranging is automatic or preset. Preset ranging is particularly useful in speeding ATE measurements when the expected level is known.

Selectable filtering is available to optimize measurement speed and display stability. Filter times, in 50 millisecond intervals to 20 seconds, are fully under operator control as either manually entered values or by bus command.

### Calibration Factor Selection

High frequency calibration factors, traceable to the National Institute of Standards and Technology, are provided for each sensor. The values can be entered and displayed by incrementing the up/down buttons in 0.01 dB steps. Subsequent measurements are then automatically corrected for the selected calibration factor. Alternatively, since the calibration factor information has been stored in the instrument's non-volatile memory, the frequency of measurement can be entered and the 4220 will automatically calculate, display, and correct the measurement for the appropriate calibration factor.

### Optional GPIB

The 4220 is normally supplied without a bus interface so as not to burden the user with the additional cost if ATE applications are not required. However, the instrument may be ordered with an optional full-service GPIB.

Complete interrupt capability, with serial poll and service request, is provided for the most efficient use of computer time in large ATE systems.

A variety of measurement modes are available over the bus. Three free running modes can be selected to provide continuously updated data, with or without complete filtering, or data that is filtered and settled to within 1% of a final value. Three externally triggered modes provide data that is filtered, filtered and settled, or delayed by a preset time after triggering.

### Quality Construction For Trouble-Free Operation

A combination of careful engineering, quality construction, and automated calibration is your assurance that the 4220 will not only meet or exceed its published specifications on arrival, but for years to come.

A useful tool to check the overall performance of the 4220 is the Model 2520 RF Calibrator. This calibrator provides NIST-traceable 30 MHz levels programmable from -70 to +20 dBm to a resolution of 0.1 dB. Accuracy is 0.055 dB at 0 dBm and SWR is less than 1.05.

# POWER METERS

## RF Power Meter

### Model 4220 (Continued)



#### Specifications

**Frequency Range:** 100 kHz to 100 GHz, sensor dependent. Refer to Power Meter Sensor section.

**Power Range:** -75 dBm to +50 dBm, sensor dependent

**Power Sensors:** Accepts up to 4 sensors with full calibration data, including high frequency calibration factors, stored in non-volatile memory. SENSOR SELECT key accesses sensors with sensor serial number and type displayed. Compatible with all Boonton sensors (see sensor characteristics.)

**Dynamic Range:** Up to 90 dB with diode sensors. (See sensor characteristics) 50 dB with thermocouple sensors.

**Inputs:** Front panel and rear panel SENSOR connectors standard. Rear panel IEEE-488 connector optional.

**Outputs:** Front panel PWR REF connector, 0 dBm, 50 MHz. Rear panel RECORDER BNC connector, 0 to 10 V into 1 M $\Omega$ . Output impedance is 9.09 k $\Omega$ . May be operated into 1 k $\Omega$  for IV fs.

**Displays:** Main data, 4½ digit LED. Cal Factor, 4 digit LED. Analog, proportional to data display.

**Display Units:** Absolute, watts and dBm. Relative, dB.

**Display Resolution:** 4½ digits, nW,  $\mu$ W, mW, and W.; 0.01 dB, dBm and dB.

**Measurement Accuracy:** Total accuracy is the sum of the following uncertainties (errors are  $\pm$  worst case):

**Instrumentation Uncertainty:** 0.32% at fs, 0.54% at 1/10 fs

**Power Reference Uncertainty:** Output Frequency: 50 MHz  $\pm$ 1.5%

Output Level: 0 dBm

Level Accuracy:  $\pm$ 0.7% (23°C) for 90 days

$\pm$ 0.9% RSS, 1.2% worst case (0-55°C) for 1 year

Source Impedance: 50  $\pm$ 1 ohm

SWR: < 1.02

Harmonic Output: < -60 dBc

**Sensor Non-Linearity Uncertainty:** See Sensor Characteristics

**Noise Uncertainty:** See Sensor Characteristics

**High Frequency Calibration Factor Uncertainty:** See Calibration Factor table

**Calibration Factors:** +3 dB to -3 dB in .01 dB steps. These calibration factors are stored in non-volatile memory. When a frequency other than that stored is used, the 4220 linearly interpolates between the cal. factor above and below the frequency entered to obtain a cal. factor.

**Ranging:** Automatic or manual

**Filtering:** Filter times in 0.05 second intervals to 20 seconds

**Zeroing:** Automatic function to calculate, store, and apply zero corrections to each range

**Display Offset (dBr):** -99.99 to 99.99 in 0.01 dB steps

**Power Consumption:** 100, 120, 220, and 240 V, 50-400 Hz, 40 VA

**Operating Temperature:** 0 to 55°C

**Weight:** 6.6 lbs., 0.66 kg

**Dimensions:** 3.5 in H x 8.25 W x 13.25 D (8.9 cm x 21.0 x 33.7)

**Optional IEEE-488 Bus:** Complies with IEEE-488 and implements: SH1, AH1, T6, L4, SR1, RL1, DC1, and DT1.

**Accessories Required:** 1 or more of the available power sensors. A 5 ft. power sensor cable model 41-2A is supplied with each sensor ordered.

**Accessories Available:** 41-2A/10 Sensor/Probe Interconnecting Cable. (10 ft.).

A special low noise cable that connects the power sensor to the power meter.

41-2A/20 Sensor/Probe Interconnecting Cable. (20 ft.).

41-2A/50 Sensor/Probe Interconnecting Cable. (50 ft.).

41-2A/100 Sensor/Probe Interconnecting Cable. (100 ft.).

950047 F/F Adapter, 41-2A.

950049 Bulkhead Connector F/F 41-2A.

951055 Adapter, type N (M) to APC 3.5 (F).

954015 Rack mounting kit.