SCM9B-1000/2000

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.

The modules contain no pots or switches to be set. Features such as address, data 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.

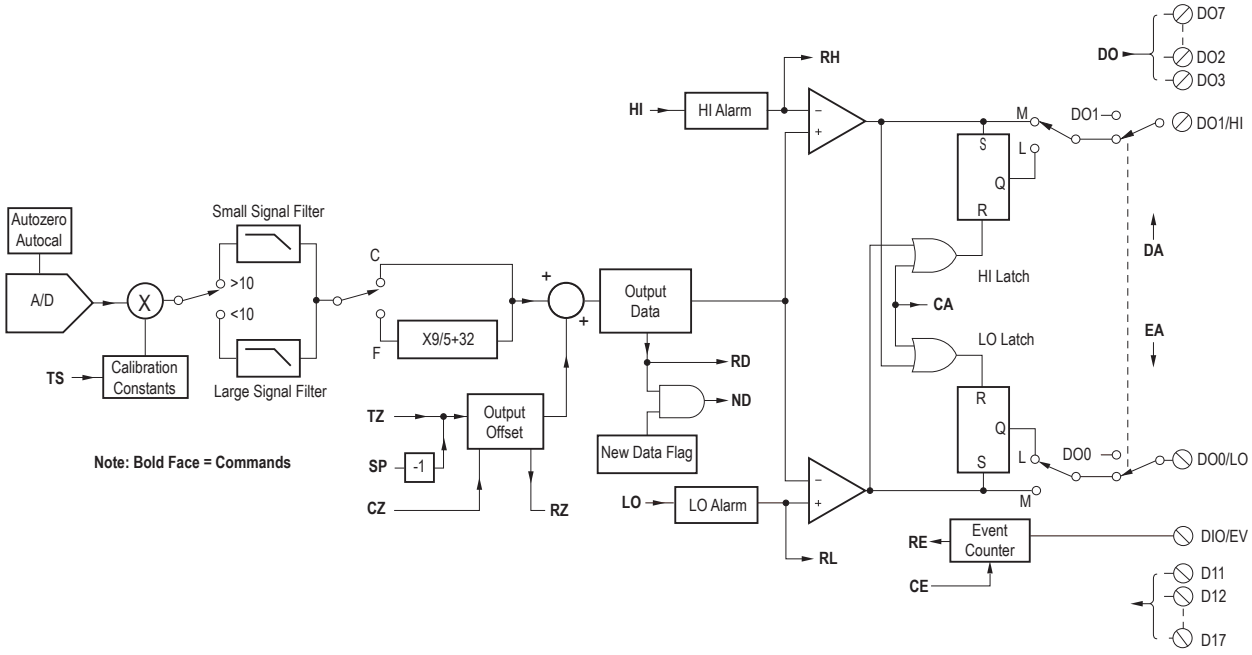
The 2000 Series is an enhanced version of the 1000 Series of sensor interfaces. The 2000 Series allows the user to scale the output data in any desired engineering units. The 2000 Series also provides the ability to program nonlinear transfer functions. This feature may be used to linearize nonstandard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



SCM9B-1000/2000 Block Diagram - For Module Dimensions and Pinouts, See Page 5-26

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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 data rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400bps
- 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, ±100mV, ±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, 4-20m ADC
- 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 = 0.00385, 0.00392, 100Ω at 0°C,
  0.00388, 100Ω at 25°C
- Ranges: 0.00385 = –200°C to +850°C
  0.00392 = –200°C to +600°C
  0.00388 = –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

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

1500/2500 Strain Gage Input Modules

- Voltage Ranges: ±30mV, ±100mV, 1-6VDC
- Resolution: <10µV (mV Span)
  0.02% of FS (V Span)
- Accuracy: ±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: ±1µV/°C (max)
- Span tempco: ±50ppm/°C (max)
- 1 Digital output

1600/2600 Timer and Frequency Input Modules

- Input impedance: 1MΩ
- Switching level: Selectable +1.7V to +2.5V
- Hysteresis: Adjustable 10mV-1.0V
- Input protection: 250VAC
- 1 Digital input/event counter

Frequency Input

- Range: 1Hz to 20kHz
- Resolution: 0.005% of reading + 0.01Hz
- Accuracy: ±0.01% of reading ±0.01Hz
- Tempco: ±20ppm/°C

Timer Input

- Range: 100µs to 30s
- Resolution: 0.005% of reading +10µs
- Accuracy: ±0.01% of reading ±10µs
- Tempco: ±20ppm/°C

Event Counter Input

- Input Bandwidth: 60Hz (optional 20kHz (max))
  SCM9B-1621–20kHz for 20kHz model
  SCM9B-1622–20kHz for 20kHz model
- Up to 10 million positive transitions.

