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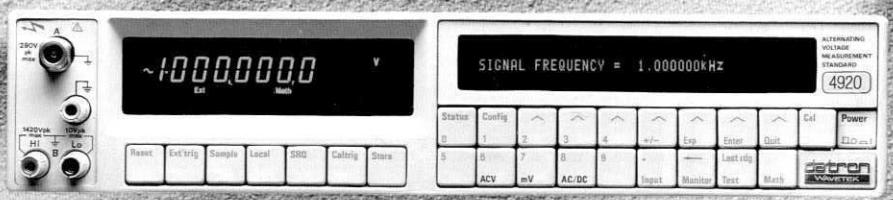
MODEL 4920

ALTERNATING VOLTAGE MEASUREMENT STANDARD



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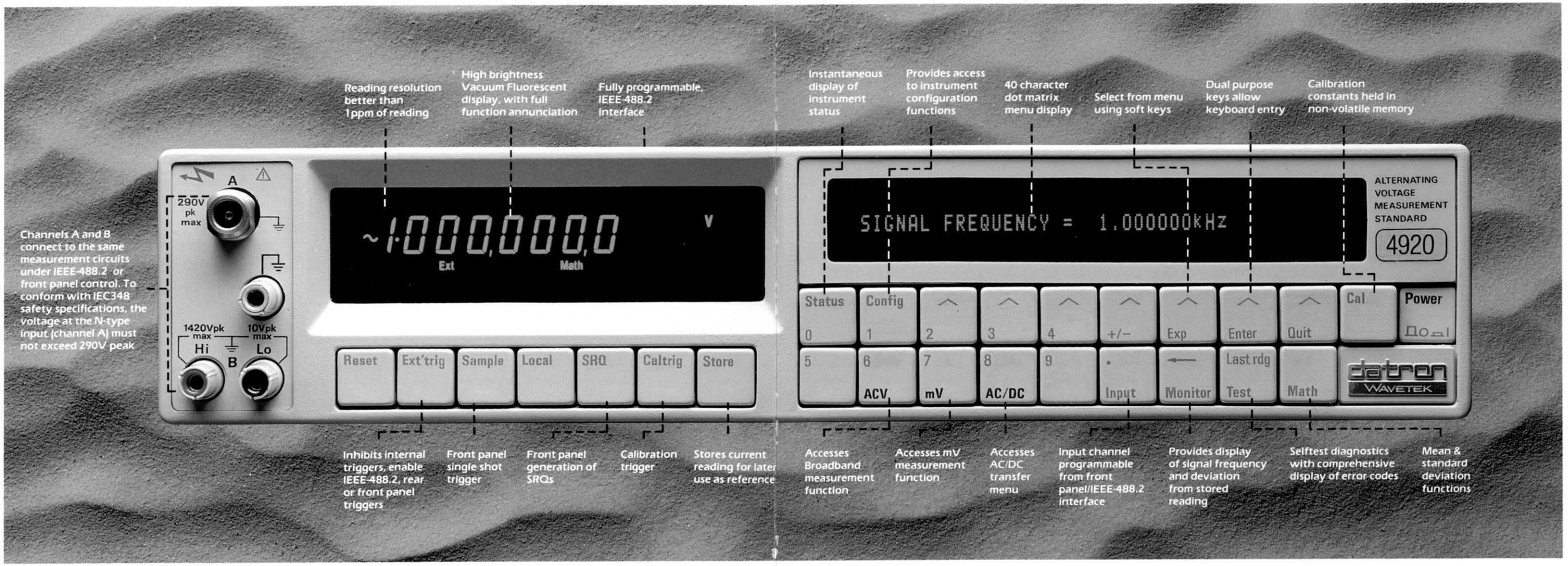
- ± 28ppm (1 year, ± 5°C) total uncertainty in standalone Measurement mode
- ± 14ppm (1 year, ± 5°C) total uncertainty in AC/DC Transfer mode
- 2.5 second measurement period (includes settling time)
- 1mV to 1000V, 1Hz to 1.25MHz
- Noise uncertainty better than 0.5ppm RMS
- Self-contained measurement system – no external references or instrumentation required for normal operation
- Fully protected on all voltage ranges
- Simple and easy to use
- Fully programmable via IEEE-488.2 interface
- Simultaneous display of Voltage and Frequency



