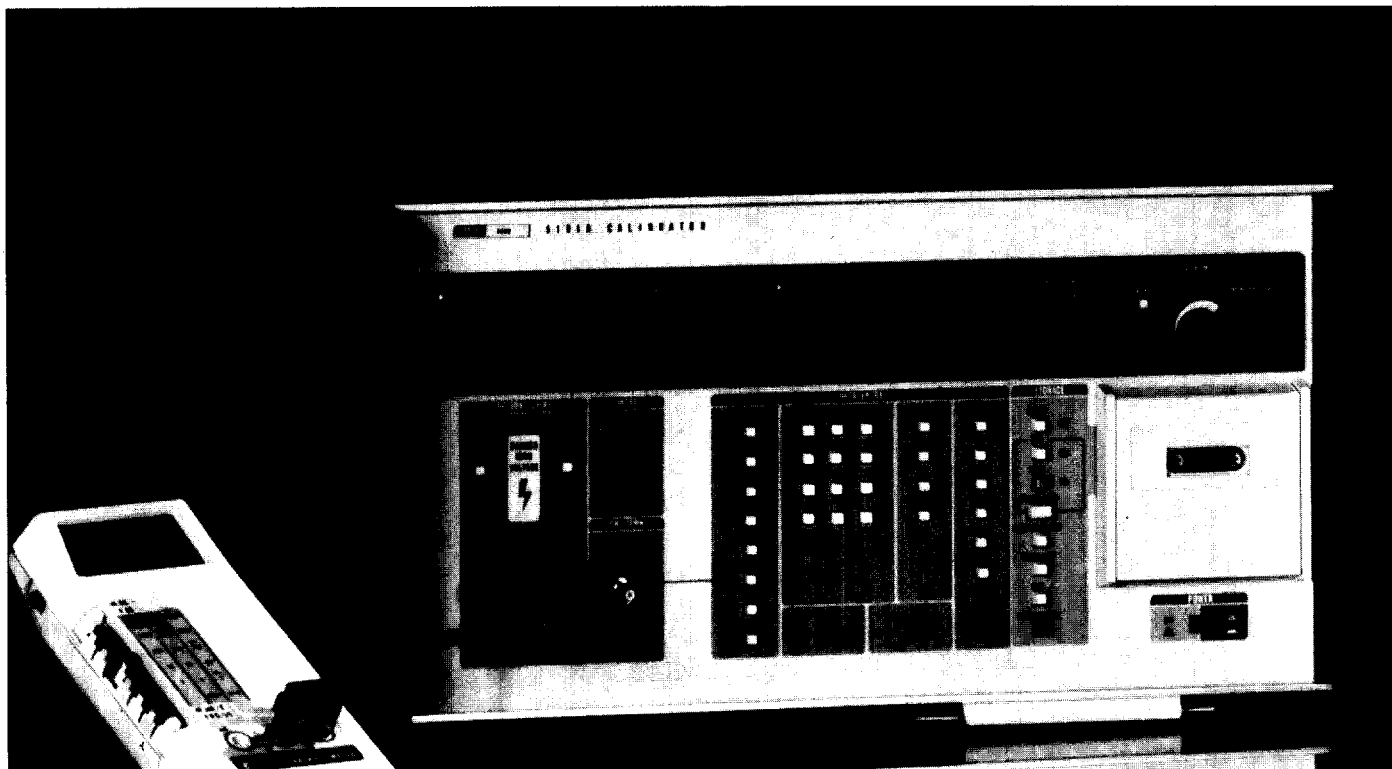


CALIBRATORS AND STANDARDS

Multimeter Calibrator
5100A/5101A **NEW**



5101A

5100A/5101A Calibrator

The 5100 Series offers the flexibility of calibrating and testing all types of meters with a single calibrator. You no longer need separate sources for dc volts, ac volts, current or resistance. The 5100 Series is at home calibrating everything from one-function panel meters to autoranging digital multimeters having up to 4½ digits of resolution. Flexibility of operation is also impressive. First, you can use the 5100A much as you would any calibrator on the bench, performing all the procedural calibration steps by hand, but letting the 5100A's microprocessor do the error computations for you. Or you can choose the 5101A if you want automated testing via the built-in cassette tape --- using procedures you "write" yourself. Finally, you can opt for full systems applications using IEEE Std. 488 or EIA Std RS-232 interfaces.

