The Keithley 6517B Electrometer/High Resistance Meter is the worldwide research laboratory standard for sensitive measurements. With over 60 years of low level measurement expertise, Keithley electrometers provide reliable measurements of current levels down to 10pA (1×10−12A) charge levels down to 1fC, and the highest resistance measurements available up to 1018Ω. The 6517B is also capable of measuring the largest voltage range—up to 200V—with an input impedance exceeding 200TΩ.

**Exceptional Performance Specifications**

The 6517B has incorporated Keithley’s decades of expertise in low level measurement technology into an innovative, low current input amplifier with an input bias current of <3fA, just 0.75fAp-p noise, and <20µA burden voltage on the lowest current ranges. The voltage circuit input impedance is greater than 200TΩ for near-ideal circuit loading. These specifications ensure the accuracy and sensitivity needed for accurate low current and high impedance voltage, resistance, and charge measurements in areas of research such as physics, optics, nanotechnology, and materials science. A built-in ±1kV voltage source with sweep capability simplifies performing leakage, breakdown, and resistance testing, as well as volume (Ω-cm) and surface resistivity (Ω/square) measurements on insulating materials.

**Wide Measurement Ranges**

The 6517B offers autoranging over the full span of ranges on current, resistance, voltage, and charge measurements. The 6517B combines the following measurement capabilities:

- Ultra-sensitive ammeter with current measurement from 10pA to 20mA
- Highest impedance voltmeter with voltage measurement from 1µV to 200V
- Ultra-high range ohmmeter with resistance measurement from 1Ω to 1018Ω
- Sensitive coulombmeter with charge measurement from 1fC to 2µC

**Improved High Resistivity Measurements**

Many test applications require measuring high levels of resistivity (surface or volume) of materials. The conventional method of making these measurements is to apply a sufficiently large voltage to a sample, measure the current that flows through the sample, then calculate the resistance using Ohm’s Law (R=V/I). While high resistance materials and devices produce very small currents that are difficult to measure accurately, Keithley electrometers and picoammeters are used successfully for such measurements.

Even with high quality instrumentation, inherent background currents in the material can make these measurements difficult to perform accurately. Insulating materials, polymers, and plastics typically exhibit background currents due to piezoelectric effects, capacitive elements charged by static electricity, and polarization effects. These background currents are often equal to or greater than the current stimulated by the applied voltage. In these cases, the result is often unstable, providing inaccurate resistance or resistivity readings or even erroneous negative values. Keithley’s 6517B is designed to solve these problems and provides consistent, repeatable, and accurate measurements for a wide variety of materials and components, especially when used in combination with the 8009 Resistivity Test Fixture.

**Alternating Polarity Method for High Resistance Measurements**

The 6517B uses the Alternating Polarity Method, which virtually eliminates the effect of any background currents in the sample. First and second order drifts of the background currents are also canceled out. The Alternating Polarity Method applies a voltage of positive polarity, then the current is measured after a specified delay (Measure Time). Next, the polarity is reversed and the current measured again, using the same delay. This process is repeated continuously, and the resistance is calculated based on a weighted average of the four most recent current measurements. This method typically produces a highly repeatable, accurate measurement of resistance (or resistivity) by the seventh rever-
The alternating voltage source polarity method eliminates the effects of background currents in materials for making repeatable, accurate high resistance and resistivity measurements.

Sal on most materials (i.e., by discarding the first three readings.) For example, a 1mm-thick sample of $10^{14} \Omega \cdot \text{cm}$ material can be measured with 0.3% repeatability in the 8009 Test Fixture, provided the background current changes less than 200fA over a 15-second period.

**Simple DMM-like Operation**

The 6517B is designed for easy, DMM-like operation via the front panel, with single-button control of important functions such as resistance measurement. Also, all the functions of the 6517B can be programmed through either the RS-232 interface or the GPIB (IEEE-488) interface.

**High Accuracy High Resistance Measurements**

The 6517B offers a number of features and capabilities that help ensure the accuracy of high resistance measurement applications. For example, the built-in voltage source simplifies determining the relationship between an insulator's resistivity and the level of source voltage used. It is well-suited for capacitor leakage and insulation resistance measurements, tests of the surface insulation resistance of printed circuit boards, voltage coefficient testing of resistors, and diode leakage characterization.

