

# SELECTION GUIDE FOR SCM5B ISOLATED SIGNAL CONDITIONING PRODUCTS

## ANALOG VOLTAGE INPUT MODULES, NARROW BANDWIDTH (4Hz BW) Page 6

MODEL	INPUT RANGE	OUTPUT RANGE*
SCM5B30-01	±10mV	±5V
SCM5B30-02	±50mV	±5V
SCM5B30-03	±100mV	±5V
SCM5B30-04	±10mV	0 to +5V
SCM5B30-05	±50mV	0 to +5V
SCM5B30-06	±100mV	0 to +5V
SCM5B31-01	±1V	±5V
SCM5B31-02	±5V	±5V
SCM5B31-03	±10V	±5V
SCM5B31-04	±1V	0 to +5V
SCM5B31-05	±5V	0 to +5V
SCM5B31-06	±10V	0 to +5V
SCM5B31-07	±20V	±5V
SCM5B31-08	±20V	0 to +5V
SCM5B31-09	±40V	±5V
SCM5B31-10	±40V	0 to +5V

## ANALOG CURRENT INPUT MODULES, NARROW BANDWIDTH (4Hz BW) Page 8

MODEL	INPUT RANGE	OUTPUT RANGE*
SCM5B32-01	4 to 20mA	0 to +5V
SCM5B32-02	0 to 20mA	0 to +5V

## LINEARIZED 2- OR 3-WIRE RTD INPUT MODULES (0 to +5V OUTPUT\*, 4Hz BW) Page 10

MODEL	TYPE***	INPUT RANGE
SCM5B34-01	100Ω Pt	-100°C to +100°C (-148°F to +212°F)
SCM5B34-02	100Ω Pt	0°C to +100°C (+32°F to +212°F)
SCM5B34-03	100Ω Pt	0°C to +200°C (+32°F to +392°F)
SCM5B34-04	100Ω Pt	0°C to +600°C (+32°F to +1112°F)
SCM5B34C-01	10Ω Cu at 0°C	0°C to +120°C (+32°F to +248°F)
SCM5B34C-02	10Ω Cu at 25°C	0°C to +120°C (+32°F to +248°F)
SCM5B34C-03	10Ω Cu at 0°C	0°C to +160°C (+32°F to +320°F)
SCM5B34N-01	120Ω Ni	0°C to +300°C (+32°F to +572°F)

## LINEARIZED 4-WIRE RTD INPUT MODULES (0 to +5V OUTPUT\*, 4Hz BW) Page 12

MODEL	TYPE***	INPUT RANGE
SCM5B35-01	100Ω Pt	-100°C to +100°C (-148°F to +212°F)
SCM5B35-02	100Ω Pt	0°C to +100°C (+32°F to +212°F)
SCM5B35-03	100Ω Pt	0°C to +200°C (+32°F to +392°F)
SCM5B35-04	100Ω Pt	0°C to +600°C (+32°F to +1112°F)
SCM5B35C-01	10Ω Cu at 0°C	0°C to +120°C (+32°F to +248°F)
SCM5B35C-02	10Ω Cu at 25°C	0°C to +120°C (+32°F to +248°F)
SCM5B35C-03	10Ω Cu at 0°C	0°C to +160°C (+32°F to +320°F)
SCM5B35N-01	120Ω Ni	0°C to +300°C (+32°F to +572°F)

## POTENTIOMETER INPUT MODULES (4Hz BW) Page 14

MODEL	INPUT RANGE	OUTPUT RANGE*
SCM5B36-01	0 to 100Ω	0 to +5V
SCM5B36-02	0 to 500Ω	0 to +5V
SCM5B36-03	0 to 1KΩ	0 to +5V
SCM5B36-04	0 to 10KΩ	0 to +5V

## THERMOCOUPLE INPUT MODULES (0 to +5V OUTPUT\*, 4Hz BW) Page 16

MODEL	TYPE**	INPUT RANGE
SCM5B37J	J	-100°C to +760°C (-148°F to +1400°F)
SCM5B37K	K	-100°C to +1350°C (-148°F to +2462°F)
SCM5B37T	T	-100°C to +400°C (-148°F to +752°F)
SCM5B37E	E	0°C to +900°C (+32°F to +1652°F)
SCM5B37R	R	0°C to +1750°C (+32°F to +3182°F)
SCM5B37S	S	0°C to +1750°C (+32°F to +3182°F)
SCM5B37B	B	0°C to +1800°C (+32°F to +3272°F)
SCM5B37C	C	+350°C to +1300°C (+662°F to +2372°F)
SCM5B37N	N	-100°C to +1300°C (-148°F to +2372°F)

## STRAIN GAGE INPUT MODULES (±5V OUTPUT\*, 4Hz or 10kHz BW) Page 18

MODEL	INPUT	EXCITATION
SCM5B38-01	4Hz -31 ±10mV Full Bridge Input, (3mV/V) 100 to 10KΩ	3.333V
SCM5B38-02	-32 ±30mV Full Bridge Input, (3mV/V) 300 to 10KΩ	10.000V
SCM5B38-03	-33 ±10mV Half Bridge Input, (3mV/V) 100 to 10KΩ	3.333V
SCM5B38-04	-34 ±30mV Half Bridge Input, (3mV/V) 300 to 10KΩ	10.000V
SCM5B38-05	-35 ±20mV Full Bridge Input, (2mV/V) 300 to 10KΩ	10.000V
SCM5B38-06	-36 ±33.3mV Full Bridge Input, (10mV/V) 100 to 10KΩ	3.333V
SCM5B38-07	-37 ±100mV Full Bridge Input, (10mV/V) 300 to 10KΩ	10.000V

## CURRENT OUTPUT MODULES (400Hz BW) Page 22

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B39-01	0 to +5V	4 to 20mA
SCM5B39-02	±5V	4 to 20mA
SCM5B39-03	0 to +5V	0 to 20mA
SCM5B39-04	±5V	0 to 20mA
SCM5B39-05	0 to 20mA	0 to 20mA
SCM5B39-07	±10V	±20mA

## MATCHED PAIR SERVO/MOTOR CONTROLLER DRIVERS (1KHz BW) Page 24

MODEL	INPUT RANGE	INTERFACE	OUTPUT RANGE
SCM5B392-0111	0 to +5V	4 to 20mA	0 to +5V
SCM5B392-0212	±5V	4 to 20mA	±5V
SCM5B392-0313	0 to +10V	4 to 20mA	0 to +10V
SCM5B392-0414	±10V	4 to 20mA	±10V

## ANALOG VOLTAGE INPUT MODULES, WIDE BANDWIDTH (10kHz BW) Page 26

MODEL	INPUT RANGE	OUTPUT RANGE*
SCM5B40-01	±10mV	±5V
SCM5B40-02	±50mV	±5V
SCM5B40-03	±100mV	±5V
SCM5B40-04	±10mV	0 to +5V
SCM5B40-05	±50mV	0 to +5V
SCM5B40-06	±100mV	0 to +5V
SCM5B41-01	±1V	±5V
SCM5B41-02	±5V	±5V
SCM5B41-03	±10V	±5V
SCM5B41-04	±1V	0 to +5V
SCM5B41-05	±5V	0 to +5V
SCM5B41-06	±10V	0 to +5V
SCM5B41-07	±20V	±5V
SCM5B41-08	±20V	0 to +5V
SCM5B41-09	±40V	±5V
SCM5B41-10	±40V	0 to +5V

## 2-WIRE TRANSMITTER INTERFACE MODULES (100Hz BW) Page 28

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B42-01	4 to 20mA	+1 to +5V
SCM5B42-02	4 to 20mA	+2 to +10V

## DISPLACEMENT TRANSDUCER INPUT MODULES, DC TRANSDUCER Page 30

MODEL	MAXIMUM INPUT	OUTPUT*
SCM5B43-01	±1V	+5V
SCM5B43-02	±2V	+5V
SCM5B43-03	±3V	+5V
SCM5B43-04	±4V	+5V
SCM5B43-05	±5V	+5V
SCM5B43-06	±6V	+5V
SCM5B43-07	±7V	+5V
SCM5B43-08	±8V	+5V

## FREQUENCY INPUT MODULES Page 32

MODEL	INPUT RANGE	OUTPUT RANGE*
SCM5B45-01	0 to 500Hz	0 to +5V
SCM5B45-02	0 to 1kHz	0 to +5V
SCM5B45-03	0 to 3kHz	0 to +5V
SCM5B45-04	0 to 5kHz	0 to +5V
SCM5B45-05	0 to 10kHz	0 to +5V
SCM5B45-06	0 to 25kHz	0 to +5V
SCM5B45-07	0 to 50kHz	0 to +5V
SCM5B45-08	0 to 100kHz	0 to +5V

## LINEARIZED THERMOCOUPLE INPUT MODULES (0 to +5V OUTPUT\*, 4Hz BW) Page 34

MODEL	TYPE**	INPUT RANGE
SCM5B47J-01	J	0°C to +760°C (+32°F to +1400°F)
SCM5B47J-02	J	-100°C to +300°C (-148°F to +572°F)
SCM5B47J-03	J	0°C to +500°C (+32°F to +932°F)
SCM5B47K-04	K	0°C to +1000°C (+32°F to +1832°F)
SCM5B47K-05	K	0°C to +500°C (+32°F to +932°F)
SCM5B47T-06	T	-100°C to +400°C (-148°F to +752°F)
SCM5B47T-07	T	0°C to +200°C (+32°F to +392°F)
SCM5B47E-08	E	0°C to +1000°C (+32°F to +1832°F)
SCM5B47R-09	R	+500°C to +1750°C (+932°F to +3182°F)
SCM5B47S-10	S	+500°C to +1750°C (+932°F to +3182°F)
SCM5B47B-11	B	+500°C to +1800°C (+932°F to +3272°F)
SCM5B47J-12	J	-100°C to +760°C (-148°F to +1400°F)
SCM5B47K-13	K	-100°C to +1350°C (-148°F to +2462°F)
SCM5B47K-14	K	0°C to +1200°C (+32°F to +2192°F)
SCM5B47N-15	N	-100°C to +1300°C (-148°F to +2372°F)

# SELECTION GUIDE FOR SCM5B ISOLATED SIGNAL CONDITIONING PRODUCTS

## VOLTAGE OUTPUT MODULES, 50mA DRIVE CAPACITY (400 Hz BW)

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MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B49-01	0 to +5V	±5V
SCM5B49-02	±5V	±5V
SCM5B49-03	±5V	0 to +5V
SCM5B49-04	0 to +10V	±10V
SCM5B49-05	±10V	±10V
SCM5B49-06	±10V	0 to +10V
SCM5B49-07	±5V	±10V

## ACCESSORIES Page 39

MODEL	DESCRIPTION
SCMPB01	Non-multiplexed, 16 channel backpanel.
SCMPB01-1	Non-multiplexed, 16 channel backpanel, no CJC.
SCMPB02	Multiplexed, 16 channel backpanel.
SCMPB02-1	Multiplexed, 16 channel backpanel, no CJC.
SCMPB03	Single channel backpanel, DIN rail mount.
SCMPB04	Dual channel backpanel, DIN rail mount.
SCMPB05	Non-multiplexed, 8 channel backpanel.
SCMPB05-1	Non-multiplexed, 8 channel backpanel, no CJC.
SCMPB06	Multiplexed, 8 channel backpanel.
SCMPB06-1	Multiplexed, 8 channel backpanel, no CJC.
SCMXCA004-xx	System interface cable for both analog backpanels.
SCMXCA005	Daisy-chain cable for SCMPB02 backpanel.
SCMXIF	Ribbon cable to screw terminal interface board.
SCMXJP-003	Package of 10 jumpers.
SCMXFS-003	Package of 10, 4A fuses.
SCMXEV	Single channel SCM5B evaluation board.
SCMXRK-002	19 inch metal rack for mounting analog backpanels.
SCMXPR-001	Power supply, 1A, 5VDC, 120VAC U.S.
SCMXPRE-001	Power supply, 1A, 5VDC, 220VAC European.
SCMXPR-003	Power supply, 3A, 5VDC, 120VAC U.S.
SCMXPRE-003	Power supply, 3A, 5VDC, 220VAC European.
SCMXR1	Precision 20Ω resistor for SCM5B32 and SCM5B42.
SCMXCJC	Encapsulated cold junction compensation circuit.
SCMXBEFE	Base element with snap foot.
SCMXBE	Base element without snap foot.
SCMXSE	Side element.
SCMXVS	Connection pins.
SCMXRAIL1	Gull wing style, perforated.
SCM5BDS	Non-isolated, unity gain module.