Optimized Calibration

The 5100 Series provides all the voltages, currents, frequencies, and resistance needed to calibrate modern analog and digital multimeters. An inspection of the ac voltage specifications will show voltages to 1000V rms are available at 400 Hz, but only lower voltages are provided at other frequencies. This was done for several reasons.

First, only a very few, mostly uncommon, voltmeters require recalibration at volt-hertz levels not provided by the 5100 Series. Even these may still be properly calibrated with the 5100 Series. Consider the ac to dc converter. A modern DMM converts ac input voltages to proportional dc levels through a circuit called the ac converter. The converter consists of two elements requiring recalibration: the input attenuator and a wide-band operational amplifier. The attenuator is a passive resistive-capacitive network which attenuates high voltage signals to 1 volt or 0.1 volt (typical)

before being applied to the amplifier. The attenuation ratio (frequency response) is usually a calibration step in a DMM and may readily be recalibrated with a high voltage low frequency and a low voltage high frequency. Such voltages are provided by the 5100 Series calibrators. The amplifier is also calibrated for frequency response, but always at low levels regardless of frequency since its maximum input from the attenuator is typically one volt. Second, calibrators with a wide volt-hertz dynamic range, such as the Fluke 5200A/5205A, require increased power at the output to compensate for the effects of capacitive loading. This output power at high voltage and frequency is also presented to the operator and equipment. Therefore, high power calibrators are a special case requiring skilled, experienced operators. Thirdly, recalibration of voltmeters does not generally require a wide dynamic range of voltage and frequency. To include such capability would add unnecessarily to the size, weight, complexity, and cost of the calibrator.

5100A

Up to three-fourths of the workload of meter calibration laboratories and production lines consists of analog and digital meters with 4½-digits or less resolution. The 5100A Calibrator will calibrate these meters quickly and efficiently.

Operating the 5100A is simple and straightforward. You enter data via a calculator type keyboard in the same format that you encounter it in the manufacturer's cal procedure. No need to convert volts to dBm or dBm to volts. The 5100A performs the mathematical computations associated with calculating the error of the unit under test (UUT) in % or in dB. Then it indicates to the operator whether the UUT passed or failed the test and the magnitude of the error.

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The 5101A is designed for the user who wants the automatic features of a large computer-based calibration system but does not want to pay the hardware and software price tag of large systems.

The 5101A employs a built-in cassette tape deck to store calibration or test programs and perform them under microprocessor control. Initially, the operator records his procedure on the cassette. Once recorded, the procedure can be conducted in a fraction of the usual time. And the entire procedure, including preparing the calibration tape and operating the 5101A, requires no knowledge of computers or computer languages. Using the optional 80-column printer available for the 5101A, you can even document both the calibration procedure and the test results for a hard copy record.

Automatic Error Computation

Calibration and test procedures require frequent calculations on the part of the operator to determine whether or not the UUT is within tolerance. These requirements vary with the function and range being tested (in a multimeter for example) and may be in volts, amps, ohms, decibels or percent. In all cases, they demand precise mathematical computation.

The 5100 Series calibrators do all the error computations for you via the microprocessor. All you have to do is adjust the 5100A controls for the output specified in the procedure, and the 5100A will do the rest.

Options

Extended Frequency Coverage Option (-03)

Wideband frequency option -03 is a high accuracy, low noise, extremely flat ac voltage source which increases the frequency capability of the 5100 Series from its standard coverage of 50 Hz - 50 kHz to 10 Hz - 10 MHz. This option enables the 5100A and 5101A to calibrate wideband meters. A dedicated front panel BNC connector provides ac output from 300 μ V (-57.5 dBm) to 3.1623V (+23 dBm) into 50 ohms impedance. The output is programmable from the front panel or I/O interface in volts ac or in dBm, where 0 dBm equals 1 mW into 50 Ω .