**Temperature and Humidity Stamping**

Humidity and temperature can influence the resistivity values of materials significantly. To help you make accurate comparisons of readings acquired under varying conditions, the 6517B offers a built-in type K thermocouple and an optional 6517-RH Relative Humidity Probe. A built-in 50,000 reading data storage buffer allows recording and recalling measurements stamped with the time of the measurement, the temperature, and the relative humidity.
Internal Test Sequences Expand and Simplify Applications

The 6517B has a number of internal test sequences that assists in easily setting up and performing a number of tests. Device characterization sequences include diode leakage current measurement, capacitor leakage current measurement, cable insulation resistance measurement, and resistor voltage coefficient measurement. Resistivity and resistance tests include volume resistivity, surface resistivity, and surface insulation resistance testing. Parameters can be characterized as a function of voltage with the square wave and staircase test sequences.

In addition to its built-in tests, the 6517B excels in low current, high impedance voltage, resistance, and charge measurements in areas of research such as physics, optics, and materials science. The electrometer’s extremely low voltage burden makes it particularly valuable for use in solar cell characterization applications and its built-in voltage source and low current sensitivity make it an excellent solution for high resistance measurements of nanomaterials such as polymer-based nanowires, other nanomaterials, ceramics, dielectric films, and biomaterials.

With its highly responsive measurements and DMM-like operation, the 6517B performs well in quality control, design engineering, and production test applications involving leakage current, breakdown, and resistance testing. Volume and surface resistivity measurements on non-conductive materials are particularly enhanced by the 6517B’s voltage reversal method. The 6517B is also excellent for electrochemistry applications such as high impedance, ion-selective electrodes and pH measurements, conductivity cells, and potentiometry.

<table>
<thead>
<tr>
<th>SERVICES AVAILABLE</th>
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<tbody>
<tr>
<td>6517B-EW</td>
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<tr>
<td>6517B-3Y-EW-STD</td>
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<td>6517B-5Y-EW-STD</td>
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<tr>
<td>C/6517B-3Y-STD</td>
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<tr>
<td>C/6517B-5Y-STD</td>
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<tr>
<td>C/6517B-3Y-DATA</td>
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<td>C/6517B-5Y-DATA</td>
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</table>

<table>
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<th>ACCESSORIES AVAILABLE</th>
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<td>6517-TP</td>
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<td>257-TRX/NG</td>
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<td>257-TRX/T</td>
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<td>257-TRX/TBC</td>
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<td>7078-TRX-GND</td>
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<td>7078-TRX/TBC</td>
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<tr>
<td>SCANNER CARDS</td>
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<tr>
<td>GPIB INTERFACES</td>
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<tr>
<td>KPCI-488LPA</td>
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<tr>
<td>KUSB-488B</td>
</tr>
</tbody>
</table>
6517B

Electrometer/High Resistance Meter

Accessories Extend Measurement Capabilities

A variety of optional accessories can be used to extend the 6517B applications and enhance its performance.

The 8009 Resistivity Chamber is a guarded test fixture for measuring volume and surface resistivities of sample materials. It has stainless-steel electrodes built to ASTM standards. The fixture's electrode dimensions are pre-programmed into the 6517B, so there's no need to calculate those values then enter them manually. This accessory is designed to protect you from contact with potentially hazardous voltages—opening the lid of the chamber automatically turns off the 6517B's voltage source.

6521 and 6522 Low Current, 10-Channel Scanner Cards

Two optional 10-channel plug-in scanner cards are available to extend the measurement performance of the 6517B Electrometer/High Resistance Meter. The cards install directly into the option slot in the back panel of the 6517B. The cards are also compatible with the 6517A and 6517.

The 6521 Low Current Scanner Card is a 10-channel multiplexer, designed for switching low currents in multipoint testing applications or when the test configuration must be changed. Offset current on each channel is <1pA and high isolation is maintained between each channel (>10^15 Ω). The 6521 maintains the current path even when the channel is deselected, making it a true current switch. BNC input connectors help provide shielding for sensitive measurements and make the card compatible with low noise coaxial cables. The 6521 is well suited for automating reverse leakage tests on semiconductor junctions or gate leakage tests on FETs.

The 6522 Voltage/Low Current Scanner Card can provide up to ten channels of low-level current, high impedance voltage, high resistance, or charge switching. Although it’s similar to the 6521 in many ways, the 6522's input connectors are 3-lug triax. The card can be software configured for high impedance voltage switching of up to 200V. Triaxial connectors make it possible to float the card 500V above ground and drive guard to 200V.

