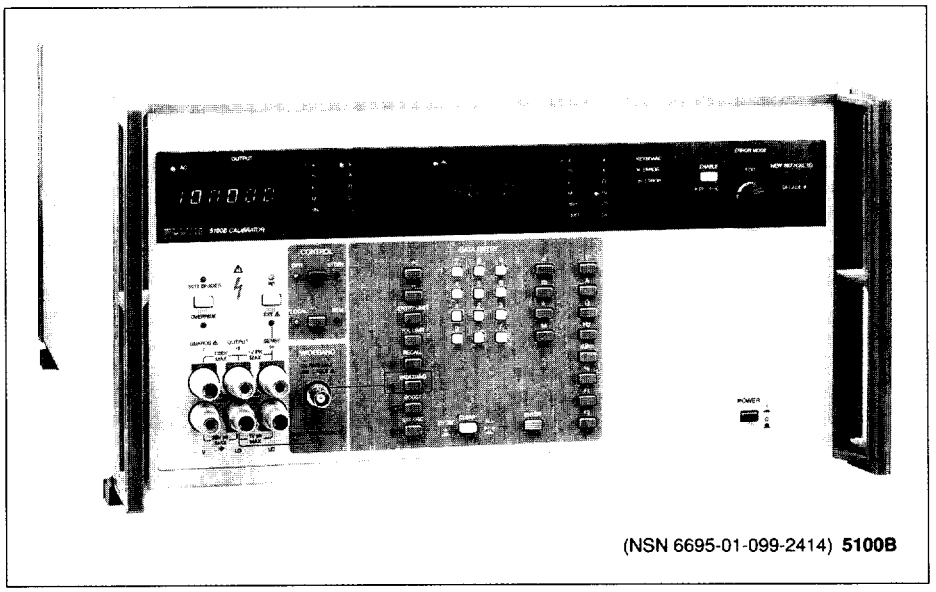
5100B Series

GPIB IEEE-488

RS-232



(NSN 6695-01-099-2414) **5100B**

5100B Series Calibrators

- Improved version of the world's most popular multifunction calibrator
- Cost-effective multimeter calibration to 4½ digits
- Five functions: Direct or alternating voltage or current plus resistance
- New front panel, new output terminals, and updated control panel
- Modern production methods offer superior quality
- Unique cassette tape drive option available for storing procedures
- Compatible with Fluke 7411C and MET/CAL based systems, 5700A Calibrator, 5205A/5215A Power Amplifiers, and 5220A Transconductance Amplifier

The 5100B Series Calibrators are the world's leading calibrators for analog and digital multimeters to 4½ digits. Dependability, five-function versatility and cost effectiveness have made the 5100B Series Calibrators basic equipment for nearly every calibration laboratory.

Now these calibrators offer even more value. DC voltage uncertainty is 40 ppm; Basic AC uncertainty is 350 ppm. The front panel includes high-voltage safety terminals together with control grouping optimized for user friendliness. Quality and reliability are also enhanced with modern manufacturing methods including statistical process control (SPC).

The versatility of the 5100B Series Calibrators is unmatched at any price. They are compatible with the popular Fluke 7411C and MET/CAL based Calibration Systems, the Navy's MECCA Systems and the new Fluke 5700A Multifunction Calibrator. Enhanced capability is also available with the 10 MHz Wideband Option and the capability to directly drive the Fluke 5220A 20A Transconductance Amplifier and the 5205A or 5215A High Voltage Amplifier.

5100B Series Increases Throughput

A large share of the workload of meter calibration laboratories and production lines consists of analog and digital meters with 4½ digit or less resolution. There are hundreds of different meters in this category representing different manufacturers, with no standard format for meter specifications.

Operating the 5100B Series is simple, making it easy to train your operators. And all data is entered via a calculator-type keyboard. No need to convert volts to dBm or dBm to volts, for example. And the 5100B Series performs the mathematical computations associated with calculating the error of the unit-under-test (UUT) – in % or in dB. It then indicates to the operator whether the UUT passed or failed, according to its specified uncertainty and the magnitude of the error.

The 5100B Series calibrates meters quickly and efficiently. It is no longer necessary to gather together separate calibration instruments requiring complex interconnection and operation. A single 5100B Series does the whole job.

5101B Has System Features

The 5101B is designed for the user who needs the automated features of a large computer aided calibration system without the hardware and software costs of a large system.

