

SPECIFICATIONS

DC VOLTS

RANGE	RESOLUTION	INPUT RESISTANCE	ACCURACY **	
			± (%rdg + counts)	
			24 Hr., * 22°-24°C	1 Yr., 18°-28°C
200mV	1 μV	>1GΩ	0.007+2	0.016+3
2 V	10 μV	>1GΩ	0.005+2	0.011+2
20 V	100 μV	11MΩ	0.006+2	0.015+2
200 V	1mV	10MΩ	0.006+2	0.015+2
1000 V	10mV	10MΩ	0.007+2	0.015+2

*Relative to calibration accuracy. **When properly zeroed.

NMRR: Greater than 60dB at 50Hz, 60Hz ±0.1%.

MAXIMUM ALLOWABLE INPUT: 1000V dc or peak ac (less than 10 seconds per minute on the 200mV and 2V ranges; 300V rms continuous).

SETTLING TIME: 1 second to within 3 counts of final reading on range.

dB MODE (ref: 600Ω): Accuracy: ±(0.02dB+1 count) above -78dBm. Resolution: 0.01dB above 0.5% of range.

TRMS AC VOLTS

RANGE	ACCURACY (1 Yr.)				
	18°-28°C ± (%rdg + counts)				
	20Hz - 50Hz*	50Hz - 10kHz*	10kHz - 20kHz*	20kHz - 50kHz**	50kHz - 100kHz**
200mV	1.00+100	0.35+100	0.6+200	1.5+250	5+400
2V - 200V	1.00+100	0.35+100	0.6+200	1.5+250	3+400
750V	1.25+100	0.75+100	1.0+200	1.8+250	3+400

*Above 1800 counts. **Above 18000 counts.

MAXIMUM ALLOWABLE INPUT: 750V rms, 1000V peak (less than 10 seconds per minute on 200mV and 2V ranges; 300V rms continuous). 10°V•Hz maximum.

3dB BANDWIDTH: 300kHz typical.

INPUT IMPEDANCE: 1MΩ paralleled by less than 75pF on 200V and 750V ranges. 1.1MΩ paralleled by 75pF on 200mV, 2V and 20V ranges. Capacitively coupled.

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

dB MODE (ref: 600Ω):

RANGE	INPUT	ACCURACY (± dBm)			
		18°-28°C ± (%rdg + counts)			
		20Hz - 10kHz	10kHz - 20kHz	50kHz	100kHz
2V - 750V	200mV to 750 V (-12 to 59.8dBm)	0.18	0.18	0.28	0.50
200mV	20mV to 200mV (-32 to -12dBm)	0.18	0.18	0.28	0.65
	2mV to 20mV (-52 to -32dBm)	0.85	1.10	2.00	—
	1mV to 2mV (-58 to -52dBm)	2.00	3.00	—	—

RESOLUTION: 0.01dB above 0.5% of range.

DC AMPS

RANGE	RESOLUTION	MAXIMUM VOLTAGE BURDEN	ACCURACY (1 Yr.)
			18°-28°C ± (%rdg + counts)
200 μA	1nA	0.3V	0.1 + 15**
2mA	10nA	0.3V	0.1 + 15
20mA	100nA	0.3V	0.1 + 15
200mA	1 μA	0.3V	0.2 + 15
2000mA	10 μA	0.8V	0.2 + 15
10 A	100 μA	0.3V	0.75 + 15*

*Above 5A derate 0.15% rdg per amp for self-heating.

**When properly zeroed.

OVERLOAD PROTECTION: mA Input: 2A fuse (250V), externally accessible. 10A Input: 20A for 15s, unfused.

SETTLING TIME: 1 second to within 3 counts of final reading.

TRMS AC AMPS

RANGE	MAXIMUM VOLTAGE BURDEN	ACCURACY (1 Yr.)*		
		18°-28°C ± (%rdg + counts)		
		20Hz - 50Hz	50Hz - 10kHz	10kHz - 30kHz
200μA - 20mA	0.3V	1.0+100	0.8+100	2+250
200mA	0.3V	1.0+100	0.8+100	—
2000mA	0.8V	1.0+100	0.8+100	—
10 A	0.3V	1.5+100**	1.0+100**	—

*Above 1800 counts. **1kHz max. Above 5A derate 0.15% rdg/amp for self-heating.