High Accuracy Voltage Measurement

The Datron Model 4920 Alternating Voltage Measurement Standard (AVMS) is designed to replace traditional AC/DC Thermal Transfer Standards in high accuracy Alternating Voltage measurement applications. Fully traceable measurements can be made with uncertainties equal to or better than all but the most specialized standards, but with the speed, ease of use and convenience of a programmable, intelligent device. What is more, these features are all contained in one single unit, other references and instrumentation are not required for normal operation. Just connect the 4920, program the appropriate voltage range from the front panel or IEEE-488.2 interface, and just seconds later, the value of the input signal is displayed on the bright, easy to read, seven segment Vacuum Fluorescent display. Compare this with the operational requirements of a traditional AC/DC Thermal Transfer Standard!

True RMS Measurements

At the heart of the 4920 is Datron's electronic true RMS sensor, in essence a specialized circuit element that converts Alternating to Direct Voltage. This technique has been utilized by Datron for more than 15 years, in one form or another, and was the basis on which the Company was originally founded. This proven method has significant advantages over the more traditional approach of balancing the heating effect of the unknown Alternating Voltage with that of a known Direct Voltage. It has a faster settling time that is independent of input level and is easy to optimize for low frequency operation, yet is a true RMS measurement method that is accepted by calibration authorities worldwide.

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Rugged Performance

At the front end of the instrument is a proprietary attenuator design that achieves three functional aspects – long term stability, frequency flatness and input overvoltage protection – that were previously thought to be incompatible. This unique design will withstand a full 1100V overload on any range without damage, while being flat to within 10ppm in the mid-band, 500ppm at 1MHz. Significantly, this frequency flatness is not dependent on the use of gain-defining trimpots or trimcaps, so the 4920 can withstand potentially rough treatment during shipment by commercial carriers to and from the primary standards lab.