1621/1622 Event Counter Input

- TTL compatible: <1V = 0
  >3.5V = 1
  ±30V (max) no damage
  Triggers on rising edge

Accumulator Input

- Input Frequency Range: 1Hz to 10kHz
- Input Timer Range: 100µs to 30s
- Pulse Count: Up to 10 million positive transitions
- Resolution: 0.005% of reading +0.01Hz (frequency)
  0.005% of reading +10µs (timer)
- Accuracy: ±0.01% of frequency reading ±0.01Hz
  ±0.01% of timer reading ±10µs
- Tempco: ±20ppm/°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: ±30V 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.

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Ordering Information – SCM9B-1100-2100 Voltage Inputs

Part Number	Input Range	Output Range	Bandwidth	Mechanical Format
SCM9B-1101	±10mV	RS-232C	Programmable	Plug-In or Hockey Puck
SCM9B-1102	±10mV	RS-485	Programmable	Plug-In or Hockey Puck
SCM9B-1111	±100mV	RS-232C	Programmable	Plug-In or Hockey Puck
SCM9B-1112	±100mV	RS-485	Programmable	Plug-In or Hockey Puck
SCM9B-1121	±1V	RS-232C	Programmable	Plug-In or Hockey Puck
SCM9B-1122	±1V	RS-485	Programmable	Plug-In or Hockey Puck
SCM9B-1131	±5V	RS-232C	Programmable	Plug-In or Hockey Puck
SCM9B-1132	±5V	RS-485	Programmable	Plug-In or Hockey Puck
SCM9B-1141	±10V	RS-232C	Programmable	Plug-In or Hockey Puck
SCM9B-1142	±10V	RS-485	Programmable	Plug-In or Hockey Puck
SCM9B-1151	±100V	RS-232C	Programmable	Plug-In or Hockey Puck
SCM9B-1152	±100V	RS-485	Programmable	Plug-In or Hockey Puck
SCM9B-2101	±10mV	RS-232C	Programmable	Plug-In or Hockey Puck
SCM9B-2102	±10mV	RS-485	Programmable	Plug-In or Hockey Puck
SCM9B-2111	±100mV	RS-232C	Programmable	Plug-In or Hockey Puck
SCM9B-2112	±100mV	RS-485	Programmable	Plug-In or Hockey Puck
SCM9B-2121	±1V	RS-232C	Programmable	Plug-In or Hockey Puck
SCM9B-2122	±1V	RS-485	Programmable	Plug-In or Hockey Puck
SCM9B-2131	±5V	RS-232C	Programmable	Plug-In or Hockey Puck
SCM9B-2132	±5V	RS-485	Programmable	Plug-In or Hockey Puck
SCM9B-2141	±10V	RS-232C	Programmable	Plug-In or Hockey Puck
SCM9B-2142	±10V	RS-485	Programmable	Plug-In or Hockey Puck
SCM9B-2152	±100V	RS-485	Programmable	Plug-In or Hockey Puck

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Ordering Information – SCM9B-1200-2200 Current Inputs

