

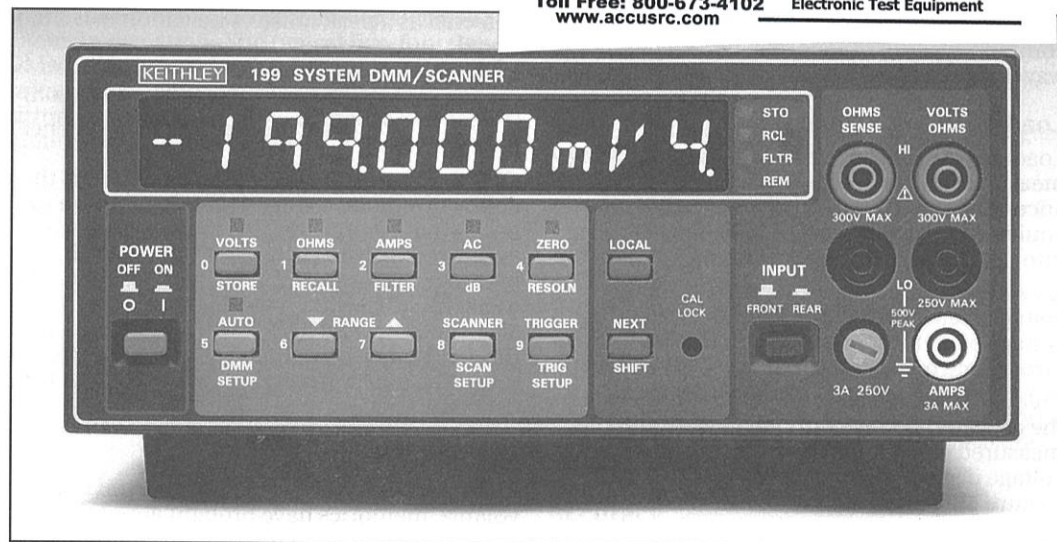
199

5½-Digit DMM

Compliments of
AccuSource
 Electronics
 Your Source for Quality Pre-Owned
 Electronic Test Equipment
 Toll Free: 800-673-4102
 www.accusrc.com

- Excellent accuracy and AC measurements
- Full 300,000 count measurements
- 150 readings/second
- 500-reading memory
- 2-year warranty
- 1μV, 100nA, 1mΩ sensitivities

IEEE-488



ORDERING INFORMATION

199
 System DMM with Instruction Manual and Model 1751 Safety Test Leads

This product is available with an Extended Warranty. See page 221 for complete ordering information, or call 1-800-552-1115 (U.S. only).

ACCESSORIES AVAILABLE

TEST LEADS

- 1681 Clip-On Test Lead Set
- 1751 Safety Test Leads
- 1754 Safety Universal Test Lead Kit
- 5806 Kelvin Test Leads

PROBES/SHUNT

- 1301 Temperature Probe
- 1600A High Voltage Probe
- 1651 50A Current Shunt
- 1682A RF Probe
- 1685 Clamp-On Current Probe

CABLES

- 7007-1 Shielded IEEE-488 Cable, 1m (3.2 ft.)
- 7007-2 Shielded IEEE-488 Cable, 2m (6.5 ft.)
- 7008-3 IEEE-488 Digital Cable, 0.9m (3 ft.)
- 7008-6 IEEE-488 Digital Cable, 1.8m (6 ft.)

RACK MOUNT KITS

- 1998-1 Single Fixed Rack Mount Kit
- 1998-2 Dual Fixed Rack Mount Kit

OTHER

- 1992 8-Channel Scanner Option

See page 163 for descriptions of all accessories.

The Model 199 is a 5½-digit system DMM in a compact, half-rack package. The DMM features six standard measurement functions—DC and AC volts, DC and AC amps, ohms (2- and 4-wire), and dB (for AC volts and amps) along with the IEEE-488 interface.

More Performance, Maximum Utility

Sensitivities are 1μV, 1mΩ, and 100nA with 60 ppm basic 90-day accuracy in DC volts. AC voltage accuracies are good to <1% of full scale, much better than competitive units. Enhancements include a digital FILTER for noise reduction and a ZERO function to subtract offsets or make measurements referenced to a specific baseline. The Model 199's functions and features can be pre-set for power-up, and the display can be programmed with operator messages.

Fast—Where it Counts

The Model 199 has the speed for a high-performance test system. It can be externally triggered to meet system timing requirements at up to 150 readings/second with 4½-digit resolution. By storing the readings in its 500-point memory, the 199 frees the system

controller from real-time data collection. In addition, the Model 199 can reduce bus communication time with Keithley's TRANSLATOR software (see explanation under Model 193A).

