

SCM9B-1000/2000 Series



Sensor-to-Computer Modules

Description

The SCM9B-1000/2000 Sensor-to-Computer Modules are a family of complete solutions designed for data acquisition systems based on personal computers and other processor-based equipment with standard serial I/O ports. The modules convert analog input signals to engineering units and transmit in ASCII format to any host with standard RS-485 or RS-232C ports. These modules can measure temperature, pressure, voltage, current and various types of digital signals. The modules provide direct connection to a wide variety of sensors and perform all signal conditioning, scaling, linearization and conversion to engineering units. Each module also provides digital I/O lines for controlling devices through solid state relays or TTL signals. These digital I/O lines along with built-in limit setting capability provide alarm and control outputs (see Figure 1).

The modules contain no pots or switches to be set. Features such as address, baud rate, parity, alarms, echo, etc. are selectable using simple commands over the communications port—without requiring access to the module. The selections are stored in nonvolatile EEPROM which maintains data even after power is removed.

The 2000 series is an enhanced version of the 1000 series of sensor interfaces. The 2000 series allows the user to scale the output data in any desired engineering units. The 2000 also provides the ability to program nonlinear transfer functions. This feature may be used to linearize nonstandard sensors or to provide outputs in engineering units which are nonlinear functions of the input.

► Features

- Complete Sensor to RS-485 or RS-232C Interface
- ASCII Format Command/Response Protocol
- 500Vrms Analog Input Isolation
- 15-Bit Measurement Resolution
- Continuous Self-Calibration; No Adjustments of Any Kind
- Programmable Digital Filter
- Digital Limit Setting and Alarm Capability
- Digital Inputs and Outputs Connect to Solid State Relays
- Events Counter to 10 Million
- Requires +10V to +30VDC Unregulated Supply
- Transient Suppression on RS-485 Communications Lines
- Screw Terminal Plug Connectors Supplied
- CE Compliant

Programmable Features (2000 Series)

(Provides intelligent features not found in the 1000 series.)

- ASCII Output Scaled to Desired Engineering Units
- User Programmable Nonlinear Transfer Function
- Straight-Line Segment Approximation: up to 24 Segments

