

# MODEL 195 SPECIFICATIONS

PART NUMBER

SPEC-195

## DC VOLTS

RANGE	RESOLUTION	INPUT RESISTANCE	ACCURACY†‡		TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C
			± (%rdg + counts) 24 Hr., 23°±1°C	1 Yr., 18°-28°C	
20mV	100 nV	>1 GΩ	0.01+40	0.025+40	0.003+2
200mV	1 μV	>1 GΩ	0.01+6	0.025+6	0.003+0.5
2 V	10 μV	>1 GΩ	0.01+8	0.020+8	0.003+0.5
20 V	100 μV	10MΩ	0.01+6	0.030+6	0.003+0.5
200 V	1mV	10MΩ	0.01+8	0.025+8	0.003+0.5
1000 V	10mV	10MΩ	0.01+6	0.025+6	0.003+0.5

† After pushbutton or bus zeroing

‡ In 4½-digit mode, counts = ±2 (except ±4 on 20mV range after zeroing).

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

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

MAXIMUM ALLOWABLE INPUT: 1000V peak.

BENCH READING RATE: 5 readings/second.

## OHMS

RANGE	RESOLUTION	OUTPUT I short	Vopen	ACCURACY†‡		TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C
				± (%rdg + counts) 24 Hr., 23°±1°C	1 Yr., 18°-28°C	
20 Ω	100 μΩ	- 2mA	-2V	0.015+25	0.025+25	0.003+2
200 Ω	1mΩ	- 2mA	-2V	0.015+7	0.025+7	0.003+0.5
2 kΩ	10mΩ	- 2mA	-2V	0.015+5	0.022+5	0.003+0.5
20 kΩ	100mΩ	- 20 μA	-2V	0.015+7	0.025+7	0.003+0.5
200 kΩ	1 Ω	- 20 μA	-2V	0.015+5	0.022+5	0.003+0.5
2MΩ	10 Ω	- 200 nA	-2V	0.03+7	0.050+7	0.015+1
20MΩ	100 Ω	- 200 nA	-2V	0.06+5	0.100+5	0.025+1

† After pushbutton or bus zeroing.

‡ In 4½-digit mode, counts = ±2 (except ±4 on 20Ω range after zeroing).

CONFIGURATION: Automatic 2- or 4-terminal.

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

BENCH READING RATE: 3 readings/second except 20MΩ range, 1 reading/second.

## TRMS AC VOLTS (Option 1950)

RANGE	RESOLUTION	ACCURACY (1 YEAR)†			
		20Hz-45Hz	45Hz-10kHz	10kHz-20kHz	20kHz-50kHz
200mV ±	1 μV	0.8+200	0.3+200	0.7+200	2.0+300
2 V	10 μV	0.8+200	0.3+200	0.7+200	2.0+250
20 V	100 μV	0.8+200	0.3+200	0.7+200	1.5+250
200 V	1mV	0.8+200	0.3+200	0.7+200	1.5+250
700 V	10mV	0.8+200	0.3+200	0.7+200	1.5+250

† In 4½-digit mode, divide count error by 10.

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

RESPONSE: True root mean square, AC coupled.

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

INPUT IMPEDANCE: 2MΩ shunted by less than 75pF.

MAXIMUM ALLOWABLE INPUT: 1000V peak, 10°V•Hz.

BENCH READING RATE: 3 readings/second.

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

BANDWIDTH: -3dB at 250kHz typical.

## DC AMPS (Option 1950)

RANGE	RESOLUTION	ACCURACY (1 YEAR)†‡		TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C	MAXIMUM VOLTAGE BURDEN
		± (%rdg + counts) 18°-28°C	0°-18°C & 28°-50°C		
20 μA	100pA	0.14+401		0.01+2	0.03 V
200 μA	1nA	0.09+10		0.01+0.5	0.25 V
2mA	10nA	0.09+10		0.01+0.5	0.25 V
20mA	100nA	0.09+10		0.01+0.5	0.25 V
200mA	1μA	0.09+10		0.01+0.5	0.28 V
2 A	10μA	0.09+10		0.01+0.5	1 V

† In 4½-digit mode, counts = ±2 (except ±4 on 20μA range after zeroing).

‡ After pushbutton or bus zeroing.

OVERLOAD PROTECTION: 2A fuse (250V), externally accessible.

BENCH READING RATE: 5 readings/second.

LTR	REVISIONS	APP.	DATE	DRN. D.I.K.	DATE
A	8623 RELEASED	Ⓜ	8-19-82	CKD.	DATE
B	8623 REVISED	Wile	9-20-82	APP.	DATE



Keithley Instruments Inc.  
Cleveland, Ohio 44139

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**TRMS AC AMPS (Option 1950)**

RANGE	RESOLUTION	ACCURACY (1 YEAR)† ± TEMPERATURE		MAXIMUM VOLTAGE BURDEN
		45Hz-10kHz ± (% rdg + counts) 18°-28°C	COEFFICIENT ± (% rdg + counts) / °C 0°-18°C & 28°-50°C	
200 μA	1nA	0.6+200	0.04+10	0.25V
2mA	10nA	0.6+200	0.04+10	0.25V
20mA	100nA	0.6+200	0.04+10	0.25V
200mA	1μA	0.6+200	0.04+10	0.28V
2 A	10μA	0.6+200	0.04+10	1 V

†In 4 1/2-digit mode, divide count error by 10. ‡ ABOVE 0.5% OF RANGE. (B)

**RESPONSE:** True root mean square, AC coupled.  
**CREST FACTOR** (ratio of peak to rms): Up to 3:1 allowable.  
**OVERLOAD PROTECTION:** 2A fuse (250V), externally accessible.  
**BENCH READING RATE:** 3 readings/second.