A typical calibration procedure consists of forty or fifty separate steps. For most benchtop systems, each step must be loaded into the calibrator – an operation that is slow and prone to human error. The 5101B has a built-in cassette tape deck to store calibration procedures and step through them under microprocessor control.

Initially, the operator records the procedure on a mini-cassette. Once recorded, the procedure can be repeated in a fraction of the usual time. Preparing the calibration tape and operating the 5101B, requires no special knowledge of computers or computer languages. Using a printer and interface option with the 5101B, you can document both the calibration procedure and the test results with a hard-copy record.

5102B Has Rugged Case

The 5102B is similar to a 5100B but constructed in a rugged combination case with removable sealed end covers for military applications. It is not rackmountable.

Automated Calibration

The 5100B Series can be used in computer-aided calibration applications by adding a Fluke 1722A Instrument Controller and 7411C Calibration Software. Examples of calibration procedures are included in the software packages. Consult your local sales office for details.

Extended Power and Current Capabilities

The 5205A Precision Power Amplifier and the 5220A Transconductance Amplifier will operate as an integrated system with either a 5100B, 5101B, or 5102B. The purpose is to extend the voltage and current sourcing capabilities beyond the basic built-in capabilities of the 5100B Series Calibrators.

High voltage loading may be extended from 6 mA maximum to 100 mA maximum at 1100V for direct voltage. And alternating volt-Hertz limits may be extended from 20V at 50 kHz to 1100V at 50 kHz. Current sourcing may be extended from 2A to 20A.

A Y5000 Interface/Buffer is needed to integrate a 5205A and/or a 5220A with 5100B Series. It connects to the rear panels and preserves the advantage of single-point control of calibration, automatic error calculation, entry limit protection, etc. The system is operated and controlled using only the front panel of the 5100B/5101B or procecures stored on a 5101B mini-cassette.

Specifications

Technical Specifications

Direct Voltage

Range	Resolution	Maximum Current	Ripple and Noise (10 Hz to 3 kHz, NL to FL, RMS)
20 mV	0.1 µV	Limited by 50Ω output resistance or 25 mA using 50Ω overide	0.01 of setting +25 µV**
200 mV	1 µV		
2V	10 µV		
20V	100 µV	25 mA 1000 pF	0.02% of setting + 50 µV
200V	1 mV	10 mA/ 400 pF*	0.05% of setting (open to 20 kΩ) 0.1 of setting (20 kΩ to full load)
1100V	10 mV	6 mA/ 400 pF*	0.05% of setting

**100 mA/1500 pF with 5205A, Y5000 and Y5001*
***Double both terms for divider override mode*

Uncertainty: ±(0.004% of setting +0.001% of range +5 µV) for all ranges, for 6 months, 20°C to 30°C ambient, non-override; ±(0.005% of setting +0.2 mV) for divider override mode
Temperature Coefficient: Above 30°C and below 20°C, ±(5 ppm of setting +1 ppm of range +1 µV)/°C to 200V, ±(5 ppm of setting +2 ppm of range)/°C, 200V to 1100V
Short Term Stability: (For 10 minutes from 0°C to 50°C) ±(10 ppm of setting +2 ppm of range +5 µV) to 500V; ±25 ppm of setting, 500V to 1100V
Load Regulation: (External Sense) ±10 ppm from 2V to 1100V, no-load to full-load. (Internal Sense) same as external except full-load is 400Ω

Alternating Voltage

Range*	Resolution	Maximum Load	Total Harmonic Distortion and Noise
20 mV	0.1 µV	Limited by 50Ω output resistance	Bandwidth of 10 Hz to 200 kHz, Distortion, line interference + noise including random spikes **20V and Higher** 50 Hz to 10 kHz: 0.08% of output rms **Below 20V** 50 Hz to 10 kHz: (0.05% of output + 10 µV) rms 10 kHz to 50 kHz: (0.08% of output + 20 µV) rms
200 mV	1 µV		
2V	10 µV	2 kΩ/ 1000 pF	
20V	100 µV	25 mA/ 1000 pF	
200V	1 mV	10 mA/ 400 pF	
1100V	10 mV	6 mA/ 400 pF**	

** Can be set in dBm where 0 dBm + 1 mW in 6008 + 0.7746V*
***200 mA/1500 pF with 5205A, Y5000 and* Y5001

Uncertainty: ±(0.035% of setting +0.005% of range +50 µV) from 50 Hz to 10 kHz and ±(0.06% of setting +0.008% of range +50 µV) from 10 kHz to 50 kHz for 6 months, 20°C to 30°C ambient
Frequencies Available (Hz): 50, 60, 70, 80, 90, 100, 200, 300, 400, 500, 600, 700, 800, and 900 for all voltage ranges.

