



Data Sheet

# 7200 Series Capacitance Meter



*Taking performance to a new peak*

# 7200 Series Capacitance Meter

The 7200 is a sophisticated capacitance meter equally suited for demanding R&D, as well as manufacturing applications. Two phase-sensitive detectors are used to extract and display both the parallel capacitance and conductance of the device under test. From the measured parameters the 7200 can calculate and display the equivalent parallel and series resistance, series capacitance, dissipation factor, and quality factor Q. Capacitance can also be displayed as a deviation from a selectable reference standard in % or pF units. The 7200 uses a software filter technique which averages consecutive measurements to achieve a stable display value. Test levels are programmable from 15 to 100 mV, making the 7200 suitable for a wide variety of semiconductor measurements. Up to 99 complete front panel setups can be stored and recalled in internal non-volatile memory.

### Bias Voltage

The 7200 accepts, measures and displays external bias voltage over a range of  $\pm 60$  V. An internal bias supply is also included and is programmable over a  $\pm 60$  V range. This bias capability, along with fast responding analog C, G and V outputs, makes the 7200 ideal for C-V and G-V semiconductor plots, as well as DLTS material studies.

### Automatic Zeroing

One key stroke zeros the 7200 for stray capacitance and loss. The 7200 is capable of zeroing up to 2000 pF. As a result, the maximum range of the instrument can be effectively increased to 4000 pF by first zeroing the 7200 with a 2000 pF specimen connected to the input.

### Special Functions

A variety of special functions are provided to extend the operation of the 7200 to meet specific requirements. For example, the instrument can be forced to hold a particular measurement or bias range. The averaging filter length can be selected from no averaging up to 500 measurements. Special functions can also be used, in conjunction with external standards, to calibrate the instrument from the front panel or over the IEEE-488 interface.



- Capacitance range, 0 to 2000 pF
- Conductance range, 0 to 2000  $\mu$ S
- Test frequency, 1 MHz crystal-controlled
- Test level, selectable 15, 30, 50, and 100 mV
- External bias  $\pm 60$  V
- Standard programmable internal bias  $\pm 60$  V
- Analog outputs proportional to both C and G and bias
- GPIB standard

### Bus Operation

The 7200 is equipped with a full function IEEE-488 interface bus. The following can be remotely programmed: all panel functions, including special functions; store and recall panel setups; and zero and bias controls. For rapid data transfer, C, G and V information is available simultaneously. Front panel setups can be stored and recalled by program location.

## Specifications

### Capacitance Display

|                   |   |
|-------------------|---|
| Capacitance Range | 0 to 2000 pF  |
| Full Scale Ranges | 2, 20, 200, 2000 pF   |
| Accuracy          | 0.25% of reading<br>+0.2% of full scale +0.005 pF   |
| Resolution        | 0.001 pF from 0 to 2 pF<br>0.01 pF from 2 to 20 pF<br>0.1 pF from 20 to 200 pF<br>1 pF above 200 pF |

### Conductance Display

|                            |  |
|----------------------------|--|
| Conductance Range          | 0 to 2000 $\mu$ S  |
| Full Scale Ranges          | 2, 20, 200, 2000 $\mu$ S   |
| Accuracy                   | 2.5% of reading +2.0% of full scale +0.05 $\mu$ S + 2 ( $\omega$ C) <sup>2</sup><br>Where C is the parallel capacitance in Farads        |
| Residual Series Resistance | 2 $\Omega$ maximum   |
| Resolution                 | 0.01 $\mu$ S from 0 to 2 $\mu$ S<br>0.1 $\mu$ S from 2 to 20 $\mu$ S<br>1 $\mu$ S from 20 to 200 $\mu$ S<br>10 $\mu$ S above 200 $\mu$ S |

### Computed Parameters

|                     |  |
|---------------------|--|
| Series Capacitance  | 0.000 to $\pm$ 9999 pF                         |
| Series Resistance   | 0.00 $\Omega$ to $\pm$ 9.999 M $\Omega$        |
| Parallel Resistance | $\pm$ 488.5 $\Omega$ to $\pm$ 9.999 M $\Omega$ |
| Dissipation         | 0.000 to $\pm$ 999.9                           |
| Quality Factor      | 0.000 to $\pm$ 999.9                           |
| $\Delta$ C          | 0.000 to $\pm$ 4047 pF                         |
| $\Delta$ %          | 0.00 to $\pm$ 99.99%                           |

### Temperature Influences

|                       |                    |
|-----------------------|--------------------|
| Operating Temperature | 10° C to 40° C     |
| Amplitude Error       | $<\pm$ 0.017% /° C |
| Phase Error           | $<\pm$ 0.2° /° C   |
| Warmup Time           | 2 Hours            |

### Test Signal

|           |                                       |
|-----------|---------------------------------------|
| Frequency | 1.0 MHz, crystal-controlled           |
| Level     | Programmable<br>15, 30, 50 and 100 mV |

### External Bias

|                 |                        |
|-----------------|------------------------|
| Voltage Range   | $\pm$ 60 V             |
| Maximum current | 62.5 mA fuse protected |

### External Bias Display

|               |                         |
|---------------|-------------------------|
| Voltage Range | $\pm$ 60 V              |
| Resolution    | 0.1 V                   |
| Accuracy      | 0.25% of rdg + 4 counts |

### Internal Bias

|                 |  |
|-----------------|--|
| Voltage Range   | $\pm$ 60 volts, programmable from the front panel            |
| Accuracy        | 0.5% of setting + 10 counts                                  |
| Resolution      | 1 mV for voltages $\leq$ 20 V<br>10 mV for voltages $>$ 20 V |
| Maximum Current | 5 mA   |

### Rear Panel Connectors

|                  |  |
|------------------|--|
| Analog Out, C    | 2 volts full scale, source resistance 1000 ohms, linearity 0.1% of reading + 0.05% of full scale         |
| Analog Out, G    | 2 volts full scale, source resistance 1000 ohms, linearity 0.1% of reading + 0.05% of full scale         |
| Analog Out, Bias | 2 volts full scale<br>Source resistance 1000 ohms  |
| IEEE-488         | Complies with IEEE-488-1978<br>Implements AH1, SH1, T6, TEO, L4, LEO, SR1, RL1, PPO, DC1, DT1, CO and E1 |
| External Bias In | $\pm$ 60 volts max<br>62.5 mA fuse protected   |

### Front Panel Controls and Displays

|          |  |
|----------|--|
| Controls | Keystitches enable data entry and selection of major functions                                     |
| Displays | Vacuum Fluorescent<br>20-digit display of BIAS LEVEL, TEST LEVEL, CAPACITANCE, LOSS, ADRS AND SPCL |

## Other Specifications

|                    |  |
|--------------------|--|
| Weight             | 12 lbs (5.4 kg)  |
| Power Requirements | 100, 120, 220, 240 V AC<br>50-60 Hz, 35 VA   |
| Council Directives | 89/336/EEC//93/68/EEC, 73/23/EEC//93/68/EEC & Standards<br>EN55011, EN50082-1, EN61010-1 |
| CE Mark            | Declares Conformity to European Community (EC)   |

## Accessories

|                        |            |
|------------------------|------------|
| Rack mount kit, single | PIN 950002 |
| Rack mount kit, dual   | PIN 950001 |



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