**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, T5, TE0, L4, LEO, SRI, RLI, PP0, DC1, DT1, C0, E1.  
**Programmable Parameters:** Range, Function, Zero, Integration Period, Averaging, EOI, Trigger, Terminator, Delay\*, 100-rdg. Storage, Calibration, Display, Multiplex Off, Status, Service Request, Self Test, Output Format.  
 \*First reading is correct when step input is coincident with trigger.

USEABLE RESOLUTION	INTEGRATION PERIOD	TRIGGER TO FIRST BYTE OUT	MAXIMUM READING RATE <sup>1</sup>
3 1/2-Digit	3.3 ms	17ms	76
4 1/2-Digit	16.66ms <sup>1</sup>	30ms	36
5 1/2-Digit	100 ms	114ms	9

<sup>1</sup>Readings/second. <sup>2</sup>20ms at 50Hz.  
**Address Modes:** TALK ONLY and ADDRESSABLE.

**FRONT PANEL PROGRAMS**

- 0 Clear - Cancels program mode.
- 1 Non-volatile RAM storage - Store programs 3, 4, 5 and 8 data in NVRAM
- 2 Multiplex - Defeats input amplifier multiplexing.
- 3 IEEE bus mode - ADDRESSABLE and TALK ONLY entry.
- 4 Line frequency - Selects 50Hz or 60Hz operation.
- 5 Calibration - Performs digital calibration.
- 6 Extended programs - Enables entry to optional expansion programs.
- 7 Data logger - Allows 100-reading storage at 9 programmable rates; also stores highest, lowest and average reading.
- 8 Diagnostics - Troubleshooting aid and self-test.
- 9 Trigger - enables front panel or external triggering.

**GENERAL**

**DISPLAY:** Six 0.5" LED digits with decimal point, exponent and polarity. Function and IEEE bus status also displayed.  
**RANGING:** Manual or fast autoranging (150ms per range change on DCV).  
**ISOLATION:** Input LO to IEEE LO or power line ground: 500V max, 5 × 10<sup>9</sup> V•Hz; greater than 10<sup>9</sup>Ω paralleled by 300pF.  
**WARMUP:** 1 hour to rated accuracy.  
**OPERATING ENVIRONMENT:** 0°-50°C, 0% to 80% relative humidity up to 35°C.  
**STORAGE ENVIRONMENT:** -25° to 65°C.  
**POWER:** 105-125V or 210-250V (internal switch selected), 50Hz to 400Hz, 24V•A maximum. 90-110V and 180-220V version available upon request.  
**CONNECTORS:** Analog: Switch selectable front or rear, 5-way gold plated binding posts. Digital: "Trigger" input and "Voltmeter Complete" output on rear panel, BNCs.  
**DIMENSIONS, WEIGHT:** 127mm high × 216mm wide × 359mm deep (5" × 8 1/2" × 14 1/8"). Net weight 3.2kg (7 lbs.).  
**ACCESSORIES AVAILABLE:**  
 Model 1019A: 5 1/2" Universal Fixed Rack Mounting Kit  
 Model 1019S: 5 1/2" Universal Slide Rack Mounting Kit  
 Model 1600A: High Voltage Probe  
 Model 1641: Kelvin Test Lead Set  
 Model 1651: 50-Ampere Shunt  
 Model 1681: Clip-On Test Lead Set  
 Model 1682A: RF Probe  
 Model 1683: Universal Test Lead Set  
 Model 1685: Clamp-On Current Probe  
 Model 1950: TRMS ACV, ACA, DCA Option  
 Model 7008-3: IEEE-488 Cable, 3 ft. (0.9m)  
 Model 7008-6: IEEE-488 Cable, 6 ft. (1.8m)  
 Prices and specifications subject to change without notice.

LTR	REVISIONS	APP.	DATE	DRN. D.J.K.	DATE 8-19-82
A	B623 RELEASED		8-19-82	CKD.	DATE
B	B689 REVISED		9-20-82	APP.	DATE

**KEITHLEY** Keithley Instruments Inc.  
 Cleveland, Ohio 44139

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Spec Addenda

The following is supplied as clarification of the 195/1950 specifications:

195

1. The NMRR specification is at 50 or 60Hz, + or - .1%. For line frequencies out of this tolerance the filter mode can be used to improve measurement ability.
2. The front panel zero requirement necessary to meet rated accuracy, should be performed within an hour of making measurements. This applies to a warmed up instrument under stable temperature conditions.
3. Program 2 defeats the auto cal and auto zeroing of the A-D converter and input amplifier. In this mode, measurements should be made in a stable environment to maintain rated accuracy. It is recommended to periodically exit Program 2 to allow the instrument to re-autocal and zero itself.

1950

1. Crest Factor: Specified for pulse widths  $\geq 100\mu\text{s}$ , peak voltage  $\leq 1.5$  times full scale.

LTR	REVISIONS	APP.	DATE	DRN. WZ	DATE	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;"><b>KEITHLEY</b></div> <div>Keithley Instruments Inc. Cleveland, Ohio 44139</div> </div>
A	RELEASE 8623	CS	8-19-82	CKD.	DATE	
B	8629 REVISED	WIL	9-20-82	APP.	DATE	
<p>SPECIFICATIONS MODEL 195</p>						<p>PART NUMBER SPEC-195</p>