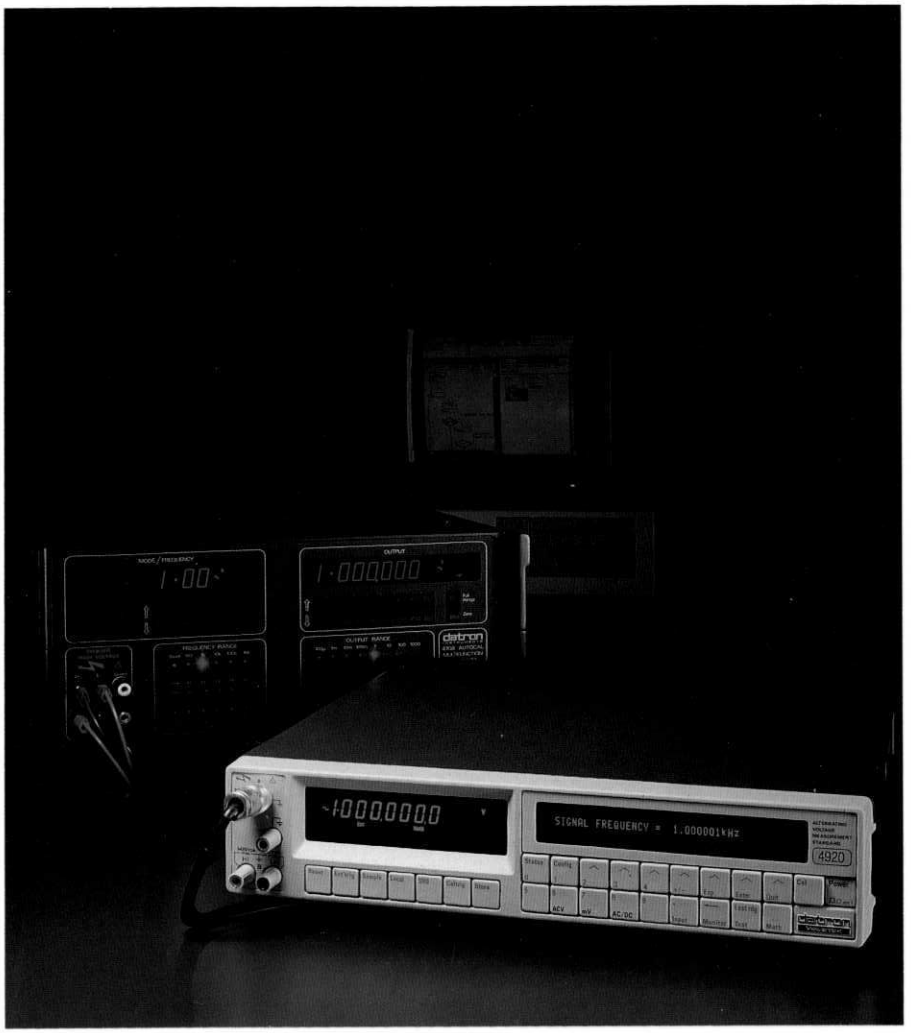
Low Cost of Ownership

One of the prime objectives of Datron's design engineers was to make calibration support of the 4920 economic. For operation in Broadband mode, only three points per voltage range require calibration, 1kHz at nominal full range, 1kHz at 30% of range and 1MHz at nominal full range (lower frequencies on the 100V to 1000V ranges). In use, the frequency and approximate amplitude of the unknown input signal is determined and automatically corrected by a calibration factor derived from the range's three calibration points, which are stored in non-volatile memory.

Spot Calibration

The Broadband operating mode is the most convenient, but not the most accurate. Reduced measurement uncertainties may be achieved in 'Spot Cal' mode, in which corrections for specific voltage/frequency points, additional to the Broadband calibration points, are stored in non-volatile memory. This is analogous to the more familiar technique used with AC/DC Thermal Transfer Standards, of reading the AC/DC difference from a calibration certificate and manually correcting a reading. With the 4920, however, these characterizations may be switched on and off by the user, and when selected are applied automatically by the microprocessor, under front panel or IEEE-488.2 control.

For Fast, Cost-Effective Calibration



The Ultimate in Alternating Voltage Measurement

AC/DC Transfer

For most applications, the 4920's performance in Broadband or Spot modes will be sufficient. However, improved long term stability and temperature performance may be achieved using the AC/DC Transfer mode, which effectively removes the effects of long term DC gain and temperature drift of the input attentuators and the 4920's internal DC reference. The user applies a known Direct Voltage to the input, first positive and then negative. The instrument then calculates the average of the two to eliminate turnover errors and compares the unknown Alternating Voltage input to this stored value. The result is displayed as a number of ppm deviation from the average of the two Direct Voltage readings. For the ultimate in measurement performance, Transfer mode may be used in conjunction with spot calibrations.

Millivolt Ranges

Calibration of the millivolt output ranges of single and multifunction calibrators has always been a difficult, time-consuming and costly process. Until now. The 4920 has simplified millivolt measurements, using a by-passable millivolt amplifier placed between the signal of interest and the calibrated higher ranges of the 4920. The gain of the amplifier at the signal frequency of interest is measured using these higher ranges, which is then used to calculate the value of the millivolt level input signal. This approach enables a level of accuracy previously attainable only through the use of specialized, expensive and time-consuming techniques.

For more detailed information on the 4920's design and how it may be applied to common AV measurement problems, an applications note entitled 'Datron Model 4920 AVMS Design, Application and Performance' has been produced. Please contact your local representative for a free copy.

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Specifications

Measurement Function

MODEL 4920

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Operation valid between 9% and 110% of nominal range, specifications valid between 30% and 110% of nominal range. Operation valid for frequencies in range 1Hz-1.25MHz, specifications valid for any frequency 1Hz-1MHz subject to a V.Hz limit of 7.5×10^7. 1.25MHz specifications typically as for 1MHz, but not traceable. Spot calibrated mode specifications valid at ±2% about the spot calibrated frequency and between 50% and 110% of nominal range. To calculate the absolute uncertainty in a measurement made with a factory calibrated 4920, combine the 4920 performance relative to calibration standards with the relevant calibration uncertainty.

