

6514 Electrometer

VOLTS		ACCURACY (1 Year) ¹ 18°–28°C	TEMPERATURE COEFFICIENT 0°–18°C & 28°–50°C
RANGE	5½ DIGIT RESOLUTION	±(%rdg+counts)	±(%rdg+counts)/°C
2 V	10 µV	0.025 + 4	0.003 + 2
20 V	100 µV	0.025 + 3	0.002 + 1
200 V	1 mV	0.06 + 3	0.002 + 1

Note:

¹ When properly zeroed, 5½-digit. Rate: Slow (100ms integration time).

NMRR: 60dB on 2V, 20V, >55dB on 200V, at 50Hz or 60Hz ±0.1%.

CMRR: >120dB at DC, 50Hz or 60Hz.

INPUT IMPEDANCE: >200TΩ in parallel with 20pF, < 2pF guarded (10MΩ with zero check on).

SMALL SIGNAL BANDWIDTH AT PREAMP OUTPUT: Typically 100kHz (–3dB).

AMPS		ACCURACY (1 Year) ¹ 18°–28°C	TEMPERATURE COEFFICIENT 0°–18°C & 28°–50°C
RANGE	5½ DIGIT RESOLUTION	±(%rdg+counts)	±(%rdg+counts)/°C
20 pA	100 aA ²	1 + 30	0.1 + 5
200 pA	1 fA ²	1 + 5	0.1 + 1
2 nA	10 fA	0.2 + 30	0.1 + 2
20 nA	100 fA	0.2 + 5	0.03 + 1
200 nA	1 pA	0.2 + 5	0.03 + 1
2 µA	10 pA	0.1 + 10	0.005 + 2
20 µA	100 pA	0.1 + 5	0.005 + 1
200 µA	1 nA	0.1 + 5	0.005 + 1
2 mA	10 nA	0.1 + 10	0.008 + 2
20 mA	100 nA	0.1 + 5	0.008 + 1

Notes:

¹ When properly zeroed, 5½-digit. Rate: Slow (100ms integration time).

² aA =10⁻¹⁸A, fA=10⁻¹⁵A.

INPUT BIAS CURRENT: <3fA at T_{CAL} (user adjustable). Temperature coefficient = 0.5fA/°C.

INPUT BIAS CURRENT NOISE: <750aA p-p (capped input), 0.1Hz to 10Hz bandwidth, damping on. Digital filter = 40 readings.

INPUT VOLTAGE BURDEN at T_{CAL} ±1°C (user adjustable):

<20µV on 20pA, 2nA, 20nA, 2µA, 20µA ranges.

<100µV on 200pA, 200nA, 200µA ranges.

<2mV on 2mA range.

<4mV on 20mA range.

TEMPERATURE COEFFICIENT OF INPUT VOLTAGE BURDEN: <10µV/°C on pA, nA, µA ranges.

PREAMP SETTling TIME (to 10% of final value): 2.5s typical on pA ranges, damping off, 3s typical on pA ranges damping on, 15ms on nA ranges, 5ms on µA and mA ranges.

NMRR: >95dB on pA, 60dB on nA, µA, and mA ranges at 50Hz or 60Hz ±0.1%. Digital Filter = 40.

OHMS		ACCURACY (1 Year) ¹ 18°–28°C	TEMPERATURE COEFFICIENT 0°–18°C & 28°–50°C	TEST CURRENT (nominal)
RANGE	5½-DIGIT RESOLUTION	±(% rdg+counts)	±(% rdg+counts)/°C	
2 kΩ	10 mΩ	0.20 + 10	0.01 + 2	0.9 mA
20 kΩ	100 mΩ	0.15 + 3	0.01 + 1	0.9 mA
200 kΩ	1 Ω	0.25 + 3	0.01 + 1	0.9 mA
2 MΩ	10 Ω	0.25 + 4	0.02 + 2	0.9 µA
20 MΩ	100 Ω	0.25 + 3	0.02 + 1	0.9 µA
200 MΩ	1 kΩ	0.30 + 3	0.02 + 1	0.9 µA
2 GΩ	10 kΩ	1.5 + 4	0.04 + 2	0.9 nA
20 GΩ	100 kΩ	1.5 + 3	0.04 + 1	0.9 nA
200 GΩ	1 MΩ	1.5 + 3	0.04 + 1	0.9 nA

¹ When properly zeroed, 5½ digit. Rate: Slow (100ms integration time).

MAXIMUM OPEN CIRCUIT VOLTAGE: 250VDC.

PREAMP SETTling TIME (To 10% of final reading with <100pF input capacitance):

2kΩ through 200kΩ: 2ms; 20MΩ through 200MΩ: 90ms. 2GΩ through 200GΩ: 1s.