### \*Note:

Any module not shown with a 10V output can be specified with 10V output. Consult factory for minimum quantity and pricing details and module specifications.

## \*\*THERMOCOUPLE ALLOY COMBINATIONS

TYPE	MATERIAL
J	Iron vs. Copper-Nickel
K	Nickel-Chromium vs. Nickel-Aluminum
T	Copper vs. Copper-Nickel
E	Nickel-Chromium vs. Copper-Nickel
R	Platinum-13% Rhodium vs. Platinum
S	Platinum-10% Rhodium vs. Platinum
B	Platinum-30% Rhodium vs. Platinum-6% Rhodium
C	Tungsten-5% Rhenium vs. Tungsten-26% Rhenium
N	Nickel-14.2% Chromium-1.4% Silicon vs. Nickel-4.4% Silicon-0.1% Magnesium

## \*\*\*RTD ALPHA COEFFICIENTS

TYPE	ALPHA COEFFICIENT
100Ω Pt	0.00385
120Ω Ni	0.00672
10Ω Cu	0.004274

## Analog Voltage Input Modules, Narrow Bandwidth

### FEATURES

- ACCEPTS MILLIVOLT AND VOLTAGE LEVEL SIGNALS
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60Hz, 90dB at 50Hz
- $\pm 0.05\%$  ACCURACY
- $\pm 0.02\%$  LINEARITY
- $\pm 1\mu\text{V}/^\circ\text{C}$  DRIFT
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT
- MIX AND MATCH SCM5B TYPES ON BACKPANELS

### DESCRIPTION

Each SCM5B30 and SCM5B31 voltage input module provides a single channel of analog input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic-switch controlled, allowing these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50\text{V}$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the SCM5B30 and SCM5B31 modules provides protection against accidental connection of power-line voltages up to 240VAC.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

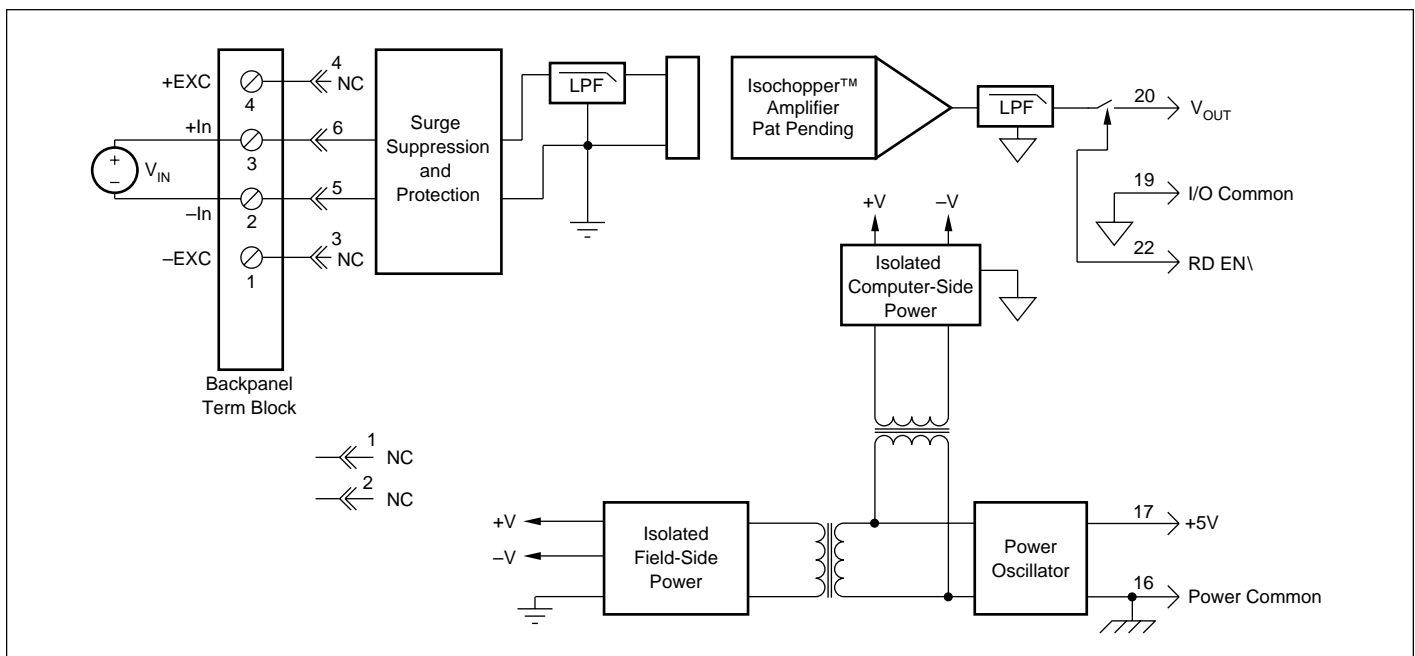


FIGURE 1. SCM5B30/31 Block Diagram.

# SPECIFICATIONS Typical at T<sub>A</sub> = +25°C and +5V power.

Module	SCM5B30	SCM5B31
Input Range	±10mV to ±100mV	±1V to ±40V
Input Bias Current	±0.5nA	±0.05nA
Input Resistance		
Normal	50MΩ	650kΩ (minimum)
Power Off	40kΩ	650kΩ (minimum)
Overload	40kΩ	650kΩ (minimum)
Input Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMV, Input to Output		
Continuous	1500Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMR (50Hz or 60Hz)	160dB	*
NMR	95dB at 60Hz, 90dB at 50Hz	*
Accuracy <sup>(1)</sup>	±0.05% Span ±10μV RTI <sup>(2)</sup> ±0.05%(V <sub>Z</sub> <sup>(3)</sup> )	±0.05% Span ±0.2mV RTI <sup>(2)</sup> ±0.05%(V <sub>Z</sub> <sup>(3)</sup> )
Nonlinearity	±0.02% Span	*
Stability		
Input Offset	±1μV/°C	±20μV/°C
Output Offset	±20μV/°C	*
Gain	±25ppm/°C	±50ppm/°C
Noise		
Input, 0.1 to 10Hz	0.2μVrms	2μVrms
Output, 100kHz	200μVrms	*
Bandwidth, -3dB	4Hz	*
Response Time, 90% Span	0.2s	*
Output Range	±5V, 0V to +5V	*
Output Resistance	50Ω	*
Output Protection	Continuous Short to Ground	*
Output Selection Time (to ±1mV of V <sub>OUT</sub> )	6μs at C <sub>load</sub> = 0 to 2000pF	*
Output Current Limit	±8mA	*
Output Enable Control		
Max Logic "0"	+0.8V	*
Min Logic "1"	+2.4V	*
Max Logic "1"	+3.6V	*
Input Current, "0", "1"	0.5μA	*
Power Supply Voltage	+5VDC ±5%	*
Power Supply Current	30mA	*
Power Supply Sensitivity	±2μV/% RTI <sup>(2)</sup>	±200μV/% RTI <sup>(2)</sup>
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)	*
Environmental		
Operating Temp. Range	-40°C to +85°C	*
Storage Temp. Range	-40°C to +85°C	*
Relative Humidity	0 to 95% Noncondensing	*
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)	*
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)	*

\* Same specification as SCM5B30.  
 NOTES: (1) Includes nonlinearity, hysteresis and repeatability.  
 (2) RTI = Referenced to input.  
 (3) V<sub>Z</sub> is the input voltage that results in 0V output.

## ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B30-01	-10mV to +10mV	-5V to +5V
SCM5B30-02	-50mV to +50mV	-5V to +5V
SCM5B30-03	-100mV to +100mV	-5V to +5V
SCM5B30-04	-10mV to +10mV	0V to +5V
SCM5B30-05	-50mV to +50mV	0V to +5V
SCM5B30-06	-100mV to +100mV	0V to +5V
SCM5B31-01	-1V to +1V	-5V to +5V
SCM5B31-02	-5V to +5V	-5V to +5V
SCM5B31-03	-10V to +10V	-5V to +5V
SCM5B31-04	-1V to +1V	0V to +5V
SCM5B31-05	-5V to +5V	0V to +5V
SCM5B31-06	-10V to +10V	0V to +5V
SCM5B31-07	-20V to +20V	-5V to +5V
SCM5B31-08	-20V to +20V	0V to +5V
SCM5B31-09	-40V to +40V	-5V to +5V
SCM5B31-10	-40V to +40V	0V to +5V

Call 800-444-7644  
 For Information and Assistance

## Analog Current Input Modules

### FEATURES

- ACCEPTS MILLIAMPER LEVEL SIGNALS
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60Hz, 90dB AT 50Hz
- $\pm 0.05\%$  ACCURACY
- $\pm 0.02\%$  LINEARITY
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT
- MIX AND MATCH SCM5B TYPES ON BACKPANELS

### DESCRIPTION

Each SCM5B32 current input module provides a single channel of analog input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

A precision  $20\Omega$  current conversion resistor is supplied with the SCM5B32 module. Sockets are provided on the SCMPB01/02/03/04/05/06 backpanels to allow installation of this resistor. Extra resistors are available under part number SCMXR1.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the SCM5B32 modules provides protection against accidental connection of power-line voltages up to 240VAC.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