Frequencies Available (kHz):

Voltage Range	1	2	3	4	5	6	7	8	9	10	20	30	40	50
110V to 1100V	•	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ
20V to 110V	•	•	•	•	•	•	•	•	•	•	•	Δ	Δ	Δ
1 mV to 20V	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Δ With 5205A, Y5000, and Y5001

Frequency Uncertainty: ±3%
Temperature Coefficient: Above 30°C and below 20°C ±(20 ppm of setting +2 ppm of range)/°C for amplitude, ±0.1%/°C for frequency
Short Term Stability: ±(0.01% of range +10 µV) for 10 minutes from 0°C to 50°C

Load Regulation: External Sense, ±200 ppm from 0.2V to 1100V, no-load to full-load; Internal Sense, same as external except regulation for voltages <0.2V is expressed as an output impedance of 50Ω

Direct Current

Range	Resolution	Compliance Voltage	Ripple and Noise
200 µA	1 nA	0 to 10V	(0.05% of output +0.01 µA) rms Measured with 10 Hz to 10 kHz bandwidth including random spikes
2 mA	10 nA		
20 mA	100 nA		
200 mA	1 µA		
2A*	10 µA	0 to 2.1V	

**20A with 5220A, Y5000, and Y5002*

Uncertainty: ±0.015% of setting +0.002% of range +0.01 µA) for compliance voltage up to 1V. Add 0.002% of setting per volt above 1V rms. Applies for 6 months and 20°C to 30°C ambient
Temperature Coefficient: Above 30°C and below 20°C ±(10 ppm of setting +2 ppm of range)/°C
Short Term Stability: ±(50 ppm of setting +5 ppm of range +0.002 µA) for 10 minutes from 0°C to 50°C
Load Regulation: ±20 ppm/volt for change in output voltage from 1 volt to maximum compliance voltage

Alternating Current

Range	Resolution	Compliance Voltage	Total Harmonic Distortion & Noise
200 µA	1 nA	0 to 7V	(0.05% of output +0.01 µA) rms Measured with 10 Hz to 10 kHz bandwidth including random spikes
2 mA	10 nA		
20 mA	100 nA		
200 mA	1 µA		
2A*	10 µA	0 to 1.4V	

**20A with 5220A, Y5000, and Y5002*

Uncertainty: ±0.05% of setting +0.005% of range +0.02 µA) for compliance voltage up to 1V rms (50 Hz to 1 kHz). Add 0.005% of setting per volt above 1V rms. Applies for 6 months in 20°C to 30°C ambient
Temperature Coefficient: Above 30°C and below 20°C ±(25 ppm of setting +10 ppm of range +0.2 nA)/°C for amplitude, +0.1%/°C for frequency
Short Term Stability: ±(0.014% of setting +0.002% of range +0.4 µA) for 10 minutes from 0°C to 50°C

Load Regulation: ±(50 ppm +20 nA)/volt for change in output voltage from 1 volt to maximum compliance voltage

Resistance

Range: 1Ω to 10 MΩ in decade steps
Uncertainty: ±0.003%, except ±0.015% (1Ω), ±0.010% (10Ω and 1 MΩ), and ±0.030% (10 MΩ) assumes 4 terminal below 100 kΩ. 6 mo 20°-30°C
Power Dissipation: 1W maximum except 100 mW max (1 MΩ) and 10 mW max (10 MΩ)
Temperature Coefficient: Above 30°C and below 20°C, ±5 ppm/°C except ±10 ppm/°C (1Ω and 10Ω), ±10 ppm/°C up to 40°C (10 MΩ), and ±50 ppm/°C above 40°C (10 MΩ)

Extended Specifications

Direct Voltage (5205A)

Range: ±100V to ±1100V, with 10 mV resolution
Maximum Load: 100 mA; 1500 pF
Uncertainty: ±(0.07% of setting +20 mV), for 6 months, 20°C to 30°C ambient
Line-Related Noise: ≤50 mV rms
Random Noise: ≤100 mV rms, 1 MHz bandwidth

Alternating Voltage (5205A or 5215A)