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

OHMS

RANGE	RESOLUTION	NOMINAL I-SHORT	MAX V ACROSS UNKNOWN	ACCURACY	
				± (%rdg + counts)	
				24 Hr., 22°-24°C	1 Yr., 18°-28°C
200 Ω	1mΩ	2mA	0.5V	0.01 + 2*	0.02 + 3*
2 kΩ	10mΩ	2mA	4.0 V	0.01 + 2	0.018 + 2
20 kΩ	100mΩ	400 μA	4.0V	0.014 + 2	0.026 + 2
200 kΩ	1 Ω	40 μA	4.0V	0.014 + 2	0.026 + 2
2MΩ**	10 Ω	4 μA	4.0V	0.02 + 2	0.035 + 2
20MΩ**	100 Ω	400 nA	4.0V	0.10 + 2	0.12 + 2
200MΩ**	10 kΩ	400 nA	5.0V	2.00 + 1	2.00 + 1

*When properly zeroed. **Appropriate range selected automatically in MΩ.

CONFIGURATION: Automatic 2- or 4-terminal.

MAXIMUM ALLOWABLE INPUT: 450V dc or peak ac 10 seconds per minute. 350V rms continuous.

OPEN-CIRCUIT VOLTAGE: +5V.

DIODE TEST: Display reads junction voltage up to 2.2V. Test Current: 1.6mA nominal.

SETTLING TIME: 2 seconds to within 3 counts of final reading on range.

GENERAL

DISPLAY: ±220,000 count LCD, 0.45 in. height; polarity, function, range, and status indication.

RANGING: Auto or manual on dc volts, ac volts, and ohms; manual on ac amps and dc amps.

RELATIVE: Pushbutton allows zeroing of on range readings. Allows readings to be made with respect to baseline value. Front panel annunciator indicates REL mode.

DATA LOGGER and MIN/MAX: 100 reading storage capacity; records data at one of six selectable rates from 3 readings/second to 1 reading/hour or by manual triggering. Also detects and stores maximum and minimum readings continuously while in data logger mode.

CONVERSION RATE: 3 readings/second.

OVERRANGE INDICATION: "OL" displayed.

CREST FACTOR (ratio of peak value to rms value), AC FUNCTIONS: 3.

MAXIMUM COMMON MODE VOLTAGE: 500V peak.

COMMON MODE REJECTION RATIO (1kΩ unbalance): Greater than 120dB at dc, 50Hz, 60Hz ±0.1%. Greater than 60dB in ac volts.

TEMPERATURE COEFFICIENT (0°-18°C & 28°-50°C): ±(0.1× applicable one year accuracy specification)/°C.

ENVIRONMENT: Operating: 0°-50°C; less than 80% relative humidity up to 35°C; linearly derate 3% RH/°C, 35°-50°C. Storage: -25° to 60°C.

WARMUP: 1 hour to rated accuracy.

POWER: 105-125V or 210-250V (external switch selected), 90-110V available; 50-60Hz, 12V•A. Optional 5-hour battery pack. Model 1978.

DIMENSIONS, WEIGHT: 89mm high × 235mm wide × 275mm deep (3 1/2 in. × 9 1/4 in. × 10 3/4 in.). Net weight 1.8kg (3 lbs., 14 oz.).

ACCESSORIES SUPPLIED: Model 1751 safety test leads, instruction manual.