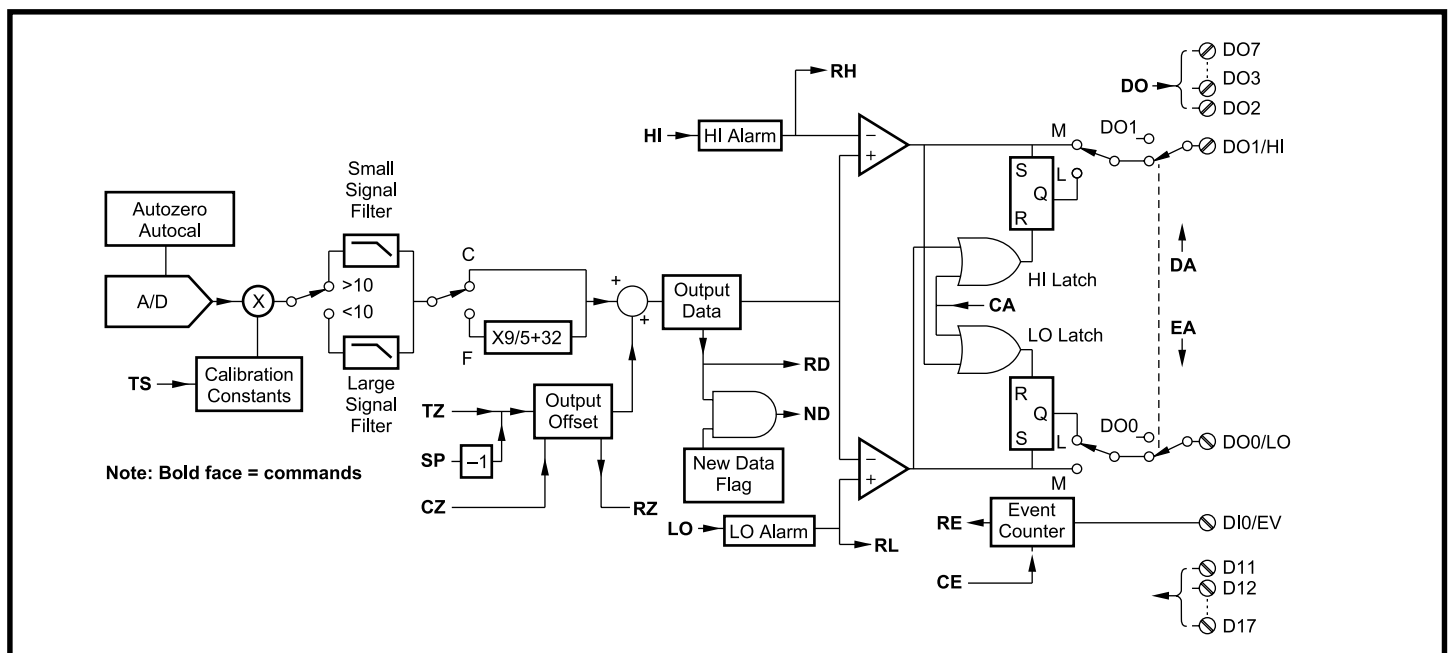


Figure 1: SCM9B-1000/2000 Block Diagram

Specifications

Typical at 25°C and nominal power supply unless otherwise noted

Analog

- Single channel analog input.
- Maximum CMV, input to output at 60Hz: 500Vrms.
- Leakage current, input to output at 115Vrms, 60Hz: <2μArms.
- 15-bit measurement resolution.
- 8 conversions per second.
- Autozero & autocalibration—no adjustment pots.

Digital

- 8-bit CMOS microcomputer.
- Digital scaling, linearization and calibration.
- Nonvolatile memory eliminates pots and switches.

Digital filtering

- Small and large signal with user selectable time constants from 0 to 16 seconds.

Events counter

- Up to 10 million positive transitions at 60Hz max., filtered for switch debounce.

Digital inputs

- Voltage levels: ±30V without damage.
- Switching levels: High, 3.5V min., low, 1.0V max.
- Internal pull up resistors for direct switch input.

Digital outputs

- Open collector to 30V, 30mA max. load.

Alarm outputs

- HI/LO limit checking by comparing input values to down-loaded HI/LO limit values stored in memory.
- Alarms: latching (stays on if input returns to within limits) or momentary (turns off if input returns to within limits.)

Communications

- Communications in ASCII via RS-232C, RS-485 ports.
- Selectable baud rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400.
- NRZ asynchronous data format: 1 start bit, 7 data bits, 1 parity bit and 1 stop bit.
- Parity: odd, even, none.
- User selectable channel address.
- ASCII format command/response protocol.
- Up to 124 multidrop modules per host serial port.
- Communications distance up to 10,000 feet (RS-485).
- Transient suppression on RS-485 communications lines.
- Communications error checking via checksum.
- Can be used with "dumb terminal".
- Scan up to 250 channels per second.
- All communications setups stored in EEPROM.

Power

- Requirements: Unregulated +10V to +30VDC, 0.75W max (1500/2500, 2.0W max.)
- Internal switching regulator.
- Protected against power supply reversals.

Environmental

- Temperature Range: Operating -25°C to +70°C.
Storage -25°C to +85°C.
- Relative Humidity: 0 to 95% noncondensing.

1100/2100 Voltage Input Modules

- Voltage ranges: ±10mV, ±1V, ±5V, ±10V, ±100VDC.
- Resolution: 0.01% of FS (4 digits).
- Accuracy: ±0.02% of FS max.
- Common mode rejection: 100dB at 50/60Hz.
- Zero drift: ±1 count max (autozero).
- Span tempco: ±50ppm/°C max.
- Input burnout protection to 250VAC.
- Input impedance: ≤ ±1V input = 100MΩ min.
≥ ±5V input = 1MΩ min.
- 1 Digital input/Event counter, 2 Digital outputs.