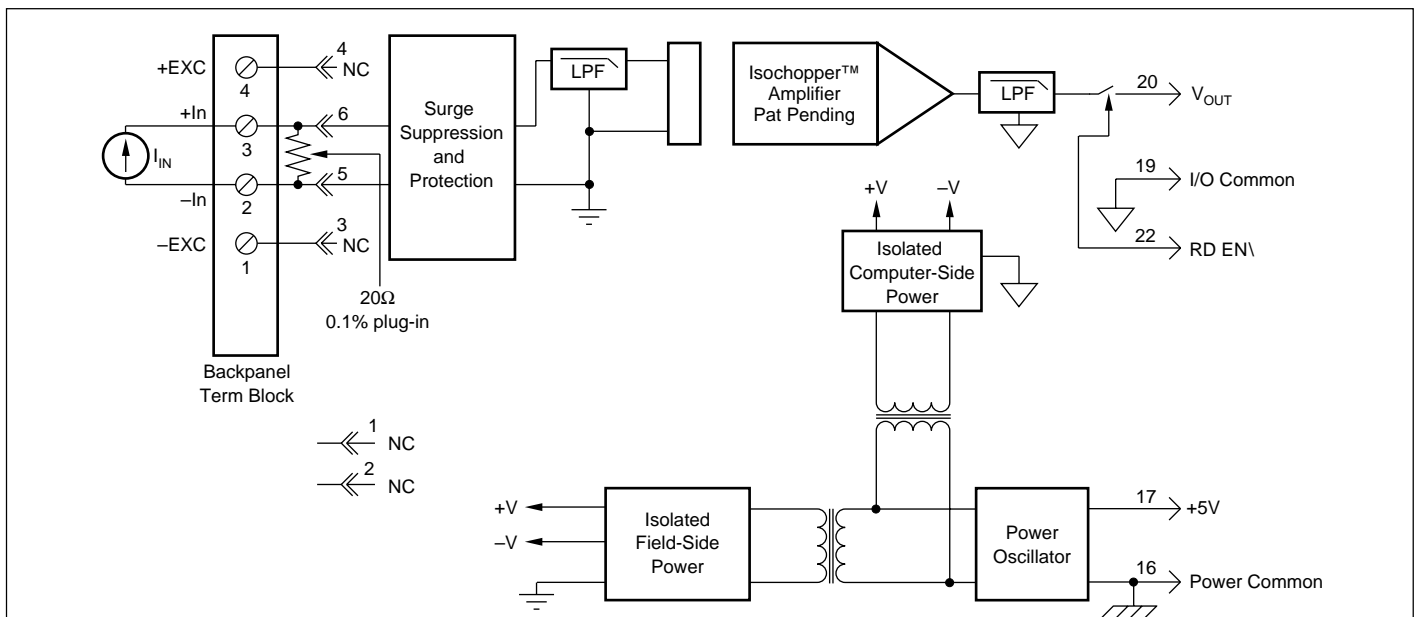


FIGURE 1. SCM5B32 Block Diagram.

## SPECIFICATIONS Typical at T<sub>A</sub> = +25°C and +5V power.

Module	SCM5B32
Input Range Input Resistor Value Accuracy Stability Input Protection Continuous Transient	0mA to 20mA or 4mA to 20mA  20.00Ω ±0.1% ±10ppm/°C  240Vrms max ANSI/IEEE C37.90.1-1989
CMV, Input to Output Continuous Transient CMR (50Hz or 60Hz) NMR	1500Vrms max ANSI/IEEE C37.90.1-1989 160dB 95dB at 60Hz, 90dB at 50Hz
Accuracy <sup>(1)</sup> Nonlinearity Stability Input Offset Output Offset Gain Noise Input, 0.1Hz to 10Hz Output, 100kHz Bandwidth, -3dB Response Time, 90% Span	±0.05% span ±0.05% (I <sub>2</sub> <sup>(2)</sup> ) ±0.02% Span  ±50nA/°C ±20μV/°C ±25ppm/°C  10nArms 200μVrms 4Hz 0.2s
Output Range Output Resistance Output Protection Output Selection Time (to ±1mV of V <sub>OUT</sub> ) Output Current Limit	0 to +5V 50Ω Continuous Short to Gnd 6μs at C <sub>load</sub> = 0 to 2000pF  +8mA
Output Enable Control Max Logic "0" Min Logic "1" Max Logic "1" Input Current, "0,1"	+0.8V +2.4V +36V 0.5μA
Power Supply Voltage Power Supply Current Power Supply Sensitivity	+5VDC ±5% 30mA ±20μV/% RTI <sup>(3)</sup>
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental Operating Temp. Range Storage Temp. Range Relative Humidity Emissions Immunity	-40°C to +85°C -40°C to +85°C 0 to 95% Noncondensing EN50081-1, ISM Group 1, Class A (Radiated, Conducted) EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)

NOTE: (1) Includes nonlinearity, hysteresis and repeatability. (2) I<sub>2</sub> is the input current that results in 0V output. (3) RTI = Referenced to input.

## ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE	BANDWIDTH
SCM5B32-01	4mA to 20mA	0V to +5V	4Hz
SCM5B32-02	0mA to 20mA	0V to +5V	4Hz

Refer to SCM5B392 specifications, p. 65, for additional current input models.

## Linearized 2- or 3-Wire RTD Input Modules

### FEATURES

- INTERFACES TO 100Ω PLATINUM, 10Ω COPPER, OR 120Ω NICKEL RTDs
- LINEARIZES RTD SIGNAL
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60Hz, 90dB AT 50Hz
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

### DESCRIPTION

Each SCM5B34 RTD input module provides a single channel of RTD input which is filtered, isolated, amplified, linearized, and converted to a high level analog voltage output (Figure 1). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

RTD excitation is provided from the module by two matched current sources. When using a three-wire RTD, this method allows an equal current to flow in each RTD lead, which cancels the effects of lead resistances. The excitation currents are very small (0.25mA for 100Ω Pt and 120Ω Ni, and 1.0mA for 10Ω Cu) which minimizes self-heating of the RTD.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side. After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the SCM5B34 modules provides protection against accidental connection of power-line voltages up to 240VAC.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

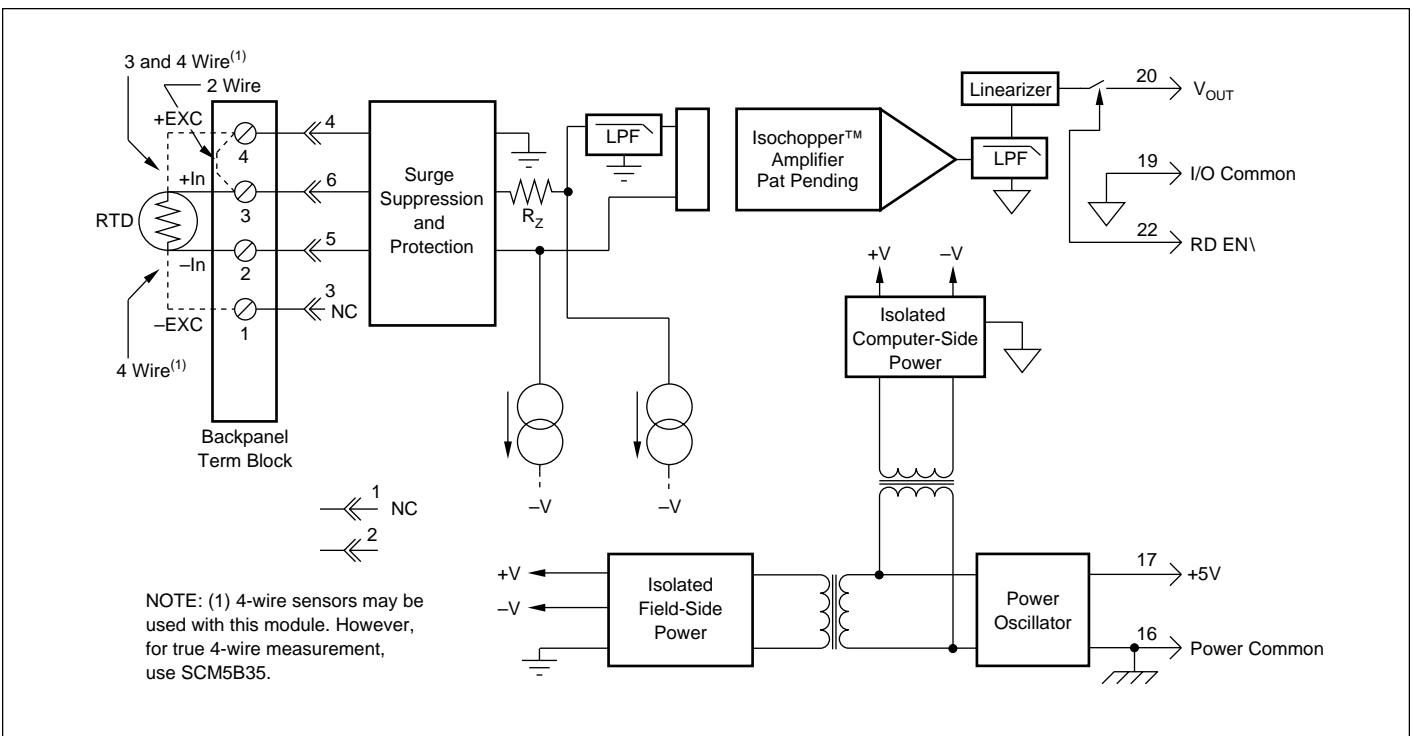
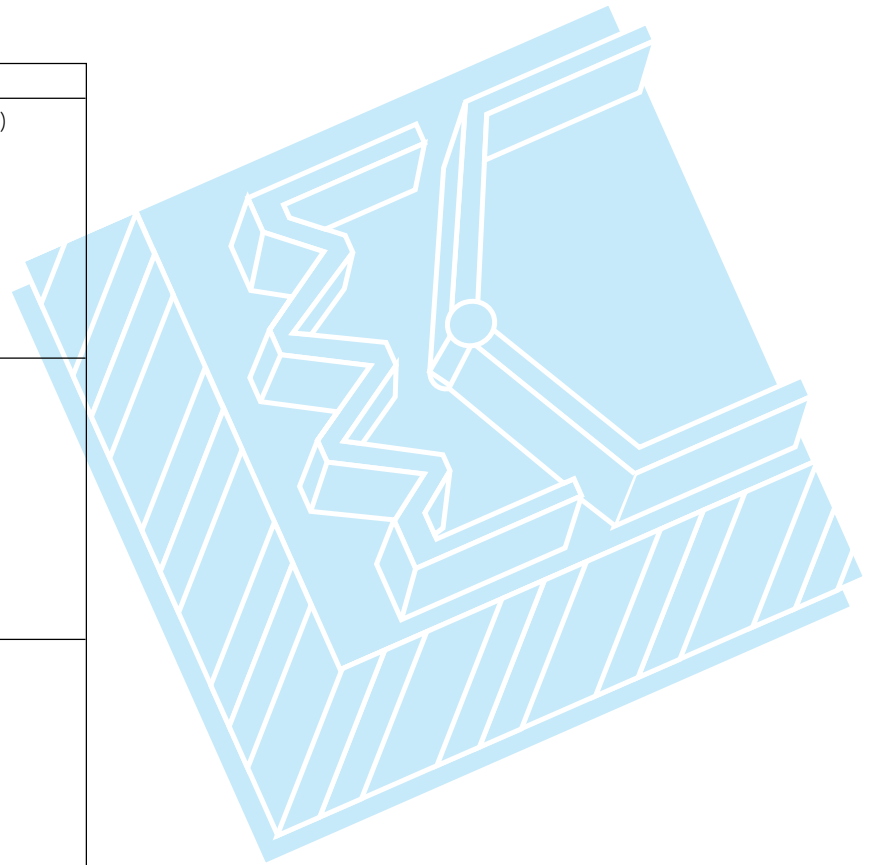


FIGURE 1. SCM5B34 Block Diagram.

