

INTERFAX SYSTEMS INC.
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THE AUTO CAL
 RANGE OF CALIBRATORS



No.	Function	Cert Spec	Test points entered
1	DCV	DCV	0.8
2	Ohms	Ohms	1.9895638
3	ACV	ACV	1.5
4	DCI	DCI	19.928469
5	ACI	ACI	1.4
6	ACI	ACI	1.9640639
			1.00
			18.9683

4	7	0	7	4	7	0	0		
		4	7	0	5				
	4	0	0	0	4	0	0	0	A
4	2	0	0	A	4	1	0	0	










THE WORLD'S FINEST RANGE OF PROGRAMMABLE CALIBRATORS

The Datron Instruments Autocal family of calibrators and automated calibration systems leads the world in innovative calibration technology, providing an unparalleled choice of functional capability and performance. Together with Datron's calibration software, controllers and accessories, the Autocal range offers a selection of high quality instruments and systems with a variety of different specifications and costs. From this range, the optimum solutions can be found to most Digital Multimeter (DMM) calibration, DC to Low Frequency Standards, and high-accuracy system-source applications.

Datron calibrator performances vary from the Standards Laboratory accuracy of a multifunction calibrator capable of calibrating today's highly accurate $7\frac{1}{2}$ & $8\frac{1}{2}$ digit DMMs, to one similar in appearance and functionality, but with a performance and price which is ideally suited for handheld and $3\frac{1}{2}$ & $4\frac{1}{2}$ digit DMM calibration requirements. Functionally, the number of options within the complete calibrator range is virtually limitless,

varying from dedicated DCV-only or ACV-only units, suitable for standards laboratory or systems use, to calibrators which are fully multifunctional: single instruments with all the flexibility of functions and the breadth of range in both amplitude and frequency to fulfil the ever more stringent demands of the modern calibration facility. Practical and straightforward to use on the bench, all Datron Autocal calibrators are fully programmable via the IEEE-488 interface, making them perfect sources for automated calibration systems. In addition, the wide temperature tolerance of these instruments extends their usefulness to many A.T.E. or systems applications outside the calibration laboratory, on the production floor or in the factory test bay. Datron Calibration Software is available to enhance these features, offering a range of fully integrated, menu driven, automated multimeter calibration systems either for use in traditional calibration environments, or for more demanding mobile calibration roles.

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DISPLAY FOR FREQUENCY, ERROR, OFFSET AND SPEC. MODES.

FULL FRONT PANEL CALIBRATION WITH AUTOCAL.

FREQUENCY RANGE SELECTION WITH AUTORANGE SWEEP FACILITY. 5 FREQUENCIES CAN BE STORED AND RECALLED.

UP/DOWN KEYS ADJUST OUTPUT SETTING WITH EITHER ONE-STEP OR RAPID 'ROLLING' CONTROL.

HIGH BRIGHTNESS PLASMA DISPLAY WITH FLOATING DECIMAL POINT, COMMAS AND FULL ANNUNCIATION FOR EASE OF READING.

UP/DOWN KEYS ADJUST FREQUENCY SETTING OR ADJUST OUTPUT IN ERROR AND OFFSET MODES.

FULLY FLOATING AND GUARDED OUTPUT, GUARD-GROUND 650V RMS (2.5kV FLASH TEST).

LOW THERMAL SAFETY OUTPUT TERMINALS OF GOLD PLATED COPPER. OPTIONAL REAR FITTING.

SELECTION OF LOCAL OR REMOTE GUARD.

CHOICE OF 2 OR 4 WIRE SENSE.

INSTANT READ-OUT OF LIMITS OF UNCERTAINTY TAKING ACCOUNT OF FUNCTION, RANGE, SETTING AND FULL SCALE PERIOD SINCE CALIBRATION SET ON REAR PANEL. DISPLAYS IN ppm, % OR ABSOLUTE VALUE.

ERROR DEVIATION WITH $\pm 10\%$ ADJUSTMENT FOR DIRECT DISPLAY OF ACCURACY OF UNIT BEING CALIBRATED.

OFFSET DEVIATION OF UP TO 2% OF RANGE ADJUSTS FOR ZERO OFFSET OF THE UNIT BEING CALIBRATED.

OPERATING INSTRUCTIONS ON A PULL-OUT CARD.

SELF-TEST DIAGNOSTICS WITH DISPLAYED ERROR CODES.

FUNCTION SELECTION.

RESET TO NORMAL OPERATION FOLLOWING EXTERNAL OVERLOAD.

SELECTS FULL RANGE OUTPUT FOR WHATEVER RANGE IS SELECTED.

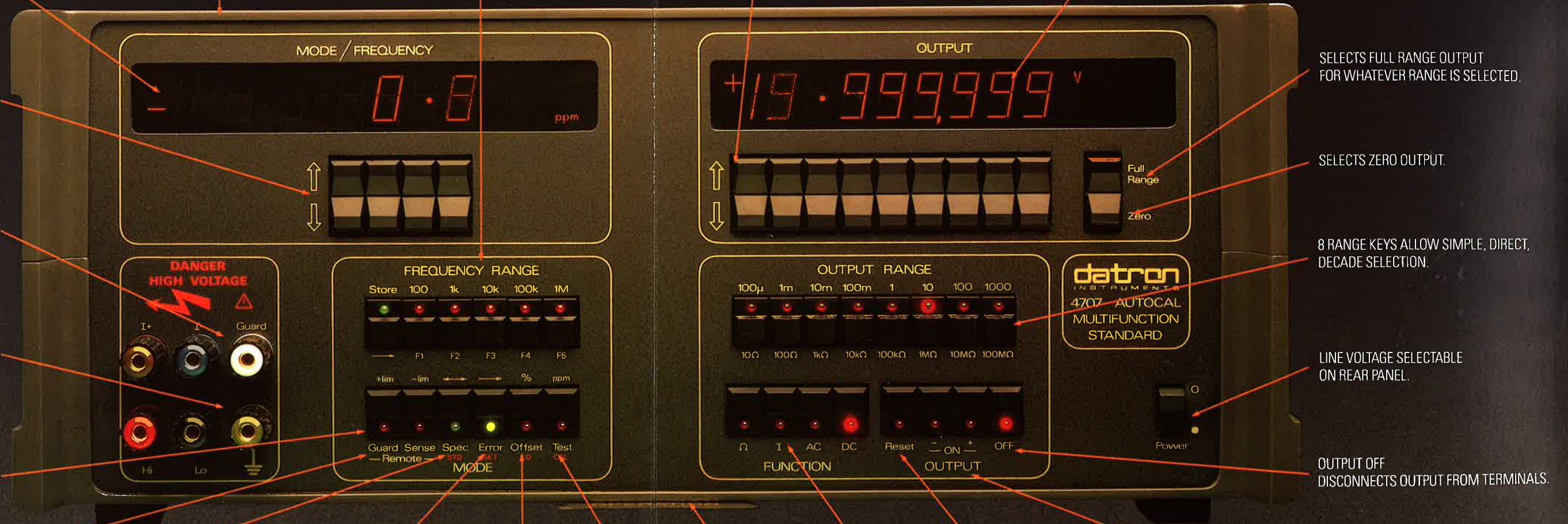
SELECTS ZERO OUTPUT.

8 RANGE KEYS ALLOW SIMPLE, DIRECT, DECADE SELECTION.

LINE VOLTAGE SELECTABLE ON REAR PANEL.

OUTPUT OFF DISCONNECTS OUTPUT FROM TERMINALS.

OUTPUT ON APPLIES SELECTED OUTPUT TO TERMINALS. ABOVE 110V (DC) OR 75V(AC), LED FLASHES AND AUDIO WARNING SIGNAL SOUNDS.



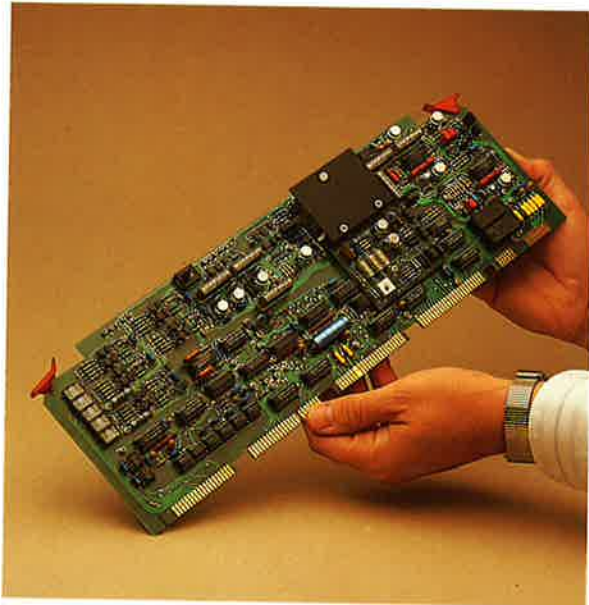
MODEL NUMBER	BASIC FUNCTIONS	OPTIONAL FUNCTIONS	DISPLAY RESOLUTION	RANGES	BASIC 90 DAY ACCURACY $\pm(\text{ppmR} + \text{ppmFS})$ $23^{\circ}\text{C} \pm 1^{\circ}\text{C}$	FREQUENCY SPAN	COMMENTS
4707	DCV, ACV (to 200V) IEEE-488	1000V DC & AC range DCI, ACI, Ω	$7\frac{1}{2}/6\frac{1}{2}$ digits	DCV: 100 μ V-1000V ACV: 1mV-1000V DCI: 100 μ A-1A ACI: 100 μ A-1A Ω : 10 Ω -100M Ω	2 + 0.25 70 + 10 20 + 5 220 + 50 3	10Hz-1MHz 10Hz-5kHz	For the calibration of DMMs up to high accuracy $8\frac{1}{2}$ digit models. 4101B Compatible.
4700	DCV, ACV (to 200V) IEEE-488	1000V DC & AC range DCI, ACI, Ω	$7\frac{1}{2}/6\frac{1}{2}$ digits	DCV: 100 μ V-1000V ACV: 1mV-1000V DCI: 100 μ A-1A ACI: 100 μ A-1A Ω : 10 Ω -100M Ω	4 + 0.5 120 + 20 40 + 7 220 + 80 6	10Hz-1MHz 10Hz-5kHz	For the calibration of DMMs up to medium performance $6\frac{1}{2}$ digit models. 4101B Compatible.
4705	DCV, ACV, DCI, ACI, Ω IEEE-488		$6\frac{1}{2}/5\frac{1}{2}$ digits	DCV: 100 μ V-1000V ACV: 1mV-1000V DCI: 100 μ A-1A ACI: 100 μ A-1A Ω : 10 Ω -100M Ω	15 + 1 250 + 50 50 + 15 220 + 80 6	10Hz-100kHz 10Hz-5kHz	For the calibration of DMMs up to $4\frac{1}{2}$ digit models. 4101B Compatible.
4000A	DCV IEEE-488	DCI, Ω	$7\frac{1}{2}/6\frac{1}{2}$ digits	DCV: 100 μ V-1000V DCI: 100 μ A-1A Ω : 1 Ω -10M Ω	2 + 0.25 20 + 5 3		For the calibration of DMMs up to high accuracy $8\frac{1}{2}$ digit models. 4101B Compatible.
4000	DCV IEEE-488	DCI, Ω	$7\frac{1}{2}/6\frac{1}{2}$ digits	DCV: 100 μ V-1000V DCI: 100 μ A-1A Ω : 1 Ω -10M Ω	3 + 0.5 20 + 5 3		For the calibration of DMMs up to high accuracy $8\frac{1}{2}$ digit models. 4101B Compatible.
4200A	ACV (to 200V) IEEE-488	1000V range ACI	$6\frac{1}{2}$ digits	ACV: 1mV-1000V ACI: 100 μ A-1A	40 120	10Hz-1MHz 10Hz-5kHz	For the calibration of high accuracy AC DMMs. Spot Frequency. 4101B Compatible.
4100	DCV, ACV, DCI, ACI, Ω IEEE-488	Range of Automated Multimeter Calibration Systems using any Datron Autocal Calibrators. Includes 4101B menu-driven software - compatible with IBM-XT, HP Vectra, and Compaq controllers.					