Part Number	Input Range	Output Range	Mechanical Format
SCM9B-1211	±10mA	RS-232C	Plug-In or Hockey Puck
SCM9B-1221	±1mA	RS-232C	Plug-In or Hockey Puck
SCM9B-1222	±1mA	RS-485	Plug-In or Hockey Puck
SCM9B-1231	±100mA	RS-232C	Plug-In or Hockey Puck
SCM9B-1232	±100mA	RS-485	Plug-In or Hockey Puck
SCM9B-1241	±1A	RS-232C	Plug-In or Hockey Puck
SCM9B-1242	±1A	RS-485	Plug-In or Hockey Puck
SCM9B-1251	4-20mA	RS-232C	Plug-In or Hockey Puck
SCM9B-1252	4-20mA	RS-485	Plug-In or Hockey Puck
SCM9B-2211	±10mA	RS-232C	Plug-In or Hockey Puck
SCM9B-2242	±1A	RS-485	Plug-In or Hockey Puck
SCM9B-2251	4-20mA	RS-232C	Plug-In or Hockey Puck
SCM9B-2252	4-20mA	RS-485	Plug-In or Hockey Puck

Ordering Information – SCM9B-1300 Thermocouple Inputs

Part Number	Thermocouple Type	Output Range	Input Temperature Range	Mechanical Format
SCM9B-1311	J	RS-232C	–200°C to 760°C	Plug-In or Hockey Puck
SCM9B-1312	J	RS-485	–200°C to 760°C	Plug-In or Hockey Puck
SCM9B-1321	K	RS-232C	–150°C to 1250°C	Plug-In or Hockey Puck
SCM9B-1322	K	RS-485	–150°C to 1250°C	Plug-In or Hockey Puck
SCM9B-1331	T	RS-232C	–200°C to 400°C	Plug-In or Hockey Puck
SCM9B-1332	T	RS-485	–200°C to 400°C	Plug-In or Hockey Puck
SCM9B-1341	E	RS-232C	–100°C to 1000°C	Plug-In or Hockey Puck
SCM9B-1342	E	RS-485	–100°C to 1000°C	Plug-In or Hockey Puck
SCM9B-1351	R	RS-232C	0°C to 1750°C	Plug-In or Hockey Puck
SCM9B-1352	R	RS-485	0°C to 1750°C	Plug-In or Hockey Puck
SCM9B-1361	S	RS-232C	0°C to 1750°C	Plug-In or Hockey Puck
SCM9B-1362	S	RS-485	0°C to 1750°C	Plug-In or Hockey Puck
SCM9B-1371	B	RS-232C	0°C to 1820°C	Plug-In or Hockey Puck
SCM9B-1372	B	RS-485	0°C to 1820°C	Plug-In or Hockey Puck
SCM9B-1381	C	RS-232C	0°C to 2315°C	Plug-In or Hockey Puck
SCM9B-1382	C	RS-485	0°C to 2315°C	Plug-In or Hockey Puck

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Ordering Information – SCM9B-1400 RTD Inputs

Part Number	Input Configuration	RTD Type	Input Range	Output Range	Mechanical Format
SCM9B-1411	2 & 3 Wire, 4 Wire	100Ω at 0°C alpha = 0.00385	–200°C to 850°C	RS-232C	Plug-In or Hockey Puck
SCM9B-1412	2 & 3 Wire, 4 Wire	100Ω at 0°C alpha = 0.00385	–200°C to 850°C	RS-485	Plug-In or Hockey Puck
SCM9B-1421	2 & 3 Wire, 4 Wire	100Ω at 0°C alpha = 0.00392	–200°C to 600°C	RS-232C	Plug-In or Hockey Puck
SCM9B-1422	2 & 3 Wire, 4 Wire	100Ω at 0°C alpha = 0.00392	–200°C to 600°C	RS-485	Plug-In or Hockey Puck
SCM9B-1431	2 & 3 Wire, 4 Wire	100Ω at 25°C alpha = 0.00388	–100°C to 125°C	RS-232C	Plug-In or Hockey Puck
SCM9B-1432	2 & 3 Wire, 4 Wire	100Ω at 25°C alpha = 0.00388	–100°C to 125°C	RS-485	Plug-In or Hockey Puck

Ordering Information – SCM9B-1400 Thermistor Inputs

Part Number	Type	Output	Input Temp. Range	Resolution	Mechanical Format
SCM9B-1411	2252Ω at 25°C	RS-232C	0°C to 100°C	0.01°C or °F	Plug-In or Hockey Puck
SCM9B-1412	2252Ω at 25°C	RS-485	0°C to 100°C	0.01°C or° F	Plug-In or Hockey Puck
SCM9B-1421	TD Series	RS-232C	–40°C to 150°C	0.1°C or °F	Plug-In or Hockey Puck
SCM9B-1422	TD Series	RS-485	–40°C to 150°C	0.1°C or °F	Plug-In or Hockey Puck