Voltage Range	Frequency (Hz)	Accuracy Relative to Calibration Standards (±ppm Reading)								Calibration Uncertainty[1] (±ppm Reading)
		24 Hour ±1°C		90 day ±1°C		1 Year ±5°C		2 years ±5°C		
		Broadband	Spot	Broadband	Spot	Broadband	Spot	Broadband	Spot	
300mV	1-2	320	230	340	250	360	300	370	330	200
	2-10	120	30	140	50	160	100	170	130	200
	10-40	15	5	20	10	30	20	35	25	45
	40-30k	15	5	20	10	30	20	35	25	13
	30k-200k	60	15	70	25	80	50	85	65	50
	200k-500k	225	50	250	75	325	200	350	250	100
	500k-1M	600	150	650	200	850	500	950	600	130
1V	1-2	320	230	340	250	360	300	370	330	180
	2-10	120	30	140	50	160	100	170	130	180
	10-40	15	5	20	10	30	20	35	25	13
	40-30k	15	5	20	10	30	20	35	25	13
	30k-200k	60	15	70	25	80	50	85	65	40
	200k-500k	225	50	250	75	325	200	350	250	100
	500k-1M	600	150	650	200	850	500	950	600	130
3V	1-2	320	230	340	250	360	300	370	330	180
	2-10	120	30	140	50	160	100	170	130	180
	10-40	15	5	20	10	30	20	35	25	13
	40-30k	15	5	20	10	30	20	35	25	8
	30k-200k	60	15	70	25	80	50	85	65	40
	200k-500k	225	50	250	75	325	200	350	250	100
	500k-1M	600	150	650	200	850	500	950	600	130
10V	1-2	320	230	340	250	360	300	370	330	200
	2-10	120	30	140	50	160	100	170	130	200
	10-40	15	5	20	10	30	20	35	25	13
	40-30k	15	5	20	10	30	20	35	25	8
	30k-200k	60	15	70	25	80	50	85	65	40
	200k-500k	225	50	250	75	325	200	350	250	100
	500k-1M	600	150	650	200	850	500	950	600	130
30V	1-2	320	230	340	250	360	300	370	330	200
	2-10	120	30	140	50	160	100	170	130	200
	10-40	15	5	20	10	30	20	35	25	25
	40-30k	15	5	20	10	30	20	35	25	13
	30k-200k	60	15	70	25	80	50	85	65	40
	200k-500k	225	50	250	75	325	200	350	250	100
	500k-1M	600	150	650	200	850	500	950	600	130
100V	1-2	320	230	340	250	360	300	370	330	200
	2-10	120	30	140	50	160	100	170	130	200
	10-40	15	5	20	10	30	20	35	25	25
	40-30k	15	5	20	10	30	20	35	25	18
	30k-200k	60	15	70	25	80	50	85	65	50
300V	1-2	330	240	350	260	380	310	400	340	200
	2-10	130	40	150	60	180	110	200	140	200
	10-40	20	10	25	15	35	25	40	30	35
	40-20k	20	10	25	15	35	25	40	30	20
	20k-100k	65	20	80	30	105	55	120	70	50
1000V	1-2	330	240	350	260	380	310	400	340	200
	2-10	130	40	150	60	180	110	200	140	200
	10-40	20	10	25	15	35	25	40	30	30
	40-20k	20	10	25	15	35	25	40	30	30
	20k-100k	65	20	80	30	105	55	120	70	60

Note 1: Calibration Uncertainties. The 4920 calibration uncertainties listed are traceable to, and include the uncertainty of, the US National Institute of Standards and Technology. The individual uncertainty contributions have been combined to give a minimum confidence level of 99%. Calibration of the 4920 to standards traceable to other National Standards Laboratories will yield different figures for calibration uncertainty due to the different capabilities of those National Standards Laboratories. For more detailed information on traceability issues in general and the factory calibration of the 4920 in detail, please refer to the applications note entitled 'Datron 4920 AVMS – Calibration and Traceability'.