## SPECIFICATIONS Typical at T<sub>A</sub> = +25°C and +5V Power.

Module	SCM5B34
Input Range Limits	-200°C to +850°C (100Ω Pt) -80°C to 320°C (120Ω Ni) -100°C to 260°C (10Ω Cu)
Input Resistance	
Normal	50MΩ
Power Off	40kΩ
Overload	40kΩ
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
Sensor Excitation Current	
100Ω Pt, 120Ω Ni	0.25mA
10Ω Cu	1.0mA
Lead Resistance Effect	
100Ω Pt, 120Ω Ni	±0.02°C/Ω <sup>(1)</sup>
10Ω Cu	±0.2°C/Ω <sup>(1)</sup>
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50 or 60Hz)	160dB
NMR	95dB at 60Hz, 90dB at 50Hz
Accuracy	See Ordering Information
Conformity Error	±0.05% Span
Stability	
Input Offset	±0.02°C/°C
Output Offset	±20μV/°C
Gain	±50ppm of reading/°C
Noise	
Input, 0.1 to 10Hz	0.2μVrms
Output, 100kHz	200μVrms
Bandwidth, -3dB	4Hz
Response Time, 90% Span	0.2s
Output Range	0V to +5V
Output Resistance	50Ω
Output Protection	Continuous Short to Ground
Output Selection Time (to ±1mV of V <sub>OUT</sub> )	6μs at C <sub>load</sub> = 0 to 2000pF
Output Current Limit	+8mA
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0,1"	0.5μA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	30mA
Power Supply Sensitivity	
100Ω Pt, 120Ω Ni	0.2°C/V
10Ω Cu	0.5°C/V
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temperature Range	-40°C to +85°C
Storage Temperature Range	-40°C to +85°C
Relative Humidity	0 to 95% noncondensing
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)

NOTES: (1) "Ω" refers to the resistance in one lead.



## ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE	ACCURACY <sup>†</sup>
<b>100Ω Pt,</b> α = 0.00385			
SCM5B34-01	-100°C to +100°C (-148°F to +212°F)	0V to +5V	±0.32°C
SCM5B34-02	0°C to +100°C (+32°F to 212°F)	0V to +5V	±0.13°C
SCM5B34-03	0°C to +200°C (+32°F to 392°F)	0V to +5V	±0.26°C
SCM5B34-04	0°C to +600°C (+32°F to 1112°F)	0V to +5V	±0.78°C
<b>10Ω Cu,</b> α = 0.004274			
SCM5B34C-01	0°C to +120°C (10Ω at 0°C) (+32°F to +248°F)	0V to +5V	±0.23°C
SCM5B34C-02	0°C to +120°C (10Ω at 25°C) (+32°F to +248°F)	0V to +5V	±0.23°C
SCM5B34C-03	0°C to +160°C (10Ω at 0°C) (+32°F to +320°F)	0V to +5V	±0.32°C
<b>120Ω Ni,</b> α = 0.00672			
SCM5B34N-01	0°C to +300°C (+32°F to +572°F)	0V to +5V	±0.40°C

<sup>†</sup>Includes conformity, hysteresis and repeatability.

# SCM5B35

## Linearized 4-Wire RTD Input Modules

### FEATURES

- INTERFACES TO 100Ω PLATINUM, 10Ω COPPER, OR 120Ω NICKEL RTDs
- TRUE 4-WIRE INPUT
- LINEARIZES RTD SIGNAL
- HIGH LEVEL VOLTAGE OUTPUT
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60HZ, 90dB AT 50HZ
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

### DESCRIPTION

In RTD temperature measurement applications requiring a very high level of accuracy, the SCM5B35 4-Wire RTD input module offers a significant advantage over 3-wire measurement techniques (Figure 1). The SCM5B35 measures only the voltage dropped across the RTD and almost completely ignores the resistance or length of the RTD lead wires. The SCM5B34 3-Wire RTD module provides lead resistance compensation, but requires equal lead resistances, while the SCM5B35 does not require matched lead resistances.

Each SCM5B35 RTD input module provides a single channel of RTD input which is filtered, isolated, amplified, linearized, and converted to a high level analog voltage output. This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

RTD excitation is provided from the module by a precision current source. The excitation current is available on two leads which are separate from the two input signal measuring leads. The excitation current does not flow in the input signal measuring leads, which allows RTD measurement to be totally independent of lead resistance. The excitation current is very small (0.25mA for 100 Ω Pt and 120 Ω Ni and 1.0 mA for 10Ω Cu) which minimizes self-heating of the RTD.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side. After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

A special input circuit on the SCM5B35 modules provides protection against accidental connection of power-line voltages up to 240VAC.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

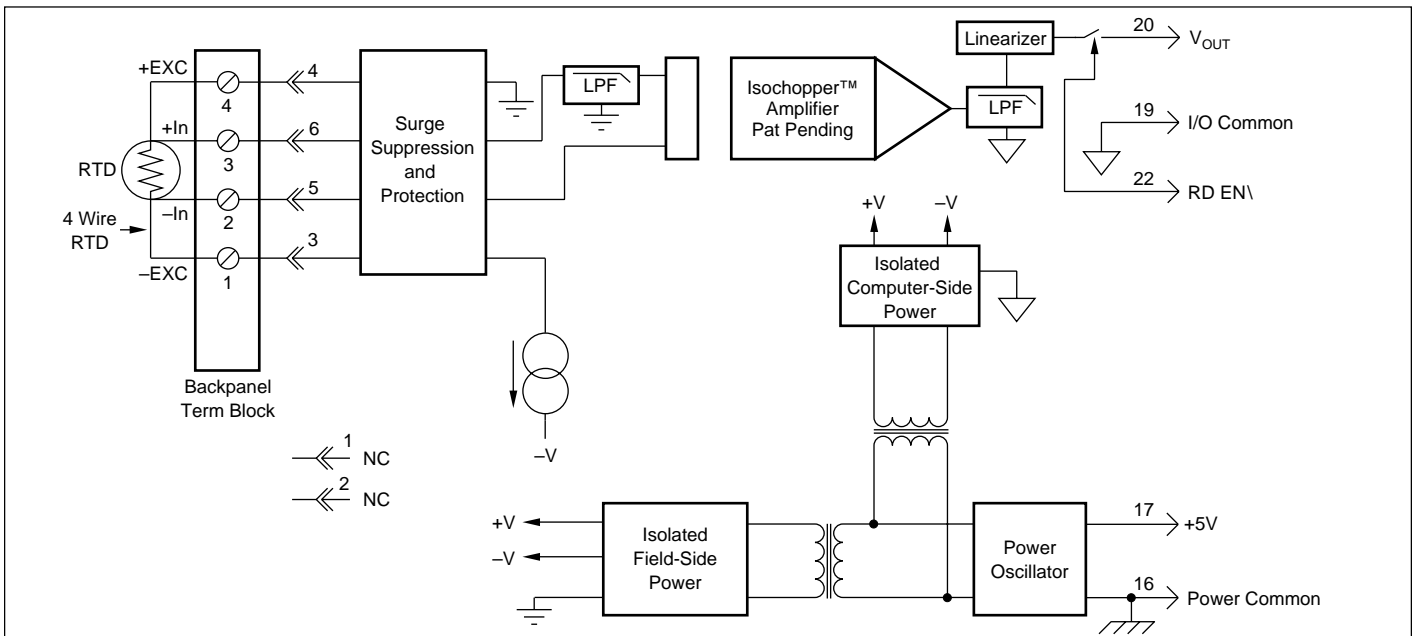


FIGURE 1. SCM5B35 Block Diagram.

## SPECIFICATIONS Typical at T<sub>A</sub> = +25°C and +5V Power.

Module	SCM5B35
Input Range Limits	-200°C to +850°C (100Ω Pt) -80°C to +320°C (120Ω Ni) -100°C to +260°C (10Ω Cu)
Input Resistance	50MΩ
Normal	40kΩ
Power Off	40kΩ
Overload	40kΩ
Input Protection	240Vrms max ANSI/IEEE C37.90.1-1989
Sensor Excitation Current	0.25mA
100Ω Pt, 120Ω Ni	1.0mA
10Ω Cu	
Lead Resistance Effect	±0.0005 °C/Ω <sup>(1)</sup>
100Ω Pt, 120Ω Ni	±0.005 °C/Ω <sup>(1)</sup>
10Ω Cu	
CMV, Input to Output	1500Vrms max
Continuous	ANSI/IEEE C37.90.1-1989
Transient	160dB
CMR (50Hz or 60Hz)	95dB at 60Hz, 90dB at 50Hz
NMR	
Accuracy	See Ordering Information
Conformity Error	±0.05% Span
Stability	
Input Offset	±0.02°C/°C
Output Offset	±20μV/°C
Gain	±50ppm of reading/°C
Noise	
Input, 0.1 to 10Hz	0.2μVrms
Output, 100kHz	200μVrms
Bandwidth, -3dB	4Hz
Response Time, 90% span	0.2s
Output Range	0V to +5V
Output Resistance	50Ω
Output Protection	Continuous short to ground
Output Selection Time (to ±1mV of V <sub>OUT</sub> )	6μs at C <sub>load</sub> = 0 to 2000pF
Output Current Limit	+8mA
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0,1"	0.5μA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	30mA
Power Supply Sensitivity	
100Ω Pt, 120Ω Ni	±0.2°C/V
10Ω Cu	±0.5°C/V
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	-40°C to +85°C
Storage Temp. Range	-40°C to +85°C
Relative Humidity	0 to 95% noncondensing
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)

NOTES: (1) "Ω" refers to the resistance in one lead.

## ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE	ACCURACY <sup>†</sup>
<b>100 Ω Pt, α = 0.00385</b>			
SCM5B35-01	-100°C to +100°C (-148°F to +212°F)	0V to +5V	±0.32°C
SCM5B35-02	0°C to +100°C (+32°F to 212°F)	0V to +5V	±0.13°C
SCM5B35-03	0°C to +200°C (+32°F to 392°F)	0V to +5V	±0.26°C
SCM5B35-04	0°C to +600°C (+32°F to 1112°F)	0V to +5V	±0.78°C
<b>10 Ω Cu, α = 0.004274</b>			
SCM5B35C-01	0°C to +120°C (10Ω at 0°C) (+32°F to +248°F)	0V to +5V	±0.23°C
SCM5B35C-02	0°C to +120°C (10Ω at 25°C) (+32°F to +248°F)	0V to +5V	±0.23°C
SCM5B35C-03	0°C to +160°C (10Ω at 0°C) (+32°F to +320°F)	0V to +5V	±0.32°C
<b>120 Ω Ni, α = 0.00672</b>			
SCM5B35N-01	0°C to +300°C (+32°F to +572°F)	0V to +5V	±0.40°C

<sup>†</sup>Includes conformity, hysteresis and repeatability.