Stand-Alone Data Logging

Use the Model 199 to track drift or other trends. The 199 can be programmed to automatically store up to 500 readings at intervals from 15ms to 16.6 minutes (over 5 days of data), or by external trigger.

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.



RANGE	RESOLUTION	ACCURACY ¹ ±(%rdg + counts) 1 Year, 18°-28°C	MAXIMUM VOLTAGE BURDEN
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)		ACCURACY ¹ ±(%rdg + counts) 1 Year, 18°-28°C		MAXIMUM VOLTAGE BURDEN
RANGE	RESOLUTION	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

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

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.

STORAGE 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.

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.

WARM-UP: 2 hours to rated accuracy.

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

ISOLATION: Input LO to IEEE LO or power line ground: 500V peak. 5 × 10⁵ V•Hz maximum. >10⁶Ω paralleled by 400pF.

OPERATING ENVIRONMENT: 0°-50°C, 80% relative humidity up to 35°C; linearly derate 3% RH/°C, 35°-50°C (0%-60% RH up to 28°C on 300MΩ 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 × 220mm wide × 330mm deep (3½ in. × 8½ in. × 12½ in.). Net weight 3kg (6 lbs., 8 oz.).

ACCESSORIES SUPPLIED: Model 1751 Safety Test Leads, instruction manual.

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.

NMRR: >60dB at 50Hz or 60Hz (±0.05%).

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

TRMS AC VOLTS (5½ Digits)

RANGE	RESOLUTION	ACCURACY ¹ ±(%rdg + counts)			
		20 Hz-50 Hz ²	50 Hz-200 Hz ²	200 Hz-20 kHz ²	20 kHz-100 kHz ³
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

dB (ref = 1V):

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	—

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.

OHMS (5½ Digits)

RANGE	RESOLUTION	NOMINAL I-SHORT	ACCURACY ¹ ±(%rdg + counts)		
			24 Hours ² 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.

MAXIMUM READING RATES (Readings/Second)¹

DCV, DCA, ACV, ACA RESOLUTION	Continuous Into Memory		External Trigger Into Memory		Triggered via IEEE-488 Bus ²	
	MUX Off	MUX On	MUX Off	MUX On	MUX Off	MUX On
4½-Digit	65	65	150	62	80	49
5½-Digit	35 (29)	9 (7½)	40 (33)	9 (7½)	34 (29)	9 (7½)
OHMS RESOLUTION	Continuous Into Memory		External Trigger Into Memory		Triggered via IEEE-488 Bus ²	
	MUX Off	MUX On	MUX Off	MUX On	MUX Off	MUX On
4½-Digit	43	20	47	20	30	18
5½-Digit	16 (13)	9 (7½)	18 (15)	9 (7½)	15 (12½)	9 (7½)

¹Reading rates are for fixed range readings with filters off, for 3V, 3kΩ, and 30mA ranges.

5½-digit rate is for 60Hz operation. Values in parentheses are for 50Hz operation.

²One shot on TALK.

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5½-Digit DMM/Scanner

Compliments of
AccuSource
 Electronics
 Your Source for Quality Pre-Owned
 Electronic Test Equipment
 Toll Free: 800-673-4102
 www.accusrc.com

- Built-in 8-channel scanner
- Switch and measure 40 channels/second
- 2- or 4-pole measurements
- Reduced bus communication time

ORDERING INFORMATION

199/1992
 System DMM with 8-Channel Scanner Option, Instruction Manual, 1751 Safety Test Leads, 1993 Quick Disconnect Scanner Connector Kit

This product is available with an **Extended Warranty**. See page 221 for complete ordering information, or call 1-800-552-1115 (U.S. only).

ACCESSORIES AVAILABLE

TEST LEADS

- 1681 Clip-On Test Lead Set
- 1751 Safety Test Leads
- 1754 Safety Universal Test Lead Kit
- 1993 Quick Disconnect Scanner Connector Kit
- 5806 Kelvin Test Leads

PROBES/SHUNT

- 1301 Temperature Probe
- 1600A High Voltage Probe
- 1651 50A Current Shunt
- 1682A RF Probe
- 1685 Clamp-On Current Probe

CABLES

- 7007-1 Shielded IEEE-488 Cable, 1m (3.2 ft.)
- 7007-2 Shielded IEEE-488 Cable, 2m (6.5 ft.)
- 7008-3 IEEE-488 Digital Cable, 0.9m (3 ft.)
- 7008-6 IEEE-488 Digital Cable, 1.8m (6 ft.)