6521 SPECIFICATIONS

- CHANNELS PER CARD: 10.
- FUNCTIONS: Amps.
- CONTACT CONFIGURATION: Single pole, “break-before-make” for signal HI input. Signal LO is common for all 10 channels and output. When a channel is off, signal HI is connected to signal LO.
- CONNECTOR TYPE: Inputs BNC. Outputs Triaxial.
- SIGNAL LEVEL: 30V, 500mA, 10VA (resistive load).
- CONTACT LIFE: >10^6 closures at maximum signal level; >10^7 closures at low signal levels.
- CONTACT RESISTANCE: <1 Ω.
- CONTACT POTENTIAL: <200µV.
- OFFSET CURRENT: <1pA (<30fA typical at 23°C, <60% RH).
- ACTUATION TIME: 2ms.
- COMMON MODE VOLTAGE: <30V peak.
- ENVIRONMENT: Operating: 0° to 50°C up to 35°C at 70% R.H. Storage: -25° to 65°C.

6522 SPECIFICATIONS

- CHANNELS PER CARD: 10.
- FUNCTIONS: Volts, Amps.
- CONTACT CONFIGURATION: Single pole, “break-before-make” for signal HI input. Signal LO is common for all 10 channels and output. 6517B can also configure channels as voltage switches.
- SIGNAL LEVEL: 200V, 500mA, 10VA (resistive load).
- CONTACT LIFE: >10^6 closures at maximum signal level; >10^7 closures at low signal levels.
- CONTACT RESISTANCE: <1 Ω.
- CONTACT POTENTIAL: <200µV.
- OFFSET CURRENT: <1pA (<30fA typical at 23°C, <60% RH).
- CHANNEL ISOLATION: >10^13 Ω, <0.3pF.
- INPUT ISOLATION: >10^10 Ω, <125pF (Input HI to Input LO).
- ACTUATION TIME: 2ms.
- COMMON MODE VOLTAGE: <300V peak.
- ENVIRONMENT: Operating: 0° to 50°C up to 35°C at 70% R.H. Storage: -25° to 65°C.
## 6517B Specifications

### Electrometer/High Resistance Meter

#### Volts

<table>
<thead>
<tr>
<th>RANGE</th>
<th>6½-DIGIT RESOLUTION</th>
<th>ACCURACY (1 Year)</th>
<th>TEMPERATURE COEFFICIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>18°–28°C</td>
<td>0°–18°C &amp; 28°–50°C</td>
</tr>
<tr>
<td>20V</td>
<td>1 µV</td>
<td>±0.025 ± 40 µV</td>
<td>±0.003 ± 20 µV</td>
</tr>
<tr>
<td></td>
<td>10 µV</td>
<td>±0.025 ± 300 µV</td>
<td>±0.002 ± 100 µV</td>
</tr>
<tr>
<td>200V</td>
<td>100 µV</td>
<td>±0.06 ± 3 mV</td>
<td>±0.002 ± 1 mV</td>
</tr>
</tbody>
</table>

