

MODEL 195A

SPECIFICATIONS

PART NUMBER
SPEC 195

DC VOLTS

(5 1/2 Digits)

RANGE	RESO- LUTION	INPUT RESISTANCE	ACCURACY ¹ ± (%rdg + counts)		TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C 0°-18°C & 28°-50°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 + 8	0.025 + 8	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 + 8	0.030 + 8	0.003 + 0.5
200 V	1mV	10MΩ	0.01 + 8	0.025 + 8	0.003 + 0.5
1000 V	10mV	10MΩ	0.01 + 8	0.025 + 8	0.003 + 0.5

¹After pushbutton or bus zeroing.
[†]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	RESO- LUTION	OUTPUT I short V open	ACCURACY ¹ ± (%rdg + counts)		TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C 0°-18°C & 28°-50°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

¹After pushbutton or bus zeroing.
[†]In 4 1/2-digit mode, counts = ±2 (except ±4 on 200 range after zeroing).
 CONFIGURATION: Automatic 2- or 4-terminal.
 MAXIMUM ALLOWABLE INPUT: 380V peak or 250V rms.
 BENCH READING RATE: 3 readings/second except 20MΩ range, 1 reading/second.

TEMPERATURE

(5 1/2 Digits)

SPAN	RESO- LUTION	4-WIRE ACCURACY ¹ ± (%rdg + counts)		TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C 0°-18°C & 28°-50°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

¹Autorange 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 0.005°C/volt at DC, 50Hz and 60Hz
 (100Ω unbalance, LO driven).
 MAXIMUM ALLOWABLE INPUT: 380V peak, 250V rms.

TRMS AC VOLTS (Option 1950)

(5 1/2 Digits)

RANGE	RESO- LUTION	ACCURACY (1 Year) [†] ± (%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

[†]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, 10⁷V/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	RESO- LUTION	ACCURACY (1 YEAR) [†] ± (%rdg + counts)		TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C 0°-18°C & 28°-50°C	MAXIMUM VOLTAGE BURDEN
		18°-28°C	18°-28°C		
20 μA	100pA	0.14 + 40†	0.14 + 40†	0.01 + 2	0.03V
200 μA	1nA	0.09 + 10	0.09 + 10	0.01 + 0.5	0.25V
2mA	10nA	0.09 + 10	0.09 + 10	0.01 + 0.5	0.25V
20mA	100nA	0.09 + 10	0.09 + 10	0.01 + 0.5	0.25V
200mA	1μA	0.09 + 10	0.09 + 10	0.01 + 0.5	0.28V
2 A	10μA	0.09 + 10	0.09 + 10	0.01 + 0.5	1 V

[†]In 4 1/2 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.

TRMS AC AMPS (Option 1950)

(5 1/2 Digits)

RANGE	RESO- LUTION	ACCURACY (1 YEAR) [†] ± (%rdg + counts)		TEMPERATURE COEFFICIENT ± (%rdg + counts)/°C 0°-18°C & 28°-50°C	MAXIMUM VOLTAGE BURDEN
		48Hz-10kHz 18°-28°C	18°-28°C		
200 μA	1nA	0.6 + 250	0.6 + 250	0.04 + 10	0.25V
2mA	10nA	0.6 + 250	0.6 + 250	0.04 + 10	0.25V
20mA	100nA	0.6 + 250	0.6 + 250	0.04 + 10	0.25V
200mA	1 μA	0.6 + 250	0.6 + 250	0.04 + 10	0.28V
2 A	10 μA	0.6 + 250	0.6 + 250	0.04 + 10	1 V

[†]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.

IEEE-488 BUS IMPLEMENTATION

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

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

Interface Functions: SH1, AH1, TS, TED, LA, LEO, SR1, RL1, PPO, DC1,

DT1, CO, E1.

Programmable Parameters: Range, Function, Zero, Integration Period, Averaging, EOJ, 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 ½ Digit	3.3 ms	17ms	76
4 ½ Digit	15.6ms†	30ms	38
5 ½ Digit	100 ms	114ms	9

†Readings/second.

‡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, 6 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 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, 5×10^5

V/Hz; greater than 10^9 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 × 358mm deep (5" × 8 ½" × 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, $\pm .1\%$. 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 $\geq 100\mu\text{sec}$, peak voltage ≤ 1.5 times full scale.

ACCESSORIES AVAILABLE

Model 1018A: Universal Fixed Rack Mounting Kit

Model 1018S: Universal Slide Rack Mounting Kit

Model 1000A: High Voltage Probe

Model 1641: Kelvin Test Lead Set

Model 1651: 50-Ampere Shunt

Model 1661: Clip-On Test Lead Set

Model 1682A: RF Probe

Model 1663: Universal Test Lead Set

Model 1685: 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 8661: Connector Kit (enables connecting to 3- or 4-wire RTDs)

Model 8663: General Purpose/Immersion Probe (4-wire)

Model 8665: Surface Probe (4-wire)

Model 8666: Air/Gas Probe (4-wire)