

# Model 192 Programmable DMM Specifications

## DC VOLTS

RANGE	RESOLUTION			INPUT RESISTANCE	5½-DIGIT ACCURACY ±(% of rdg + digits)			TEMPERATURE COEFFICIENT ±(% rdg + digits)/°C 0°-10°C & 28°-50°C
	6½*	5½	4½**		24 HR. 23°C ±1°C	90 DAYS 18° to 28°C	1 YEAR 18° to 28°C	
0.2 V	1 μV	10 μV	10 μV	> 1000MΩ	0.004+2***	0.003+2***	0.009+2***	0.0003+1
2 V	1 μV	10 μV	100 μV	> 1000MΩ	0.003+1.5	0.005+1.5	0.007+1.5	0.0003+0.1
20 V	10 μV	100 μV	1mV	> 1000MΩ	0.003+1	0.005+1	0.009+1	0.0004+0.1
200 V	100 μV	1mV	10mV	10MΩ	0.004+2	0.007+2	0.010+2	0.0007+0.1
1200 V	1mV	10mV	100mV	10MΩ	0.004+1	0.007+1	0.011+1	0.0007+0.1

\*Multiply digit error by 10.

\*\*Using Model 1923 Interface.

\*\*\*After pushbutton zeroing.

**MAXIMUM ALLOWABLE INPUT:** 1200V peak.

**CMRR:** Greater than 120dB at DC and 50 or 60Hz (with 1kΩ in either lead).

**NMRR:** Greater than 60dB at 50 or 60Hz.

**BENCH READING RATE:** 8/s.

**SETTLING TIME:** 250ms to within 6 digits at 5½-digit resolution.

## OHMS

RANGE	RESOLUTION			MAXIMUM OUTPUT		5½-DIGIT ACCURACY ±(% of rdg + digits)			TEMP. COEFFICIENT ±(% rdg + digits)/°C 0°-18°C & 28°-50°C
	6½*	5½	4½**	I SHORT	V OPEN	24 HR. 23°C ±1°C	90 DAYS 18°-28°C	1 YR. 18°-28°C	
0.2 kΩ		1mΩ	10mΩ	-5 mA	-0.5V	0.0035+2***	0.007+2***	0.010+2***	0.001 +0.7
2 kΩ	1mΩ	10mΩ	100mΩ	-5 mA	-5 V	0.0035+2	0.007+2	0.010+2	0.001 +0.1
20 kΩ	10mΩ	100mΩ	1 Ω	-500 μA	-5 V	0.0035+1	0.007+2	0.010+2	0.001 +0.1
200 kΩ	100mΩ	1 Ω	10 Ω	-50 μA	-5 V	0.0035+1	0.007+2	0.010+2	0.001 +0.1
2000 kΩ	1 Ω	10 Ω	100 Ω	-5 μA	-5 V	0.005 +1	0.010+2	0.010+2	0.0012+0.1
20 MΩ	10 Ω	100 Ω	1 kΩ	-0.5 μA	-5 V				

\*Multiply digit error by 10.

\*\*Using Model 1923 Interface.

\*\*\*After pushbutton zeroing.

**CONFIGURATION:** Automatic 2- or 4-terminal.

**MAXIMUM ALLOWABLE INPUT:** 360V peak or 250V rms.

**BENCH READING RATE:** 8/s on 0.2kΩ—2000kΩ ranges; 4/s on 20MΩ range.

**SETTLING TIME:** 250ms to within 6 digits at 5½-digit resolution on 0.2kΩ—2000kΩ ranges; 500ms on 20MΩ range.

## AC VOLTS (Option 1910)

RANGE	RESOLUTION			5½-DIGIT ACCURACY ±(% of rdg + digits)			
	6½*	5½	4½**	1 YEAR, 18°-28°C (above 1000 counts)		TEMPERATURE COEFFICIENT ±(% rdg + digits)/°C 0°-18°C & 28°-50°C	
				50Hz-20kHz	20kHz-100kHz	50Hz-20kHz	20-50Hz & 20kHz-100kHz
2 V	1 μV	10 μV	100 μV	0.1 +10	1+20	0.015 +.5	0.05+0.5
20 V	10 μV	100 μV	1mV	0.1 +10	1+20	0.015+.5	0.05+0.5
200 V	100 μV	1mV	10mV	0.1 +10	1+20	0.015+.5	0.05+0.5
1000 V	1mV	10mV	100mV	0.15+10†	1+20‡	0.020+.5†	0.05+0.5‡

\*Multiply digit error by 10.

\*\*Using Model 1923 Interface.

†150Hz-10kHz.  
‡20Hz-50Hz & 10kHz-20kHz.