**NMRR:** 2V and 20V ranges >60dB, 200V range >55dB, 50Hz or 60Hz².

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

**INPUT IMPEDANCE:** >200Ω in parallel with 20pF, <2pF guarded (1MΩ with zero check on).

**SMALL SIGNAL BANDWIDTH AT PREAMP OUTPUT:** Typically 10kHz (±3dB).

#### Amps

<table>
<thead>
<tr>
<th>RANGE</th>
<th>6½-DIGIT RESOLUTION</th>
<th>ACCURACY (1 Year)</th>
<th>TEMPERATURE COEFFICIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>18°–28°C</td>
<td>0°–18°C &amp; 28°–50°C</td>
</tr>
<tr>
<td>20 pA</td>
<td>10 µA</td>
<td>±0.1 ± 500 pA</td>
<td>±0.05 ± 100 pA</td>
</tr>
<tr>
<td>200 pA</td>
<td>100 µA</td>
<td>±0.1 ± 5000 pA</td>
<td>±0.05 ± 1000 pA</td>
</tr>
<tr>
<td>2 nA</td>
<td>1 nA</td>
<td>±0.2 ± 500 pA</td>
<td>±0.05 ± 100 pA</td>
</tr>
<tr>
<td>20 nA</td>
<td>10 nA</td>
<td>±0.2 ± 5000 pA</td>
<td>±0.05 ± 1000 pA</td>
</tr>
<tr>
<td>200 nA</td>
<td>100 nA</td>
<td>±0.2 ± 500 pA</td>
<td>±0.05 ± 100 pA</td>
</tr>
<tr>
<td>2 µA</td>
<td>1 µA</td>
<td>±0.1 ± 100 nA</td>
<td>±0.05 ± 20 nA</td>
</tr>
<tr>
<td>20 µA</td>
<td>10 µA</td>
<td>±0.1 ± 1000 nA</td>
<td>±0.05 ± 2000 nA</td>
</tr>
<tr>
<td>200 µA</td>
<td>100 µA</td>
<td>±0.1 ± 100 nA</td>
<td>±0.05 ± 2000 nA</td>
</tr>
<tr>
<td>2 mA</td>
<td>1 nA</td>
<td>±0.1 ± 100 nA</td>
<td>±0.008 ± 200 nA</td>
</tr>
<tr>
<td>20 mA</td>
<td>10 nA</td>
<td>±0.1 ± 1000 nA</td>
<td>±0.008 ± 20000 nA</td>
</tr>
</tbody>
</table>

**INPUT BIAS CURRENT:** <30A at T_Cal. Temperature coefficient = ±0.5A/°C, 20pA range.

**INPUT BIAS CURRENT NOISE:** <750nA p-p (capped input), 0.1Hz to 10Hz bandwidth, damping on. Digital filter = 40 readings, 20pA range.

**INPUT VOLTAGE BURDEN at T_Cal:** ±10V.

**TEMPERATURE COEFFICIENT OF INPUT VOLTAGE BURDEN:** <±0.02V/°C on pA, nA, and µA ranges.

**PREAMP SETTLING TIME (to 10% of final value):** Typical: 0.5sec (damping off), 2.0sec (damping on) on pA ranges. 15sec on nA ranges damping off, 1msec on µA ranges damping off. 500usec on mA ranges damping off.

**NMRR:** >60dB on all ranges at 50Hz or 60Hz².

### Temperature Source

#### Ohms

### Ohms (Normal Method)

#### Ohms (Alternating Polarity Method)

The alternating polarity sequence compensates for the background (offset) currents of the material or device under test. Maximum tolerable offset up to full scale of the current range used.

Using Keithley 8009 fixture

**REPEATABILITY:** ΔI_D < 0.1% (1σ) (instrument temperature constant ±1°C).

**ACCURACY:** (V_{src} - I_{meas} × R/V_{alt}) where:

- ΔV_{src} is a measured, typical background current noise from the sample and fixture.
- ΔI_{meas} is the alternating polarity voltage used.
- ΔI_{meas} is the accuracy (in volts) of the voltage source using V_{alt} / R as the reading.

**INSTRUMENT TEMPERATURE:** ±1°C.

**NOISE:** Typical: 0.1σ RMS, ±1mA, hardware short circuit protection at <14mA.

### Voltage Source

#### Repeatability:

- ±1mA, hardware short circuit protection at <14mA.

**Settling Time:**<1ms to rated accuracy.

**Noise:** Typical: ±2.6mA RMS, ±1mA, hardware short circuit protection at <14mA.

### Notes

1. When properly zeroed, 6½-digit, 1PLC (power line cycle), median filter on, digital filter = 10 readings.
2. Line sync on.
3. Typically 100kHz (–3dB).

**VOLTAGE SOURCE TEMPERATURE:**

<table>
<thead>
<tr>
<th>RANGE</th>
<th>5½-DIGIT RESOLUTION</th>
<th>ACCURACY (1 Year)</th>
<th>TEMPERATURE COEFFICIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>18°–28°C</td>
<td>0°–18°C &amp; 28°–50°C</td>
</tr>
<tr>
<td>100 V</td>
<td>5 mV</td>
<td>±0.15 ± 10 mV</td>
<td>±0.005 ± 1 mV</td>
</tr>
<tr>
<td>500 V</td>
<td>50 mV</td>
<td>±0.15 ± 100 mV</td>
<td>±0.005 ± 100 mV</td>
</tr>
</tbody>
</table>

**MAXIMUM OUTPUT CURRENT:**

- 100V Range: ±10mA, hardware short circuit protection at <14mA.
- 1000V Range: ±1mA, hardware short circuit protection at <1.4mA.

**Settling Time:**

- <1ms to rated accuracy.
- <50ms to rated accuracy.