COULOMBS		ACCURACY (1 Year) ^{1,2} 18°–28°C	TEMPERATURE COEFFICIENT 0°–18°C & 28°–50°C
RANGE	6½ DIGIT RESOLUTION	±(%rdg+counts)	±(%rdg+counts)/°C
20 nC	10 fC	0.4 + 50	0.04 + 10
200 nC	100 fC	0.4 + 50	0.04 + 10
2 µC	1 pC	1 + 50	0.05 + 10
20 µC	10 pC	1 + 50	0.05 + 10

Notes:

¹ Charge acquisition time must be <1000s, derate 2% for each additional 10,000s.

² When properly zeroed, 6½ digit. Rate: Slow (100ms integration time).

INPUT BIAS CURRENT: <4fA at T_{CAL}. Temperature coefficient = 0.5fA/°C.

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IEEE-488 BUS IMPLEMENTATION

MULTILINE COMMANDS: DCL, LLO, SDC, GET, GTL, UNT, UNL, SPE, SPD.

IMPLEMENTATION: SCPI (IEEE-488.2, SCPI-1996.0); DDC (IEEE-488.1).

UNILINE COMMANDS: IFC, REN, EOI, SRQ, ATN.

INTERFACE FUNCTIONS: SH1, AH1, T5, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT1, C0, E1.

PROGRAMMABLE PARAMETERS: Function, Range, Zero Check, Zero Correct, EOI (DDC mode only), Trigger, Terminator (DDC mode only), Data Storage 2500 Storage, Calibration (SCPI mode only), Display Format, SRQ, REL, Output Format, Guard, V-offset Cal, I-offset Cal.

ADDRESS MODES: TALK ONLY and ADDRESSABLE.

LANGUAGE EMULATION: 6512, 617, 617HIQ emulation via DDC mode.

TRIGGER TO READING DONE: 150ms typical, with external trigger.

RS-232 IMPLEMENTATION:

Supports: SCPI 1996.0.

Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19.2k, 38.4k, 57.6k.

Protocols: Xon/Xoff, 7 or 8 bit ASCII, parity-odd/even/none.

Connector: DB-9 TXD/RXD/GND.

GENERAL

DISPLAY: 6½-digit vacuum fluorescent.

OVERRANGE INDICATION: Display reads "OVRFLOW".

RANGING: Automatic or manual.

CONVERSION TIME: Selectable 0.01 PLC to 10 PLC.

PROGRAMS: Provide front panel access to IEEE address, choice of engineering units or scientific notation, and digital calibration.

MAXIMUM INPUT: 250V peak, DC to 60Hz sine wave; 10s per minute maximum on mA ranges.

MAXIMUM COMMON MODE VOLTAGE (DC to 60Hz sine wave): Electrometer, 500V peak;

ISOLATION (Meter COMMON to chassis): Typically $10^{10}\Omega$ in parallel with 500pF.

INPUT CONNECTOR: Three lug triaxial on rear panel.

2V ANALOG OUTPUT: 2V for full range input. Inverting in Amps and Coulombs mode. Output impedance 10k Ω .

PREAMP OUTPUT: Provides a guard output for Volts measurements. Can be used as an inverting output or with external feedback in Amps and Coulombs modes.

DIGITAL INTERFACE:

Handler Interface: Start of test, end of test, 3 category bits.

Digital I/O: 1 Trigger input, 4 outputs with 500mA sink capability.

Connector: 9 Pin D subminiature, male pins.

EMC: Conforms with European Union Directive 89/336/EEC EN55011, EN50082-1, EN61000-3-2, EN61000-3-3, FCC part 15 class B.

SAFETY: Conforms with European Union Directive 73/23/EEC EN61010-1.

GUARD: Switchable voltage and ohm guard available.

TRIGGER LINE: Available, see manual for usage.

READING STORAGE: 2500 readings.

READING RATE:

To internal buffer 1200 readings/second¹

To IEEE-488 bus 500 readings/second^{1,3}

To front panel 17 readings/second at 60Hz;²

15 readings/second at 50Hz²

Notes:

¹ 0.01 PLC, digital filters off, front panel off, auto zero off.

² 1.00 PLC, digital filters off.

³ Binary transfer mode.

DIGITAL FILTER: Median and averaging (selectable from 2 to 100 readings).

DAMPING: User selectable on Amps function.

ENVIRONMENT:

Operating: 0°–50°C; relative humidity 70% non-condensing, up to 35°C.

Storage: –25° to +65°C.

WARM-UP: 1 hour to rated accuracy (see manual for recommended procedure).

POWER: 90–125V or 210–250V, 50–60Hz, 60VA.

PHYSICAL:

Case Dimensions: 90mm high × 214mm wide × 369mm deep
(3½ in. × 8⅞ in. × 14⅞ in.).

Working Dimensions: From front of case to rear including power cord and IEEE-488 connector: 15.5 inches.

Net Weight: <4.6 kg (<10.1 lbs).

Shipping Weight: <9.5 kg (<21 lbs).