The wideband option also functions with the Edit control. Thus the error of wideband meters can be calculated in % or in dB. The wideband option in conjunction with the Edit control and NEW REF is particularly useful in testing the frequency response of meters. This method provides direct readings in percent or, more importantly, in dB which is ideal for making bode plots.

IEEE Interface Option (-05)

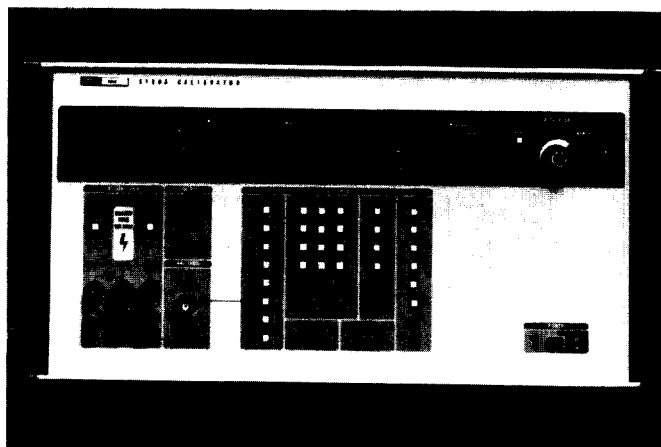
The IEEE Interface Provides I/O compatibility per the IEEE-488 Standard specifications. Address coding is done by logic switches accessible on the rear panel. Data is transmitted bi-directionally in ASCII coded format.

This interface allows the 5100A or 5101A to be used in a system under the control of an IEEE calculator or computer.

The -05 option also interfaces the 5101A to its IEEE Printer, accessory Y8005. The -05 interface must be ordered whenever the Y8005 printer is ordered.

Bit Serial Interface Option (-06)

The bit serial asynchronous interface option provides either voltage loop (EIA Standard RS-232-B or -C) or current loop



5100A

(20 mA). 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.

This interface allows the 5100A or 5101A to be used in systems under control of a calculator or computer with a bit serial interface.

The -06 option also interfaces the 5101A to its RS232 Printer, accessory Y8006. The -06 interface must be ordered when ordering the Y8006 printer.

Accessories

Printers Y8005 and Y8006

The 5101A Printer Accessory provides a hardcopy printout of the calibration or test procedure that has been programmed via the 5101A cassette tape. It also provides a written record of the calibration or test results as you actually conduct the test.

The calibration or test procedure is printed on a standard 8½ x 11 inch page in easy-to-read format. This allows you to standardize your various procedures into one format. Extra copies can be produced any time you need them at the touch of a button.

The printed test results include the nominal value, tolerance limits, actual test results, and pass or fail indication for each step of the calibration or test procedure. A printed record of your calibrations or test can be very valuable. It documents exactly what tests were conducted, including all parameters and results, making it very important for troubleshooting and repair operations at a future date. It also makes it possible to observe trends in a particular instrument or types of instruments so that cal cycles can be lengthened or shortened as required. This can save money and keep equipment downtime at a minimum.

Two printer models are available: Y8005, with IEEE Interface, and Y8006, with RS-232-C interface. Both are 80-column printers.

Static Controller

The MIS-7190K Static Controller is a troubleshooting and service aid that simplifies the job of troubleshooting the 5100 Series calibrators. The controller permits testing and verification of modules completely independent of the rest of the unit. This greatly reduces the time required in isolating and correcting malfunctions and restoring the calibrators to service.

Extender Cables and Cards

Accessory kit 5100A-7005K consists of two extender cards and two cables.

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Specifications

DC Volts

Range	Accuracy (6 months, 20°C to 30°C)	Resolution	Maximum Current	Ripple and Noise (10 Hz to 3 kHz, NL to FL, RMS)
20 mV	±(0.005% of setting + 0.001% of range + 5 µV)	0.1 µV	Limited by 50Ω output resistance or 25 mA using 50Ω override	<0.01% of setting +25 µV
200 mV		1 µV		
2V		10 µV	25 mA/1000 pF	
20V		100 µV	10 mA/400 pF	
200V		1 mV	6 mA/400 pF	
1100V		10 mV		<0.05% of setting (open to 20 kΩ) <0.1% of setting (20 kΩ to full load) <0.05% of setting

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, 200 V to 1100V.