FAMILY CHARACTERISTICS

The Autocal range of calibrators, although widely varied in performance and function, possesses a high degree of commonality in design. Many of the circuit modules used throughout the range were derived from the well established Datron 4000A DC Standard and the 4200A AC Standard. Representing the State-of-the-Art in their own respective areas, their tried and tested designs have been adapted to create the 4700 series of multifunction calibrators. By changing the critical accuracy-defining components within these instruments, the performance of these calibrators can be tailored to different application areas.

DC VOLTAGE

DC Voltages are derived from the reference and divider designs pioneered in the Datron 4000A Autocal DC Standard. The DC reference uses a closely matched set of specially conditioned and selected zener diodes (the number of diodes depends on the actual model), providing an ultra stable voltage reference with low noise. These diodes are mounted in an isothermal enclosure with precision temperature compensation elements and operated at near ambient temperature. This design avoids the requirement for an oven which would degrade the noise and long term stability of the reference. The compensation elements provide the necessary insensitivity to temperature variations so that the calibrators may be operated outside controlled calibration laboratory conditions, such as in the test bay or within an A.T.E. rack, maintaining specifications over a broad temperature band. Microprocessor controlled time division pulse width modulation is used in the precision electronic divider to provide a highly linear output with resolution to one part in 20 million. Fast switching between the reference voltage and zero into a rapid settling, 7 pole, low pass, active filter provides a filter output voltage directly proportional to the ratio of the switching periods of each state. As this ratio is determined digitally, the division is not only inherently free of long term drift effects, but is also fundamentally linear. With a linearity specification of $<0.5\text{ppm}$ for its entire life, the range of calibrators is ideally suited to check the linearity of DMMs.



AC VOLTAGE

AC voltages are derived from a totally electronic true RMS AC/DC transfer process, which has a wider dynamic range and faster response time than traditional thermal methods permit. Frequencies are generated using a synthesized source which provides continuously variable frequency selection accurate to within 100ppm. The AC voltage output is produced by a double integrator sine wave oscillator, phase locked to the synthesizer, resulting in an output of high spectral purity. This output is continuously compared to the internal AC reference, which takes the form of a quasi sine wave signal generated precisely from the DC reference voltage. This comparison takes place in a high precision electronic comparator producing a feedback signal which in turn controls the output amplitude at the terminals so that it matches the true RMS value of the quasi

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sine wave reference. In effect, an internal AC/DC transfer takes place at up to 30 times per second.

Unlike thermal transfer techniques, the gain of this electronic comparator can be made independent of the output voltage, which means that settling times are not only fast, but also independent of output settings – a highly desirable feature, especially for automated calibration systems or A.T.E. applications.

In order to give the family a 1000V output capability over a wide frequency range, Datron has made use of the VMOS amplifier and amorphous alloy transformer core technology first used in the Datron 4200 Autocal AC Standard. This offers all the benefits of low power dissipation, solid state reliability and low distortion, and eliminates the need for an external amplifier to meet the high voltage – high frequency calibration requirements of the latest multimeters.

Fully floating, high accuracy DC and AC currents are generated using a voltage to current converter which incorporates specially developed low loss shunts and is driven directly from either the DCV or ACV sections of the calibrator.

Resistance outputs are derived from eight fixed value, hermetically sealed standard resistors, each one being 4-wire or 2-wire connected to the output terminals, using ultra high isolation relay switches.

A major design objective of the Autocal range was to make them simple and straightforward to operate. Rapid rolling up/down keys are used for fast and easy setting of amplitude and frequency. For convenience, two further keys provide immediate selection of full range and zero. The selected output is shown at all times on a high brightness display, and 100% overrange is provided to match that of modern DMMs, simplifying the linearity checking of such instruments.

Function and amplitude range can be accomplished directly from front panel keystrokes or their equivalent IEEE-488 commands. Within any particular range, the output value may be varied to permit linearity checking without needing to worry about the uncertainties and discontinuities due to hidden range changes inherent in 'autorange-only' alternatives. For those calibrators incorporating some form of AC, frequency selection is continuous over the frequency span of the instrument and is again made with easy to use up/down keys. Additionally, five front panel selectable memories can store any fixed frequency within the calibrator's spectrum for fast recall when carrying out repetitive calibrations.



DC CURRENT, AC CURRENT AND RESISTANCE

EASE OF USE

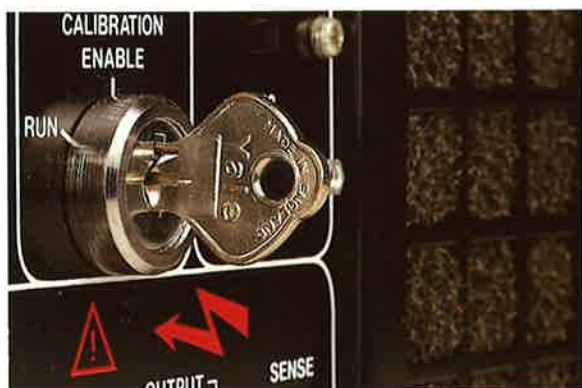


PROGRAMMABILITY



Each Datron calibrator is equipped with an IEEE-488 interface as standard to transform it from a bench top calibrator to a computer controllable systems instrument. Basic performance and speed are coupled with features such as programmable string terminators to enable these calibrators to adapt to a wide variety of systems configurations. As well as ease and flexibility of control via the IEEE-488 digital interface, Datron calibrators provide all analog outputs from a single set of terminals, making analog connection within a test or calibration system very simple. Furthermore, their ability to operate in an uncontrolled temperature environment means that the Autocal range can be put to work in many different automated areas without having to worry about reduced performance or the need to compromise test specification requirements.

AUTOCAL



The facility from which the range gets its name, Autocal is a Datron pioneered technique for complete traceable calibration which eliminates the need to remove lids or make any internal adjustments at calibration.

Using only front panel keystrokes, or the equivalent IEEE-488 interface commands, the method is fast, simple and complete, working on the principle of storing digital corrections for analog errors measured when comparing the calibrator's output against standards equipment.

Protected from misuse by a rear panel keyswitch, calibration of the Datron range of calibrators can be achieved with a high degree of accuracy due to the minimal transfer uncertainty that is associated with the Autocal process.

ERROR AND OFFSET

Deviation controls, – error and offset – enable the output of the calibrator to differ from that indicated on the main output display. This is particularly useful for checking both the linearity and the calibration of measuring instruments.

Error introduces a gain deviation of up to $\pm 10\%$ and can be used simultaneously with an offset (DC functions only) of up to $\pm 2\%$ of range.

SPECIFICATION READOUT

Accuracy calculations on multifunction instruments are often complex and tedious. Datron's patented spec. feature overcomes this by storing in memory the whole accuracy specification table for the calibrator in question. The specified limits of uncertainty can be automatically computed and displayed at any time, using the spec. key. Furthermore, the readout can be expressed in ppm, percent or absolute limits for 24 hour, 90 day, or 1 year specifications.

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With particular concern for user protection, Datron engineers have devised extensive safety features for the range of calibrators. Specially designed safety terminals guard against accidental contact with live parts while front panel key control of sense and guard connections removes the need for fitting exposed copper links between terminals at dangerously high voltages. In addition, a watchdog circuit permanently checks for invalid output voltages, immediately isolating the terminals if this occurs either through instrument failure or through accidental misuse.

The output of any voltage in excess of 110V peak requires a fixed sequence of keystrokes, while an audible alarm warns of imminent danger and continues whenever high voltage levels are present. These interlocks are fixed under hardware control which prevents the user inadvertently resetting to dangerous limits.

The Datron Autocal range of calibrators has been designed and built to meet the most exacting quality standards.

To optimise serviceability, internal self diagnostic routines continuously monitor instrument status. These indicate a wide range of failure conditions – from output overloads to power supply failures and over-temperature.

In addition, a self test routine can be selected at any time to provide rigorous operational checks and if service does become necessary, simple access is provided and all major circuits are on plug-in cards. All Datron calibrators carry the comprehensive Datron warranty. This, together with the complete backup support and excellent recalibration facilities provided in our service centers worldwide, means that customers receive the high level of service they have come to expect from Datron Instruments.

SAFETY

RELIABILITY AND SUPPORT





THE **4707**
AUTOCAL
MULTIFUNCTION
STANDARD

The 4707 is the world's finest, fully multifunction, programmable calibrator. It is a single instrument capable BY ITSELF of calibrating today's highly accurate $7\frac{1}{2}$ & $8\frac{1}{2}$ digit DMMs – offering performance in five functions which even the best single function calibrators have difficulty in matching.

The basic 4707 offers DC Voltage outputs up to 200V at 90 day absolute accuracies to ± 4.5 ppm and with a minimum resolution of 10nV. In addition, AC Voltage is provided over an amplitude range from 90 μ V to 200V and a frequency span from 10Hz to 1MHz with 90 day accuracies to better

- DCV, ACV, DCI, ACI, Ω functions
- ACV output from 10Hz to 1MHz
- IEEE-488
- Calibrates high accuracy DMMs of up to $8\frac{1}{2}$ digit scale length

than 130ppm. All output amplitude values are displayed on a high brightness $7\frac{1}{2}/6\frac{1}{2}$ digit display.

Optional facilities include the 1000V range, extending the output in both DC and AC voltage to 1100V, and the DC Current, AC Current and Resistance option providing the extra functions necessary to make the unit fully multifunctional.

The IEEE-488 interface is fitted as standard, enabling the 4707 to form the heart of a compact and highly accurate calibration or test system, while its rugged construction and insensitivity to temperature variations make it ideal for applications outside the traditional calibration environment.

The instrument is compatible with the Datron 4101B Multimeter Calibration software package, a combination which forms an automated multimeter calibration system capable of calibrating anything from simple handheld multimeters up to the most sophisticated Standards DMMs.

