486 Picoammeter

The Model 486 is a 5½-digit autoranging picoammeter designed for low current applications where fast reading rates must be made. It offers a speed of 180 readings per second.

The 486 is ideal for low-level DC current applications, such as:
- PMT current measurements
- mass spectrometer current measurements
- probe current measurements in electrochemistry
- plasma generated currents
- ion chamber currents

Operation is fast and convenient. Selectable analog and digital filters provide optimum wide-band performance with minimum noise. Autoranging selects the most appropriate range within 100ms. The measurement buffer holds up to 512 readings for fast data acquisition. Any reading within the buffer may be displayed, or the entire buffer may be searched for the maximum and minimum values.

Other important features include REL, which allows measurements to be made relative to a selectable baseline. ZERO CHECK and CORRECT functions correct for voltage offset errors using front panel or software commands.

The IEEE-488 interface provides simple integration and convenient user interaction. Digital calibration can be accomplished over the bus or completely from the front panel. The display features three selectable intensities (bright, dim, and off) for use in light-sensitive environments.

487 Picoammeter/Voltage Source

The Model 487 is designed for measurement of low currents and very high resistances. This instrument incorporates all the capabilities of the 486, and adds a programmable ±500V source. This combination of picoammeter and voltage source provides a powerful high resistance meter and fast picoammeter in one instrument.

The 487 sources up to 500V, measures the current with 10fA sensitivity, and then instantly calculates the resistance value, from 500mΩ to 5 × 10¹⁶Ω. The unit displays either current or resistance. Reading intervals from 10ms to 1000s can be programmed, simplifying tests that require a predetermined “soak” time.

Two displays, one for current readings and one for voltage sourcing, permit the voltage setting and the measured current to be viewed throughout the measurement.

The Model 487 and the 6517A are the most effective test instruments for performing such tasks as resistivity, IV measurements, component leakage, and insulation resistance. A common test procedure, written by the American Society of Testing and Materials, D257: D-C RESISTANCE OR CONDUCTANCE OF INSULATING MATERIALS, is easily performed with the 487 or the 6517A.
# Model 486 and 487 Specifications

## LOW I/HIGH R PRODUCTS

<table>
<thead>
<tr>
<th>RANGE</th>
<th>RESOLUTION</th>
<th>ACCURACY (1 Year)*</th>
<th>ANALOG OUTPUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 nA</td>
<td>10 fA</td>
<td>±(5%rdg+offset)</td>
<td>Offline Filter</td>
</tr>
<tr>
<td>20 nA</td>
<td>10 pA</td>
<td>0.2 + 500 fA</td>
<td>12 ms</td>
</tr>
<tr>
<td>200 nA</td>
<td>1 nA</td>
<td>0.15 + 200 pA</td>
<td>4 ms</td>
</tr>
<tr>
<td>2 µA</td>
<td>10 pA</td>
<td>0.15 + 200 pA</td>
<td>20 µA</td>
</tr>
<tr>
<td>200 µA</td>
<td>10 nA</td>
<td>0.1 + 200 pA</td>
<td>160 µA</td>
</tr>
<tr>
<td>2 mA</td>
<td>100 nA</td>
<td>0.1 + 200 pA</td>
<td>370 µA</td>
</tr>
</tbody>
</table>

* When properly zeroed.

### MAXIMUM OVERLOAD

- 350V peak on nA ranges and 2µA range; 50V peak on 20µA, 200µA, and 2mA ranges.
- Higher voltage sources must be current limited at 3mA.

### INPUT VOLTAGE BURDEN

- <200µV (18°–28°C) for inputs <100µA; <2mV for inputs ≥ 100µA; 20µV/°C temperature coefficient.

### TEMPERATURE COEFFICIENT

- ±(0.15 × applicable accuracy specification)/°C.

### NMRR

- >60dB at 50Hz (LINE 50Hz integration) or 60Hz (LINE 60Hz integration).

### ANALOG OUTPUT

- **Range:** ±2V for full range input (non-inverting).
- **Accuracy:** ±(2.5% + 3mV); resistive loads >2kΩ, 18°–28°C.
- **Impedance:** <100Ω, DC–2kHz.

### RANGING

- Automatic or manual.

### AUTORANGING TIME

- <200ms to final range (analog filter OFF).

### MAXIMUM READING RATES (readings/second):

<table>
<thead>
<tr>
<th>INTEGRATION SETTING</th>
<th>RESOLUTION</th>
<th>DATA STORE</th>
<th>DATA STORE</th>
<th>IEEE-488 BUS**</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAST</td>
<td>4½-Digit</td>
<td>100</td>
<td>180</td>
<td>16</td>
</tr>
<tr>
<td>LINE 60Hz</td>
<td>5½-Digit</td>
<td>60</td>
<td>44</td>
<td>14</td>
</tr>
<tr>
<td>LINE 50Hz</td>
<td>5½-Digit</td>
<td>33</td>
<td>38</td>
<td>12</td>
</tr>
</tbody>
</table>

** One-shot on TALK, G7 data format.

### VOLTAGE SOURCE (487 only):

<table>
<thead>
<tr>
<th>RANGE (maximum value)</th>
<th>STEP SIZE (typical)</th>
<th>ACCURACY (1 Year)</th>
<th>NOISE (p-p)***</th>
<th>TEMPERATURE COEFFICIENT 0°–18°C &amp; 28°–50°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>±505.00 V</td>
<td>10 mV</td>
<td>0.15 + 40 mV</td>
<td>1.5 µV</td>
<td>±(0.15 × applicable accuracy specification)</td>
</tr>
<tr>
<td>±50.50 V</td>
<td>1 mV</td>
<td>0.1 + 4 mV</td>
<td>150 µV</td>
<td>±(0.15 × applicable accuracy specification)</td>
</tr>
</tbody>
</table>

*** With LO terminal connected to chassis.

### SELECTABLE CURRENT LIMIT

- 2.5mA ±0.5mA or 25µA ±5µA

### WIDEBAND NOISE

- <30mV p-p 0.1Hz to 20MHz.

### TIME STABILITY

- ±0.005% + 1mV over 24 hours at constant temperature.

### OUTPUT RESISTANCE

- <2.5Ω.

### V/I OHMS (487 only)

Used with voltage source; resistance calculated from voltage setting and measured current. V/I OHMS accuracy equals voltage source accuracy plus ammeter accuracy. Typical accuracy better than 0.6% for readings between 1Ω and 1TΩ.

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# Accessories Available

- **Cables:**
  - 236-ILC-3 Safety Interlock Cable
  - 257-ALG-2 Low Noise Cable
  - 7078-TRX-3 3-Slot Male Triax to 3-Slot Male Triax Cable, 0.9m (3 ft)

- **Adapters:**
  - 6171 3-Slot Male Triax to 2-Lug Female Triax
  - 6172 2-Slot Male Triax to 2-Lug Female Triax
  - 7078-TRX-BNC 3-Slot Male Triax to BNC Adapter

- **Test Fixtures:**
  - 8008 Resistivity Chamber

- **Rack Mounts:**
  - 4288-1 Single Fixed Rack Mount Kit
  - 4288-2 Dual Fixed Rack Mount Kit
  - 4288-4 Dual Fixed Rack Mount Kit