

DC VOLTS (5½ Digits)

RANGE	RESOLUTION	INPUT RESISTANCE	ACCURACY ¹		
			±(%rdg + counts)		
			24 Hours ² 23° ±1°C	90 Days 18°-28°C	1 Year 18°-28°C
300 mV	1 µV	>1 GΩ	0.004 + 3 ³	0.009 + 3 ³	0.012 + 3 ³
3 V	10 µV	>1 GΩ	0.003 + 2	0.006 + 2	0.007 + 2
30 V	100 µV	11 MΩ	0.004 + 2	0.008 + 2	0.009 + 2
300 V	1 mV	10 MΩ	0.004 + 2	0.008 + 2	0.009 + 2

¹For 4½-digit accuracy, count error is 5 (except 15 on 300mV range).
²Relative to calibration standards.
³When properly zeroed.

CMRR: >120dB at dc, 50Hz or 60Hz (±0.05%) with 1kΩ in either lead.

NMR: >60dB at 50Hz or 60Hz (±0.05%).

MAXIMUM ALLOWABLE INPUT: 300V rms or 425V peak, whichever is less.

OHMS (5½ Digits)

RANGE	RESOLUTION	NOMINAL I-SHORT	ACCURACY ¹		
			±(%rdg + counts)		
			24 Hours ⁴ 23° ±1°C	90 Days 18°-28°C	1 Year 18°-28°C
300 Ω ²	1 mΩ	1.7 mA	0.005 + 4 ³	0.009 + 4 ³	0.012 + 4 ³
3 kΩ ²	10 mΩ	1.7 mA	0.004 + 2	0.008 + 3	0.009 + 3
30 kΩ ²	100 mΩ	160 µA	0.004 + 2	0.008 + 3	0.009 + 3
300 kΩ	1 Ω	50 µA	0.014 + 2	0.024 + 3	0.026 + 3
3 MΩ	10 Ω	5 µA	0.02 + 2	0.03 + 3	0.03 + 3
30 MΩ	100 Ω	0.5 µA	0.1 + 5	0.12 + 5	0.12 + 5
300 MΩ	1 kΩ	0.5 µA	2.0 + 5	2.0 + 5	2.0 + 5

¹For 4½-digit accuracy, count error is 5 (except 15 on 300Ω range).
²4-wire accuracy, 300Ω-30kΩ ranges.
³When properly zeroed.
⁴Relative to calibration standards.

CONFIGURATION: Automatic 2- or 4-wire.

MAXIMUM ALLOWABLE INPUT: 300V rms or 425V peak, whichever is less.

OPEN CIRCUIT VOLTAGE: <5.5V.

TRMS AC VOLTS (5½ Digits)

RANGE	RESOLUTION	ACCURACY ¹			
		±(%rdg + counts) 1 Year, 18°-28°C			
		20 Hz - 50 Hz ²	50 Hz - 200 Hz ²	200 Hz - 20 kHz ²	20 kHz - 100 kHz ²
300 mV	1 µV	2 + 100	0.35 + 100	0.15 + 200	2.0 + 300
3 V	10 µV	2 + 100	0.35 + 100	0.15 + 200	1.5 + 300
30 V	100 µV	2 + 100	0.35 + 100	0.15 + 200	1.5 + 300
300 V	1 mV	2 + 100	0.35 + 100	0.15 + 200	1.5 + 300

¹For 4½-digit accuracy, divide count error by 10; 4½-digit specifications apply for inputs >200Hz.
²Sinewave inputs >2000 counts.
³Sinewave inputs >20,000 counts.

RESPONSE: True root mean square, ac coupled.

CREST FACTOR (ratio of peak to rms): Up to 3:1 allowable.

NON-SINUSOIDAL INPUTS (>20,000 counts):

For rectified sine wave, add 0.3% of reading to above specifications for fundamental frequencies <20kHz.

For pulse waveforms, add 0.3% of reading for fundamental frequencies <1kHz, or 3.5% for frequencies <10kHz.

INPUT IMPEDANCE: 1MΩ shunted by <100pF.

MAXIMUM ALLOWABLE INPUT: 300V rms or 425V peak, 10⁷V•Hz, whichever is less.

