

Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as spectrum analyzers, signal generators, oscilloscopes, power meters, logic analysers etc from all the major suppliers such as Agilent, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 1 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, presenting flexible technical + commercial solutions and supplying a loan unit during warranty repair, if available.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based at Aldermaston in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our 40GHz in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

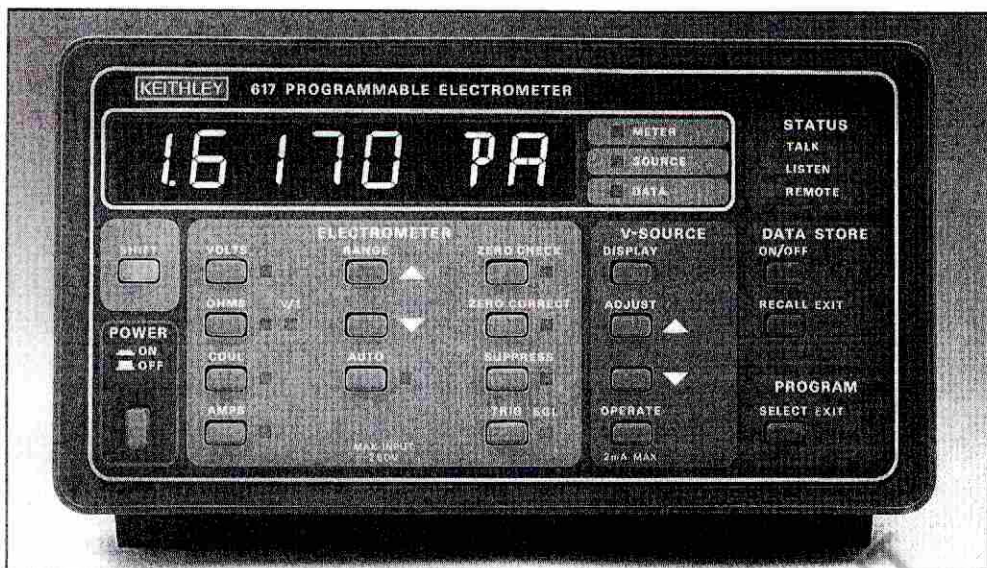
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617 Electrometer/Source



- Built-in V source
- Full autoranging
- Built-in IEEE-488 interface
- Built-in V-Ω Guard
- Resistance measurement from 0.1Ω to $>10^{16}\Omega$

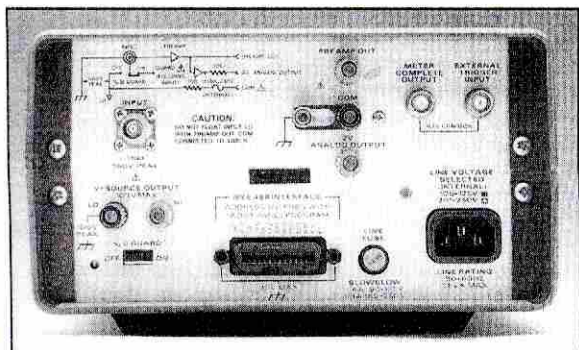
For most new applications our Model 6517A (page A-69) offers better performance than the 617 at a similar cost. The 617-HIQ, however, offers the highest charge measuring capability of any of our instruments.

The 617 can measure resistances or generate I-V curves using either of two measurement techniques. Using the InA to 100μA decade current source, a known constant current is forced through the unknown resistance. The developed voltage is measured with a high input impedance voltmeter, and the resistance or voltage is displayed and transmitted over the IEEE-488 bus. Alternately, the 617's programmable voltage source is applied across the unknown resistance and the resulting current is detected by the 617's sensitive current circuitry. Current may be displayed directly, or resistances as high as $10^{16}\Omega$ can be directly measured; the 617 can calculate and display the quantity V/I.

The 617's built-in IEEE-488 interface makes all controls programmable.

Pushbutton suppression lets you make relative measurements with respect to a selected baseline, or cancel background signals. ZERO CORRECT cancels internal offsets at the touch of a button. Both are bus programmable.

The built-in V-Ω GUARD switch lets you drive the inner shield of the triaxial input cable at guard voltage, minimizing leakage current and time constants. 100-point data storage is also built in, with Min/Max readings available from front panel or bus.



ORDERING INFORMATION

- 617** Electrometer/Source with Model 6011 Input Leads and Model 6172 Triax Adapter
- 617-HIQ** Electrometer/Source with extended charge measurement range, Model 6011 Input Leads and Model 6172 Triax Adapter

This product is available with an **Extended Warranty**. See section C for complete ordering information.