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 INSTRUMENTS

FUNCTION	RANGE	FREQUENCY (Hz)	STABILITY 24 HOUR ± (ppm OUTPUT + ppm FS) [1][2]	ACCURACY RELATIVE TO CALIBRATION STANDARDS ±(ppm OUTPUT + ppm FS) [2]			CALIBRATION UNCERTAINTY (ppm) [3]
				24 HOUR 23°C ± 1°C	90 DAYS 23°C ± 1°C	1 YEAR 23°C ± 5°C	
DC VOLTAGE	100.00µV to 100.00000mV 1.0000000V 10.000000V 100.00000V 1000.0000V[7]		0.6 + 0.3µV 0.5 + 0.25 0.3 + 0.05 0.5 + 0.13 0.5 + 0.1	2 + 0.4µV 1 + 0.4 0.5 + 0.25 1 + 0.5 1 + 0.25	4 + 0.4µV 3 + 0.4 2 + 0.25 3 + 0.5 4 + 0.25	10 + 0.5µV 8 + 0.5 5 + 0.25 8 + 0.5 10 + 0.25	5 + 1µV 3 2 4 4
AC VOLTAGE	1.0000mV to 100.0000mV	10 - 31 32 - 330 300 - 10k 10k - 33k 30k - 100k 100k - 330k 300k - 1M	60 + 5 + 5µV 30 + 5 + 5µV 20 + 5 + 5µV 20 + 5 + 5µV 30 + 5 + 5µV 80 + 10 + 5µV 130 + 10 + 5µV	120 + 30 + 5µV 100 + 20 + 5µV 100 + 20 + 5µV 100 + 20 + 5µV 120 + 20 + 5µV 400 + 100 + 10µV 0.2% + 0.1% + 20µV	150 + 30 + 5µV 110 + 20 + 5µV 100 + 20 + 5µV 110 + 20 + 5µV 150 + 20 + 5µV 450 + 100 + 10µV 0.2% + 0.1% + 20µV	170 + 30 + 5µV 120 + 30 + 5µV 110 + 30 + 5µV 120 + 30 + 5µV 180 + 30 + 5µV 550 + 100 + 10µV 0.3% + 0.1% + 20µV	50 + 1µV 50 + 1µV 50 + 1µV 200 + 1µV 500 + 1µV 600 + 1µV [6] 800 + 1µV [6]
	1.000000V and 10.00000V	10 - 31 32 - 330 300 - 10k 10k - 33k 30k - 100k 100k - 330k 300k - 1M	40 + 10 20 + 5 15 + 5 15 + 5 20 + 5 50 + 10 120 + 10	100 + 20 60 + 10 50 + 10 50 + 10 100 + 20 350 + 100 0.2% + 0.04%	120 + 20 80 + 10 70 + 10 70 + 10 120 + 20 400 + 100 0.2% + 0.04%	140 + 30 90 + 20 80 + 20 80 + 20 150 + 20 500 + 100 0.3% + 0.04%	50 40 40 50 80 300 600
	100.0000V	10 - 31 32 - 330 300 - 10k 10k - 33k 30k - 100k	40 + 10 20 + 5 15 + 5 15 + 5 20 + 5	100 + 20 60 + 10 50 + 10 60 + 10 120 + 20	120 + 20 80 + 10 70 + 10 80 + 10 150 + 20	140 + 30 90 + 20 80 + 20 90 + 20 160 + 20	50 40 40 50 80
	1000.000V [7]	45 - 330 300 - 10k 10k - 33k	50 + 5 30 + 5 50 + 8	100 + 25 90 + 25 130 + 25	120 + 25 100 + 25 150 + 25	180 + 25 140 + 25 180 + 25	50 60 100
RESISTANCE (4 WIRE) [4] [8]	10.000000Ω 100.00000Ω 1.0000000kΩ 10.000000kΩ 100.00000kΩ 1.0000000MΩ 10.000000MΩ 100.00000MΩ		2 1 1 1 1 2 2 3	4 1.5 1.5 1.5 1.5 4 10 15	10 3 3 3 3 10 25 30	25 9 9 9 12 25 50 70	10 5 5 5 12 20 25 200
DC CURRENT [8]	100.0000µA 1.000000mA 10.00000mA 100.0000mA 1.000000A [5]		7 + 10 3 + 4 3 + 4 3 + 4 7 + 10	10 + 10 5 + 5 5 + 5 5 + 5 10 + 10	50 + 10 20 + 5 20 + 5 20 + 5 50 + 10	100 + 10 50 + 5 50 + 5 50 + 5 100 + 10	10 10 10 10 25
AC CURRENT [8]	100.0000µA	10 - 1k 1k - 5k	50 + 20 70 + 30	160 + 30 200 + 50	400 + 50 550 + 80	500 + 80 650 + 100	200 500
	1.000000mA to 100.0000mA	10 - 1k 1k - 5k	50 + 20 50 + 20	100 + 30 150 + 30	220 + 50 350 + 50	350 + 80 450 + 80	100 100
	1.000000A [5]	10 - 1k 1k - 5k	50 + 20 70 + 30	400 + 30 550 + 50	400 + 50 550 + 80	500 + 80 650 + 100	100 200

4707 SPECIFICATIONS

To provide the user with a full understanding, the main specifications of the 4707 are shown under the following headings.

Stability is the repeatability of a set output for exactly the same conditions.

Accuracy relative to calibration standards includes all the effects of stability, temperature coefficient, noise and linearity under worst case line and load conditions.

Calibration uncertainty shows the traceability of Datron's calibration of the 4707.

After re-calibration the traceability of the users standards should be substituted.

Absolute accuracy is expressed by a summation of 'accuracy relative to calibration standards' plus 'calibration uncertainty'.

NOTES:

- [1] For same conditions between 18°C and 28°C.
- [2] FS = 2 × Range.
- [3] Includes factory traceability to National Standards and National Standards uncertainty.
- [4] Ranges are nominal. Actual calibrated values are displayed.
- [5] Typical above 1 Amp.
- [6] Estimated, not fully traceable.
- [7] Requires Option 17.
- [8] Requires Option 27.

FUNCTION	RANGE	FREQUENCY (Hz)	TEMPERATURE COEFFICIENT (\pm ppm OUTPUT/ $^{\circ}$ C) 13 $^{\circ}$ C-18 $^{\circ}$ C 28 $^{\circ}$ C-33 $^{\circ}$ C	TOTAL HARMONIC DISTORTION (%) [1]	IMPEDANCE OR ZERO TO FULL LOAD REGULATION	COMPLIANCE	OTHER SPECIFICATIONS
DC VOLTAGE	100 μ V to 100mV 1V 10V 100V 1000V		1.4 0.8 0.3 0.8 0.8		100 Ω < 0.1m Ω < 0.1m Ω < 1m Ω < 10m Ω	- 25mA 25mA 25mA 25mA	Output: True bipolar output capable of delivering 1100V with respect to Output Lo Overrange: 100% on 100 μ V to 100V ranges 10% on 1000V range (1100V) Voltage Sensing: Selectable remote or local voltage sensing on 1V to 1000V ranges Guarding: Selectable remote or local guard connection Max. Guard to Ground voltage of 650V rms (2.5kV flash test) Common Mode Rejection: 140dB at DC to 400Hz Settling Time: To 10ppm of step size < 1s
AC VOLTAGE	1mV to 100mV	10 - 31 32 - 330 300 - 10k 10k - 33k 30k - 100k 100k - 330k 300k - 1M	5 5 5 5 5 20 50	0.1 0.04 0.04 0.04 0.1 0.3 1.0	30 Ω at all frequencies		Scale Length: 9% to 200% of range, 1mV to 100V ranges 9% to 110% of range, 1000V range (1100V) Voltage Sensing: Selectable remote or local voltage sensing on 1V to 1000V ranges Guarding: Selectable remote or local guard connection Common Mode Rejection: 140dB at DC to 400Hz Settling Time: To 100ppm of step size (double for range changes) 10 - 32Hz < 10s 32 - 330Hz < 3s > 330Hz < 1s
	1V and 10V	10 - 31 32 - 330 300 - 10k 10k - 33k 30k - 100k 100k - 330k 300k - 1M	3 3 3 3 3 10 50	0.1 0.04 0.04 0.04 0.1 0.3 1.0	Typically 0.001%FS to 33kHz increasing to 0.3%FS at 1MHz	1V Range -25mA 10V Range -60mA	Frequency Accuracy: < \pm 100ppm Maximum Load Capacitance: 1V to 100V ranges 1000pF 1kV range 300pF
	100V	10 - 31 32 - 330 300 - 10k 10k - 33k 30k - 100k	3 3 3 3 5	0.1 0.04 0.04 0.04 0.2	Typically 0.002%FS to 33kHz increasing to 0.02%FS at 100kHz	120mA	
	1000V	45 - 330 300 - 10k 10k - 33k	5 5 5	0.2 0.1 0.1	Typically 0.002%FS	< 3.3kHz - 15mA > 3.0kHz - 65mA	
RESISTANCE	10 Ω 100 Ω 1k Ω 10k Ω 100k Ω 1M Ω 10M Ω 100M Ω		6 2 2 2 2 6 10 20			Specified 10mA at 10mA 1mA 100 μ A 100 μ A 10 μ A 1 μ A 1 μ A	Connection: Selectable 2 or 4 wire connection to resistors 2 wire displayed value includes internal lead resistance Guarding: Selectable remote or local guard connection Protection: All resistors fuse protected to max applied voltage of 120V rms
DC CURRENT	100 μ A 1mA 10mA 100mA 1A		15 6 6 6 15		> 2G Ω > 2G Ω > 200M Ω > 20M Ω > 1M Ω	3V 3V 3V 3V 3V	Output: True bipolar output capable of delivering \pm 2A Overrange: 100% on all ranges Settling Time: 1s to full specification Local Sense Only, all ranges
AC CURRENT	100 μ A 1mA 10mA 100mA 1A	10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k	10 20 10 10 10 10 10 10 20 25	0.2 0.5 0.2 0.2 0.2 0.2 0.2 0.2 0.2 1.0	100M Ω 30M Ω 3M Ω 300k Ω 30k Ω	3V rms 3V rms 3V rms 3V rms 3V rms	Scale Length: 9% to 200% of range, all ranges Settling Time: To 100ppm of step size (double for range changes) 10 - 32Hz < 10s 32 - 330Hz < 3s > 330Hz < 1s Frequency Accuracy: < \pm 100ppm Maximum Load Capacitance: 10nF Maximum Load Inductance: 1mH, < 1 μ s

NOTES: [1] - Predominantly second harmonic (negligible error on mean sensing instruments).

4707 SPECIFICATIONS

ORDERING INFORMATION

- 4707: Autocal Multifunction Standard
Option 17: 1000V Ranges (DCV & ACV)
Option 27: DC Current, AC Current & Resistance Functions
Option 42: Alternative Rear Output
Option 90: Rack Mounting Kit

GENERAL	
POWER SUPPLY	100/120/220/240 volts \pm 10% 50Hz or 60Hz
POWER CONSUMPTION	370VA normal 660VA full power
OPERATING TEMP.	0 $^{\circ}$ C to +50 $^{\circ}$ C
STORAGE TEMP.	-40 $^{\circ}$ C to +70 $^{\circ}$ C
DIMENSIONS	178mm (7") \times 455mm (17.9") \times 563mm (22.2")
WEIGHT	36kg (80lbs)
SAFETY	Designed to UL1244, IEC348 & BS4743
WARRANTY	1 Year



- DCV, ACV, DCI, ACI, Ω functions
- ACV outputs from 10Hz to 1MHz
- IEEE-488

Calibrates medium performance DMMs of up to 6½ digit scale length ■

Recent advances in multimeter technology have led to a situation where the calibrators used for the calibration of multimeters with performances ranging from handheld instruments up to medium performance 5½ & 6½ digit DMMs, have too small a margin of accuracy over and above what they are trying to calibrate.

The 4700 is a programmable multifunction calibrator which addresses this problem and, with its wide range of functional capability and performance, can easily meet the ever more stringent calibration requirements of such DMMs. Moreover, this is achieved without having to resort to any external enhancement techniques, such as using Standards DMMs to monitor outputs, in order to obtain the necessary calibration margins or functional performance.

The basic 4700 offers DC Voltage outputs up to 200V at 90 day absolute accuracies to ± 10 ppm, displayed on a 7½/6½ digit high brightness display. AC Voltage outputs are also provided over an amplitude range from 90 μ V to 200V and a frequency span from 10Hz to 1MHz with 90 day accuracies to better than ± 300 ppm.

Optional facilities include the 1000V range, extending the output in both DC and AC voltage to 1100V, and the DC Current, AC Current and Resistance option providing the extra functions necessary to make the unit fully multifunctional.

The IEEE-488 interface is fitted as standard, enabling the 4700 to be integrated into a compact and accurate calibration or test system, and its rugged construction and insensitivity to temperature variations make it ideal for applications outside the traditional calibration environment.