Millivolt Measurement Specifications

Voltage Range	Frequency (Hz)	Absolute accuracy (±ppm Reading)		
		90 day ±1°C	1 year ±5°C	2 years ±5°C
3mV	10-100	1270	1300	1320
	100-30k	1100	1130	1150
	30k-200k	1580	1650	1680
	200k-500k	2750	3000	3150
	500k-1M	5400	6100	6450
10mV	10-100	390	420	440
	100-30k	230	260	270
	30k-200k	530	600	630
	200k-500k	1450	1700	1800
	500k-1M	3500	4100	4500
30mV	10-100	310	330	350
	100-30k	180	200	210
	30k-200k	390	430	450
	200k-500k	1150	1300	1400
	500k-1M	2700	3100	3400
100mV	10-100	235	250	260
	100-30k	100	120	130
	30k-200k	210	230	250
	200k-500k	620	700	750
	500k-1M	1600	1850	2000

AC/DC Transfer Specifications

Voltage Range	Frequency (Hz)	Accuracy Relative to Calibration Standards (±ppm Reading)						Calibration Uncertainty[2] (±ppm Reading)
		90 day ±1°C		1 year ±5°C		2 years ±5°C		
		Broadband	Spot	Broadband	Spot	Broadband	Spot	
300mV	40-30k	17	7	17	7	18	8	12
1V	40-30k	17	7	17	7	18	8	12
3V	40-30k	17	7	17	7	18	8	7
10V	40-30k	17	7	17	7	18	8	7
30V	40-30k	17	7	17	7	18	8	12
100V	40-30k	17	7	17	7	18	8	17
300V	40-20k	22	12	22	12	23	13	19
1000V	40-20k	22	12	22	12	23	13	29

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Millivolt Measurement Function

The measurement method consists of two steps. In step one, a nominal 100mV signal at the frequency of interest is applied to the input terminals (the absolute value is unimportant) and a sequence of measurements on the higher, traceably calibrated ranges establishes the gain of a bypassable millivolt amplifier. Within 24 hours, ±1°C and ±1% in frequency of this gain measurement, the unknown millivolt level signal may then be measured by amplification and measurement on the calibrated higher ranges. For more detailed information on this operating mode, refer to the applications note 'Datron 4920 AVMS – Design, Application and Performance'. The performance specifications opposite include all contributions of error; the performance of the higher voltage ranges of the 4920, the calibration of these ranges, the error in the measurement of the gain of the bypassable millivolt amplifier and the gain stability, temperature stability and linearity of the amplifier. Specifications are valid from 30% to 110% of nominal range. The 24 hour ±1°C, 90 day ±1°C, 1 year ±5°C and 2 year ±5°C time and temperature spans refer to the time and temperature change since traceable calibration of the higher voltage ranges of the 4920.

AC/DC Transfer Function

The AC/DC Transfer function displays the difference between the unknown AC signal and the average of a positive and negative DC signal of known magnitude in the range 100mV to 1100V, previously stored under front panel or IEEE-488.2 control. This operating mode is valid for any voltage and frequency combination, but yields a significant improvement in measurement uncertainty only for the frequency band from 40Hz to 30kHz. Therefore, specifications for this mode are as the specifications for the Measurement Function, with the exceptions shown opposite, and are valid when DC and AC are within 1% and within +10% and −30% of nominal full range. For more detailed information on this operating mode, refer to the applications note 'Datron 4920 AVMS – Design, Application and Performance'.

Note 2: Calibration Uncertainty. The 4920 calibration uncertainties listed are traceable to, and include the uncertainty of, the US National Institute of Standards and Technology. The individual uncertainty contributions have been combined to give a minimum confidence level of 99%. Calibration of the 4920 to standards traceable to other National Standards Laboratories will yield different figures for calibration uncertainty due to the different capabilities of those National Standards Laboratories. The uncertainties listed opposite define Datron's ability to transfer the National Standard of AC/DC difference to the 4920, rather than an absolute AC voltage, hence the difference between these columns of Calibration Uncertainties and those listed in the 'Measurement Function' specifications. To calculate the uncertainty in an AC/DC Transfer measurement, simply combine the Calibration Uncertainty specification to the 4920 accuracy relative to calibration standards AND the traceability of the DC signal used in the Transfer process.

Secondary Specifications

Display Resolution:

0.1ppm of range on X1 ranges, 0.33ppm of range on X3 ranges, to a maximum resolution of 100nV.