1200/2200 Current Input Modules

- Current ranges: ±1mA, ±10mA, ±100mA, ±1A, 4-20mADC.
- Resolution: 0.01% of FS (4 digits), 0.04% of FS (4-20mA).
- Accuracy: ±0.02% of FS, 0.04% of FS (4-20mA).
- Common mode rejection: 100dB at 50/60Hz.
- Zero drift: ±1 count max (autozero).
- Span tempco: ±50ppm/°C max. (±1A = ±80 ppm/°C max.)
- Voltage drop: ±0.1V max.
- 1 Digital input/Event counter, 2 Digital outputs.

1300 Thermocouple Input Modules

- Thermocouple types: J, K, T, E, R, S, B, C (factory set).
- Ranges: J = -200°C to +760°C B = 0°C to +1820°C
K = -150°C to +1250°C S = 0°C to +1750°C
T = -200°C to +400°C R = 0°C to +1750°C
E = -100°C to +1000°C C = 0°C to +2315°C
- Resolution: ±1°.
- Overall Accuracy (error from all sources) from 0 to +40°C ambient:
±1.0 °C max (J, K, T, E).
±2.5 °C max (R, S, B, C)(300°C to FS).
- Common mode rejection: 100dB at 50/60Hz.
- Input impedance: 100MΩ min.
- Lead resistance effect: <20μV per 350Ω.
- Open thermocouple indication.
- Input burnout protection to 250VAC.
- User selectable °C or °F.
- Overrange indication.
- Automatic cold junction compensation and linearization.
- 2 Digital inputs, Event counter, 3 Digital outputs.

1400 RTD Input Modules

- RTD types: α = .00385, .00392, 100Ω at 0°C,
.00388, 100Ω at 25°C.
- Ranges: .00385 = -200°C to +850°C.
.00392 = -200°C to +600°C.
.00388 = -100°C to +125°C.
- Resolution: 0.1°.
- Accuracy: ±0.3°C.
- Common mode rejection: 100dB at 50/60Hz.
- Input connections: 2, 3, or 4 wire.
- Excitation current: 0.25mA.
- Lead resistance effect: 3 wire - 2.5°C per Ω of imbalance.
4 wire - negligible.
- Max lead resistance: 50Ω.
- Input protection to 120VAC.
- Automatic linearization and lead compensation.
- User selectable °C or °F.
- 1 Digital output.

1450 Thermistor Input Modules

- Thermistor types: 2252Ω at 25°C, TD Series
- Ranges: 2252Ω = -0°C to +100°C.
TD = -40°C to +150°C.
- Resolution: 2252Ω = 0.01°C or F.
TD = 0.1°C or F
- Accuracy: 2252Ω = ±0.1°C.
TD = ±0.2°C
- Common mode rejection: 100dB at 50/60Hz.
- Input protection to 30VDC.
- User selectable °C or °F.
- 1 Digital input/ Event counter, 2 Digital outputs.

Specifications

Typical at 25°C and nominal power supply unless otherwise noted

1500/2500 Strain Gage Input Modules

- Voltage Ranges: $\pm 30\text{mV}$, $\pm 100\text{mV}$, 1-6VDC.
- Resolution: $<10\mu\text{V}$ (mV Spans).
0.02% of FS (V Span).
- Accuracy: $\pm 0.05\%$ of FS max.
- Common mode rejection: 100dB at 50/60Hz.
- Offset Control: Full input range.
- Excitation Voltage: 5V, 8V, 10VDC, 60mA max.
- Input burnout protection to 30V, any pin
- Zero drift: $\pm 1\mu\text{V}/^\circ\text{C}$ max.
- Span tempco: $\pm 50\text{ppm}/^\circ\text{C}$ max.
- 1 Digital output.

1600/2600 Timer and Frequency Input Modules

- Input impedance: $1\text{M}\Omega$.
- Switching level: Selectable +1.7V to +2.5V.
- Hysteresis: Adjustable 10mV-1.0V.
- Input protection: 250VAC.
- 1 Digital input/event counter.