ACCESSORIES AVAILABLE:

- Model 1010: Single Rack Mounting Kit
- Model 1017: Dual Rack Mounting Kit
- Model 1301: Temperature Probe
- Model 1600A: High Voltage Probe
- Model 1641: Kelvin Test Lead Set
- Model 1651: 50-Ampere Current Shunt
- Model 1681: Clip-On Test Lead Set
- Model 1682A: RF Probe
- Model 1684: Hard Shell Carrying Case
- Model 1685: Clamp-On Ac Probe
- Model 1751: Safety Test Leads
- Model 1754: Universal Test Lead Kit
- Model 1972: IEEE-488 with Analog Output
- Model 1973: IEEE-488 Interface
- Model 1978: Rechargeable Battery Pack
- Model 7008-3: IEEE-488 Digital Cable (3 ft.)
- Model 7008-6: IEEE-488 Digital Cable (6 ft.)
- Model 8573: IEEE-488 Interface for IBM PC (use with 1972/3)

SECTION 1

GENERAL INFORMATION

1.1 INTRODUCTION

The Model 197 is a six function, 5½ digit resolution autoranging digital multimeter with a ±220,000 count LCD (Liquid Crystal Display). This A/D range is greater than the normal ±199,999 count A/D used in many 5½ digit DMMs. The 5½ digit resolution allows the Model 197 to measure DC voltage from 1μV/count to 1000V. AC voltage and current measurements are standard in the Model 197. TRMS ACV capability ranges from 1μV/count to 750V. The Model 197 measures resistance from 1mΩ to 220MΩ on seven resistance ranges. The Model 197 has six current ranges that measure current from 1nA (10⁻⁹A) to 10A.

The dB function makes it possible to compress a large range of readings into a much smaller scope. The Model 197 dBm measurements are referenced to the standard 600Ω impedance but can be modified with the use of relative (REL) feature.

The Model 197 has two IEEE-488 interface options: The Model 1972 and the Model 1973. These optional interfaces enhance the capabilities of the Model 197 by allowing programmed control over the IEEE-488 bus. The Model 1972 also includes an analog output. The bus commands are the same for each interface and respond to IEEE-488 protocol.

1.2 FEATURES

The Model 197 includes the following features:

1. Six Measurement Functions—DCV, ACV, DCA, ACA, OHMS and dB all built in.
2. (REL) Relative Mode—The relative mode allows offsets to be nulled out (e.g. test lead resistance for low resistance measurements) and selects a variety of reference impedances for dB measurements.
3. Digital Calibration—A non-volatile RAM stores calibration constants and can be performed from the front panel or over the IEEE-488 bus.
4. Data Logger—A data storage buffer is included to allow up to 100 readings and minimum/maximum readings be internally stored at a user selectable rate. The buffer may be read and controlled from the front panel or over the IEEE-488 bus. In the talk-only mode, the output rate can also be programmed.
5. Autoranging—The Model 197 includes a fast autoranging feature for easier measurements.
6. 5½ Digit Resolution—The Model 197 has a ±220,000 count A/D that surpasses the more common ±199,999 count A/D.
7. Four Terminal Ohms—These terminals are used to eliminate the voltage drop across the current carrying leads.
8. Sensitivity—The Model 197 has 1μV, 1mΩ and 1nA sensitivity. The 1μV of sensitivity allows minute levels of offset, temperature etc. A 1nA sensitivity allows low current measurements without special equipment. Measure leakage, bias and offset current. A 1mΩ sensitivity allows easy low resistance measurements.

1.3 WARRANTY INFORMATION

Warranty information may be found on the inside front cover of this manual. Should it become necessary to exercise the warranty, contact your Keithley representative or the factory to determine the proper course of action. Keithley Instruments maintains service facilities in the United States, United Kingdom and throughout Europe. Information concerning the application, operation or service of your instrument may be directed to the applications engineer at any of these locations. Check the inside front cover for addresses.

1.4 MANUAL ADDENDA

Information concerning improvements or changes to this instrument which occur after the printing of this manual will be found on an addendum sheet included with this manual. Be sure to review these changes before attempting to operate or service the instrument.

1.5 SAFETY SYMBOLS AND TERMS

The following safety symbols and terms are used in this manual or found on the Model 197.

The symbol  on the instrument denotes the user should refer to the operating instructions in this manual.

The symbol  on the instrument denotes that a potential of 1000V or more may be present on the terminal(s). Standard safety practices should be observed when such dangerous levels are encountered.