Input Impedance:

404kΩ shunted by 90pF on 3mV to 1V, 300V and 1kV ranges, 124kΩ shunted by 150pF on 3V to 100V ranges.

Input Protection:

300mV to 1kV ranges fully protected to 1100V rms, non-destructive, recovery to full accuracy specifications within 30 seconds from removal of overload condition. The mV measurement function is designed to withstand 3V rms continuous, and cause a typical current limited calibrator to 'trip' above this level. An internal fuse protects the measurement circuits from permanent damage in the case of overload above this level.

Distortion:

All specifications valid for sinusoid input with harmonic distortion <1%.

Measurement Period (includes settling delays):

2.5s at >100Hz, 4s at 40Hz to 100Hz, 10s at 10Hz to 40Hz, 60s at 1Hz to 10Hz.

Warmup Time:

Full specifications apply after 90 minutes warmup.

General

LINE SUPPLY:	100V to 130V or 200V to 260V, 47Hz to 63Hz
POWER CONSUMPTION:	37VA
OPERATING TEMPERATURE:	0°C to +50°C
STORAGE TEMPERATURE:	−40°C to +70°C
DIMENSIONS (H × W × D)	88mm (3.5") × 427mm (16.8") × 487mm (19.2")
WEIGHT:	11.8kg (26lbs)
SAFETY:	Designed to UL1244, IEC 348
EMI:	FCC Rules, part 15, sub-part J. Limits A and B VDE 0871, Limits A and B
WARRANTY:	1 year

Ordering Information

Model 4920 Alternating Voltage Measurement Standard*.

Option 10 Millivolt Measurement Function

*Two versions of the product are available, the 4920 and 4920M. The functional and performance specification of the 4920M, specially designed for the US Navy, are described in a separate datasheet. Please contact your local representative for further information.

Datron Instruments reserves the right to make changes in materials, specifications or accessories without notice.

Datron Range

Datron Instruments leads the world in the design and manufacture of programmable calibrators, automated calibration systems and digital multimeters. Complementing the Datron Instruments range, other divisions within the Group are also engaged in the production of some of the world's finest test instruments. To assist you, data sheets are available with more detailed product information and full specifications. Contact us now and we will be pleased to send you the information you require.

50 MHz Wideband Option

The Wideband Measurement Head, Option 50, extends the frequency range of the 4920 to 50MHz. Input is via N-type connector into 50 ohms impedance. An exceptionally low V.S.W.R. of 1.02:1 is maintained across the frequency range from 10Hz to 50 MHz.

Option 50 is supplied in a custom case with three accessories; a male to male N-type connector allowing direct connection to generators, a BNC to N-type to monitor the wideband output of some AC Calibrators and a 50 ohms match for the channel A input to the 4920. Some older 4920s may need modification before wide band can be installed – contact factory for details.

Option 50 (Model 4920)

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Specifications

Range:
1V to 3.5V on single 3V range.
Input:
N-type connector, 50 ohms impedance,
VSWR = 1.02:1 (10Hz – 50MHz)

Accuracy: 1 year, 23°C ±5°C

0.1%	(10 – 40Hz)
0.125%	(40 – 1MHz)
0.15%	(1M – 10MHz)
0.2%	(10M – 20MHz)
0.5%	(20M – 30MHz)
2%	(30M – 50MHz)

Flatness: WRT 1kHz, 1 year, 23°C ±5°C

0.075%	(10 – 40Hz)
0.025%	(40 – 1MHz)
0.05%	(1M – 10MHz)
0.1%	(10M – 20MHz)
0.3%	(20M – 30MHz)
1%	(30M – 50MHz)

Frequency Monitor: 200Hz to 50MHz
±10ppm ±1 Digit
6½ Digit scale length

Dimensions
Module: H x W x D
36.6mm (1.4ins) x 125mm (4.9ins)
x 176mm (6.9ins)
Presentation case:
65.0mm (2.6ins) x 225mm (8.9ins)
x 350mm (13.8ins)

Weight
Module: 1.35kg (3lbs)
Module in case: 3.6kg (8lbs 1oz)

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Your local Representative is :-