ACCESSORIES AVAILABLE

PROBE

6103C Voltage Divider Probe (1000:1) (requires 6012 adapter)

CABLES

- 6011 Input Leads, triax to clips, 1.5m (5 ft)
 6011-10 Input Leads, triax to clips, 3m (10 ft)
 7024-3 Triaxial Cable, 0.9m (3 ft)
 7024-10 Triaxial Cable, 3m (10 ft)

ADAPTERS

- 6012 Triaxial to Coaxial UHF Adapter
 6146 Triax Tee Adapter
 6147 Male Triax to Female BNC Adapter
 6171 3-Slot Male to 2-Lug Female Triaxial Adapter
 6172 2-Slot Male to 3-Lug Female Triaxial Adapter
 7023 Female Triaxial Bulkhead Connector

TEST FIXTURES

- 6105 Resistivity Chamber
 8002A Guarded High Resistance Test Fixture

RACK MOUNT KITS

- 1019A-1 Single Fixed Rack Mount Kit
 1019A-2 Dual Fixed Rack Mount Kit
 1019S-1 Single Slide Rack Mount Kit
 1019S-2 Dual Slide Rack Mount Kit
 4288-4 Dual Fixed Rack Mount Kit

See page A-231 for descriptions of all accessories.

For measurements of charge as high as 20pC, the 617-HIQ version offers three higher charge ranges. These higher ranges have proven useful on Faraday cup measurements and other static charge applications including photocopy research and development.

617 Electrometer/Source

VOLTS

RANGE	RESOLUTION	ACCURACY	TEMPERATURE
		(1 Year)* 18°-28°C ±(%rdg+counts)	COEFFICIENT 0°-18°C & 28°-50°C ±(%rdg+counts)/°C
200 mV	10 µV	0.05 + 4	0.004 + 3
2 V	100 µV	0.05 + 1	0.004 + 0.3
20 V	1 mV	0.05 + 1	0.005 + 0.1
200 V	10 mV	0.07 + 1	0.007 + 0.1

*When properly zeroed.

NMR: >80dB on 200mV, 60dB on 2V and 20V, 55dB on 200V range, at 50Hz or 60Hz ±0.1%.

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

INPUT IMPEDANCE: >200Ω in parallel with 20pF (<2pF guarded).

GAIN ERROR AT PREAMP OUTPUT: Typically 5ppm.

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

AMPS

RANGE	RESOLUTION	ACCURACY	TEMPERATURE
		(1 Year)* 18°-28°C ±(%rdg+counts)	COEFFICIENT 0°-18°C & 28°-50°C ±(%rdg+counts)/°C
2 pA	100 nA	1.6 + 66	0.15 + 8
20 pA	1 fA	1.6 + 7	0.15 + 1
200 pA	10 fA	1.6 + 1	0.15 + 0.1
2 nA	100 fA	0.25 + 5	0.015 + 0.3
20 nA	1 pA	0.25 + 1	0.015 + 0.3
200 nA	10 pA	0.25 + 1	0.015 + 0.1
2 µA	100 pA	0.15 + 4	0.005 + 0.3
20 µA	1 nA	0.15 + 1	0.005 + 0.3
200 µA	10 nA	0.15 + 1	0.006 + 0.1
2 mA	100 nA	0.15 + 4	0.005 + 0.3
20 mA	1 µA	0.15 + 1	0.005 + 0.3

*When properly zeroed using recommended warm-up procedure.

INPUT BIAS CURRENT: <5fA at 23°C

INPUT VOLTAGE BURDEN: <1mV except 3mV on 20mA range.

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

NMR: >95dB on pA, 60dB on nA, µA, and mA ranges at 50Hz or 60Hz ±0.1%.

COULOMBS

RANGE	RESOLUTION	ACCURACY	TEMPERATURE
		(1 Year)* 18°-28°C ±(%rdg+counts)	COEFFICIENT 0°-18°C & 28°-50°C ±(%rdg+counts)/°C
200 pC	10 fC	0.4 + 4	0.02 + 3
2 nC	100 fC	0.4 + 1	0.02 + 0.3
20 nC	1 pC	0.4 + 1	0.02 + 0.1
(617-HIQ)			
200 nC	10 pC	2.0 + 4	0.04 + 3
2 µC	100 pC	2.0 + 1	0.04 + 0.3
20 µC	1 nC	2.0 + 1	0.04 + 0.1

*When properly zeroed.

INPUT BIAS CURRENT: <5fA at 23°C.

IEEE-488 BUS IMPLEMENTATION

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

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

INTERFACE FUNCTIONS: SH1, AH1, T5, TE0, L4, LE0, SR1, RL0, PPO, DC1, DT1, C0, E1.

PROGRAMMABLE PARAMETERS: Function, Range, Zero Check, Zero Correct, Zero Suppress, EOI, Trigger, Terminator, 100-Reading Storage and Retrieval, Calibration, V Source Output, Display Format, SRQ, Status (including V Source I-Limit), Output Format.

