# SM-2010 Series

**4½-Digit ISA-Bus Multimeters**

## Functional Description

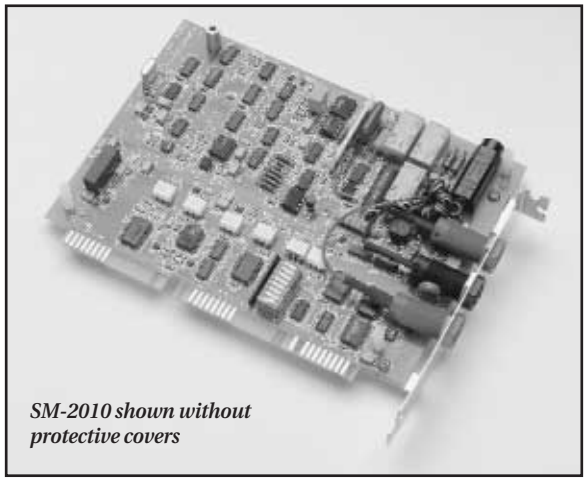
The SM-2010 sets a new standard for low cost, precision measurement in the PC. It implements a full featured, versatile 4½-digit DMM that plugs into any half size PC ISA bus slot and, best of all, is low in cost. The SM-2010 couples the convenience of PC-based data analysis with all the functionality, performance, and durability of a bench top multimeter. Need to measure differentially a millivolt floating at 200V above system ground? Not a problem with the SM-2010.

Signal leads from the device under test connect directly to the SM-2010. There are no additional power or data cables to a separate bench top instrument. It's all inside your PC for minimum foot print and maximum ease of use.

Your PC controls the SM-2010 and implements its front panel with a Windows based display. Point and click control is provided with your mouse. You can choose control program options ranging from very easy to use to the flexibility of a programming language

You can use Visual Basic or C to develop language based applications. To get you started, source code for two virtual front panels (written in Visual Basic) are supplied with your SM-2010CT.

For AC applications, frequency counting and period measurement are available with the SM-2010CT model.



*SM-2010 shown without protective covers*

The front end of the SM0-2010 has 250V of isolation and protection. It is rugged enough to handle inadvertent over voltage events and maintain accuracy.

**FEATURES**

- Flexible, full featured autoranging DMM
- DC & AC Volts, Current & Ohms, each fully protected
- Measure 10µV to 250V
- Up to 200 measurements/s
- 10Hz to 20kHz true rms ACV
- Optional frequency counter 5Hz to 100kHz
- Power management
- 250V isolation barrier

**APPLICATIONS**

- Automated production testing
- Laboratory automation
- OEM equipment
- Portable field data acquisition
- Low power (0.5W on)

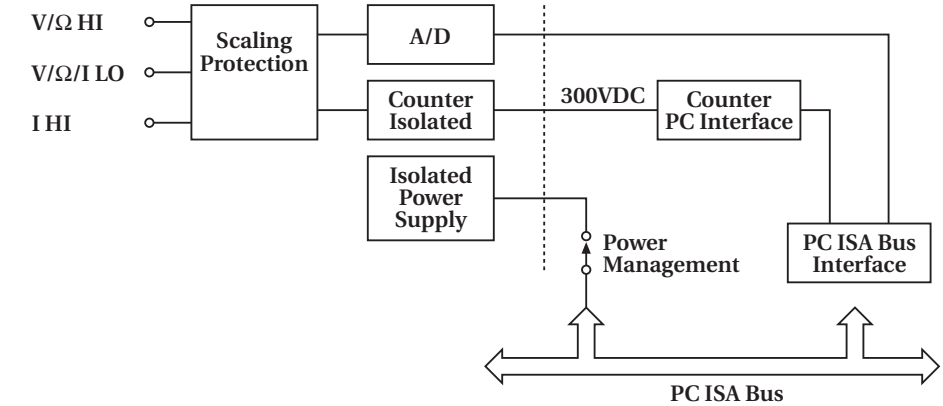

## Programming

Software for two control panels comes with your SM-2010 allowing you to start using your DMM immediately. The control panels provide point and click control over all instrument functions. The simplest one (shown to the right) emulates the function of an autoranging hand-held DMM. The full control panel shown on the next page allows complete control over all functions of the SM-2010. If you want to make changes, the control panel application programs (sources written in Visual Basic) are part of the bundled software supporting Windows 3.x and Windows 95.

## Language Based Applications

Language based programming allows the highest level flexibility in configuring an application. Drivers are provided with the SM-2010 to support application development in a variety of language and operating system environments.

*Block Diagram*






KEITHLEY

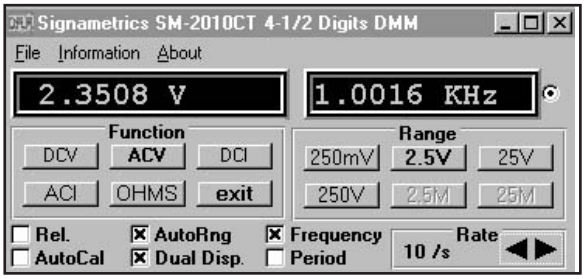
# SM-2010 Series

The following table summarizes driver availability:

| DOS | WIN 3.X | WIN 95 | |
|---|---|---|---|
| Control Panel | | X | X |
| Borland C, MS C++ | X | | |
| Visual Basic 3.0 | | X | X |
| Visual Basic 4.0 | | | X |
| 16-bit DLL | | X | X |
| 32-bit DLL | | | X |
| 32-bit OCX | | | X |

Drivers for DOS, Windows 3.x, and Windows 95/98 are included with each SM-2010. These drivers implement 30 well documented functions. The OCX control can easily be linked to a wide variety of Windows 95/98 applications. It is also a handy tool for off-line control of the SM-2010 during development.