**Noise (Typical):**

- 100V Range: ±2.6mA RMS.
- 1000V Range: ±2.6mA RMS.
6517B Specifications

Electrometer/High Resistance Meter

IEEE-488 BUS IMPLEMENTATION

TRIGGER TO READING DONE: 150 ms typical, with external trigger.
RS-232 IMPLEMENTATION: Supports: SCPI 1991.0. Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19.2k, 38.4k, 57.6k, and 115.2k.
FLOW CONTROL: None, Xon/Xoff.
CONNECTOR: DB-9 TXD/RXD/GND.

GENERAL

OVERRANGE INDICATION: Display reads “OVERFLOW” for readings >105% of range. The display reads “OUT OF LIMIT” for excessive overrange conditions.
RANGING: Automatic or manual.
CONVERSION TIME: Selectable 0.01 PLC to 10 PLC.
MAXIMUM INPUT: 250V peak, DC to 60 Hz sine wave; 10 sec per minute maximum on mA ranges.
MAXIMUM COMMON MODE VOLTAGE (DC to 60 Hz sine wave): Electrometer, 500V peak; V Source, 750V peak.
ISOLATION (Meter COMMON to chassis): >10^10 Ω, <500 pF.
INPUT CONNECTOR: Three lug triaxial on rear panel.
2V ANALOG OUTPUT: 2V for full range input. Non-inverting in Volts mode, inverting when measuring Amps, Ohms, or Coulombs. Output impedance 10 kΩ.
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.
EXTERNAL TRIGGER: TTL compatible External Trigger and Electrometer Complete.
GUARD: Switchable voltage guard available.
DIGITAL I/O AND TRIGGER LINE: Available, see manual for usage.
READING STORAGE: 50,000.
READING RATES:

1. Specifications apply immediately after charge acquisition. Add

\[ \left( \frac{1}{4A + \frac{T_{A}}{RC}} \right) \]

where \( T_{A} \) = period of time in seconds between the coulombs zero and measurement and \( Q_{AV} \) = average charge measured over \( T_{A} \) and \( RC = 300,000 \) typical.
2. When properly zeroed, 6½-digit. 1 PLC (power line cycle), median filter on, digital filter = 10 readings.
INPUT BIAS CURRENT: <4 fA at \( T_{CAL} \). Temperature coefficient = 0.5 fA/°C, 2 nC range.

TEMPERATURE (Thermocouple)

<table>
<thead>
<tr>
<th>THERMOCOUPLE TYPE</th>
<th>RANGE</th>
<th>ACCURACY (1 Year)(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>–25°C to 150°C</td>
<td>±(0.3% + 1.5°C)</td>
</tr>
</tbody>
</table>

NOTES
1. Excluding probe errors, \( T_{A} \) = 5°C, 1 PLC integration time.

HUMIDITY

<table>
<thead>
<tr>
<th>RANGE</th>
<th>ACCURACY (1 Year)(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–100%</td>
<td>±(0.3% + 0.5)</td>
</tr>
</tbody>
</table>

NOTES
1. Humidity probe accuracy must be added. This is ±3% RH for Model 6517-RH, up to 65°C probe environment, not to exceed 85°C.

IEEE-488 BUS IMPLEMENTATION

TRIGGER TO READING DONE: 150ms typical, with external trigger.
RS-232 IMPLEMENTATION: Supports: SCPI 1991.0. Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19.2k, 38.4k, 57.6k, and 115.2k.
FLOW CONTROL: None, Xon/Xoff.
CONNECTOR: DB-9 TXD/RXD/GND.

GENERAL

OVERRANGE INDICATION: Display reads “OVERFLOW” for readings >105% of range. The display reads “OUT OF LIMIT” for excessive overrange conditions.
RANGING: Automatic or manual.
CONVERSION TIME: Selectable 0.01 PLC to 10 PLC.
MAXIMUM INPUT: 250V peak, DC to 60 Hz sine wave; 10 sec per minute maximum on mA ranges.
MAXIMUM COMMON MODE VOLTAGE (DC to 60 Hz sine wave): Electrometer, 500V peak; V Source, 750V peak.
ISOLATION (Meter COMMON to chassis): >10^10 Ω, <500 pF.
INPUT CONNECTOR: Three lug triaxial on rear panel.
2V ANALOG OUTPUT: 2V for full range input. Non-inverting in Volts mode, inverting when measuring Amps, Ohms, or Coulombs. Output impedance 10 kΩ.
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.
EXTERNAL TRIGGER: TTL compatible External Trigger and Electrometer Complete.
GUARD: Switchable voltage guard available.
DIGITAL I/O AND TRIGGER LINE: Available, see manual for usage.
READING STORAGE: 50,000.
READING RATES:

