8500A Series Peak Power Meters

The Giga-tronics 8500A Series Peak Power Meters combine CW power measurement with the ability to make precise peak power measurements at any point on a pulsed waveform.

This dual, built-in capability lets you measure and analyze pulsed waveforms with a single instrument.

VITAL STATISTICS

8500A Series meters let you view a pulsed waveform, along with critical parameters, on a built-in display.

A reference cursor pinpoints the precise measurement location on the waveform with 100 ps resolution.

Precise sequential sampling lets you measure the same point on each pulse at over 70 measurements per second.

THE ACCURACY STANDARD

At the heart of an 8500A Series meter is a built-in power sweep calibrator with NIST traceable accuracy.

The calibration system uses the inherent linearity and stability of an ovenized thermistor to accurately calibrate the high-speed diode sensors from 0 to 50°C, ambient. This built-in capability lets you make absolute power measurements with accuracy generally found only in thermistor power meters. And automatic self-calibration take less than a minute.

ONE OR TWO CHANNELS

Choose the Model 8501A meter for single-channel operation, or the Model 8502A meter for two-channel capability.

For tests on pulse modulators and pulsed TWTs, the 8502A can measure a CW signal on one channel and a pulsed signal on the other. And the power reading from each sensor is independently corrected, automatically.

BUILT-IN FREQUENCY RESPONSE CALIBRATION

Correcting for sensor frequency response is easy and automatic.

Each sensor contains an EEPROM programmed with the frequency calibration factors measured at the factory, or in your cal lab.

When you key in the frequency at which power is being measured, the meter automatically applies the correct cal factor

from the sensor EEPROM.

Not only is this an easy way to handle cal factors, but it also avoids the chance of errors from reading a table or graph.

It also saves time on GPIB systems, because you don't have to manually enter a new set of cal factors when changing sensors.

Sensor diodes and PROMS can be replaced in the field. Use the Giga-tronics PROM programmer to download new cal factor data into the replacement PROM.

AUTOMATIC SELF EXAMINATION AND CALIBRATION

8500A Series meters automatically execute a self-test routine at turn-on that performs eleven different checks on critical internal circuitry.

When turned on, an 8500A Series meter also checks the serial number of the attached sensor and, if necessary, requests selection of the automatic calibration routine.

MENU DRIVEN OPERATION

8500A Series meters are extremely easy to use.

Interactive prompts and soft-key-operated menus step you quickly and easily through triggering setups and measurements. Rise time, pulse width and fall time can be displayed automatically.

ANALYZE PULSE PROFILES

Analyze pulse profiles and read peak power at any point on the pulse using the reference level cursor.

And make precise timing measurements, such as rise time and pulse width, using up to four measurement points per channel.

GBIP OPERATION

GPIB capability allows computer control of the instrument. Many internal high-level functions, such as rise time and pulse width, are available directly over the bus, freeing you to perform other tasks.

Power readings can typically be made every 10ms, using the Fast Data mode. An optional internal MATE interface is also available.

HIGH-SPEED DIODE SENSORS

Giga-tronics uses high-speed diode sensors, rather than slower thermal sensors, to achieve higher sampling rates.

Interchangeable sensors cover the frequency range from 30 MHz to 40 GHz.

Fast rise time sensors are available to measure single shot or repetitive pulses as narrow as 15 ns.

And the same sensors measure CW signals over a wide -40 to +20 dBm dynamic range.

Sensor Selection Guide

Model	Frequency Range	Power Range Peak	Power Range CW	Maximum Power	Maximum VSMR		RF Connector
High Speed Sensors (< 15 ns Rise Time, Typically 10 ns)							
16936A	750 MHz to 18.5 GHz	–20 to +20 dBm	–40 to +20 dBm	+23 dBM 200 mW	Below 2.0 GHz 2.0 to 12.4 GHz 12.4 to 18.0 GHz	1.12 1.22 1.37	Type N(m) 50 Ω
16937A	750 MHz to 18.5 GHz	–20 to +20 dBm	–40 to +20 dBm	+23 dBM 200 mW	Below 2.0 GHz 2.0 to 12.4 GHz 12.4 to 18.0 GHz	1.12 1.22 1.37	APC-7 50 Ω
17266A	750 MHz to 26.5 GHz	–20 to +20 dBm	–40 to +20 dBm	+23 dBM 200 mW	Below 2.0 GHz 2.0 to 12.4 GHz 12.4 to 18.0 GHz 18.0 to 26.5 GHz	1.12 1.22 1.37 1.50	Type K(m) 50 Ω
17071A	750 MHz to 40.0 GHz	–20 to +20 dBm	–40 to +20 dBm	+23 dBM 200 mW	Below 2.0 GHz 2.0 to 12.4 GHz 12.4 to 18.0 GHz 18.0 to 26.5 GHz 26.5 to 40.0 GHz	1.12 1.22 1.37 1.50 1.92	Type K(m) 50 Ω
Low Frequency Sensors (< 750 ns Rise Time, Typically 500 ns)							
16934A	30 MHz to 18.5 GHz	–20 to +20 dBm	–40 to +20 dBm	+23 dBM 200 mW	Below 2.0 GHz 2.0 to 12.4 GHz 12.4 to 18.0 GHz	1.12 1.22 1.37	Type N(m) 50 Ω
16935A	30 MHz to 18.5 GHz	–20 to +20 dBm	–40 to +20 dBm	+23 dBM 200 mW	Below 2.0 GHz 2.0 to 12.4 GHz 12.4 to 18.0 GHz	1.12 1.22 1.37	APC-7 50 Ω
17267A	30 MHz to 26.5 GHz	–20 to +20 dBm	–40 to +20 dBm	+23 dBM 200 mW	Below 2.0 GHz 2.0 to 12.4 GHz 12.4 to 18.0 GHz 18.0 to 26.5 GHz	1.12 1.22 1.37 1.50	Type K(m) 50 Ω