RACK MOUNT KITS

- 1998-1 Single Fixed Rack Mount Kit
- 1998-2 Dual Fixed Rack Mount Kit

OTHER

- 1992 8-Channel Scanner Option

See page 163 for descriptions of all accessories.

Convert the 199 Into a Complete Measurement System

Add the factory- or field-installable Model 1992 8-Channel Scanner option to the 199 System DMM and automatically switch and measure multiple points with one instrument. Each set of contacts creates less than 1µV thermal contact error. Thus the scanner can make low-level 4-wire measurements on 4 channels as well as 2-pole measurements on 8 channels. With the scanner option, ratios can be measured and displayed directly.

The DMM/Scanner combination can switch and measure at up to 40 channels/second. Acquire data three ways:

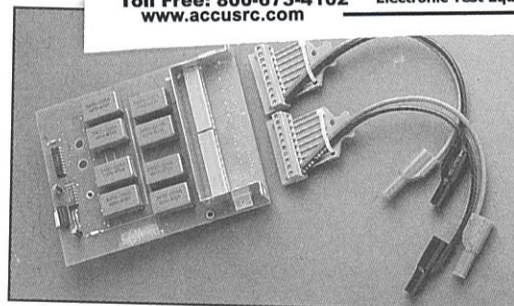
1. **Manual:** Switch channels from the front panel.
2. **Step:** Automatically increment through each channel at a defined interval.
3. **Scan:** Automatically scan a set of channels at a defined interval. The scan mode is excellent for near-simultaneous trend recording of multiple points.

Savings Through Integration

The Model 199 with the scanner option saves more than just the price of one extra instrument. You also save rack space, and start-up time is reduced since you learn to program a single instrument instead of two. Program execution time is also reduced since bus communications occur with one and not two instruments. Finally, save on maintenance costs—the 199/1992 has a 2-year warranty.

The 1992 8-Channel Scanner Option is field-installable and can therefore be purchased at any time. Maintain individual wiring setups with the Model 1993 Quick Disconnect Scanner Connector Kit (included with the 1992 and also available separately) and save system assembly time.

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Model 1992 8-Channel Scanner Option includes a pair of Model 1993 Quick Disconnects.

MODEL 1992 SCANNER OPTION

CONTACT CONFIGURATION: 8-channel 2-pole, or 4-channel 4-pole; break-before-make.

CONTACT POTENTIAL: <1µV 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: <1Ω.

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

ISOLATION BETWEEN ANY TERMINAL AND EARTH: >10⁹Ω, <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 × 130mm wide × 170mm deep (1 in. × 5 in. × 6½ in.). Adds 0.3kg (8 oz.) to Model 199.

SCANNING CAPABILITIES

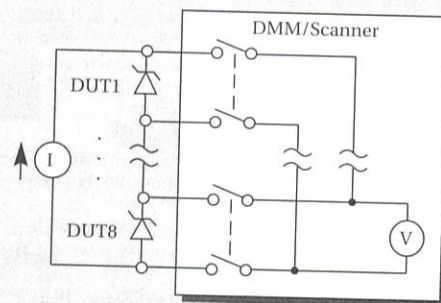
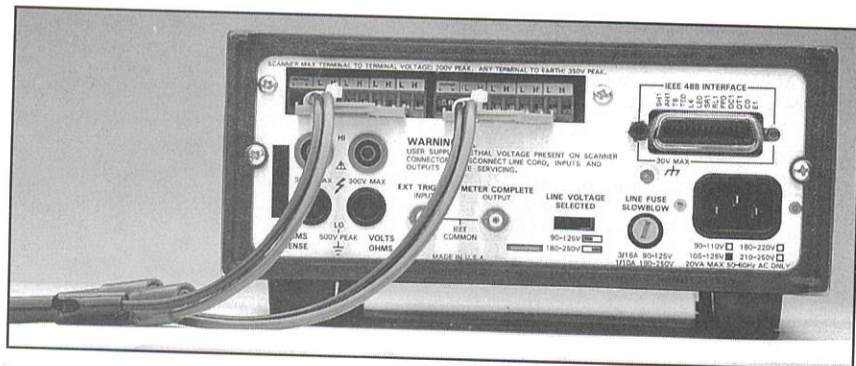
PROGRAMMABLE CONFIGURATION: 2- or 4-pole.

PROGRAMMABLE CHANNEL LIMIT: 1 to 8.

PROGRAMMABLE SCANNING MODES: Manual, step, and scan.

RATIO: Channels 2 through 8 referenced to Channel 1.

See page 25 for complete Model 199 System DMM specifications.



Use the Model 199 DMM/Scanner to evaluate multiple components, such as zener diodes, in a single test.