## Potentiometer Input Modules

### FEATURES

- INTERFACES TO POTENTIOMETERS UP TO 10,000 OHMS
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500 VOLT TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60HZ, 90dB AT 50HZ
- MIX AND MATCH SCM5B TYPES ON BACKPANEL
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT

### DESCRIPTION

Each SCM5B36 Potentiometer input module provides a single channel of Potentiometer input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

Excitation for the potentiometer is provided from the module by two matched current sources. When using a three-wire potentiometer, this method allows cancellation of the effects of lead resistances. The excitation currents are very small (less than 1.0mA) which minimizes self-heating of the potentiometer.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are in the output stage. After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the SCM5B36 module provides protection against accidental connection of power-line voltages up to 240VAC.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

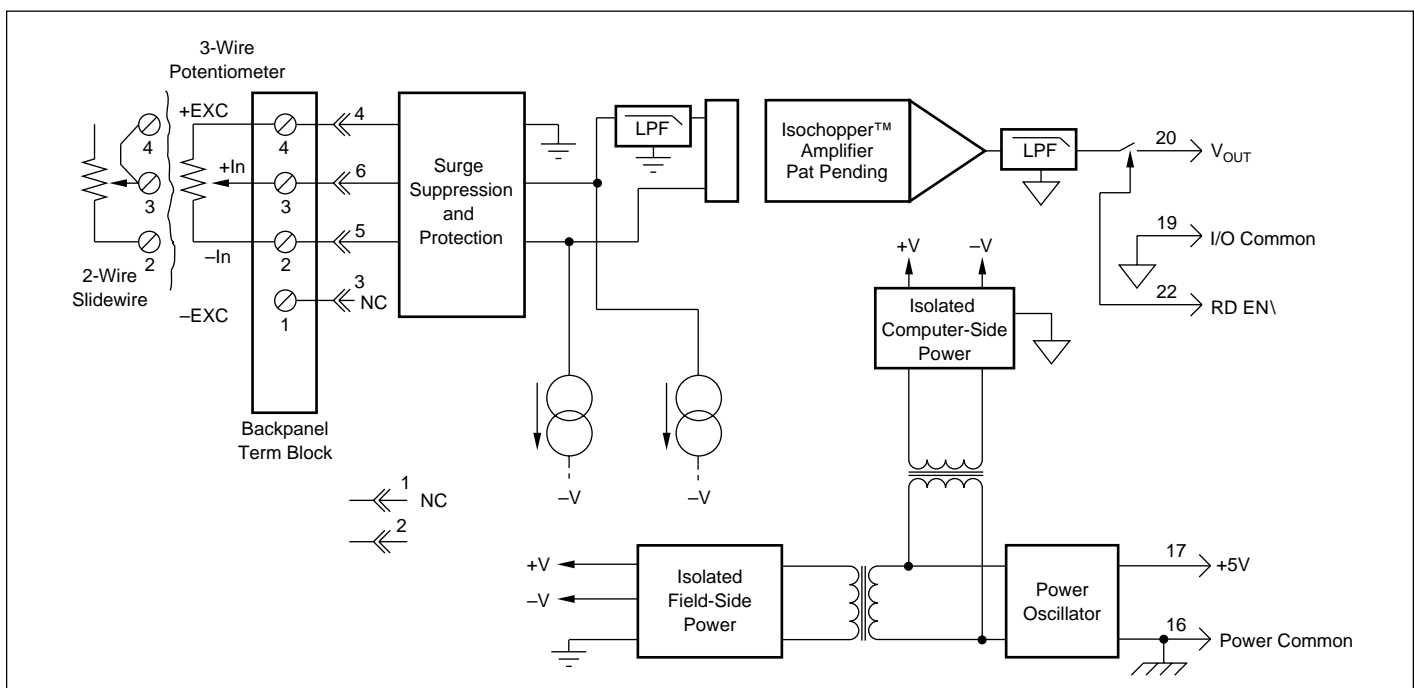


FIGURE 1. SCM5B36 Block Diagram.

## SPECIFICATIONS Typical at Ta = +25°C and +5V Power

Module	SCM5B36
Input Range	0 to 10K $\Omega$
Input Resistance	
Normal	50M $\Omega$
Power Off	40K $\Omega$
Overload	40K $\Omega$
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
Sensor Excitation Current	0.25mA; 100 $\Omega$ , 500 $\Omega$ , 1K $\Omega$ sensor 0.10mA; 10K $\Omega$ sensor
Lead Resistance Effect	$\pm 0.01\Omega/\Omega$ ; 100 $\Omega$ , 500 $\Omega$ , 1K $\Omega$ sensor $\pm 0.02\Omega/\Omega$ ; 10K $\Omega$ sensor
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50 or 60Hz)	160dB
NMR	95dB @ 60Hz, 90dB @ 50Hz
Accuracy <sup>(2)</sup>	$\pm 0.08\%$ Span
Stability	
Input Offset	$\pm 0.004\Omega/^\circ\text{C}$ ; 100 $\Omega$ , 500 $\Omega$ , 1K $\Omega$ sensor $\pm 0.010\Omega/^\circ\text{C}$ ; 10K $\Omega$ sensor
Output Offset	$\pm 20\mu\text{V}/^\circ\text{C}$
Gain	$\pm 50\text{ppm}$ of reading/ $^\circ\text{C}$
Noise	
Input, 0.1 to 10Hz	0.2 $\mu\text{V}$ /rms
Output, 100KHz	200 $\mu\text{V}$ /rms
Bandwidth, -3dB	4Hz
Response Time, 90% span	0.2s
Output Range	0 to +5V
Output Resistance	50 $\Omega$
Output Protection	Continuous short to ground
Output Selection Time (to $\pm 1\text{mV}$ of $V_{\text{out}}$ )	6 $\mu\text{s}$ at $C_{\text{load}} = 0$ to 2000pF
Output Current Limit	+8mA
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0,1"	0.5 $\mu\text{A}$
Power Supply Voltage	+5VDC $\pm 5\%$
Power Supply Current	30mA
Power Supply Sensitivity	$\pm 2\mu\text{V}/\%$ RTI <sup>(1)</sup>
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	-40°C to +85°C
Storage Temp. Range	-40°C to +85°C
Relative Humidity	0 to 95% noncondensing
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)

NOTES: (1) Referenced to input. (2) Includes nonlinearity, hysteresis and repeatability.

## ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B36-01	0 to 100 $\Omega$	0V to +5V
SCM5B36-02	0 to 500 $\Omega$	0V to +5V
SCM5B36-03	0 to 1K $\Omega$	0V to +5V
SCM5B36-04	0 to 10K $\Omega$	0V to +5V

## Thermocouple Input Modules

### FEATURES

- INTERFACES TO TYPES J, K, T, E, R, S, C, N AND B THERMOCOUPLES
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60Hz, 90dB at 50Hz
- $\pm 0.05\%$  ACCURACY
- $\pm 0.02\%$  LINEARITY
- $\pm 1\mu\text{V}/^\circ\text{C}$  DRIFT
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

### DESCRIPTION

Each SCM5B37 thermocouple input module provides a single channel of thermocouple input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic-switch controlled, allowing these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50\text{V}$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The SCM5B37 can interface to nine industry standard thermocouple types: J, K, T, E, R, S, C, N, and B. Its corresponding output signal operates over a 0V to +5V range. Each module is cold-junction compensated to correct for parasitic thermocouples formed by the thermocouple wire and screw terminals on the mounting backpanel. Upscale open thermocouple detect is provided by an internal pull-up resistor. Downscale indication can be implemented by installing an external  $47\text{M}\Omega$  resistor,  $\pm 20\%$  tolerance, between screw terminals 1 and 3 on the SCMPB01/02/03/04/05/06 backpanels.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the SCM5B37 modules provides protection against accidental connection of power-line voltages up to 240VAC.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

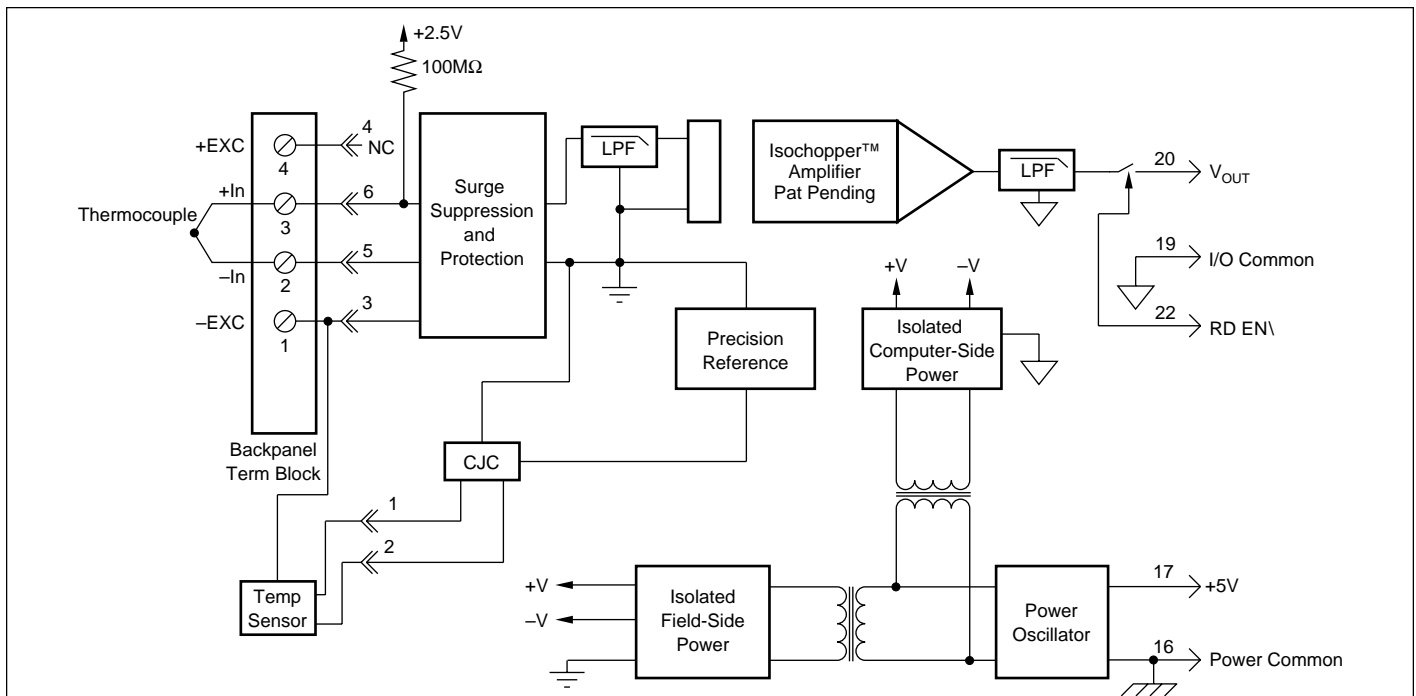


FIGURE 1. SCM5B37 Block Diagram.