METER

Frequency Range: 30 MHz to 40 GHz depending on sensors (see sensors specifications)

Power Range:

Pulse: -20 to +20 dBm

CW: -40 to +20 dBm (see sensor specifications)

ACCURACY

The uncertainty of microwave power measurements depends on several factors, the most imporant being the effective mismatch of both the power sensor and the RF source. Excluding mismatch effects, the measurement uncertainties of the instrument are:

Calibration Power Uncertainty (at 0 dBm): ± 1.5%

Linearity after Automatic Calibration: ± 3% (at stable temperature)

Typical Temperature Coefficient of Linearity at Ambient

± 5° C, CW and Peak; typical:

>-10 dBm: negligible, 0 to 50° C

<-10 dBm; ± 0.5%/° C, 15 to 50° C;

± 1.0%/° C, 0 to 15° C (Instrument indicates if ± 5° C calibration range is exceeded.)

Uncertainty due to Zeroing and Noise:

CW (Avg.=500): <± 10 nW, 15 to 50° C; <± 20 nW, 0 to 15° C

Peak (Avg.=100): <± 3.5 µW, 15 to 50° C; <± 5.0 µW, 0 to 15° C

Single Pulse (typ.): <± 15 µW, 15 to 50° C; <± 30 µW, 0 to 15° C

Measurement Uncertainty (Using Root of the Sum of the Squares)

Assume Frequency = 6 GHz and Source Return Loss 16 dB

	Total Uncertainty	RSS Uncertainty
Calibration Factor Uncertainty at 6 GHz	3.40%	1.82%
Calibrator at 1 GHz	1.50%	0.80%
Calibrator/Sensor Mismatch at 1 GHz	0.60%	0.60%
Linearity (If not near 1 mW)	3.00%	3.00%
Noise	±3.5 µW	
Sensor/Source Mismatch	3.20%	3.20%
Total Measurement Uncertainty= 11.7% ±3.5 µW		
RSS Value = 4.85% ±3.5 µW[1]		

[1] *Total Measurement Uncertainty = Total Calibration Factor Uncertainty + Total Calibrator Uncertainty + Total Calibrator/Sensor Mismatch Uncertainty + Total Linearity Uncertainty + Total Sensor/Source Mismatch Uncertainty + Total Noise Uncertainty*

Time Base Range: 1.2 ns/div to 20 ms/div (12 ns to 200 ms time window, using either the Data Entry Keyboard or the Control Knob.)

Maximum Resolution: 0.1 ns

Accuracy: 0.01% of time window, ± 1 ns

Triggering Modes:
Internal: -20 to + 16 dBm
External (BNC): TTL Levels, Maximum PRF 1 MHz

Trigger Delay Range: 0 to 200 ms, using either the Data Entry Keyboard or the Control Knob.
Resolution: 0.1 ns
Accuracy: 0.01% of delay, ± 1 ns

Minimum Pulse Width: 20 ns, 15 ns rise time sensors

Markers: Up to 4 markers per channel plus a Reference Power Level cursor. Markers can be positioned at any point on the pulse waveform. Typcially they would be positioned to make rise time and pulse width measurements. The markers and cursor can be positioned either at user selected delays or automatically at specified percentage of amplitude for pulse parameter measurements.

Graph Display Mode: Plots the outline of the detected pulse on the front panel display, and provides readout of amplitude and timing information.

Fast Measurement Mode: Available under GPIB control to provide fast data acquisition and output. For an average number = 1, typically between 70 and 120 measurements per second are made. Via the rear panel analog output, swept frequency response tests can be made using a network analyzer.