ADDRESS MODES: TALK ONLY and ADDRESSABLE.

TRIGGER TO READING DONE: 350ms typical.

OHMS

RANGE	RESOLUTION	ACCURACY*	TEMPERATURE	TEST CURRENT ±1.5%
		(1 Year) 18°-28°C ±(%rdg+counts)	COEFFICIENT 0°-18°C & 28°-50°C ±(%rdg+counts)/°C	
2 kΩ	100 mΩ	0.20 + 4	0.01 + 3	100 µA
20 kΩ	1 Ω	0.15 + 1	0.01 + 0.3	100 µA
200 kΩ	10 Ω	0.25 + 1	0.01 + 0.3	10 µA
2 MΩ	100 Ω	0.25 + 1	0.02 + 0.3	1 µA
20 MΩ	1 kΩ	0.25 + 1	0.02 + 0.3	100 nA
200 MΩ	10 kΩ	0.30 + 1	0.02 + 0.3	10 nA
2 GΩ	100 kΩ	1.5 + 1	0.04 + 0.3	1 nA
20 GΩ	1 MΩ	1.5 + 1	0.04 + 0.1	1 nA
200 GΩ	10 MΩ	1.5 + 1	0.04 + 0.1	1 nA

*When properly zeroed.

MAXIMUM OPEN CIRCUIT VOLTAGE: 300V DC.

PREAMP SETTLING TIME (To 0.1% of final reading with <100pF input capacitance): 2kΩ through 20MΩ: 15ms; 200MΩ: 150ms. (To 1% of final value with Input Guard on and <1pF of unguarded input capacitance): 2GΩ: 10ms; 20GΩ: 100ms; 200GΩ: 1s.

V/I MODE: Used with V source; displays resistance (5×10^4 to $10^{16}\Omega$) calculated from measured current.

V/I Ohms accuracy equal to accuracy of V source plus accuracy of selected amps range.

VOLTAGE SOURCE

OUTPUT: -102V to +102V in 50mV steps.

ACCURACY (1 Yr., 18°-28°C): ±(0.2% + 50mV).

TEMPERATURE COEFFICIENT: ±(0.005% + 1mV)/°C

MAXIMUM OUTPUT CURRENT: ±2mA; active current limit at <4mA with annunciation.

SETTLING TIME: <3ms to rated accuracy.

NOISE: <(1 ppm of output voltage + 200µV) p-p from 0.1Hz to 10Hz.

GENERAL

DISPLAY: 4½-digit numeric LEDs with appropriate decimal point and polarity indication; signed two-digit alphanumeric exponent.

OVERRANGE INDICATION: Display reads "OL".

RANGING: Automatic or manual.

CONVERSION TIME: 330ms.

DATA STORE and MIN/MAX: 100-reading store capacity; records data at one of six selectable rates from every reading to 1 reading/hour, or by manual triggering. Also detects and stores maximum and minimum readings continuously while in the Data Store mode.

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; V Source, 100V peak.

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

INPUT CONNECTOR: Two lug triaxial on rear panel.

OUTPUT CONNECTORS: 5-way binding posts on rear panel for V source, preamp, and analog outputs. Rear panel BNC for External Trigger and Meter Complete.

2V ANALOG OUTPUT: 2V for full range input. Inverting in Volts and Ohms modes. Output impedance 10kΩ.

PREAMP OUTPUT: Provides a guard output for Volts and Ohms measurements. Can be used as an inverting output or with external feedback in Amps and Coulombs modes. Output impedance 100Ω.

GAIN ERROR AT PREAMP OUTPUT: Typically 5ppm.

SMALL SIGNAL BANDWIDTH AT PREAMP OUTPUT: Typically -3dB at 100kHz.

EXTERNAL TRIGGER: TTL compatible External Trigger and Electrometer Complete.

V, Ω GUARD SWITCH: OFF position: Inner shield of triax is Input LO, input capacitance is ≤20pF. ON position: Inner shield of triax is Guard (follows input HI). Input capacitance is ≤2pF. Use Analog Output COM for Input LO connection.

ENVIRONMENT: Operating: 0°-50°C; relative humidity 70% non-condensing, up to 35°C. Storage: -25° to +65°C.

SHIELDING: Double shielded.

WARM-UP: 2 hours to rated accuracy (see manual for recommended procedure).

POWER: 105-125V or 210-250V (internal switch selected), 90-110V available; 50-60Hz, 25VA.

DIMENSIONS, WEIGHT: 127mm high × 216mm wide × 359mm deep (5 in × 8½ in × 14¼ in). Net weight 3.6kg (8 lb).

ACCESSORIES SUPPLIED: Model 6011 Input Leads and Model 6172 Triax Adapter.