THE
4 7 0 0
 AUTOCAL
 MULTIFUNCTION
 CALIBRATOR

As an accurate test source or stimulus, the 4700 provides a very cost effective solution to meet the growing requirement in A.T.E.s for improved test accuracy and confidence. For example, the basic 4700 – without any options – can be installed as an integral source within an A.T.E. rack to provide accurate, stable, programmable DC and AC voltages up to 200V.

In addition, the instrument is compatible with the Datron 4101B Multimeter Calibration software package. Together, the 4700 and the 4101 B can form the basis of a compact and highly versatile automated multimeter calibration system capable of calibrating anything from simple handheld multimeters up to 5½ & 6½ digit DMMs.

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I N S T R U M E N T S

FUNCTION	RANGE	FREQUENCY (Hz)	STABILITY 24 HOUR ± (ppm OUTPUT + ppm FS) [1][2]	ACCURACY RELATIVE TO CALIBRATION STANDARDS ±(ppm OUTPUT + ppm FS) [2]			CALIBRATION UNCERTAINTY (ppm) [3]
				24 HOUR 23°C ± 1°C	90 DAYS 23°C ± 1°C	1 YEAR 23°C ± 10°C	
DC VOLTAGE	100.00µV to 100.00000mV 1.0000000V 10.000000V 100.00000V 1000.0000V(7)		1.2 + 0.6 µV	3 + 0.8µV	6 + 0.8µV	15 + 1.0µV	10 + 1µV
			1.0 + 0.5	2 + 0.8	6 + 0.8	15 + 1.0	7
			0.6 + 0.1	1 + 0.5	4 + 0.5	15 + 1.0	5
			1.0 + 0.3	2 + 1.0	6 + 1.0	15 + 1.0	9
			1.0 + 0.2	3 + 0.5	6 + 0.5	15 + 1.0	12
AC VOLTAGE	1.0000mV to 100.0000mV	10 - 31 32 - 33k 30k - 100k 100k - 330k 300k - 1M	120 + 10 + 10µV	200 + 60 + 10µV	250 + 60 + 10µV	340 + 60 + 10µV	110 + 12µV
			80 + 10 + 10µV	160 + 40 + 10µV	200 + 40 + 10µV	240 + 60 + 10µV	250 + 10µV
			60 + 10 + 10µV	600 + 60 + 10µV	600 + 60 + 10µV	700 + 60 + 10µV	560 + 11µV
			160 + 20 + 10µV	0.2% + 0.02% + 20µV	0.2% + 0.02% + 20µV	0.2% + 0.02% + 20µV	800 + 12µV
			260 + 20 + 10µV	0.5% + 0.2% + 30µV	0.6% + 0.2% + 30µV	0.6% + 0.2% + 30µV	1300 + 12µV
	1.000000V and 10.00000V	10 - 31 32 - 33k 30k - 100k 100k - 330k 300k - 1M	80 + 20	180 + 40	200 + 40	280 + 60	160
			40 + 10	100 + 20	120 + 20	180 + 40	130
			40 + 10	180 + 30	200 + 30	300 + 40	170
			100 + 20	500 + 200	600 + 200	1000 + 200	450
			240 + 20	0.3% + 0.1%	0.4% + 0.1%	0.6% + 0.1%	1150
	100.0000V	10 - 31 32 - 33k 30k - 100k	80 + 20	180 + 40	200 + 40	280 + 60	160
			40 + 10	100 + 20	120 + 20	180 + 40	130
			40 + 10	220 + 40	250 + 40	320 + 40	200(6)
	1000.000V(7)	45 - 330 300 - 10k 10k - 33k	100 + 20	180 + 50	200 + 50	360 + 50	190
			60 + 20	120 + 50	150 + 50	280 + 50	170
			100 + 30	220 + 50	250 + 50	360 + 50	250
RESISTANCE (4 WIRE) [4] [8]	10.000000Ω 100.00000Ω 1.0000000kΩ 10.000000kΩ 100.00000kΩ 1.0000000MΩ 10.000000MΩ 100.00000MΩ		6	8	20	50	25
			2.5	3	6	20	10
			2.5	3	6	20	10
			2.5	3	6	20	10
			2.5	3	6	25	20
			6	8	20	50	40
			15	20	50	100	65
			30	40	100	400	200
DC CURRENT [8]	100.0000µA 1.000000mA 10.00000mA 100.0000mA 1.000000A(5)		7 + 10	10 + 10	50 + 10	100 + 10	35
			7 + 5	10 + 7	40 + 7	100 + 10	33
			7 + 5	10 + 7	40 + 7	100 + 10	33
			7 + 5	10 + 7	40 + 7	100 + 10	33
			15 + 10	20 + 15	100 + 15	200 + 20	80
AC CURRENT [8]	100.0000µA 1.000000mA 10.00000mA 100.0000mA 1.000000A(5)	10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k	50 + 20	400 + 80	400 + 80	500 + 100	400
			70 + 30	550 + 100	550 + 100	650 + 160	900
			50 + 20	200 + 80	220 + 80	350 + 100	255
			50 + 20	350 + 80	350 + 80	450 + 100	255
			200 + 80	200 + 80	220 + 80	350 + 100	255
			350 + 80	350 + 80	350 + 80	450 + 100	255
			200 + 80	200 + 80	220 + 80	350 + 100	255
			350 + 80	350 + 80	350 + 80	450 + 100	255
			200 + 80	200 + 80	220 + 80	350 + 100	255
			350 + 80	350 + 80	350 + 80	450 + 100	255
400 + 80	400 + 80	400 + 80	500 + 100	290			
550 + 100	550 + 100	550 + 100	650 + 160	440			

4700 SPECIFICATIONS

To provide the user with a full understanding, the main specifications of the 4700 are shown under the following headings.

Stability is the repeatability of a set output for exactly the same conditions.

Accuracy relative to calibration standards includes all the effects of stability,

temperature coefficient, noise and linearity under worst case line and load conditions.

Calibration uncertainty shows the traceability of Datron's calibration of the 4700.

After re-calibration the traceability of the users standards should be substituted.

Absolute accuracy is expressed by a summation of 'accuracy relative to calibration standards' plus 'calibration uncertainty'.

NOTES:

[1] For same conditions between 18°C and 28°C.

[2] FS = 2 × Range.

[3] Factory calibration uncertainty using automated calibration equipment. Better traceability is obtainable using traditional methods - see 4707 specifications for Datron's full capability.

[4] Ranges are nominal. Actual calibration values are displayed.

[5] Typical above 1 Amp.

[6] Estimated not fully traceable.

[7] Requires Option 10.

[8] Requires Option 20.

FUNCTION	RANGE	FREQUENCY (Hz)	TEMPERATURE COEFFICIENT (±ppm OUTPUT/°C) 3°C-13°C 33°C-43°C	TOTAL HARMONIC DISTORTION (%) [1]	IMPEDANCE OR ZERO TO FULL LOAD REGULATION	COMPLIANCE	OTHER SPECIFICATIONS
DC VOLTAGE	100µV to 100mV 1V 10V 100V 1000V		2.0 1.5 1.0 1.5 2.0		100Ω < 0.1mΩ < 0.1mΩ < 1mΩ < 10mΩ	25mA 25mA 25mA 25mA	Output: True bipolar output capable of delivering 1100V with respect to Output Lo Overrange: 100% on 100µV to 100V ranges 10% on 1000V range (1100V) Voltage Sensing: Selectable remote or local voltage sensing on 1V to 1000V ranges Guarding: Selectable remote or local guard connection Max. Guard to Ground voltage of 650V rms (2.5kV flash test) Common Mode Rejection: 140dB at DC to 400Hz Settling Time: To 10ppm of step size < 1s
AC VOLTAGE	1mV to 100mV	10 - 31 32 - 33k 30k - 100k 100k - 330k 300k - 1M	10 10 10 40 100	0.1 0.04 0.1 0.3 1.0	30Ω at all frequencies		Scale Length: 9% to 200% of range, 1mV to 100V ranges 9% to 110% of range, 1000V range (1100V) Voltage Sensing: Selectable remote or local voltage sensing on 1V to 1000V ranges Guarding: Selectable remote or local guard connection Common Mode Rejection: 140dB at DC to 400Hz Settling Time: To 100ppm of step size (double for range changes)
	1V and 10V	10 - 31 32 - 33k 30k - 100k 100k - 330k 300k - 1M	6 6 6 20 100	0.1 0.04 0.1 0.3 1.0	Typically 0.001%FS to 33kHz increasing to 0.3%FS at 1MHz	1V Range -25mA 10V Range -60mA	10 - 32Hz < 10s 32 - 330Hz < 3s > 330Hz < 1s < ±100ppm
	100V	10 - 31 32 - 33k 30k - 100k	6 6 10	0.1 0.04 0.2	Typically 0.002%FS to 33kHz increasing to 0.02%FS at 100kHz	120mA	Frequency Accuracy: Maximum Load Capacitance: 1V to 100V ranges 1000pF 1kV range 300pF
	1000V	45 - 330 300 - 10k 10k - 33k	10 10 10	0.2 0.1 0.1	Typically 0.002%FS	< 3.3kHz - 15mA > 3.0kHz - 65mA	
RESISTANCE	10Ω 100Ω 1kΩ 10kΩ 100kΩ 1MΩ 10MΩ 100MΩ		6 2 2 2 2 6 10 20			Specified 10mA at 10mA 1mA 100µA 100µA 10µA 1µA 1µA	Connection: Selectable 2 or 4 wire connection to resistors 2 wire displayed value includes internal lead resistance Guarding: Selectable remote or local guard connection Protection: All resistors fuse protected to max applied voltage of 120V rms
DC CURRENT	100µA 1mA 10mA 100mA 1A		30 12 12 12 30		> 2GΩ > 2GΩ > 200MΩ > 20MΩ > 1MΩ	3V 3V 3V 3V 3V	Output: True bipolar output capable of delivering ±2A Overrange: 100% on all ranges Settling Time: 1s to full specification Local Sense Only, all ranges
AC CURRENT	100µA 1mA 10mA 100mA 1A	10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k	20 40 20 20 20 20 20 20 40 40	0.2 0.5 0.2 0.2 0.2 0.2 0.2 0.2 0.2 1.0	100MΩ 30MΩ 3MΩ 300kΩ 30kΩ	3V rms 3V rms 3V rms 3V rms 3V rms	Scale Length: 9% to 200% of range, all ranges Settling Time: To 100ppm of step size (double for range changes) 10 - 32Hz < 10s 32 - 330Hz < 3s > 330Hz < 1s < ±100ppm Frequency Accuracy: Maximum Load Capacitance: 10nF Maximum Load Inductance: 1mH, < 1µs

NOTES: [1] - Predominantly second harmonic (negligible error on mean sensing instruments).

4700 SPECIFICATIONS

ORDERING INFORMATION

4700: Autocal Multifunction Calibrator

Option 10: 1000V Ranges (DCV & ACV)

Option 20: DC Current, AC Current & Resistance Functions

Option 42: Alternative Rear Output

Option 90: Rack Mounting Kit

GENERAL	
POWER SUPPLY	100/120/220/240 volts ±10% 50Hz or 60Hz
POWER CONSUMPTION	370VA normal 660VA full power
OPERATING TEMP.	0°C to +50°C
STORAGE TEMP.	-40°C to +70°C
DIMENSIONS	178mm (7") × 455mm (17.9") × 563mm (22.2")
WEIGHT	36kg (80lbs)
SAFETY	Designed to UL1244, IEC348 & BS4743
WARRANTY	1 Year



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THE **4705**
AUTO CAL
MULTIFUNCTION
CALIBRATOR

The 4705 is a fully multifunction, programmable calibrator designed to calibrate up to 4½ digit DMMs. This rugged, compact, and inexpensive unit has all functions fitted as standard and is capable of 90 day DC Voltage absolute accuracies to ±20ppm with outputs up to 1100V, displayed on a 6½/5½ digit high brightness display with a minimum resolution of 100nV. In addition, the 4705 features 90 day absolute AC Voltage accuracy to better than ±500ppm, with outputs from 90µV to 1100V and a minimum resolution of 1µV. The frequency of the ACV output is continuously variable from 10Hz to 100kHz.