## SPECIFICATIONS Typical at T<sub>A</sub> = +25°C and +5V power.

Module	SCM5B37
Input Range	-0.1V to +0.5V
Input Bias Current	-25nA
Input Resistance	
Normal	50M $\Omega$
Power Off	40k $\Omega$
Overload	40k $\Omega$
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50Hz or 60Hz)	160dB
NMR	95dB at 60Hz, 90dB at 50Hz
Accuracy	See Ordering Information
Nonlinearity	$\pm 0.02\%$ Span
Stability	
Input Offset	$\pm 1\mu\text{V}/^\circ\text{C}^{(3)}$
Output Offset	$\pm 20\mu\text{V}/^\circ\text{C}$
Gain	$\pm 25\text{ppm}/^\circ\text{C}$
Noise	
Input, 0.1 to 10Hz	0.2 $\mu\text{V}$ rms
Output, 100kHz	200 $\mu\text{V}$ rms
Bandwidth, -3dB	4Hz
Response Time, 90% Span	0.2s
Output Range	0V to +5V
Output Resistance	50 $\Omega$
Output Protection	Continuous Short to Ground
Output Selection Time (to $\pm 1\text{mV}$ of V <sub>OUT</sub> )	6 $\mu\text{s}$ at C <sub>load</sub> = 0 to 2000pF
Output Current Limit	+8mA
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0", "1"	0.5 $\mu\text{A}$
Open Input Response	Upscale
Open Input Detection Time	10s
Cold Junction Compensation	
Accuracy, 25°C	$\pm 0.25^\circ\text{C}$
Accuracy, +5°C to +45°C	$\pm 0.5^\circ\text{C}$
Accuracy, -40°C to +85°C	$\pm 1.25^\circ\text{C}$
Power Supply Voltage	+5VDC $\pm 5\%$
Power Supply Current	30mA
Power Supply Sensitivity	$\pm 2\mu\text{V}/\%$ RTI <sup>(2)</sup>
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	-40°C to +85°C
Storage Temp. Range	-40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)

NOTES: (1) Includes nonlinearity, hysteresis and repeatability. Does not include CJC accuracy. (2) RTI = Referenced to input. (3) This is equivalent to °C as follows: Type J 0.020 °C/°C, Types K, T 0.025°C/°C, Type E 0.016°C/°C, Types R, S 0.168°C/°C, Type N 0.037°C/°C, Type C, 0.072°C/°C.

## ORDERING INFORMATION

MODEL	TYPE	INPUT RANGE	OUTPUT RANGE	ACCURACY <sup>(1)</sup>	
SCM5B37J	Type J	-100°C to +760°C (-148°F to +1400°F)	0V to +5V	$\pm 0.07\%$	$\pm 0.61^\circ\text{C}$
SCM5B37K	Type K	-100°C to +1350°C (-148°F to +2462°F)	0V to +5V	$\pm 0.07\%$	$\pm 0.97^\circ\text{C}$
SCM5B37T	Type T	-100°C to +400°C (-148°F to +752°F)	0V to +5V	$\pm 0.09\%$	$\pm 0.46^\circ\text{C}$
SCM5B37E	Type E	0°C to +900°C (+32°F to +1652°F)	0V to +5V	$\pm 0.07\%$	$\pm 0.59^\circ\text{C}$
SCM5B37R	Type R	0°C to +1750°C (+32°F to +3182°F)	0V to +5V	$\pm 0.10\%$	$\pm 1.72^\circ\text{C}$
SCM5B37S	Type S	0°C to +1750°C (+32°F to +3182°F)	0V to +5V	$\pm 0.10\%$	$\pm 1.82^\circ\text{C}$
SCM5B37B	Type B	0°C to +1800°C (+32°F to +3272°F)	0V to +5V	$\pm 0.12\%$	$\pm 2.21^\circ\text{C}$
SCM5B37C	Type C	+350°C to +1300°C (+662°F to +2372°F)	0V to +5V	$\pm 0.11\%$	$\pm 1.01^\circ\text{C}$
SCM5B37N	Type N	-100°C to +1300°C (-148°F to +2372°F)	0V to +5V	$\pm 0.70\%$	$\pm 0.98^\circ\text{C}$

Call 800-444-7644  
For Information and Assistance

 **DATAFORTH**<sup>®</sup>  
A Burr-Brown Company

## Strain Gage Input Modules, Narrow Bandwidth

### FEATURES

- INTERFACES TO 100Ω THRU 10kΩ, FULL-BRIDGE, HALF-BRIDGE, OR QUARTER-BRIDGE STRAIN GAGES
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- FULLY ISOLATED EXCITATION SUPPLY
- 160dB CMR
- 4Hz SIGNAL BANDWIDTH
- ±0.08% ACCURACY
- ±0.02% LINEARITY
- ±1μV/°C DRIFT
- MIX AND MATCH SCM5B TYPES ON BACKPANEL
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT

### DESCRIPTION

Each SCM5B38 Strain Gage input module provides a single channel of Strain Gage input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic

switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The SCM5B38 can interface to full-bridge or half-bridge transducers with a nominal resistance of 100Ω to 10kΩ. A matched pair of bridge-completion resistors (to ±1mV at +10V excitation) allows use of low cost half-bridge or quarter-bridge transducers (Figures 2, 3, 4).

Strain Gage excitation is provided from the module by a very stable 10V or 3.333V source. The excitation supply is fully isolated, allowing the amplifier inputs to operate over the full range of the excitation voltage. This feature offers significant flexibility in real world applications. Full scale sensitivities of 2mV/V, 3mV/V or 10mV/V are offered as standard. With 10V excitation, this results in ±20mV, ±30mV or ±100mV full scale input range producing ±5V full scale output.

After initial field side filtering the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

Special input circuits on the SCM5B38 module provide protection of the signal inputs and the isolated excitation supply up to 240VAC.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

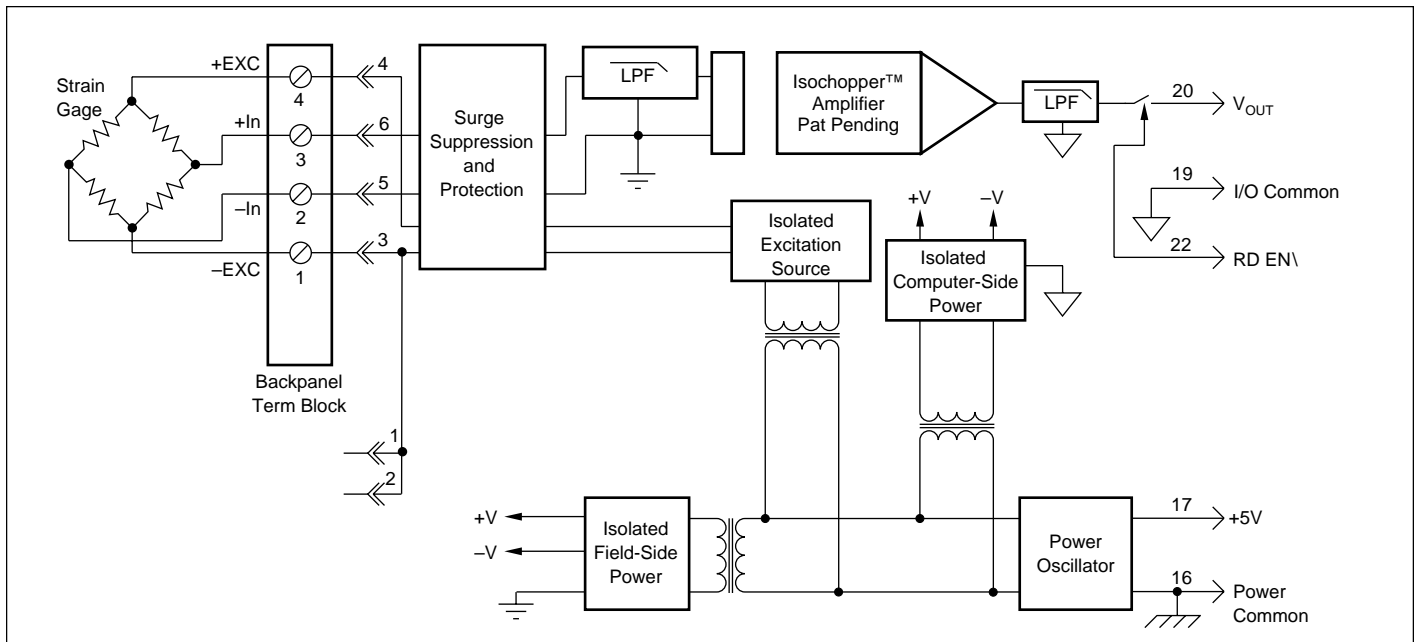


FIGURE 1. SCM5B38 Block Diagram.

# SPECIFICATIONS Typical at $T_A = +25^\circ\text{C}$ and +5V power.

Module	Full Bridge SCM5B38-31, -32, -35, -36, -37	Half Bridge SCM5B38-33, -34
Input Range	$\pm 10\text{mV}$ to $\pm 100\text{mV}$	*
Input Bias Current	$\pm 0.5\text{nA}$	*
Input Resistance		
Normal	$50\text{k}\Omega$	*
Power Off	$40\text{k}\Omega$	*
Overload	$40\text{k}\Omega$	*
Signal Input Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
Excitation Output (-32, -34, -35, -37)	+10V $\pm 3\text{mV}$	*
Excitation Output (-31, -33, -36)	+3.333V $\pm 2\text{mV}$	*
Excitation Load Regulation	$\pm 5\text{ppm}/\text{mA}$	*
Excitation Stability	$\pm 15\text{ppm}/^\circ\text{C}$	*
Half Bridge Voltage Level (-34)	NA	+5V $\pm 1\text{mV}$
Half Bridge Voltage Level (-33)	NA	+1.667V $\pm 1\text{mV}$
Isolated Excitation Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMV, Input to Output		
Continuous	1500Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMR (50 or 60Hz)	160dB	*
NMR	95dB at 60Hz, 90dB at 50Hz	*
Accuracy <sup>(2)</sup>	$\pm 0.08\%$ Span $\pm 10\mu\text{V}$ RTI <sup>(3)</sup>	*
Nonlinearity	$\pm 0.02\%$ Span	*
Stability		
Input Offset	$\pm 1\mu\text{V}/^\circ\text{C}$	*
Output Offset	$\pm 20\mu\text{V}/^\circ\text{C}$	*
Gain	$\pm 25\text{ppm}$ of Reading/ $^\circ\text{C}$	*
Noise		
Input, 0.1 to 10Hz	0.2 $\mu\text{V}$ rms	1 $\mu\text{V}$ rms
Output, 100kHz	200 $\mu\text{V}$ rms	*
Bandwidth, -3dB	4Hz	*
Response Time, 90% span	0.2s	*
Output Range	$\pm 5\text{V}$	*
Output Resistance	$50\Omega$	*
Output Protection	Continuous Short to Ground	*
Output Selection Time (to $\pm 1\text{mV}$ of $V_{\text{OUT}}$ )	6 $\mu\text{s}$ at $C_{\text{load}} = 0$ to 2000pF	*
Output Current Limit	$\pm 8\text{mA}$	*
Output Enable Control		
Max Logic "0"	+0.8V	*
Min Logic "1"	+2.4V	*
Max Logic "1"	+36V	*
Input Current, "0,1"	0.5 $\mu\text{A}$	*
Power Supply Voltage	+5VDC $\pm 5\%$	*
Power Supply Current	170mA Full Exc. Load, 70mA Exc. No Load	*
Power Supply Sensitivity	$\pm 2\mu\text{V}/\%$ RTI <sup>(3)</sup>	*
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)	*
Environmental		
Operating Temperature Range	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	*
Storage Temperature Range	$-40^\circ\text{C}$ to $+85^\circ\text{C}$	*
Relative Humidity	0 to 95% Noncondensing	*
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)	*
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)	*

FIGURE 2. Full Bridge Connection.