**RESPONSE:** Average, calibrated in rms of a sine wave.

**MAXIMUM ALLOWABLE INPUT:** 1000V rms sine or DC.  
2 × 10<sup>7</sup> V/Hz.

**CMRR:** Greater than 60dB at DC, 50 & 60Hz (1kΩ in either lead).

**INPUT IMPEDANCE:** 2MΩ shunted by less than 50pF.

**BENCH READING RATE:** 2/s.

**SETTLING TIME:** Less than 1.3s to within 0.05% of final reading.

## GENERAL

**RANGING:** Manual or Fast Autoranging (less than 150ms per range change on DCV).

**ZERO:** Pushbutton zeroing of offsets.

**DISPLAY:** Seven 0.5-inch LED digits with appropriate decimal point.

**OVERRANGE INDICATION:** Display indicates polarity and OFLO.

**ISOLATION:** Input LO to IEEE LO or power line ground; 1400V peak, 5 × 10<sup>7</sup> V/Hz; greater than 10<sup>9</sup> parallel by 1200pF.

**WARMUP:** 2 hours to rated accuracy.

**ENVIRONMENTAL LIMITS:** Operating: 0°-50°C, 0% to 80% relative humidity up to 35°C. Storage: -25°C to 65°C.

**POWER:** 105-125 or 210-250 volts (internal switch selected), 50Hz-400Hz, 30V•A maximum.

**INPUT CONNECTORS:** 5-way binding posts.

**DIMENSIONS, WEIGHT:** 127mm high × 216mm wide × 359mm deep (5" × 8½" × 14½"). Net weight 3.4kg (7.5 lbs.).

## ACCESSORIES AVAILABLE:

- Model 1019 Universal Rack Mounting Kit
- Model 1600 High Voltage Probe
- Model 1641 Kelvin Test Lead Set
- Model 1651 50-Ampere Shunt
- Model 1681 Clip-On Test Lead Set
- Model 1682 RF Probe
- Model 1683 Universal Test Lead Set
- Model 1685 Clamp-On Current Probe
- Model 1901 Current Adapter
- Model 1910 ACV Option
- Model 1923 IEEE-488 Interface
- Model 1924 Rear Input Adapter

Model 7008 IEEE Cable (1.8m, 6 ft.)

Model 192 (DCV & Ohms)

Prices and specifications subject to change without notice.

For more information on specifications, refer to the Model 192 Operator's Manual, P/N 30839.

## MODEL 1923 IEEE-488 INTERFACE SPECIFICATIONS

### I. IEEE-488-1978 BUS IMPLEMENTATION:

Multiline Commands: DCL, SDC, GET, LLO, GTL, UNT, UNL, SPE, SPD.

Uniline Commands: IFC, REN, EOI, SRQ, ATN.

INTERFACE FUNCTIONS: SHL, AHL, TS, TRS, LA, LRW, SRL, RLL, PPS, DCL, DTL, CS, EI

Programmable Parameters: Function, Range, Zero, Trigger Modes, Delay, EOI State, SRQ Bus Response, Data Terminators, Data Store to 100 Readings.

Conversion Rates: Nine different conversion rates may be selected; fastest modes for DC volts are:

USEABLE RESOLUTION	INTEGRATION PERIOD	TRIGGER TO FIRST BYTE OUT
4½-digits	4.4ms	27ms
5½-digits	16.67ms*	39ms

\*20ms at 50Hz.

Data String: 16 bytes (excluding terminators).

4½-digit accuracy:  $\pm(0.015\% + 1d)$  for 1 year on DCV and Ohms (below 2000k $\Omega$ ).

Address Modes: TALK ONLY and ADDRESSABLE.

### II. STATUS PORT:

Separate port providing function and HI/LO/PASS outputs (open collector, 100mA sink).

## FRONT PANEL PROGRAMS

PROGRAM	NAME	DESCRIPTION
0	CLEAR	Cancels Programs 3 through 7.
1	RESOLUTION	Selects 5½- or 6½-digit resolution.
2	FILTER	Selects extra digital filtering.
3	OFFSET/SCALE	Displays the result of $Y = sX + b$ . s and b are entered from the front panel.
4	% DEVIATION	Displays the percent deviation from an entered value.
5	MIN/MAX	Remembers the minimum and maximum reading for front panel recall.
6	HI/LO/PASS	Displays HI, LO or PASS defined by entered limits. Status output available with 1923 option.
7	DATA LOGGER	Saves up to 100 readings for front panel recall. Interval programmable up to 1 hour.

TJD/cet  
7-17-80

### 192 Spec Addenda

The following information is supplied as clarification of 192 specifications.

1. NMRR. To prevent AD saturation, peak AC + DC value must be less than full scale on any range.
2. IEEE low to power line ground isolation is  $1M\Omega$ .
3. **Four** terminal lead resistance: Maximum per lead for additional 1 digit error at 5-1/2 digits.

Range	Resistance
.2k	7 $\Omega$
2k	22 $\Omega$
20k	70 $\Omega$
200k	220 $\Omega$
2000k	700 $\Omega$
20M	2200 $\Omega$

4. Input current. With  $1M\Omega$  shunt on 2V range, display should be less than 5 digits ( $<50pA$ ) at  $T_A = 23^{\circ}C$  (use filter program 2).