- DCV, ACV, DCI, ACI, Ω functions
- ACV outputs from 10Hz to 100kHz
- IEEE-488
- Calibrates DMMs of up to 4½ digit scale length

The combination of fully floating DC Current with 90 day accuracies to ±110ppm, AC Current outputs at frequencies up to 5kHz, and Resistance outputs of 10Ω to 100MΩ completes the multifunction characteristics of the instrument.

The 4705 has an IEEE-488 interface fitted as standard, and can be readily integrated into compact and very cost effective calibration or test system. Furthermore, its rugged construction and insensitivity to temperature variations make it ideal for applications outside the traditional calibration environment.

The Datron 4101B Multimeter Calibration software package is compatible with the 4705, and they can be used together to create an inexpensive and yet highly adaptable automated multimeter calibration system capable of calibrating anything from simple handheld multimeters up to 4½ digit DMMs.

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 INSTRUMENTS

FUNCTION	RANGE	FREQUENCY (Hz)	STABILITY 24 HOUR ± (ppm OUTPUT + ppm FS) [1][2]	ACCURACY RELATIVE TO CALIBRATION STANDARDS ±(ppm OUTPUT + ppm FS) [2]			CALIBRATION UNCERTAINTY (ppm) [3]
				24 HOUR 23°C ± 1°C	90 DAYS 23°C ± 1°C	1 YEAR 23°C ± 10°C	
DC VOLTAGE	100.0µV to 100.0000mV 1.000000V 10.00000V 100.0000V 1000.000V		2 + 1µV 2 + 1 1 + 0.5 2 + 0.5 2 + 0.5	6 + 1µV 6 + 1 6 + 1 6 + 1 6 + 1	15 + 1µV 15 + 1 15 + 1 15 + 1 15 + 1	35 + 5µV 35 + 5 35 + 5 35 + 5 35 + 5	10 + 1µV 7 5 9 12
AC VOLTAGE	1.000mV to 100.000mV	10 - 31 32 - 33k 30k - 100k	170 + 10 + 10µV 80 + 10 + 10µV 80 + 10 + 10µV	250 + 60 + 10µV 200 + 60 + 10µV 800 + 80 + 10µV	300 + 60 + 10µV 250 + 60 + 10µV 800 + 80 + 10µV	400 + 60 + 10µV 300 + 60 + 10µV 0.1 + 80 + 10µV	110 + 12µV 250 + 10µV 560 + 11µV
	1.00000V and 10.0000V	10 - 31 32 - 33k 30k - 100k	150 + 20 80 + 10 80 + 10	250 + 60 200 + 50 250 + 80	300 + 60 250 + 50 300 + 80	400 + 60 300 + 50 500 + 80	160 130 170
	100.000V	10 - 31 32 - 33k 30k - 100k	150 + 20 80 + 10 80 + 10	250 + 60 200 + 50 250 + 80	300 + 60 250 + 50 300 + 80	400 + 60 300 + 50 500 + 80	160 130 200 [6]
	1000.00V	45 - 330 300 - 10k 10k - 33k	150 + 20 80 + 20 150 + 30	250 + 60 200 + 50 250 + 80	300 + 60 250 + 50 300 + 80	400 + 60 300 + 50 500 + 80	190 170 250
RESISTANCE [4] (4 WIRE)	10.00000Ω 100.0000Ω 1.000000kΩ 10.00000kΩ 100.0000kΩ 1.000000MΩ 10.00000MΩ 100.0000MΩ		10 2.5 2.5 2.5 2.5 8 30 40	12 3 3 3 3 10 40 50	30 6 6 6 6 25 100 125	75 20 20 20 25 60 200 500	25 10 10 10 20 40 65 200
DC CURRENT	100.000µA 1.00000mA 10.0000mA 100.000mA 1.00000A[5]		15 + 10 15 + 10 15 + 10 15 + 10 15 + 15	20 + 15 20 + 15 20 + 15 20 + 15 20 + 20	50 + 15 50 + 15 50 + 15 50 + 15 115 + 20	115 + 20 115 + 20 115 + 20 115 + 20 250 + 30	35 33 33 33 80
AC CURRENT	100.000µA 1.00000mA 10.0000mA 100.000mA 1.00000A[5]	10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k 10 - 1k 1k - 5k	50 + 20 70 + 30 50 + 20 50 + 20 50 + 20 50 + 20 50 + 20 50 + 20 50 + 20 50 + 20 70 + 30	400 + 80 550 + 100 200 + 80 350 + 80 200 + 80 350 + 80 200 + 80 350 + 80 200 + 80 350 + 80 550 + 100	400 + 80 550 + 100 220 + 80 350 + 80 220 + 80 350 + 80 220 + 80 350 + 80 220 + 80 350 + 80 550 + 100	500 + 100 650 + 160 350 + 100 450 + 100 350 + 100 450 + 100 350 + 100 450 + 100 350 + 100 450 + 100 650 + 160	400 900 255 255 255 255 255 255 255 255 290 440

4705 SPECIFICATIONS

To provide the user with a full understanding, the main specifications of the 4705 are shown under the following headings.

Stability is the repeatability of a set output for exactly the same conditions.

Accuracy relative to calibration standards includes all the effects of stability, temperature coefficient, noise and linearity under worst case line and load conditions.

Calibration uncertainty shows the traceability of Datron's calibration of the 4705.

After re-calibration the traceability of the users standards should be substituted.

Absolute accuracy is expressed by a summation of 'accuracy relative to calibration standards' plus 'calibration uncertainty'.

NOTES:

[1] For same conditions between 18°C and 28°C.

[2] FS = 2 × Range.

[3] Factory calibration uncertainty using automated calibration equipment.

Better traceability is obtainable using traditional methods - see 4707 specification for Datron's full capability.

[4] Ranges are nominal. Actual calibrated values are displayed.

[5] Typical above 1 Amp.

[6] Estimated, not fully traceable.

FUNCTION	RANGE	FREQUENCY (Hz)	TEMPERATURE COEFFICIENT (± ppm OUTPUT/°C) 3°C-13°C 33°C-43°C	TOTAL HARMONIC DISTORTION (%) [1]	IMPEDANCE OR ZERO TO FULL LOAD REGULATION	COMPLIANCE	OTHER SPECIFICATIONS
DC VOLTAGE	100µV to 100mV 1V 10V 100V 1000V		2.0 1.5 1.0 1.5 2.0		100Ω <0.1mΩ <0.1mΩ <1mΩ <10mΩ	25mA 25mA 25mA 25mA	Output: True bipolar output capable of delivering 1100V with respect to Output Lo Overrange: 100% on 100µV to 100V ranges Voltage Sensing: 10% on 1000V range (1100V) Guarding: Selectable remote or local voltage sensing on 1V to 1000V ranges Common Mode Rejection: Selectable remote or local guard connection Max. Guard to Ground voltage of 650V rms (2.5kV flash test) Settling Time: 140dB at DC to 400Hz To 10ppm of step size <1s
AC VOLTAGE	1mV to 100mV	10-31 32-33k 30k-100k	10 10 10	0.1 0.04 0.1	30Ω at all frequencies		Scale Length: 9% to 200% of range, 1mV to 100V ranges Voltage Sensing: 9% to 110% of range, 1000V range (1100V) Guarding: Selectable remote or local voltage sensing on 1V to 1000V ranges Common Mode Rejection: Selectable remote or local guard connection Settling Time: 140dB at DC to 400Hz To 100ppm of step size (double for range changes) 10-32Hz <10s 32-330Hz <3s >330Hz <1s <±100ppm
	1V and 10V	10-31 32-33k 30k-100k	6 6 6	0.1 0.04 0.1	Typically 0.001%FS to 33kHz increasing to 0.02%FS at 100kHz	1V Range -25mA 10V Range -60mA	Frequency Accuracy: Maximum Load Capacitance: 1V to 100V ranges 1000pF 1kV range 300pF
	100V	10-31 32-33k 30k-100k	6 6 10	0.1 0.04 0.2	Typically 0.002%FS to 33kHz increasing to 0.02%FS at 100kHz	120mA	
	1000V	45-330 300-10k 10k-33k	10 10 10	0.2 0.1 0.1	Typically 0.002%FS	<3.3kHz - 15mA >3.0kHz - 65mA	
RESISTANCE	10Ω 100Ω 1kΩ 10kΩ 100kΩ 1MΩ 10MΩ 100MΩ		6 2 2 2 2 6 10 20			Specified at 10mA 10mA 1mA 100µA 100µA 10µA 1µA 1µA	Connection: Selectable 2 or 4 wire connection to resistors 2 wire displayed value includes internal lead resistance Guarding: Selectable remote or local guard connection Protection: All resistors fuse protected to max applied voltage of 120V rms
DC CURRENT	100µA 1mA 10mA 100mA 1A		30 12 12 12 30		>2GΩ >2GΩ >200MΩ >20MΩ >1MΩ	3V 3V 3V 3V 3V	Output: True bipolar output capable of delivering ±2A Overrange: 100% on all ranges Settling Time: 1s to full specification Local Sense Only, all ranges
AC CURRENT	100µA 1mA 10mA 100mA 1A	10-1k 1k-5k 10-1k 1k-5k 10-1k 1k-5k 10-1k 1k-5k 10-1k 1k-5k	20 40 20 20 20 20 20 20 40 40	0.2 0.5 0.2 0.2 0.2 0.2 0.2 0.2 0.2 1.0	100MΩ 30MΩ 3MΩ 300kΩ 30kΩ	3V rms 3V rms 3V rms 3V rms 3V rms	Scale Length: 9% to 200% of range, all ranges Settling Time: To 100ppm of step size (double for range changes) 10-32Hz <10s 32-330Hz <3s >330Hz <1s <±100ppm Frequency Accuracy: Maximum Load Capacitance: 10nF Maximum Load Inductance: 1mH, <1µs

NOTES: [1] - Predominantly second harmonic (negligible error on mean sensing instruments).

4705 SPECIFICATIONS

ORDERING INFORMATION

4705: Autocal Multifunction Calibrator

Option 42: Alternative Rear Output

Option 90: Rack Mounting Kit

GENERAL	
POWER SUPPLY	100/120/220/240 volts ±10% 50Hz or 60Hz
POWER CONSUMPTION	370VA normal 660VA full power
OPERATING TEMP.	0°C to +50°C
STORAGE TEMP.	-40°C to +70°C
DIMENSIONS	178mm (7") × 455mm (17.9") × 563mm (22.2")
WEIGHT	36kg (80lbs)
SAFETY	Designed to UL1244, IEC348 & BS4743
WARRANTY	1 Year



DCV, DCI, Ω functions ■
IEEE-488 ■

Calibrates high accuracy DMMs of up to 8½ digit scale length ■

The 4000 Autocal Standard is a DC Voltage calibrator specially designed for transportable accuracy, speed of operation and ease of use both in the standards laboratory and in the production environment. The 4000A includes all the features of the 4000 but extends the performance still further. With super-selected reference components and ultra high stability three terminal attenuators in gain-defining circuits, the 4000A achieves levels of stability and accuracy in hostile environments previously only available in temperature controlled laboratories.