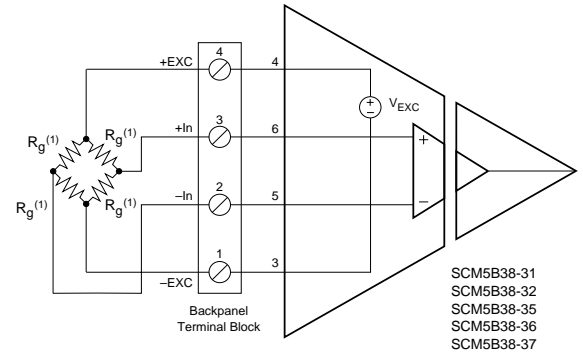


FIGURE 3. Half Bridge Connection.

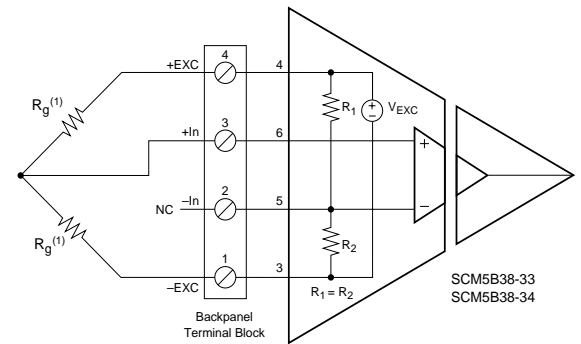
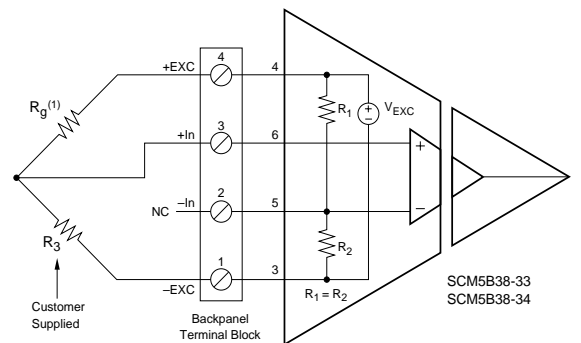


FIGURE 4. Quarter Bridge Connection.



\* Same as -31, -32, -35, -36, -37 modules.

NOTES: (1) Strain element. (2) Includes excitation error, nonlinearity, hysteresis and repeatability. (3) Referenced to input.

MODEL	INPUT BRIDGE TYPE	INPUT RANGE	EXCITATION	OUTPUT RANGE
SCM5B38-31	Full Bridge	100 $\Omega$ to 10k $\Omega$	3.333V at 3mV/V Sensitivity	-5V to +5V
SCM5B38-32	Full Bridge	300 $\Omega$ to 10k $\Omega$	10.0V at 3mV/V Sensitivity	-5V to +5V
SCM5B38-33	Half Bridge	100 $\Omega$ to 10k $\Omega$	3.333V at 3mV/V Sensitivity	-5V to +5V
SCM5B38-34	Half Bridge	300 $\Omega$ to 10k $\Omega$	10.0V at 3mV/V Sensitivity	-5V to +5V
SCM5B38-35	Full Bridge	300 $\Omega$ to 10k $\Omega$	10.0V at 2mV/V Sensitivity	-5V to +5V
SCM5B38-36	Full Bridge	100 $\Omega$ to 10k $\Omega$	3.333V at 10mV/V Sensitivity	-5V to +5V
SCM5B38-37	Full Bridge	300 $\Omega$ to 10k $\Omega$	10.0V at 10mV/V Sensitivity	-5V to +5V

## ORDERING INFORMATION

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# SCM5B38

## Strain Gage Input Modules, Wide Bandwidth

### FEATURES

- INTERFACES TO 100Ω THRU 10kΩ, FULL-BRIDGE, HALF-BRIDGE, OR QUARTER-BRIDGE STRAIN GAGES
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- FULLY ISOLATED EXCITATION SUPPLY
- 100dB CMR
- 10kHz SIGNAL BANDWIDTH
- ±0.08% ACCURACY
- ±0.02% LINEARITY
- ±1μV/°C DRIFT
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

### DESCRIPTION

Each SCM5B38 Strain Gage input module provides a single channel of Strain Gage input which is filtered, isolated, amplified, and converted to a high level analog voltage output (Figure 1). This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to ±50V from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The SCM5B38 can interface to full-bridge or half-bridge transducers with a nominal resistance of 100Ω to 10kΩ. A matched pair of bridge-completion resistors (to ±1mV at +10V excitation) allows use of low cost half-bridge or quarter-bridge transducers (Figures 2, 3, 4). The 10kHz bandwidth allows measurement of high speed processes such as vibration analysis.

Strain Gage excitation is provided from the module by a very stable 10V or 3.333V source. The excitation supply is fully isolated, allowing the amplifier inputs to operate over the full range of the excitation voltage. This feature offers significant flexibility in real world applications. Full scale sensitivities of 2mV/V, 3mV/V or 10mV/V are offered as standard. With 10V excitation, this results in ±20mV, ±30mV or ±100mV full scale input range producing ±5V full scale output.

The input signal is processed through a pre-amplifier on the field side of the isolation barrier. This pre-amplifier has a gain-bandwidth product of 5MHz and is bandwidth limited to 10kHz. After amplification, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC, ±5%.

Special input circuits on the SCM5B38 module provide protection of the signal inputs and the isolated excitation supply up to 240VAC.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

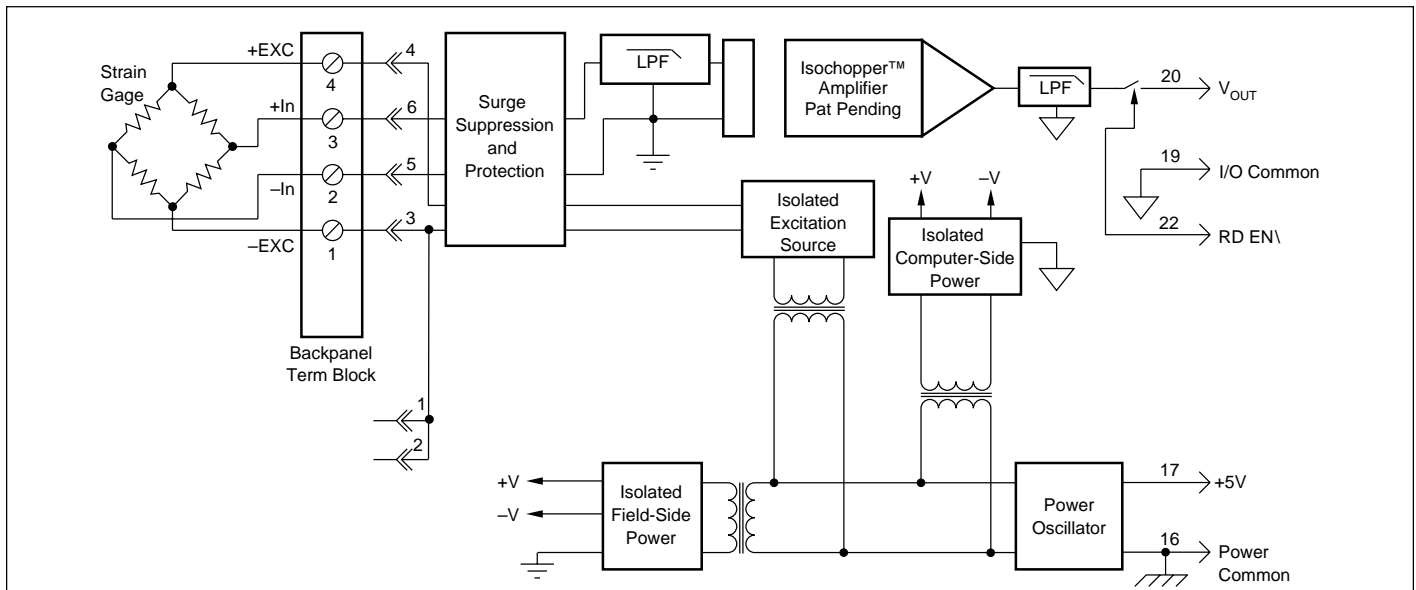


FIGURE 1. SCM5B38 Block Diagram.

# SPECIFICATIONS Typical at T<sub>A</sub> = +25°C and +5V power.

Module	Full Bridge SCM5B38-01, -02, -05, -06, -07	Half Bridge SCM5B38-03, -04
Input Range	±10mV to ±100mV	*
Input Bias Current	±0.3nA	*
Input Resistance		
Normal	50MΩ	*
Power Off	40kΩ	*
Overload	40kΩ	*
Signal Input Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
Excitation Output (-02, -04, -05, -07)	+10V ±3mV	*
Excitation Output (-01, -03, -06)	+3.333V ±2mV	*
Excitation Load Regulation	±5ppm/mA	*
Excitation Stability	±15ppm/°C	*
Half Bridge Voltage Level (-04)	NA	+5V ±1mV
Half Bridge Voltage Level (-03)	NA	+1.667V ±1mV
Isolated Excitation Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMV, Input to Output		
Continuous	1500Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMR (50 or 60Hz)	100dB	*
NMR (-3dB at 10kHz)	120dB per Decade above 10kHz	*
Accuracy <sup>(2)</sup>	±0.08% Span ±10μV RTI <sup>(3)</sup>	*
Nonlinearity	±0.02% Span	*
Stability		
Input Offset	±1μV/°C	*
Output Offset	±40μV/°C	*
Gain	±25ppm of Reading/°C	*
Noise		
Input, 0.1 to 10Hz	0.4μVrms	2μVrms
Output, 100kHz	10mVp-p	*
Bandwidth, -3dB	10kHz	*
Rise Time, 10 to 90% span	35μs	*
Setting Time, to 0.1%	250μs	*
Output Range	±5V	*
Output Resistance	50Ω	*
Output Protection	Continuous Short to Ground	*
Output Selection Time (to ±1mV of V <sub>OUT</sub> )	6μs at C <sub>load</sub> = 0 to 2000pF	*
Output Current Limit	±8mA	*
Output Enable Control		
Max Logic "0"	+0.8V	*
Min Logic "1"	+2.4V	*
Max Logic "1"	+36V	*
Input Current, "0,1"	0.5μA	*
Power Supply Voltage	+5VDC ±5%	*
Power Supply Current	170mA Full Exc. Load, 70mA No Exc. Load	*
Power Supply Sensitivity	±2μV/% RTI <sup>(3)</sup>	*
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)	*
Environmental		
Operating Temperature Range	-40°C to +85°C	*
Storage Temperature Range	-40°C to +85°C	*
Relative Humidity	0 to 95% Noncondensing	*
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)	*
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)	*

FIGURE 2. Full Bridge Connection.