Optional 32-bit support SW for Windows NT is available.




## SPECIFICATIONS

### SM-2010 and SM-2010CT

± (% of reading + Number of counts)

### DC VOLTAGE

| RANGE | FULL SCALE 4½ DIGITS | RESOLUTION | ONE YEAR ACCURACY 18°C TO 28°C |
|---|---|---|---|
| 250 mV | ±250.00 mV | 10 µV | 0.03 + 2 |
| 2.5 V | ±2.5000 V | 100 µV | 0.03 + 1 |
| 25 V | ±25.000 V | 1 m V | 0.03 + 1 |
| 250 V | ±250.00 V | 10 m V | 0.03 + 1 |

**INPUT RESISTANCE:** >1000MΩ on 250mV and 2.5V ranges. 10MΩ on 25V and 250V ranges.

### RESISTANCE

| RANGE | FULL SCALE 4½ DIGITS | RESOLUTION | ONE YEAR ACCURACY 18°C TO 28°C |
|---|---|---|---|
| 250 Ω | 250.00 Ω | 10 mΩ | 0.03 + 2 |
| 2.5 kΩ | 2.5000 kΩ | 100 mΩ | 0.03 + 2 |
| 25 kΩ | 25.000 kΩ | 1 Ω | 0.03 + 2 |
| 250 kΩ | 250.00 kΩ | 10 Ω | 0.05 + 2 |
| 2.5 MΩ | 2.5000 MΩ | 100 Ω | 0.2 + 2 |
| 25 MΩ | 25.000 MΩ | 1 kΩ | 1.0 + 2 |

Has self-calibrated function. Absolute or relative measurement.

**MAXIMUM ALLOWABLE INPUT IN Ω:** 250VDC or rms AC.

**OPEN CIRCUIT VOLTAGE:** <5V on all ranges.

**SETTLING TIME:** 2 seconds to within 1 count of final reading on range.

### DC CURRENT

| RANGE | FULL SCALE 4½ DIGITS | RESOLUTION | ONE YEAR ACCURACY 18°C TO 28°C |
|---|---|---|---|
| 2.5 mA | ±2.5000 mA | 100 nA | 0.04 + 5 |
| 25 mA | ±25.000 mA | 1 µA | 0.03 + 2 |
| 250 mA | ±250.00 mA | 10 µA | 0.03 + 5 |
| 2.5 A | ±2.5000 A | 100 µA | 0.05 + 2 |

**BURDEN VOLTAGE:** <1V on all ranges.

**OVERLOAD PROTECTION:** 2.5A fuse (250V).

### AC VOLTAGE, TRUE RMS (AC Coupled)

| RANGE | FREQUENCY | FULL SCALE 4½ DIGITS | ONE YEAR ACCURACY 18°C TO 28°C |
|---|---|---|---|
| 250mV | 10 Hz - 45 Hz | 250.00 mV | 3.0 + 40 |
| | 45 Hz - 5 kHz | | 0.3 + 35 |
| | 5 kHz - 20 kHz | | 0.8 + 35 |
| 2.5V - 250V | 10 Hz - 45 Hz | 2.5000 V, 25.000 V, | 3.0 +30 |
| | 45 Hz - 5 kHz | 250.00 V | 0.3 + 20 |
| | 5 kHz - 20 kHz | | 0.7 + 30 |

**INPUT IMPEDANCE:** 1MΩ in parallel with <75pF.

### AC CURRENT, AC + DC TRUE RMS (DC Coupled)

| RANGE | FREQUENCY | FULL SCALE 4½ DIGITS | ONE YEAR ACCURACY 18°C TO 28°C |
|---|---|---|---|
| 250mV-2.5A | 10Hz - 45Hz | 2.5000 mA, | 1.0 +30 |
| | 45Hz - 1kHz | 25.000 mA, | 0.9 + 20 |
| | 1kHz - 5kHz | 250.00 mA, | 1.2 +30 |
| | | 2.5000 A | |

**BURDEN VOLTAGE:** <1V on all ranges.

**OVERLOAD PROTECTION:** 2.5A fuse (250V).

### FREQUENCY MEASUREMENT (SM-2010CT only)

**RANGE:** 5Hz–100kHz.

**SENSITIVITY:** Input Voltage > 250mV up to 50kHz, >2V up to 100kHz.

**BEST RESOLUTION:** 1mHz.

**FREQUENCY UNCERTAINTY:** 50ppm.

### GENERAL SPECIFICATIONS

**READING RATE:** 200 readings/s to 1 reading/s.

**PHYSICAL SIZE:** Half length ISA card.

**TYPICAL POWER REQUIREMENTS:** +5V, less than 100mA. Can be turned on/off by software control.

**ISOLATION:** Input COM to computer ground, 250VDC or rms AC.

**SOFTWARE:** Windows 3.1 DLL, VB control panels, DOS.LIB for Microsoft Visual C++ and Borland C++, Windows 95/98 DLL (16 and 32 bits, OCX, and control panels.

**OPTIONAL SOFTWARE:** Windows NT Drivers.

**TERMINALS:** Three safety jacks – Volts/Ohms High, Current High, Low.

**EMC:** Conforms to European Union Directive 89/336/EEC.

**SAFETY:** Meets EN61010-1/IEC 1010.

| ORDER | DESCRIPTION |
|---|---|
| **SM-2010** | Full featured 4½-digit DMM |
| **SM-2010CT** | Same as SM-2010 with frequency, counter, and period measurement |
| **OPTIONS** | |
| **SM-2010WNT** | Windows NT driver software upgrade |