In their most basic format these calibrators offer very high performance DC Voltage outputs up to 1100V, controllable from the front panel and via the integral IEEE-488 interface. The capabilities of the 4000 and 4000A can be further extended with the addition of the combined DC Current and Resistance option.

The 4000 and 4000A are both compatible with the Datron 4101B multi-meter calibration software package, and, if either is teamed up with the 4200A AC Standard, a very high accuracy automated multimeter calibration system can be configured which is capable of calibrating anything from handheld multimeters to Standards DMMs.

THE
4000/A
AUTOCAL
DC STANDARDS

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INSTRUMENTS

FUNCTION	RANGE	STABILITY [2] ± (ppm output + ppm FS) [4]		ACCURACY RELATIVE TO CALIBRATION STANDARDS ± (ppm output + ppm FS) [4]						CALIBRATION UNCERTAINTY ppm [3]
		10 MINS	24 HOURS	23°C ± 1°C			23°C ± 5°C			
				24 HOURS	90 DAYS	1 YEAR	24 HOURS	90 DAYS	1 YEAR	
DC VOLTAGE 4000A	100.00µV to 100.00000mV 1.0000000V 10.000000V 100.00000V 1000.0000V	0.3 + 0.3µV 0.2 + 0.25 0.2 + 0.05 0.2 + 0.13 0.3 + 0.1	0.6 + 0.3µV 0.5 + 0.25 0.3 + 0.05 0.5 + 0.13 0.5 + 0.1	2 + 0.4µV 1 + 0.4 0.5 + 0.25 1 + 0.5 1 + 0.25	4 + 0.4µV 3 + 0.4 2 + 0.25 3 + 0.5 4 + 0.25	8 + 0.4µV 6 + 0.4 4 + 0.25 6 + 0.5 8 + 0.25	4 + 0.5µV 2.5 + 0.5 1 + 0.25 2.5 + 0.5 3.5 + 0.25	6 + 0.5µV 4.5 + 0.5 2.5 + 0.25 4.5 + 0.5 5.5 + 0.25	10 + 0.5µV 8 + 0.5 5 + 0.25 8 + 0.5 10 + 0.25	5 + 1µV 3 2 4 4
DC VOLTAGE 4000	100.00µV to 100.00000mV 1.0000000V 10.000000V 100.00000V 1000.0000V	0.3 + 0.3µV 0.2 + 0.25 0.2 + 0.05 0.2 + 0.13 0.3 + 0.1	1.5 + 0.3µV 1.2 + 0.25 0.6 + 0.05 1.2 + 0.13 1.2 + 0.1	3 + 0.5µV 2 + 1.0 1 + 0.5 2 + 1.0 3 + 1.5	6 + 0.5µV 4 + 1.0 3 + 0.5 4 + 1.0 6 + 1.5	12 + 0.5µV 8 + 1.0 6 + 0.5 8 + 1.0 11 + 1.5	7 + 0.5µV 5 + 1.0 3 + 0.5 5 + 1.0 7 + 1.5	10 + 0.5µV 7 + 1.0 5 + 0.5 7 + 1.0 10 + 1.5	16 + 0.5µV 11 + 1.0 8 + 0.5 11 + 1.0 15 + 1.5	5 + 1µV 3 2 4 4
DC CURRENT 4000/4000A	100.0000µA 1.000000mA 10.00000mA 100.0000mA 1.000000A [5]	-	-	5 + 5 5 + 5 5 + 5 5 + 5 10 + 10	20 + 5 20 + 5 20 + 5 20 + 5 50 + 10	40 + 5 40 + 5 40 + 5 40 + 5 75 + 10	15 + 5 15 + 5 15 + 5 15 + 5 40 + 10	30 + 5 30 + 5 30 + 5 30 + 5 80 + 10	50 + 5 50 + 5 50 + 5 50 + 5 100 + 10	10 10 10 10 25
RESISTANCE [1] (4 WIRE) 4000/4000A	1.0000000Ω 10.000000Ω 100.00000Ω 1.0000000kΩ 10.000000kΩ 100.00000kΩ 1.0000000MΩ 10.000000MΩ	Accuracy specified at 100mA		10 4 1.5 1.5 1.5 1.5 4 10	15 10 3 3 3 3 10 25	25 15 5 5 5 5 8 15 35	30 15 5 5 5 5 15 30	35 20 7 7 7 7 20 40	45 25 9 9 9 9 25 50	15 10 5 5 5 5 12 20 25

4000/4000A SPECIFICATIONS

To provide the user with a full understanding, the main specifications of the 4000A are shown under the following headings.

Stability is the repeatability of a set output for exactly the same conditions.

Accuracy relative to calibration standards includes all the effects of stability, temperature coefficient, noise and linearity under worst case line and load conditions.

Calibration uncertainty shows the traceability of Datron's calibration of the 4000A.

After re-calibration the traceability of the users standards should be substituted.

Absolute accuracy is expressed by a summation of 'accuracy relative to calibration standards' plus 'calibration uncertainty'.

NOTES

[1] - Ranges are nominal. Actual calibrated values are displayed.

[2] - For same conditions.

[3] - Includes factory traceability to National Standards and National Standards uncertainty.

[4] - FS = 2 × Range.

[5] - Typical above 1 amp.

FUNCTION	RANGE	TEMPERATURE COEFFICIENT (±ppm OUTPUT/°C) 13°C-18°C 28°C-33°C	OUTPUT		SETTLING TIME	OTHER SPECIFICATIONS
			IMPEDANCE	COMPLIANCE		
DC VOLTAGE 4000A	100µV to 100mV 1V 10V 100V 1000V	1.4 0.8 0.3 0.8 0.8	100Ω <0.1mΩ <0.1mΩ <1mΩ <10mΩ	- 25mA 25mA 25mA 25mA	<0.35s to 100ppm of step size <1s to 10ppm of step size	Output: True bipolar output capable of delivering + or - 1200V with respect to Output Lo Overrange: 100% on 100µV to 100V ranges 20% on 1000V range (1200V) Voltage Sensing: Selectable remote or local voltage sensing on 1V to 1000V ranges Guarding: Selectable remote or local guard connection Max Guard to Ground voltage 650Vrms (2.5kV flash test) Common Mode Rejection: 140dB at DC to 400Hz
DC VOLTAGE 4000	100µV to 100mV 1V 10V 100V 1000V	2.4 1.4 1.0 1.6 2.0	100Ω <0.1mΩ <0.1mΩ <1mΩ <10mΩ	- 25mA 25mA 25mA 25mA	<5s to 1ppm of step size Typically twice as fast	
DC CURRENT 4000/4000A	100µA 1mA 10mA 100mA 1A	6 6 6 6 15	> 20GΩ > 2GΩ >200MΩ > 20MΩ > 1MΩ	3V on all ranges	<2s to full specification	Output: True bipolar output capable of delivery + or - 2A Overrange: 100% on all ranges
RESISTANCE 4000/4000A	1Ω 10Ω 100Ω 1kΩ 10kΩ 100kΩ 1MΩ 10MΩ	10 6 2 2 2 2 6 10				Connection: Selectable 2 or 4 wire connection to resistors. 2 wire displayed value includes lead resistance Guarding: Selectable remote or local guard connection Protection: All resistors fuse protected to max applied voltage of 120V rms

RANGE	BANDWIDTH			
	2.5kHz (RMS)	Average over 1 Line Period (pk - pk)	Average over 10 Line Periods (pk - pk)	DC - 2Hz Typical Null Detector (pk - pk)
100µV - 100mV	2µV	0.2µV	0.05µV	0.1µV
1V	3µV	1.5µV	0.5µV	0.5µV
10V	10µV	5µV	2µV	2µV
100V	400µV	50µV	25µV	25µV
1000V	2.5mV	500µV	150µV	150µV

NOISE

For 10kHz wide band multiply 2.5kHz figures by 2.

For DC - 10Hz, multiply DC - 2Hz figures by 2

For RMS divide pk - pk by 6.

4000/4000A SPECIFICATIONS

ORDERING INFORMATION

- 4000: DC Voltage Calibrator
4000A: DC Voltage Calibrator
Option 20: Resistance and Current Functions
Option 42: Alternative Rear Output
Option 90: Rack Mounting Kit

GENERAL	
POWER SUPPLY	100/120/220/240 volts ± 10%, 50Hz or 60Hz
POWER CONSUMPTION	< 300 watts
OPERATING TEMP	0°C to +50°C
STORAGE TEMP	-40°C to +70°C
DIMENSIONS (H×W×D)	178mm(7")×455mm(17.9")×563mm(22.2")
WEIGHT	30kg (66lbs)
SAFETY	Designed to UL1244, IEC348 & BS4743
WARRANTY	1 YEAR



THE **4200A**
AUTOCAL
AC STANDARD

The 4200A Autocal AC Standard is the most accurate programmable AC source available. It features 90 day performance to ± 40 ppm on a $6\frac{1}{2}$ digit scale, with output ranges from 1mV to 100V, and with options available to extend the output to 1100V and to provide an AC Current function.

The 4200A is the ultimate prime AC source for any standards or calibration laboratory, achieving levels of stability and accuracy in hostile environments previously only available in temperature controlled laboratories.

The frequencies available from the instrument vary from

- ACV, ACI functions
- ACV outputs from 10Hz to 1MHz
- IEEE-488
- Calibrates high accuracy AC DMMs

10Hz to 1MHz, and a 'Spot' calibration feature can be used to eliminate the flatness component of the accuracy specification, providing even higher accuracy at these user-defined spot frequencies.

Being fully programmable via the IEEE-488 interface, the 4200A has been specifically designed to complement the Datron 4000/A DCV, DCI, and Resistance source to produce an extremely accurate fully multifunction combination. The 4000/A and the 4200A are both compatible with the Datron 4101B multimeter calibration software, and can be used together to configure an automated multimeter calibration system capable of calibrating anything from simple handheld multimeters up to the most sophisticated Standards DMMs.