Ordering Information – SCM9B-1500-2500 Strain Gage Inputs

Part Number	Excitation Voltage	Sensitivity	Input Configuration	Input Range	Output Range
SCM9B-1511	5.0V	3mV/V to 600mV/V	Full Bridge	±30mV	RS-232C
SCM9B-1512	5.0V	3mV/V to 600mV/V	Full Bridge	±30mV	RS-485
SCM9B-1521	10.0V	3mV/V to 600mV/V	Full Bridge	±30mV	RS-232C
SCM9B-1522	10.0V	3mV/V to 600mV/V	Full Bridge	±30mV	RS-485
SCM9B-1531	5.0V	3mV/V to 600mV/V	Full Bridge	±100mV	RS-232C
SCM9B-1532	5.0V	3mV/V to 600mV/V	Full Bridge	±100mV	RS-485
SCM9B-1541	10.0V	3mV/V to 600mV/V	Full Bridge	±100mV	RS-232C
SCM9B-1542	10.0V	3mV/V to 600mV/V	Full Bridge	±100mV	RS-485
SCM9B-1562	10.0V	3mV/V to 600mV/V	Full Bridge	+1 to +6V	RS-485
SCM9B-2511	5.0V	3mV/V to 600mV/V	Full Bridge	±30mV	RS-232C
SCM9B-2512	5.0V	3mV/V to 600mV/V	Full Bridge	±30mV	RS-485
SCM9B-2521	10.0V	3mV/V to 600mV/V	Full Bridge	±30mV	RS-232C
SCM9B-2522	10.0V	3mV/V to 600mV/V	Full Bridge	±30mV	RS-485
SCM9B-2532	5.0V	3mV/V to 600mV/V	Full Bridge	±100mV	RS-485
SCM9B-2541	10.0V	3mV/V to 600mV/V	Full Bridge	±100mV	RS-232C
SCM9B-2551	8.0V	3mV/V to 600mV/V	Full Bridge	+1 to +6V	RS-232C
SCM9B-2552	8.0V	3mV/V to 600mV/V	Full Bridge	+1 to +6V	RS-485
SCM9B-2561	10.0V	3mV/V to 600mV/V	Full Bridge	+1 to +6V	RS-232C

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Ordering Information – 1600-2600 Time/Frequency-inputs

Part Number	Input Range	Output Range	Bandwidth	Mechanical Format
SCM9B-1601	0 to 60Hz	RS-232C	Adjustable 10mV - 1V	Plug-In or Hockey Puck
SCM9B-1602	0 to 60Hz	RS-485	Adjustable 10mV - 1V	Plug-In or Hockey Puck
SCM9B-1612	100µs to 30s	RS-485	Adjustable 10mV - 1V	Plug-In or Hockey Puck
SCM9B-1621	0 to 60Hz	RS-232C	Adjustable 10mV - 1V	Plug-In or Hockey Puck
SCM9B-1622	0 to 60Hz	RS-485	Adjustable 10mV - 1V	Plug-In or Hockey Puck
SCM9B-1631	1 to 10kHz	RS-232C	Adjustable 10mV - 1V	Plug-In or Hockey Puck
SCM9B-1632	1 to 10kHz	RS-485	Adjustable 10mV - 1V	Plug-In or Hockey Puck
SCM9B-1642	100µs to 30s	RS-485	Adjustable 10mV - 1V	Plug-In or Hockey Puck
SCM9B-2601	0 to 60Hz	RS-232C	Adjustable 10mV - 1V	Plug-In or Hockey Puck
SCM9B-2602	0 to 60Hz	RS-485	Adjustable 10mV - 1V	Plug-In or Hockey Puck
SCM9B-2631	1 to 10kHz	RS-232C	Adjustable 10mV - 1V	Plug-In or Hockey Puck
SCM9B-2632	1 to 10kHz	RS-485	Adjustable 10mV - 1V	Plug-In or Hockey Puck

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