Frequency Input

- Range: 60 Hz standard.
SCM9B-1622–20kHz for 20kHz model.
- Resolution: 0.005% of reading + 0.01Hz.
- Accuracy: $\pm 0.01\%$ of reading $\pm 0.01\text{Hz}$.
- Tempco: $\pm 20\text{ppm}/^\circ\text{C}$.

Timer Input

- Range: $100\mu\text{s}$ to 30s.
- Resolution: 0.005% of reading + $10\mu\text{s}$.
- Accuracy: $\pm 0.01\%$ of reading $\pm 10\mu\text{s}$.
- Tempco: $\pm 20\text{ppm}/^\circ\text{C}$.

Event Counter Input

- Input Bandwidth: 60Hz, (optional 20kHz max.).
- Up to 10 million positive transitions.

1622 Event Counter Input

- TTL compatible:
 $<1\text{V}=0$
 $>3.5\text{V}=1$
 $\pm 30\text{V}$ max no damage.
Triggers on rising edge.

Accumulator Input

- Input Frequency Range: 1Hz to 10kHz.
- Input Timer Range: $100\mu\text{s}$ to 30s.
- Pulse Count: Up to 10 million positive transitions.
- Resolution: 0.005% of reading + 0.01Hz (frequency).
0.005% of reading + $10\mu\text{s}$ (timer).
- Accuracy: $\pm 0.01\%$ of frequency reading $\pm 0.01\text{Hz}$.
 $\pm 0.01\%$ of timer reading $\pm 10\mu\text{s}$.
- Tempco: $\pm 20\text{ppm}/^\circ\text{C}$.

1700 Digital Input/Output Modules

1711, 1712: 15 digital input/output bits.

- User can define any bit as an input or an output.
- Input voltage levels: 0-30V without damage.
- Input switching levels: High, 3.5V min., Low, 1.0V max.
- Outputs: Open collector to 30V, 100mA max. load.
- Vsat: 1.0V max at 100mA.
- Single bit or parallel I/O addressing.

1701, 1702: 7 digital inputs and 8 digital outputs.

- Input voltage levels: $\pm 30\text{V}$ without damage.
- Input switching levels: High, 3.5V min., Low, 1.0V max.
- Outputs: open collector to 30V, 30mA max. load.
- Vsat: 0.2V max at 30mA.
- Internal pull up resistors for direct switch input.
- Inputs/Outputs are read/set in parallel.

Specifications are subject to change without notice.

Ordering Information

Voltage Input

Model	Description
SCM9B-1101/2101	±10mV Input/RS-232C Output
SCM9B-1102/2102	±10mV Input/RS-485 Output
SCM9B-1111/2111	±100mV Input/RS-232C Output
SCM9B-1112/2112	±100mV Input/RS-485 Output
SCM9B-1121/2121	±1V Input/RS-232C Output
SCM9B-1122/2122	±1V Input/RS-485 Output
SCM9B-1131/2131	±5V Input/RS-232C Output
SCM9B-1132/2132	±5V Input/RS-485 Output
SCM9B-1141/2141	±10V Input/RS-232C Output
SCM9B-1142/2142	±10V Input/RS-485 Output
SCM9B-1151/2151	±100V Input/RS-232C Output
SCM9B-1152/2152	±100V Input/RS-485 Output

Current Inputs

Model	Description
SCM9B-1211/2211	±10mA Input/RS-232C Output
SCM9B-1212/2212	±10mA Input/RS-485 Output
SCM9B-1221/2221	±1mA Input/RS-232C Output
SCM9B-1222/2222	±1mA Input/RS-485 Output
SCM9B-1231/2231	±100mA Input/RS-232C Output
SCM9B-1232/2232	±100mA Input/RS-485 Output
SCM9B-1241/2241	±1A Input/RS-232C Output
SCM9B-1242/2242	±1A Input/RS-485 Output
SCM9B-1251/2251	4-20mA Input/RS-232C Output
SCM9B-1252/2252	4-20mA Input/RS-485 Output