1. Specifications apply immediately after charge acquisition. Add

\[ \left( \frac{1}{4A + \frac{T_{A}}{RC}} \right) \]

where \( T_{A} \) = period of time in seconds between the coulombs zero and measurement and \( Q_{AV} \) = average charge measured over \( T_{A} \) and \( RC = 300,000 \) typical.
2. When properly zeroed, 6½-digit. 1 PLC (power line cycle), median filter on, digital filter = 10 readings.
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<th>ACCURACY (1 Year)(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>–25°C to 150°C</td>
<td>±(0.3% + 1.5°C)</td>
</tr>
</tbody>
</table>

NOTES
1. Excluding probe errors, \( T_{A} \) = 5°C, 1 PLC integration time.

HUMIDITY

<table>
<thead>
<tr>
<th>RANGE</th>
<th>ACCURACY (1 Year)(^1)</th>
</tr>
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<tbody>
<tr>
<td>0–100%</td>
<td>±(0.3% + 0.5)</td>
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</table>

NOTES
1. Humidity probe accuracy must be added. This is ±3% RH for Model 6517-RH, up to 65°C probe environment, not to exceed 85°C.

IEEE-488 BUS IMPLEMENTATION

TRIGGER TO READING DONE: 150ms typical, with external trigger.
RS-232 IMPLEMENTATION: Supports: SCPI 1991.0. Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19.2k, 38.4k, 57.6k, and 115.2k.
FLOW CONTROL: None, Xon/Xoff.
CONNECTOR: DB-9 TXD/RXD/GND.

GENERAL

OVERRANGE INDICATION: Display reads “OVERFLOW” for readings >105% of range. The display reads “OUT OF LIMIT” for excessive overrange conditions.
RANGING: Automatic or manual.
CONVERSION TIME: Selectable 0.01 PLC to 10 PLC.
MAXIMUM INPUT: 250V peak, DC to 60 Hz sine wave; 10 sec per minute maximum on mA ranges.
MAXIMUM COMMON MODE VOLTAGE (DC to 60 Hz sine wave): Electrometer, 500V peak; V Source, 750V peak.
ISOLATION (Meter COMMON to chassis): >10^10 Ω, <500 pF.
INPUT CONNECTOR: Three lug triaxial on rear panel.
2V ANALOG OUTPUT: 2V for full range input. Non-inverting in Volts mode, inverting when measuring Amps, Ohms, or Coulombs. Output impedance 10 kΩ.
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.
EXTERNAL TRIGGER: TTL compatible External Trigger and Electrometer Complete.
GUARD: Switchable voltage guard available.
DIGITAL I/O AND TRIGGER LINE: Available, see manual for usage.
READING STORAGE: 50,000.
READING RATES:

1. Specifications apply immediately after charge acquisition. Add

\[ \left( \frac{1}{4A + \frac{T_{A}}{RC}} \right) \]

where \( T_{A} \) = period of time in seconds between the coulombs zero and measurement and \( Q_{AV} \) = average charge measured over \( T_{A} \) and \( RC = 300,000 \) typical.
2. When properly zeroed, 6½-digit. 1 PLC (power line cycle), median filter on, digital filter = 10 readings.
INPUT BIAS CURRENT: <4 fA at \( T_{CAL} \). Temperature coefficient = 0.5 fA/°C, 2 nC range.

TEMPERATURE (Thermocouple)

<table>
<thead>
<tr>
<th>THERMOCOUPLE TYPE</th>
<th>RANGE</th>
<th>ACCURACY (1 Year)(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>–25°C to 150°C</td>
<td>±(0.3% + 1.5°C)</td>
</tr>
</tbody>
</table>

NOTES
1. Excluding probe errors, \( T_{A} \) = 5°C, 1 PLC integration time.

HUMIDITY

<table>
<thead>
<tr>
<th>RANGE</th>
<th>ACCURACY (1 Year)(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–100%</td>
<td>±(0.3% + 0.5)</td>
</tr>
</tbody>
</table>

NOTES
1. Humidity probe accuracy must be added. This is ±3% RH for Model 6517-RH, up to 65°C probe environment, not to exceed 85°C.
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For Further Information
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