CMRR: >60dB at 50Hz or 60Hz (±0.05%) with 1kΩ in either lead.

SETTLING TIME: 1 second to within 0.1% of change in reading.

INPUT	RESOLUTION	ACCURACY ±dB	
		1 Year, 18°-28°C	
		20 Hz-20 kHz	20 kHz-100 kHz
-34 to +49 dB (20 mV to 300 V)	0.01 dB	0.2	0.4
-54 to -34 dB (2 mV to 20 mV)	0.01 dB	1.1	-

DC AMPS (5½ Digits)

RANGE	RESOLUTION	ACCURACY ¹	MAXIMUM VOLTAGE BURDEN
		±(%rdg + counts) 1 Year, 18°-28°C	
30 mA	100 nA	0.05 + 15	0.4 V
3 A	10 µA	0.1 + 15	2 V

¹For 4½-digit accuracy, count error is 20.
 MAXIMUM ALLOWABLE INPUT: 3A. Protected with 3A, 250V fuse accessible from front panel.

TRMS AC AMPS (5½ Digits)

RANGE	RESOLUTION	ACCURACY ¹		MAXIMUM VOLTAGE BURDEN
		±(%rdg + counts) 1 Year, 18°-28°C		
		20 Hz-45 Hz	45 Hz-10 kHz	
30 mA	100 nA	2 + 100	0.6 + 100	0.4 V
3 A	10 µA	2 + 100	0.6 + 100	2 V

¹Inputs >2000 counts. For 4½-digit accuracy, divide count error by 10; 4½-digit specifications apply for inputs >200Hz.

RESPONSE: True root mean square, ac coupled.

CREST FACTOR (ratio of peak to rms): Up to 3:1 allowable at ¾ full range.

NON-SINUSOIDAL INPUTS: Specified accuracy for fundamental frequencies <1kHz.

MAXIMUM ALLOWABLE INPUT: 3A. Protected with 3A, 250V fuse accessible from front panel.

SETTLING TIME: 1 second to within 0.1% of final reading.

INPUT	RESOLUTION	ACCURACY ±dB
		1 Year, 18°-28°C 20 Hz-10 kHz
-14 to +69 dB (200 µA to 3 A)	0.01 dB	0.6

MAXIMUM READING RATES (Readings/Second)¹**DCV, DCA, ACV, ACA**

RESOLUTION	Continuous Into Memory MUX:		External Trigger Into Memory MUX:		Triggered Via IEEE-488 Bus ² MUX:	
	OFF	ON	OFF	ON	OFF	ON
4½-Digit	65	65	150	62	80	49
5½-Digit	35 (29)	9 (7.5)	40 (33)	9 (7.5)	34 (29)	9 (7.5)

OHMS

RESOLUTION	Continuous Into Memory MUX:		External Trigger Into Memory MUX:		Triggered Via IEEE-488 Bus ² MUX:	
	OFF	ON	OFF	ON	OFF	ON
4½-Digit	43	20	47	20	30	18
5½-Digit	16 (13)	9 (7.5)	16 (13)	9 (7.5)	15 (12.5)	9 (7.5)

¹Reading rates are for fixed range readings with filters off, for 3V, 3k Ω , and 30mA ranges. 5½-digit rate is for 60Hz operation. Values in parentheses are for 50Hz operation.

²One shot on TALK.

STORAGE & SCANNING CAPABILITIES

500-Reading Memory: Stores reading, range, and scanner channel.

Trigger: One shot or continuous from front panel, IEEE-488 bus, and rear panel BNC.

Programmable Reading Interval: 15ms to 999.999s.

Programmable Trigger Delay: 1ms to 999.999s.

WITH MODEL 1992 8-CHANNEL SCANNER

Programmable Configuration: 2- or 4-pole.

Programmable Channel Limit: 1 to 8.

Programmable Scanning Modes: Manual, step, and scan.

Ratio: Channels 2 through 8 referenced to Channel 1.

IEEE-488 BUS IMPLEMENTATION

MULTILINE COMMANDS: DCL, LLO, SDC, GET, GTL, UNT, UNL, SPE, SPD.