Voltage Range: 100V to 1100V rms, with 10 mV resolution
Maximum Load: 200 mA, decreasing linearly to 140 mA from 100 Hz to 50 Hz; 1500 pF
Voltage Uncertainty: ±(0.08% of setting +0.1V) for 50 Hz to 10 kHz; ±(0.12% of setting + 0.15V) for 10 kHz to 50 kHz, for 6 months, 20°C to 30°C ambient
Frequency Range: Discrete selections from 50 Hz to 50 kHz with 1 MSD resolution
Frequency Uncertainty: ±3%
Harmonic Distortion and Noise: 0.1% of setting from 50 Hz to 20 kHz, 0.2% of setting from 20 kHz to 50 kHz, for bandwidth of 10 Hz to 1 MHz

Direct Current (5220A)

Range: ±1A to ±19.9999A, with 100 µA resolution
Compliance Voltage: 0 to 4V
Uncertainty: ±(0.025% of setting +1 mA), for 6 months, 20°C to 30°C ambient
Ripple and Noise: 0.05% of setting +1 mA rms, 10 Hz to 3 kHz bandwidth

Alternating Current (5220A)

Current Range: 1A to 19.9999A rms, with 100 µA resolution
Compliance Voltage: 0 to 3V rms
Current Uncertainty: ±(0.07% of setting +1 mA) rms from 50 Hz to 1 kHz, ±(0.07% of setting +1 mA) x frequency (in kHz) from 1 kHz to 5 kHz, for 6 months, 20°C to 30°C ambient
Frequency Range: Discrete selections from 50 Hz to 5 kHz with 1 MSD resolution
Frequency Uncertainty: ±3%
Harmonic Distortion and Noise: ±(0.07% of setting +1 mA) rms, for bandwidth of 10 Hz to 300 kHz

Option Specifications

Wideband aV Option (-03)

Option -03 is an accurate, low-noise, flat alternating voltage source that allows the 5100B Series to be used for calibrating wideband voltmeters. Frequency coverage expands to 10 Hz-10 MHz. A dedicated front panel BNC connector provides ac output from 300 µV (-57.5 dBm) to 3.1623V (+23 dBm) into 50Ω impedance. The output is programmable from the front panel or I/O interface in volts or in dBm (where 0 dBm equals 1 mW into 50Ω). Using a simple formula for calculation of a correction factor and the NEW REF feature, the wideband output can be directly programmed for dBm referenced to other impedances.

With the EDIT control the error of wideband meters can be calculated in % or in dB. With the EDIT control and NEW REF, you may test the frequency response of meters. This method provides a direct reading in percent or dB, ideal for making Bode plots.
Range: 10 Hz to 10 MHz

Amplitude Uncertainty, at 1 kHz, Terminated in 50Ω*

Voltage Range	Approx dBm Range	±(% of Setting + % of Range)
1V-3.1623V	+13 to +23	0.25 + 0.25
0.31624V-0.99999V	+3 to +13	0.5 + 0.25
0.1V-0.31623V	-7 to +3	0.75 + 0.25
31.624mV-99.999mV	-17 to -7	1.0 + 0.25
10mV-31.623mV	-27 to -17	1.25 + 0.25
3.1624mV-9.9999mV	-37 to -27	1.5 + 0.25
1mV-3.1623mV	-47 to -37	1.75 + 0.25
300µV-0.99999 mV	-57.5 to -47	2.0 + 0.25

**For 6 months, 20°C to 30°C ambient*

Amplitude Flatness*
10 Hz to 30 Hz: ±0.3%
30 Hz to 1 MHz: ±0.25%
1 MHz to 5 MHz: ±0.25% above 1 mV, ±0.6% ≤1 mV
5 MHz to 10 MHz: ±0.6%
**Using 1 foot of RG 58U cable terminated in 50Ω*

Temperature Coefficient: Above 30°C and below 20°C ±(0.1 times basic accuracy)/°C for amplitude; ±0.25%/°C for frequency
Harmonics: -40 dB or lower relative to fundamental for each frequency except -32 dB above 5 MHz
Spurious Outputs: -50 dB or lower relative to fundamental for each frequency
Frequency Resolution: 1 MSD
Frequency Uncertainty: ±3%

IEEE-488 Interface Option (-05)

This interface allows the 5100 Series B to be used in a system compatible with IEEE Std 488-1978. System control is via the Fluke 1722A or 1752A Instrument Controller or any host computer. Address coding is done using logic switches accessible on the rear panel. Data is transmitted bi-directionally in ASCII coded format. The following subsets are supported: SH1, AH1, T6, L4, SR1, RL1, DC1, and E2.