Thermocouple Inputs

Model	Description
SCM9B-1311	J Thermocouple Input/RS-232C Output
SCM9B-1312	J Thermocouple Input/RS-485 Output
SCM9B-1321	K Thermocouple Input/RS-232C Output
SCM9B-1322	K Thermocouple Input/RS-485 Output
SCM9B-1331	T Thermocouple Input/RS-232C Output
SCM9B-1332	T Thermocouple Input/RS-485 Output
SCM9B-1341	E Thermocouple Input/RS-232C Output
SCM9B-1342	E Thermocouple Input/RS-485 Output
SCM9B-1351	R Thermocouple Input/RS-232C Output
SCM9B-1352	R Thermocouple Input/RS-485 Output
SCM9B-1361	S Thermocouple Input/RS-232C Output
SCM9B-1362	S Thermocouple Input/RS-485 Output
SCM9B-1371	B Thermocouple Input/RS-232C Output
SCM9B-1372	B Thermocouple Input/RS-485 Output
SCM9B-1381	C Thermocouple Input/RS-232C Output
SCM9B-1382	C Thermocouple Input/RS-485 Output

RTD Inputs

Model	Description
SCM9B-1411	.00385 RTD Input/RS-232C Output
SCM9B-1412	.00385 RTD Input/RS-485 Output
SCM9B-1421	.00392 RTD Input/RS-232C Output
SCM9B-1422	.00392 RTD Input/RS-485 Output
SCM9B-1431	.00388 RTD Input/RS-232C Output
SCM9B-1432	.00388 RTD Input/RS-485 Output
SCM9B-1451	2252Ω Thermistor Input/RS-232C Output
SCM9B-1452	2252Ω Thermistor Input/RS-485 Output
SCM9B-1461	TD Thermistor Input/RS-232C Output
SCM9B-1462	TD Thermistor Input/RS-485 Output

Strain Gage Inputs

Model	Description
SCM9B-1511/2511	±30mV Bridge Input, 5V Excitation/RS-232C Output
SCM9B-1512/2512	±30mV Bridge Input, 5V Excitation/RS-485 Output
SCM9B-1521/2521	±30mV Bridge Input, 10V Excitation/RS-232C Output
SCM9B-1522/2522	±30mV Bridge Input, 10V Excitation/RS-485 Output
SCM9B-1531/2531	±100mV Bridge Input, 5V Excitation/RS-232C Output
SCM9B-1532/2532	±100mV Bridge Input, 5V Excitation/RS-485 Output
SCM9B-1541/2541	±100mV Bridge Input, 10V Excitation/RS-232C Output
SCM9B-1542/2542	±100mV Bridge Input, 10V Excitation/RS-485 Output
SCM9B-1551/2551	1-6V Bridge Input, 8V Excitation/RS-232C Output
SCM9B-1552/2552	1-6V Bridge Input, 8V Excitation/RS-485 Output
SCM9B-1561/2561	1-6V Bridge Input, 10V Excitation/RS-232C Output
SCM9B-1562/2562	1-6V Bridge Input, 10V Excitation/RS-485 Output

Timer/Frequency Inputs

Model	Description
SCM9B-1601/2601	Frequency Input/RS-232C Output
SCM9B-1602/2602	Frequency Input/RS-485 Output
SCM9B-1611/2611	Timer Input/RS-232C Output
SCM9B-1612/2612	Timer Input/RS-485 Output
SCM9B-1621	Event Counter/RS-232C Output
SCM9B-1622	Event Counter/RS-485 Output
SCM9B-1631/2631	Accumulator, Frequency Input/RS-232C Output
SCM9B-1632/2632	Accumulator, Frequency Input/RS-485 Output
SCM9B-1641/2641	Accumulator, Timer Input/RS-232C Output
SCM9B-1642/2642	Accumulator, Timer Input/RS-485 Output

Digital Inputs/Outputs

Model	Description
SCM9B-1701	7 Digital Inputs, 8 Digital Outputs/RS-232C Output
SCM9B-1702	7 Digital Inputs, 8 Digital Outputs/RS-485 Output
SCM9B-1711	15 Digital Inputs and/or Outputs/RS-232C Output
SCM9B-1712	15 Digital Inputs and/or Outputs/RS-485 Output