UNILINE COMMANDS: IFC, REN, EOI, SRQ, ATN.

INTERFACE FUNCTIONS: SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT1, C0, E1.

All front panel functions and programs are available over the IEEE-488 bus, in addition to Status, Service Request, Output Format, EOI, Trigger, Terminator, Display Message, and Non-Volatile TRANSLATOR.

IEEE-488 address is programmable from the front panel.

MODEL 1992 SCANNER OPTION

CONTACT CONFIGURATION: 8-channel 2-pole, or 4-channel 4-pole.

CONTACT POTENTIAL: <1 μ V per contact pair.

MAXIMUM SWITCHING RATE: 40 channels/second, including Model 199 4½-digit DCV reading time.

CONNECTOR TYPE: Quick disconnect screw terminals, #14 AWG maximum wire size.

MAXIMUM SIGNAL LEVEL: 200V peak, 100mA, resistive load.

CONTACT LIFE: >10⁶ operations (at maximum signal level); >10⁸ operations (cold switching).

CONTACT RESISTANCE: <1 Ω .

ISOLATION BETWEEN ANY TWO TERMINALS: >10⁹ Ω , <75pF.

ISOLATION BETWEEN ANY TERMINAL AND EARTH: >10⁹ Ω , <150pF.

COMMON MODE VOLTAGE: 350V peak between any terminal and earth.

MAXIMUM VOLTAGE

BETWEEN ANY TWO TERMINALS: 200V peak.

MAXIMUM VOLTAGE BETWEEN ANY TERMINAL AND MODEL 199 INPUT LO: 200V peak.

DIMENSIONS, WEIGHT: 25mm high \times 130mm wide \times 170mm deep (1 in. \times 5 in. \times 6½ in.). Adds 0.3kg (8 oz.) to Model 199.

GENERAL

MAXIMUM READING: 302,999 counts in 5½-digit mode.

CONNECTORS: **Measurement:** Switch selectable front or rear, safety jacks. **Digital:** TRIGGER input and METER COMPLETE output on rear panel, BNCs.

WARMUP: 2 hours to rated accuracy.

TEMPERATURE COEFFICIENT (0°-18°C & 28°-50°C): < $\pm(0.1 \times \text{applicable accuracy specification})/^\circ\text{C}$.

ISOLATION: Input LO to IEEE LO or power line ground: 500V peak. 5×10^8 V \cdot Hz maximum. >10⁹ Ω paralleled by 400pF.

OPERATING ENVIRONMENT: 0°-50°C, 80% relative humidity up to 35°C; linearly derate 3% RH/ $^\circ\text{C}$, 35°-50°C (0%-60% RH up to 28°C on 300M Ω range).

STORAGE ENVIRONMENT: -25° to +65°C.

POWER: 105-125V or 210-250V, rear panel switch selected, 50Hz or 60Hz, 20VA maximum. 90-110V and 180-220V versions available upon request.

DIMENSIONS, WEIGHT: 90mm high \times 220mm wide \times 330mm deep (3½ in. \times 8½ in. \times 12¼ in.). Net weight 3kg (6 lbs., 8 oz.).

ACCESSORIES SUPPLIED: Model 1751 Safety Test Leads, Instruction Manual.

ACCESSORIES AVAILABLE:

Model 1992: 8-Channel Scanner

Model 1993: Quick Disconnect Scanner Connector Kit

Model 1998-1: Single Fixed Rack Mounting Kit

Model 1998-2: Dual Fixed Rack Mounting Kit

Model 1651: 50-Ampere Shunt

Model 1681: Clip-On Test Lead Set

Model 1682A: RF Probe

Model 1685: Clamp-On Current Probe

Model 1751: General Purpose Test Leads

Model 1754: Universal Test Lead Kit

Model 5806: Kelvin Clip Leads

Model 7007-1: Shielded IEEE-488 Cable, 1m

Model 7007-2: Shielded IEEE-488 Cable, 2m

Model 7008-3: IEEE-488 Cable, 0.9m (3 ft.)

Model 7008-6: IEEE-488 Cable, 1.8m (6 ft.)