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# MODEL 195A SPECIFICATIONS

PART NUMBER

SPEC 195A

### DC VOLTS

(5 1/2 Digits)

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

<sup>1</sup>After pushbutton or bus zeroing.  
<sup>2</sup>In 4 1/2 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

(5 1/2 Digits)

RANGE	RESOLUTION	OUTPUT I short	OUTPUT V open	ACCURACY <sup>1</sup> ± (%rdg + counts)		TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C
				24Hr., 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

<sup>1</sup>After pushbutton or bus zeroing.  
<sup>2</sup>In 4 1/2-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.

### TEMPERATURE

(5 1/2 Digits)

SPAN	RESOLUTION	4-WIRE ACCURACY <sup>1</sup> ± (%rdg + counts)		TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C
		1 Yr., 18°-28°C	1 Yr., 18°-28°C	
°C				
-200.00° to 230.00°	0.01°	0.03 + 10	0.03 + 10	0.003 + 0.4
230.00° to 630.00°	0.01°	0.03 + 40	0.03 + 40	0.003 + 4
-220.00° to -200.00°	0.01°	0.03 + 40	0.03 + 40	0.003 + 4
°F				
-328.00° to 448.00°	0.01°	0.03 + 18	0.03 + 18	0.003 + 0.7
448.00° to 1100.00°	0.01°	0.03 + 72	0.03 + 72	0.003 + 7
-360.00° to -328.00°	0.01°	0.03 + 72	0.03 + 72	0.003 + 7

<sup>1</sup>Autorange mode, excluding probe errors.  
 RTD TYPE: 100Ω platinum; DIN 43 760 or IPTS-68, Programmable alpha and delta 3- or 4-wire.  
 MAXIMUM LEAD RESISTANCE (each lead): 4-wire: 25Ω.  
 3-wire: 15Ω.  
 SENSOR CURRENT: 1.0mA maximum, RMS.  
 BENCH READING RATE: 1.2 reading per second.  
 MAXIMUM COMMON MODE VOLTAGE: 500V (42V with Model 1951 connected).  
 COMMON MODE REJECTION: Less than 0.006°C/volt at DC, 50Hz and 60Hz (1000 unbalance, LO driven).  
 MAXIMUM ALLOWABLE INPUT: 360V peak, 250V rms.

### TRMS AC VOLTS (Option 1950)

(5 1/2 Digits)

RANGE	RESOLUTION	ACCURACY (1 Year) <sup>1</sup> ± (%rdg + counts)			
		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

<sup>1</sup>In 4 1/2 digit mode, divide count error by 10.  
 \*Above 1mV.  
 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<sup>7</sup>V<sup>2</sup>/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)

(5 1/2 Digits)

RANGE	RESOLUTION	ACCURACY (1 YEAR) <sup>1</sup> ± (%rdg + counts)	TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C	MAXIMUM VOLTAGE BURDEN
20 μA	100pA	0.14 + 40 <sup>2</sup>	0.01 + 2	0.03V
200 μA	1nA	0.09 + 10	0.01 + 0.5	0.25V
2mA	10nA	0.09 + 10	0.01 + 0.5	0.25V
20mA	100nA	0.09 + 10	0.01 + 0.5	0.25V
200mA	1μA	0.09 + 10	0.01 + 0.5	0.25V
2 A	10μA	0.09 + 10	0.01 + 0.5	1 V

<sup>1</sup>In 4 1/2 digit mode, counts = ± 2 (except ± 4 on 20μA range after zeroing).  
<sup>2</sup>After pushbutton or bus zeroing.  
 OVERLOAD PROTECTION: 2A fuse (250V), externally accessible.  
 BENCH READING RATE: 5 readings/second.

### TRMS AC AMPS (Option 1950)

(5 1/2 Digits)

RANGE	RESOLUTION	ACCURACY (1 YEAR) <sup>1</sup> ± (%rdg + counts)	TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C	MAXIMUM VOLTAGE BURDEN
200 μA	1nA	0.6 + 250	0.04 + 10	0.25V
2mA	10nA	0.6 + 250	0.04 + 10	0.25V
20mA	100nA	0.6 + 250	0.04 + 10	0.25V
200mA	1 μA	0.6 + 250	0.04 + 10	0.25V
2 A	10 μA	0.6 + 250	0.04 + 10	1 V

<sup>1</sup>In 4 1/2 digit mode, divide count error by 10.  
 \*Above 0.5% of range.  
 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.

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LTR	REVISIONS	APP.	DATE	DRN <i>[Signature]</i>	DATE <i>2/23/88</i>	<b>KEITHLEY</b> Keithley Instruments Inc. Cleveland, Ohio 44139
A	9721 RELEASED	Ⓟ	03/4/88	CKD.	DATE	
				APP.	DATE	
SPECIFICATIONS						PART NUMBER SPEC 195A

**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, TS, TED, LA, LED, SRT, RL1, PPO, 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.

Conversion Rates (DC Volts):

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

†Readings/second.

‡20ms at 60Hz.

Address Modes: TALK ONLY and ADDRESSABLE.

**FRONT PANEL PROGRAMS**

- 0 Clear—Cancels program mode.
- 1 Non-Volatile RAM Storage—Store programs 3, 4, 5, 6 and 8 data in NVRAM
- 2 Multiplex—Defaults 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 Temperature—Allows °C and °F temperature measurements.
- 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 x 10<sup>5</sup> V•Hz; greater than 10<sup>10</sup> paralleled by 300pF.

WARMUP: 1 hour to rated accuracy.

OPERATING ENVIRONMENT: 0°-60°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 x 216mm wide x 358mm deep (5" x 8 1/2" x 14 1/8 "). Net weight 3.2kg (7 lbs.).

**SPEC ADDENDA**

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

**195A**


- 1. The NMRR specification is at 50 or 60Hz, ± .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 ≥ 100µsec, peak voltage ≤ 1.5 times full scale.

**ACCESSORIES AVAILABLE**

- Model 1019A: Universal Fixed Rack Mounting Kit
- Model 1019S: Universal Slide Rack Mounting Kit
- Model 1000A: 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 1686: Clamp-On Current Probe
- Model 1950: TRMS ACV, ACA, DCA Option
- Model 1951: Input Adapter for Temperature Probes (4-wire)
- Model 7008-3: IEEE-488 Cable, 3 ft. (0.9m)
- Model 7008-6: IEEE-488 Cable, 6 ft. (1.8m)
- Model 8891: Connector Kit (enables connecting to 3- or 4-wire RTDs)
- Model 8893: General Purpose/Immersion Probe (4-wire)
- Model 8896: Surface Probe (4-wire)
- Model 8898: Air/Gas Probe (4-wire)

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