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 INSTRUMENTS

FUNCTION	RANGE	STABILITY [2] ± (ppm OUTPUT + ppm FS) [4]			SPOT FREQUENCY FULL RANGE ACCURACY RELATIVE TO CALIBRATION STANDARDS ± (ppm OUTPUT) [1]		WIDEBAND ACCURACY RELATIVE TO CALIBRATION STANDARDS ± (ppm OUTPUT + ppm FS) [4]		CALIBRATION UNCERTAINTY ± (ppm + μV) [3]
		FREQUENCY Hz	24 HOURS	90 DAYS	23°C ± 5°C		23°C ± 5°C		
					90 DAYS	1 YEAR	90 DAYS	1 YEAR	
AC VOLTAGE [6]	1.0000mV to 100.0000mV [7]	10 - 31	60 + 5 + 5μV	80 + 10 + 5μV	100 + 5μV	120 + 5μV	150 + 30 + 5μV	170 + 30 + 5μV	50 + 1
		32 - 330	30 + 5 + 5μV	40 + 10 + 5μV	60 + 5μV	90 + 5μV	110 + 20 + 5μV	120 + 30 + 5μV	50 + 1
		300 - 10k	20 + 5 + 5μV	30 + 10 + 5μV	50 + 5μV	70 + 5μV	100 + 20 + 5μV	110 + 30 + 5μV	50 + 1
		10k - 33k	20 + 5 + 5μV	30 + 10 + 5μV	50 + 5μV	70 + 5μV	110 + 20 + 5μV	120 + 30 + 5μV	200 + 1
		30k - 100k	30 + 5 + 5μV	40 + 10 + 5μV	60 + 5μV	80 + 5μV	150 + 20 + 5μV	180 + 30 + 5μV	500 + 1
100k - 330k	80 + 10 + 5μV	150 + 20 + 5μV	200 + 5μV	350 + 5μV	450 + 100 + 10μV	550 + 100 + 10μV	600 + 1 [5]	600 + 1 [5]	
300k - 1M	130 + 10 + 5μV	300 + 100 + 5μV	500 + 5μV	0.1% + 5μV	0.2% + 0.1% + 20μV	0.3% + 0.1% + 20μV	800 + 1 [5]	800 + 1 [5]	
	1.000000V and 10.00000V	10 - 31	40 + 10	50 + 10	60	80	120 + 20	140 + 30	50
		32 - 330	20 + 5	30 + 10	50	60	80 + 10	90 + 20	40
		300 - 10k	15 + 5	20 + 10	40	50	70 + 10	80 + 20	40
		10k - 33k	15 + 5	20 + 10	40	50	70 + 10	80 + 20	50
		30k - 100k	20 + 5	30 + 10	50	60	120 + 20	150 + 20	80
		100k - 330k	50 + 10	70 + 20	100	150	400 + 100	500 + 100	300
300k - 1M	120 + 10	300 + 100	500	0.1%	0.2% + 0.04%	0.3% + 0.04%	600		
	100.0000V	10 - 31	40 + 10	50 + 10	60	80	120 + 20	140 + 30	50
		32 - 330	20 + 5	30 + 10	50	60	80 + 10	90 + 20	40
		300 - 10k	15 + 5	20 + 10	40	50	70 + 10	80 + 20	40
		10k - 33k	15 + 5	20 + 10	40	50	80 + 10	90 + 20	50
		30k - 100k	20 + 5	30 + 10	70	80	150 + 20	160 + 20	80
100k - 200k	50 + 10	70 + 20	150	200	450 + 100	550 + 100	300 [5]		
	1000.000V [8]	45 - 330	50 + 5	70 + 10	80	130	120 + 25	180 + 25	50
		300 - 10k	30 + 5	40 + 10	60	100	100 + 25	140 + 25	60
		10k - 33k	50 + 8	60 + 10	80	120	150 + 25	180 + 25	100
		30k - 100k	80 + 10	120 + 20	150	200	850 + 50	0.1% + 50	500
AC CURRENT [6] [9]	100.0000μA	10 - 1k	50 + 20	70 + 30	150	250	400 + 50	500 + 80	200
		1k - 5k	70 + 30	100 + 40	200	300	550 + 80	650 + 100	500
	1.000000mA to 100.0000mA	10 - 1k	50 + 20	70 + 30	120	220	220 + 50	350 + 80	100
		1k - 5k	50 + 20	70 + 30	120	220	350 + 50	450 + 80	100
	1.000000A	10 - 1k	50 + 20	70 + 30	150	250	400 + 50	500 + 80	100
		1k - 5k	70 + 30	100 + 40	200	300	550 + 80	650 + 100	200

4200A SPECIFICATIONS

To provide the user with a full understanding, the main specifications of the 4200A are shown under the following headings.

Stability is the repeatability of a set output for exactly the same conditions.

Accuracy relative to calibration standards includes all the effects of stability, temperature coefficient, noise and linearity under worst case line and load conditions.

Calibration uncertainty shows the traceability of Datron's calibration of the 4200A.

After re-calibration the traceability of the users standards should be substituted.

Absolute accuracy is expressed by a summation of 'accuracy relative to calibration standards' plus 'calibration uncertainty'.

NOTES:

- [1] - For other than full range add ppm:
 $2 \times (\text{Wideband 'ppm FS'}) \times (\text{ICalibrated voltage} - \text{Output Voltage}) / (\text{Output Voltage})$.
- [2] - For same conditions between 18°C and 28°C.
- [3] - Includes factory traceability to National Standards and National Standards uncertainty.
- [4] - FS = 2 × Range.
- [5] - Estimated not fully traceable.
- [6] - Assumes typical thermal transfer measurement.
- [7] - Rear output not recommended for wideband measurement of millivolt levels.
- [8] - Requires Option 10
- [9] - Requires Option 30

FUNCTION	RANGE	FREQUENCY (Hz)	TEMPERATURE COEFFICIENT (\pm ppm OUTPUT/ $^{\circ}$ C) 13 $^{\circ}$ C-18 $^{\circ}$ 28 $^{\circ}$ C-33 $^{\circ}$	TOTAL HARMONIC DISTORTION (%) [1]	OUTPUT		OTHER SPECIFICATIONS
					IMPEDANCE OR ZERO TO FULL LOAD REGULATION	COMPLIANCE	
AC VOLTAGE	1 mV to 100 mV	10-31 32-330 300-10k 10k-33k 30k-100k 100k-330k 300k-1M	5 5 5 5 5 20 50	0.1 0.04 0.04 0.04 0.1 0.3 1.0	Output Resistance: 30 Ω at all Frequencies		Settling time: To 100ppm of step size 10-31Hz < 10s 32-330Hz < 3s > 330Hz < 1s Maximum load Capacitance: 1V to 100V ranges 1000pF 1kV range 300pF (150pF > 30kHz)
	1V and 10V	10-31 32-330 300-10k 10k-33k 30k-100k 100k-330k 300k-1M	3 3 3 3 3 10 50	0.1 0.04 0.04 0.04 0.1 0.3 1.0	Typically 0.001%FS to 33kHz increasing to 0.2%FS at 1MHz	1V Range -25mA 10V Range -60mA	Frequency accuracy: < \pm 100ppm Voltage Sensing: Selectable remote or local voltage sensing on 1V to 1000V ranges Guarding: Selectable remote or local guard connection Max Guard to Ground voltage 650Vrms (2.5kV flash test) Common Mode Rejection: 140dB at DC to 400Hz Scale Length: 9% to 200% range, 1mV to 100V ranges 9% to 110% range, 1000V range
	100V	10-31 32-330 300-10k 10k-33k 30k-100k 100k-200k	3 3 3 3 5 20	0.1 0.04 0.04 0.04 0.2 0.3	Typically 0.002%FS to 33kHz increasing to 0.02%FS at 200kHz	120mA	
	1000V 750V	45-330 300-10k 10k-33k 30k-100k	5 5 5 7	0.2 0.1 0.1 0.5	Typically 0.001%FS to 33kHz increasing to 0.005%FS at 100kHz	< 3.3kHz - 15mA > 3.0kHz - 65mA	
AC CURRENT	100 μ A 1mA to 100mA 1A	10-1k 1k-5k 10-1k 1k-5k 10-1k 1k-5k	10 20 10 10 20 25	0.2 0.5 0.2 0.2 0.2 1.0		All ranges 3V RMS	Settling time: To 100ppm of step size 10-31Hz < 10s 32-330Hz < 3s > 330Hz < 1s Frequency Accuracy: < \pm 100ppm Maximum Load Capacitance: 10nF Maximum Load Inductance: 1mH, < 1 μ sec Local Sense only, all ranges. Scale Length: 9% to 200% of range, all ranges

NOTES: [1] - Predominantly second harmonic (negligible error on mean sensing instruments).

4200A SPECIFICATIONS

ORDERING INFORMATION

4200A: AC Voltage Calibrator
Option 10: 1000V Range
Option 30: AC Current Function
Option 42: Alternative Rear Output
Option 90: Rack Mounting Kit

GENERAL	
POWER SUPPLY	100/120/220/240 volts \pm 10% 50Hz or 60Hz
POWER CONSUMPTION	100 watts normal, 450 watts full power
OPERATING TEMP.	0 $^{\circ}$ C to +50 $^{\circ}$ C
STORAGE TEMP.	-40 $^{\circ}$ C to +70 $^{\circ}$ C
DIMENSIONS	178mm (7") \times 455mm (17.9") \times 564mm (22.2")
WEIGHT	35kg (77lbs)
SAFETY	Designed to UL1244, IEC348 & BS4743
WARRANTY	1 Year



The 4100 PORTOCAL series of multimeter calibration systems offers a selection of high quality systems configured with Datron calibrators, calibration software and accessories. All 4100 systems are supplied with Datron 4101B Multimeter Calibration Software, a powerful and flexible package which is totally menu driven, and compatible with all Datron calibrators and IBM XT, HP Vectra, or Compaq controllers.

Users of this software have a tremendous choice of options in setting up automated calibration systems, not only on calibrator performance – ranging from the 4707 for very high accuracy work to the 4705 for low performance DMM calibration – but also on controlling hardware – the speed of the HP Vectra or the compactness of the Compaq.

In addition, a range of accessories is also available which includes lead kits, bar code readers, tape drive units, cabinets and calibration carts so that systems can be configured for many different requirements – from bench use in the calibration laboratory to far more demanding mobile calibration applications.

THE
 4 1 0 0
 PORTOCAL
 SERIES OF
 CALIBRATION
 SYSTEMS

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 INSTRUMENTS

MAXIMUM FLEXIBILITY

The choice of calibrator, controller, software, and accessories gives the user the maximum flexibility to tailor an automated multimeter calibration exactly to his performance requirements, from a system geared for the calibration of 4½ digit DMMs to systems capable of calibrating the world's most accurate DMMs. The following charts show the wide choice of system components, options and accessories that are available, and the various bench and mobile systems that can be configured from them.

SYSTEM COMPONENTS

DATRON SYSTEM COMPONENTS		
Calibrators	4797 DCV,ACV,DCI,ACI,Ohms 4798 DCV,ACV,DCI,ACI,Ohms 4795 DCV,ACV,DCI,ACI,Ohms 4800 DCV,DCI,Ohms 4800A DCV,DCI,Ohms 4200A ACV,ACI	
Software	4101B Multimeter Calibration	Select
Carts	4102 for 4800/A and 4200A 4112 for 4797, 4798, and 4795	F1 4797 F2 4798 F3 4795 F4 4800 F5 4800A F6 4200A
Controllers	4103 IBM XT 4103A HP Vectra 4103B Compaq	
Printer	4104 Epson FX Series	F9 Options F10 Exit

OPTIONS

DATRON OPTIONS AND ACCESSORIES		
Options	02 Tape Backup Includes Cliper 5218 Tape Backup System, connecting cable and software support. Permits rapid backup of system hard disk onto tape. (Not available for 4103A or 4103B).	
	03 Bar Code Reader Includes HP 16001A decoder and wand. Uses RS 232-C interface, and allows system to automatically configure itself for calibration of the instrument on reading the bar code. Recognises 1 3 of 9, Interleaved 2 of 5, Industrial 2 of 5.	
	11 Companion Desk Unit Desk unit to stand alongside 4102/4112 carts	Select
Accessories	PLK-1 Benchtop Lead Kit (for 4800/A and 4200 combination)	F1 Option 02 F2 Option 03 F3 Option 11
	PLK-2 Benchtop Lead Kit (for 4797, 4798 or 4795)	F9 System F10 Exit

ACCESSORIES

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I N S T R U M E N T S

CALIBRATOR	CONTROLLER	PRINTER [1]	SOFTWARE	CART [2]
4707	IBM XT (4103) or HP Vectra (4103A) or Compaq (4103B)	4104	4101B	4112
4700	IBM XT (4103) or HP Vectra (4103A) or Compaq (4103B)	4104	4101B	4112
4705	IBM XT (4103) or HP Vectra (4103A) or Compaq (4103B)	4104	4101B	4112
4000/A and 4200A	IBM XT (4103) or HP Vectra (4103A) or Compaq (4103B)	4104	4101B	4102

NOTES

[1] - Includes printer cable.