Short Term Stability: (10 min. 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, NL to FL. (Internal Sense) Same as external except FL is 400Ω

AC Volts

Range ¹	Amplitude Accuracy (6 months, 20°C to 30°C)	Resolution	Maximum Current	Total Harmonic Distortion and Noise
20 mV	50 Hz to 10 kHz: ±(0.05% of setting + 0.005% of range + 50 µV)	0.1 µV	25 mA	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	from 50Ω source resistance	
2V		10 µV		
20V	10 kHz to 50 kHz: ±(0.08% of setting + 0.008% of range + 50 µV)	100 µV	25 mA/ 1000 pF	
200V		1 mV	10 mA/ 400 pF	
1100V		10 mV	6 mA/ 400 pF	

¹ Can be set in dBm where 0 dBm = 1 mW in 600Ω = 0.7746V

Frequency

Voltage Range	Discrete Frequencies Available (Hz)													
	50	60	70	80	90	100	200	300	400	500	600	700	800	900
250V to 1100V														
110V to 250V	•	•	•	•	•	•	•	•	•	•	•	•	•	•
20V to 110V	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1 mV to 20V	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Voltage Range	Discrete Frequencies Available (kHz)													
	1	2	3	4	5	6	7	8	9	10	20	30	40	50
110V to 250V	•													
20V to 110V	•	•	•	•	•	•	•	•	•	•	•	•	•	•
1 mV to 20V	•	•	•	•	•	•	•	•	•	•	•	•	•	•

Accuracy: ±3%

Resolution: 1 MSD

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: (10 min. from 0°C to 50°C) ±(0.01% of range + 10 µV)

Load Regulation: (External Sense) ±200 ppm from 0..V to 1100V, NL to FL. (Internal Sense) Same as external except regulation for voltages < 0.2V is expressed as an output impedance of 50Ω.

DC Current

Range	Accuracy (6 months, 20°C to 30°C)	Resolution	Compliance Voltage (min)	Ripple and Noise
199 µA	±(0.025% of setting + 0.0025% of range + 0.01 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	Compliance voltage >1V add 0.002% setting/volt	1 µA	0 to 2.1V	
2A		10 µA		

Temperature Coefficient: (above 30°C and below 20°C) ±(10 ppm of setting + 2 ppm of range)/°C

Short Term Stability: (10 min. from 0°C to 50°C) ±(50 ppm of setting + 5 ppm of range + 0.002 µA)

Load Regulation: ±20 ppm/volt for change in output voltage from 1 volt to max. compliance voltage

AC Current

Range	Accuracy (6 months, 20°C to 30°C)	Resolution	Compliance Voltage (min)	Total Harmonic Distortion and Noise
200 µA	±(0.07% of setting + 0.01% of range + 2 µA)	1 nA	0 to 7V rms	Distortion, line interference +noise including random spikes (0.05% of output + 2 µA) rms
2 nA		10 nA		
20 mA	100 nA			
200 mA	Compliance voltage >1V rms add 0.005% of setting/volt	1 µA	0 to 1.4V rms	
2A		10 µA		

Temperature Coefficient: (above 30°C and below 20°C) ±(25 ppm of setting + 10 ppm of range)/°C for amplitude. ±0.1%/°C for frequency

Short Term Stability: (10 min. from 0°C to 50°C) ±(0.014% of setting + 0.002% of range + 0.4 µA)

Load Regulation: ±50 ppm/volt for change in output voltage from 1 volt to max. compliance voltage

Resistance

Range: 1Ω to 10 MΩ in decade steps

Accuracy: (6 months, 20°C to 30°C) ±0.005% except ±0.02% (1Ω), ±0.01% (10Ω and 1 MΩ), and ±0.05% (10MΩ)

Power Dissipation: 1W max. 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)