Bit Serial Interface Option (-06)

Provides compatibility with EIA Standard RS-232-C or 20 mA current loops. Thirteen baud rates are available from 50 to 9600 and either one or two stop-bits can be set up. Selection is made via rear panel logic switches.

General Specifications

Shock and Vibration: Meets requirements of MIL-T-28800 for Class 5, Style E equipment
Temperature
5100B and 5102B: 0°C to 50°C operating; -20°C to +65°C non-operating
5101B: (With mini-cassette tape) +10°C to +40°C operating; +4°C to +50°C, non-operating. Without mini-cassette: same as 5100B
Relative Humidity: 185% to 35°C, ≤70% to 40°C, ≤50% to 50°C
Power: 100, 110, 115, 120, 200, 220, 230, 240V ac, switch-selectable ±10%, 50 Hz to 60 Hz. 200VA (5100B) or 220VA (5101B) with all options
Size: 22.2 cm H x 60.3 cm W x 43.2 cm L (8.75 in H x 17 in W x 23.75 in L)
Weight
5100B: 30.4 kg (67 lb) basic, 32.7 kg (72 lb) with all options
5101B: 32.7 kg (72 lb) basic, 34.9 kg (77 lb) with all options
5102B: 35.8 kg (79 lb) basic, 38.1 kg (84 lb) with all options
Included with Instrument: Manual, power cord, serialized and dated calibration certificate. Also one mini-cassette tape with 5101B.

Ordering Information

Models

January 1990 prices

5100B Calibrator $11,450
5101B Calibrator, w/procedure storage 14,400
5102B Calibrator in portable case 15,250
5205A* Power Amplifier 11,250
5220A* Transconductance Amplifier .. 5900

** Y5001 or Y5002 cable and Y5000 interface required when used with 5100B Series Calibrator*

Options (for 5100B, 5101B, 5102B)

-03 Wideband AC Voltage ..... $ 3100
-05* IEEE-488 Compatible Interface 650
-06* EIA RS-232-C Interface 650

**Cannot have -05 and -06 together*

Accessories (Also see Section 17)

5100B-7003K* Fiberglass Carrying Case, for 5100B/5101B ..... $ 1095
5100B-7005K Extender Kit 550
M08-205-600 8 3/4" Rack Mount Kit, 5100B/5101B 110
M00-280-610** 24" Rack Slides 130
Y5000 Interface Buffer for 5205A, 5215A and 5220A 600
Y5001 Interface Cable for 5205A/5215A and Y5000 275
Y5002 Interface Cable for 5220A and Y5000 240
Y8021 Shielded IEEE-488 bus Cable, 1m 130
Y8022 Shielded IEEE-488 bus Cable, 2m 145
Y8023 Shielded IEEE-488 bus Cable, 4m 155
Y8004 Shielded RS-232-C Cable, 1.5m 110
Y8007 Mini-cassettes, 10-pack for 5101B 150

**Cannot be used as a shipping case.*
***Requires M08-205-600*

National Stock Numbers

5100B 6625-01-099-2414
5101B 6625-01-105-3598
5102B with -03 and -05 6625-01-233-7104

Customer Support Services

Warranty

One-year product warranty. See Section 16 for further information on warranty terms and conditions.

Extended Warranty

A 10% discount is available when you order the following at the time of the instrument purchase or when ordered within the factory warranty period.

SC1-5100B Repair ..... $ 697
SC2-5100B Calibration 462
SC3-5100B Full Service 1080
SC4-5100B Performance Verification-Plus 277

SC1-5101B Repair 697
SC2-5101B Calibration 462
SC3-5101B Full Service 1080
SC4-5101B Performance Verification-Plus 277

SC1-5102B Repair 697
SC2-5102B Calibration 462
SC3-5102B Full Service 1080
SC4-5102B Performance Verification-Plus 277

SC1-5205A Repair 772
SC2-5205A Calibration 462
SC3-5205A Full Service 1148
SC4-5205A Performance Verification-Plus 277

SC1-5220A Repair 150
SC2-5220A Calibration 288
SC3-5220A Full Service 417
SC4-5220A Performance Verification-Plus 173

Note: Incoming and/or outgoing calibration readings are available as an option.