Power Sensor Calibration Factor Uncertainties

Power Sensors	16934A 16935A 16936A 16937A	17266A 17267A 17071A	16934A 16935A 16936A 16937A	17266A 17267A 17071A
Frequency	Sum of Uncertainties (%)[2]		Probable Uncertainties (%)[3]	
30.0 MHz to 1.0 GHz	1.39	3.06	1.25	1.64
1.0 to 2.0 GHz	2.34	3.51	1.44	1.73
2.0 to 4.0 GHz	2.93	4.42	1.60	1.93
4.0 to 8.0 GHz	3.42	4.94	1.82	2.08
8.0 to 12.4 GHz	4.31	6.04	2.30	2.55
12.4 to 18.0 GHz	4.91	6.86	2.53	2.83
18.0 to 26.5 GHz	–	9.27	–	3.63
26.5 to 40.0 GHz	–	15.19	–	6.06

[2]Includes uncertainty of reference standard and transfer uncertainty. Directly traceable to NIST.

[3]Square root of the sum of the individual uncertainties squared (RSS).

CALIBRATOR

Frequency: 1 GHz ± 5%
Power Uncertainty at 1 mW: ± 1.5%
Return Loss at 1 mW: >25 dB
Self Calibration Time: <1 minute
Connector: Type N(f)

GENERAL

Stored Setups: Saves settings at power down and ten additional stored setups in non-volatile memory.

Self-Test: Performed automatically at turn-on and optionally at anytime. A diagnostic code indicates the cause and location of any errors.

Reset Control (Rear Panel): Returns instrument to present default condition.

Design and Construction: To the intent of MIL-T-28800C, Type III, Class 5, Style E or F, Color R.

Power Requirements: 100, 120, 220 or 240 VAC ± 10%, 48 to 480 Hz.
Power Consumption: Approximately 100 VA

Temperature:
Operating: 0 to 50° C (32 to 122° F)
Non-operating: -40 to +65° C (-40 to 149° F)

Humidity (Operating w/o precipitation):
95% ±5% to 30° C; 75% ±5% to 40° C; 45% ±5% to 50° C

Physical Characteristics:
Size: 13.3 cm H x 42.6 cm W x 35.6 cm D
(5.25 in x 16.75 in x 14 in)
Weight: Model 8501A, 12 kg (26 lbs);
Model 8502A, 13 kg (28 lbs)

AUXILIARY OUTPUTS/INPUTS (BNC)

Monitor: Provides a real time profile of the detected RF envelope. Rise time is typically 20 ns, output impedance is nominally 50 Ω. Voltage output is typically 4 mV to +2 V depending on power level.

Trigger Input: TTL

RF Blanking: TTL open collector low during zeroing. Used to control power source.

Analog Output: Provides a voltage proportional to detected power. Scale factor is 100 mV/dB, ±0.5%, offset is <±10 mV.

Voltage Proportional to Frequency (V/GHz): Allows direct entry of frequency from RF power sources equipped with V prop F output.

GPIB INTERFACE

In accordance with IEEE STD 488-1978

GPIB Indicators: REM, TLK, LSN, SRQ, LLO

Remote Operation: Complete setup and measurement capabilities accessible via GPIB. Reporting of errors, malfunctions, operational status and self-test diagnostics available through serial poll capability.

Direct Plot Output: Outputs hardcopy pulse profile, including time, date and part identification, to a GPIB plotter.

GPIB Address: Selectable from front panel.

GPIB Interface Functions: SHI, AHI, T6, L4, SRI, RLI, PPO, DCI, DTI, TEO, LEO

ORDERING INFORMATION

Peak Power Meters

8501A Single Channel Peak Power Meter
8502A Dual Channel Peak Power Meter

Power Sensors

16934A 30 MHz to 18.5 GHz, Type N
16935A 30 MHz to 18.5 GHz, APC-7
16936A 750 MHz to 18.5 GHz, High Speed, Type N
16937A 750 MHz to 18.5 GHz, High Speed, APC-7
17266A 750 MHz to 26.5 GHz, High Speed Sensor, Type K
17267A 30 MHz to 26.5 GHz, Type K
17071A 750 MHz to 40.0 GHz, High Speed Sensor, Type K
17071/S5428 500 MHz to 40.0 GHz, High Speed, Type K

Options

01 Rack Mount
03 Rear Panel Sensor and Calibrator Connectors (Replaces Front Panel Connectors)
04 Internal MATE Interface

Accessories and Maintenance Tools

16956-001 Extra Sensor Cable Assembly, 5 ft.
16956-002 Extra Sensor Calbe Assembly, 10 ft.
14052 IEEE-488 (GPIB) Cable, 2 Meter
16976 Sensor PROM Programmer
17075 Extender Board, Single Connector
17076 Extender Board, Dual Connector
20790 Extra 8500A Series Manual
19206 8500A Series Calibration Kit: Consists of 17075, 17076, 16976 & 20790

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