[2] - Includes all necessary cabling, power distribution, IEEE-488 cables and analog leads.

4100 MOBILE SYSTEMS - CONFIGURATION



CALIBRATOR	CONTROLLER	PRINTER [1]	SOFTWARE	ANALOG LEAD KIT	IEEE-488 CABLES
4707	IBM XT (4103) or HP Vectra (4103A) or Compaq (4103B)	4104	4101B	PLK-2	2
4700	IBM XT (4103) or HP Vectra (4103A) or Compaq (4103B)	4104	4101B	PLK-2	2
4705	IBM XT (4103) or HP Vectra (4103A) or Compaq (4103B)	4104	4101B	PLK-2	2
4000/A and 4200A	IBM XT (4103) or HP Vectra (4103A) or Compaq (4103B)	4104	4101B	PLK-1	3

NOTES

[1] - Includes printer cable.

4100 BENCHTOP SYSTEMS - CONFIGURATION



Above: 4000A and 4200A Calibrators in a 4102 Cart with 4103A HP Vectra Controller.

Below: 4700 Calibrator with 4103B Compaq Controller and PLK-2 Analog Lead Kit.

SOFTWARE VERSATILITY

The 4101B package is designed to maximize the effectiveness of the Datron Autocal range of calibrator hardware and to guide the user in developing and controlling the following processes:

- Full calibration adjustment on DMMs incorporating some form of electronic calibration, such as Autocal.
- Performance verification of IEEE-488 controllable DMMs, where the system automatically controls both the DMM and the calibrator(s).
- Manual adjustments on IEEE-488 controllable DMMs, where in addition to controlling DMMs and calibrators, the system instructs the operator on how to adjust the DMM to meet the required specification.
- Performance verification of manually controlled DMMs and analog meters, where the system controls the calibrator and instructs the operator on any required manual intervention.
- Manual adjustments on manually controlled DMMs and analog meters. The system controls the calibrators and instructs the operator on how to manually set up the DMM and carry out the necessary adjustments.

Additionally, the software has an extensive results and inventory management facility, providing management information on past results and future workloads, while a unique certificate design capability allows the operator to tailor the calibration certificate to his or her own in-house requirements.

SIMPLE TO OPERATE

Ease of use is a prime feature of the 4101B software which, being menu driven, does not require the user to be familiar with either instrument controllers or their various languages. Furthermore, the software is specifically designed for the minimum of operator intervention in order to reduce possible human errors. For example, incorporating instrument and procedure files on a high capacity hard disk means that an operator has only to enter the instrument serial number to completely set up the system for calibrating that instrument. The storage of all programs and results files on the same hard disk also removes the need for an operator to be constantly changing floppy disks.

All of these features ensure that the learning curve for the software is short and that useful work will commence from the day of installation.

Procedure Generator

This is a password protected program which is used to create calibration procedures for any type of DMM or analog meter. A series of menus asks questions on how, and against what specifications, the calibration is to be performed. In this way enough information is given to the system to enable it to carry out the calibration in exactly the manner the user desires. Multiple procedures can be developed, edited, tested and stored on disk, so that the calibration technician can then run them repeatedly using the 'calibrate' program.

Calibrate

This program allows the operator to select the approved calibration procedure and then forces all subsequent action to follow the defined sequence, causing every calibration performed with that procedure to be identical. Easy to follow displays prompt the operator through the entire process with the minimum of intervention. This approach, when combined with sophisticated checks on data entry and instrument control, prevents both simple errors and catastrophic mistakes.

Recall Results

All results are stored on a hard disk. As results accumulate on this disk, they can be archived onto floppy disks for long term storage. The program allows the operator to track and search through past results, review them on the screen, and print out selections in the form of calibration certificates.

COMPREHENSIVE STRUCTURE

5.2 DEFINE/EDIT PROCEDURE - FUNCTION MENU 01.00.00

Manufacturer : DATRON		Type number : 10610
Procedure reference : 850045/9		Calibration type : E1. cal
Specification period : 90 days		Number of functions : 5

Enter pre/post-run instructions Enter IEEE I/O specification

No.	Function	Cent Spec	Function IEEE Code	Test points entered	Select
1	DCV	DCV	F3	Yes	F1 DC volts
2	Ohms	Ohms	F1	Yes	F2 AC volts
3	ACV	ACV	F2	Yes	F3 Ohms
4	DCI	DCI	F5	Yes	F4 DC current
5	ACI	ACI	F4	Yes	F5 AC current
					F6 DC/AC volts
					F7 DC/AC current
					F8 Special
					F10 Procedure menu

1.6 CALIBRATION IN PROGRESS DC Voltage

Procedure nos. 010 Test point 01.04.01

Range	Test value	Freq (Hz)	Measured value	Spec tol	Error	% Error of spec
10	0.00000		0.00000	10 d	0 d	(1)
10	10.00000	10.0000	10.0000	10 d	-12 ppm	0.12%
10	-0.00000		0.00000	10 d	0 d	(1)
10	-10.00000	10.0000	-10.0000	10 d	14 ppm	0.14%
100	0.00000		0.00000	10 d	0 d	(1)

Instructions

Select

- Esc Alert
- F3 Value
- F5 Range
- F7 Function
- F10 Continue

Pause/Step mode - Select F3-F7 to repeat test point(s) or F10 to continue

PORTAL SYSTEM MENU

- F1 Calibrate menu
- F2 Recall results menu
- F3 System manager menu
- F4 Certificate generator menu
- F5 Procedure generator menu

- F9 Options menu/Portal exit
- F10 Title page

Date 10-10-1986 Time 13:19:30

Certificate Generator

Most users have their own preferred format of calibration certificate. This password protected section of the software allows the user to modify the standard system calibration certificate and store up to 20 alternatives on disk for future use.

9.12 CERTIFICATE COLUMN HEADINGS

CALIBRATION RESULTS

Range	Test value	Freq (Hz)	Measured value	Spec tol	Error	% Error of spec
Pass indication						
Borderline indication						
Fail indication						
Noise indication						
Instructions			Borderline value : 70 %			
Select and enter column descriptions to be displayed and pointed on the certificate as appropriate.			Select F1 Absolute specification F2 %ppm/d specification F3 Error F4 % Error of spec F5 % Margin of spec F6 Pass/Fail F9 Column menu			

System Manager

The important management functions of the software are contained in this password protected program. It allows a user to format and back-up disks, to delete files and also provides other general disk utilities.

Additionally, it can be used to archive selected results onto floppy disk, and search for information on the instruments calibrated by the system – a highly useful inventory management function. For example, the instrument database can be interrogated to determine which instruments are due for calibration during a certain week.

3.4 MANAGER - INVENTORY SEARCH Page no. 001

No.	Manuf.	Type	Serial number	Code number	Location	Due date
1	DATRON	1061A	16745		TEST BAY	10-30-86
2	DATRON	1061A	16392		TEST BAY	11-01-86
3	DATRON	1061A	16712		F A D	11-01-86
4	DATRON	1061A	15987		F A D	11-02-86
5	DATRON	1061A	13722		ATE	11-01-86

10

Search main field : Out of cal

Search sub-field : Date/Period
Date : 10-28-86 Period : 7 days

Print search ?

Select

F1 Manuf.	F6 Job no.
F2 Type	F7 Date/Period
F3 Serial number	F8 Out of cal.
F4 Code number	F9 Do search
F5 Location	F10 Manager menu

SYSTEM ANALOG PERFORMANCE

To specify performance at the remote end of the analog lead assembly (either the Datron 4102/4112 carts or the Datron PLK-1 and PLK-2 lead kits), add the following uncertainties to the specifications of the calibrator being used in the system.

DCV: No additions required

ACV: 1 mV to 100mV ranges, 100kHz to 1 MHz: add 2%R+3%FS (typical)
1V and 10V ranges, 300kHz-1 MHz: add 0.3%R+0.1%FS
Volt × Herz product: 2×10^7 maximum
No other additions required

Resistance: 1 MΩ range: add 10ppmR
10 MΩ range: add 100ppmR
100 MΩ range: add 1000ppmR
No other additions required

DCI: No additions required

ACI: No additions required

4101B SOFTWARE SPECIFICATIONS

Program size: 1.5Mbytes

Maximum number of procedures: 999

Typical procedure file size: 10kbytes

Maximum number of certificate designs: 20

Typical certificate file size: 8kbytes

Maximum number of instruments: 32000

Typical instrument file size: 120bytes

Disk Operating System: PC DOS 3.0 or later

MS DOS 3.0 or later

4100 SPECIFICATIONS

CONTROLLER CONFIGURATIONS

These are the configurations of the controllers that will support the 4101B software package.

1) 4103 (IBM-XT)

- a) IBM-XT System Unit (includes 640K RAM, one 360K floppy disk drive, a 20M hard disk, and Asynchronous Communications Adaptor)
- b) Parallel Printer Adaptor
- c) Color Card
- d) Color Monitor
- e) Keyboard
- f) IBM PC DOS (3.0 or later)
- g) IBM Basic
- h) Ziotech ZT 1488A and zSBx 20 IEEE-488 interface cards†

2) 4103A (HP VECTRA)

- a) HP Vectra PC Model 60 (HP 72460AU) (includes 640K RAM, one 1.2M floppy disk drive, a 40M hard disk, and keyboard)
- b) Serial/Parallel Interface (HP 24540A)
- c) Multimode Video Adaptor (HP 45981A)
- d) Multimode Color Adaptor (HP 45984A)
- e) 12" Color Monitor (HP 35741 B)
- f) HP Vectra PC DOS (HP 45951A)
- g) HP Vectra PC Basic Interpreter (HP 45952A)
- h) Ziotech ZT 1488A and zSBx 20 IEEE-488 interface cards†

3) 4103B (COMPAQ)

- a) Compaq Portable II - Model 3 (includes 640K RAM, one 360K floppy disk drive, a 10M hard disk, parallel printer interface, asynchronous communications interface, keyboard, and integral monitor)
- b) MS-DOS/Basic
- c) Ziotech ZT 1488A and zSBx 20 IEEE-488 interface cards†
†Available as Datron part number 440127

GENERAL	4102/4112	4103 (IBM XT)	4103A (HP VECTRA)	4103B (COMPAQ)	4104 (EPSON)
POWER SUPPLY	100/120/220/240V±10% 50Hz or 60Hz	120/220/240V±10% 50Hz or 60Hz	115/230V±5% 50Hz or 60Hz	120/220/240±10% 50Hz or 60Hz	120/220/240±10% 50Hz or 60Hz
POWER CONSUMPTION (Approx.)	20W	500W	500W	180W	70W
OPERATING TEMP.	0°C to 50°C	+15°C to +32°C	+5°C to +40°C	+10°C to +40°C	+5°C to +35°C
STORAGE TEMP.	-40°C to 70°C	+10°C to +43°C	-55°C to +75°C	+0°C to 60°C	+5°C to +43°C
DIMENSIONS (H × W × D)	912mm × 706mm × 827mm (36" × 28" × 32.5") Opt. 11: 912mm × 1180mm × 827mm (36" × 46.5" × 32.5")	439mm × 500mm × 610mm (16.2" × 19.6" × 24")	500mm × 530mm × 645mm (19.8" × 20.6" × 22.5")	190mm × 450mm × 350mm (7.5" × 17.7" × 13.9")	100mm × 441mm × 347mm (4" × 17.4" × 13.7")
WEIGHT	80kg (176 lbs)	28kg (65 lbs)	27kg (60 lbs)	12kg (26 lbs)	8kg (17 lbs)
WARRANTY	1 year	1 year	1 year	1 year	1 year

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