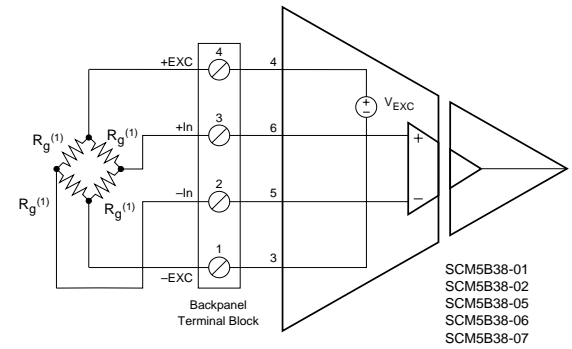


FIGURE 3. Half Bridge Connection.

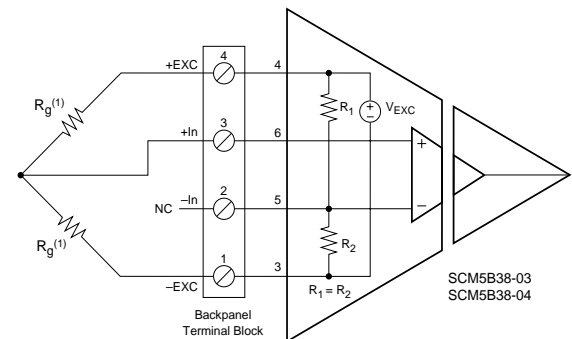
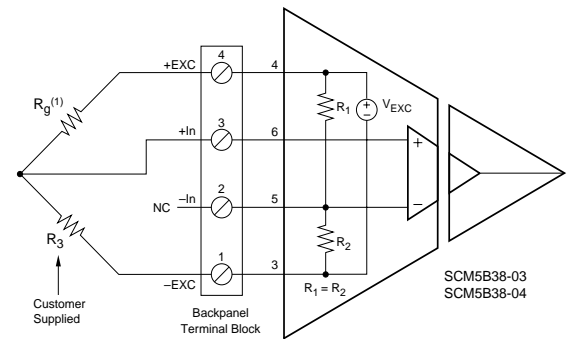


FIGURE 4. Quarter Bridge Connection.



\* Same as -01, -02, -05, -06, -07 modules.

NOTES: (1) Strain element. (2) Includes excitation error, nonlinearity, hysteresis and repeatability. (3) Referenced to input.

MODEL (10kHz)	INPUT BRIDGE TYPE	INPUT RANGE	EXCITATION	OUTPUT RANGE
SCM5B38-01	Full Bridge	100Ω to 10kΩ	3.333V at 3mV/V Sensitivity	-5V to +5V
SCM5B38-02	Full Bridge	300Ω to 10kΩ	10.0V at 3mV/V Sensitivity	-5V to +5V
SCM5B38-03	Half Bridge	100Ω to 10kΩ	3.333V at 3mV/V Sensitivity	-5V to +5V
SCM5B38-04	Half Bridge	300Ω to 10kΩ	10.0V at 3mV/V Sensitivity	-5V to +5V
SCM5B38-05	Full Bridge	300Ω to 10kΩ	10.0V at 2mV/V Sensitivity	-5V to +5V
SCM5B38-06	Full Bridge	100Ω to 10kΩ	3.333V at 10mV/V Sensitivity	-5V to +5V
SCM5B38-07	Full Bridge	300Ω to 10kΩ	10.0V at 10mV/V Sensitivity	-5V to +5V

## ORDERING INFORMATION



# SCM5B39

## Current Output Modules

### FEATURES

- ACCEPTS HIGH LEVEL VOLTAGE OR PROCESS CURRENT INPUT
- UNIPOLAR OR BIPOLAR CURRENT OUTPUT
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- OUTPUT PROTECTED TO 240VAC CONTINUOUS
- 110dB CMR
- 400Hz SIGNAL BANDWIDTH
- $\pm 0.05\%$  ACCURACY
- $\pm 0.02\%$  LINEARITY
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

### DESCRIPTION

Each SCM5B39 current output module provides a single channel of analog output. The track-and-hold circuit in the input stage can be operated in a hold mode where one DAC can supply many output modules, or a track mode where one DAC is dedicated to each module. In addition to the track-and-hold circuit, each module provides signal buffering, isolation, filtering, and conversion to a high level current output (Figure 1).

Setting of the track or hold mode is controlled by the logic state of WR EN $\bar{}$ , module pin 23. When pin 23 is low, the track mode is enabled. If pin 23 is open or high, the hold mode is enabled. The module is designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the track and hold circuit. For a low state, simply connect pin 23, the Write-Enable pin, to I/O Common, pin 19.

The SCMPB02 and SCMPB06 backpanels allow host computer control of the WR EN $\bar{}$  control line, which allows multiplexing of one host DAC to up to 64 SCM5B39 output modules. During power-up, the output remains at 0mA for 100ms on all models except the SCM5B39-07, which allows the track-and-hold circuit to be initialized.

A special circuit in the output stage of the module provides protection against accidental connection of power-line voltages up to 240VAC on all models except the SCM5B39-07.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

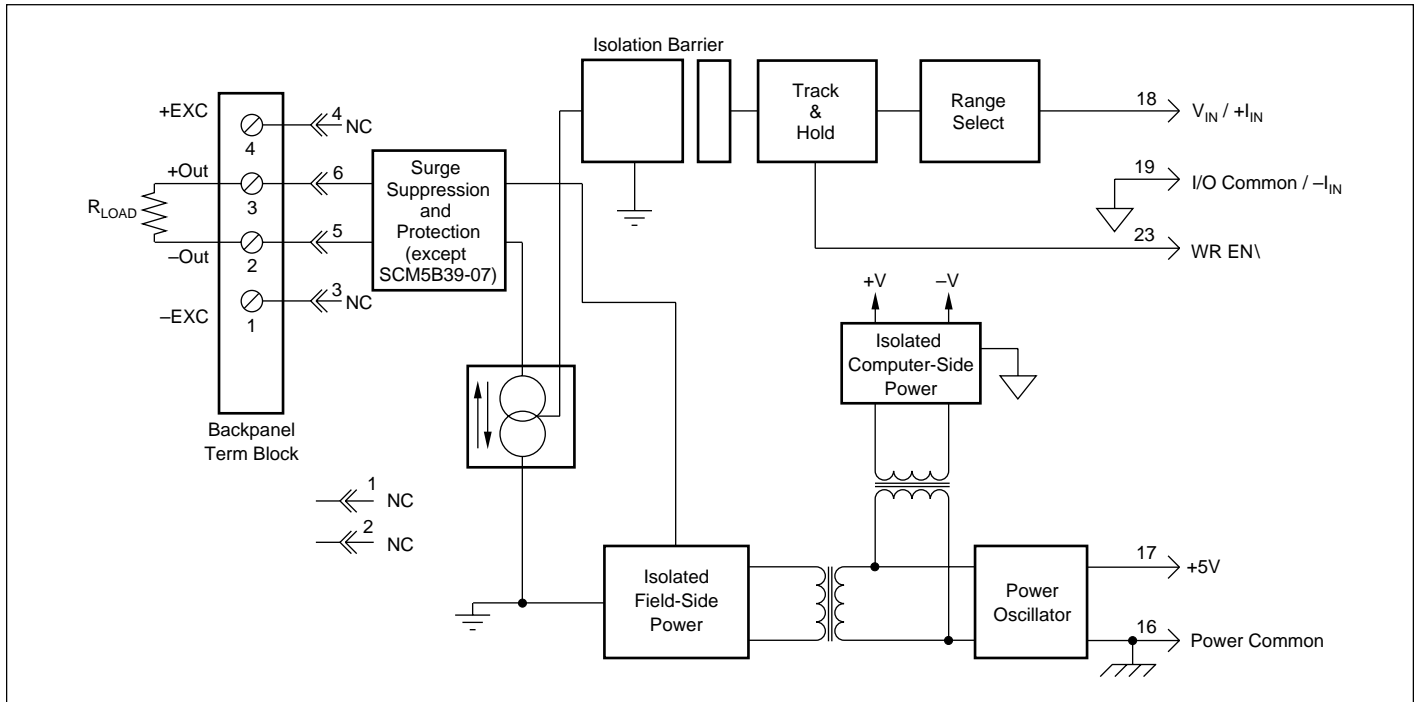


FIGURE 1. SCM5B39 Block Diagram.

## SPECIFICATIONS

Typical at  $T_A = +25^\circ\text{C}$  and +5V power.

Module	Unipolar Output Current SCM5B39-01, 02, 03, 04, 05	Bipolar Output Current SCM5B39-07
Input Voltage Range Input Current Range (-05) Input Voltage Maximum Input Current, Maximum (-05) Input Resistance Input Resistance (-05)	$\pm 5\text{V}$ or $0\text{V}$ to $+5\text{V}$ 0 to 20mA $\pm 36\text{V}$ (no damage) 75mA (no damage) 50M $\Omega$ 20 $\Omega$	$\pm 10\text{V}$ N/A * N/A 2M $\Omega$ N/A
Output Current Range Over Range Capability Output Compliance Voltage (Open Circuit) Load Resistance Range  Output I Under Fault, max Output Protection Continuous Transient	0 to 20mA or 4 to 20mA 10% 22VDC 0 to 650 $\Omega$ (0 to 750 $\Omega$ for Power Supply Voltage greater than 4.95VDC) 26mA  240Vrms max ANSI/IEEE C37.90.1-1989	$\pm 20\text{mA}$ *  $\pm 15\text{VDC}$ 0 to 450 $\Omega$ (0 to 500 $\Omega$ for Power Supply Voltage greater than 4.95VDC) *  N/A N/A
CMV, Output to Input Continuous Transient CMR (50Hz or 60Hz) NMR (-3dB at 400 Hz)	1500Vrms max ANSI/IEEE C37.90.1-1989 110dB 40dB per Decade above 400Hz	* * * 40dB per Decade above 275Hz
Accuracy Nonlinearity Stability Zero Span Noise Output Ripple, 1kHz bandwidth Bandwidth, -3dB Rise Time, 10 to 90% Span	$\pm 0.05\%$ Span $\pm 0.02\%$ Span  $\pm 0.5\mu\text{A}/^\circ\text{C}$ $\pm 20\text{ppm}/^\circ\text{C}$  10 $\mu\text{A}$ -p 400Hz 0.75ms	$\pm 0.10\%$ Span $\pm 0.04\%$ Span  *  $\pm 40\text{ppm}/^\circ\text{C}$  * 275Hz 1.2ms
Sample and Hold Output Droop Rate Acquisition Time	40 $\mu\text{A}/\text{s}$ 50 $\mu\text{s}$	* *
Track-and-Hold Enable Control Max Logic "0" Min Logic "1" Max Logic "1" Input Current, "0"	+0.8V +2.4V +36V 0.5 $\mu\text{A}$	* * * *
Power Supply Voltage Power Supply Current Power Supply Sensitivity	+5VDC $\pm 5\%$ 170mA $\pm 0.5\mu\text{A}/\%$ typ	* 130mA *
Mechanical Dimensions	2.28" x 2.26" x 0.6" (58mm x 57mm x 15mm)	*
Environmental Operating Temp. Range Storage Temp. Range Relative Humidity Emissions Immunity	-40 $^\circ\text{C}$ to +85 $^\circ\text{C}$ -40 $^\circ\text{C}$ to +85 $^\circ\text{C}$ 0 to 95% Noncondensing EN50081-1, ISM Group 1, Class A (Radiated, Conducted) EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)	* * * * *

\* same specification

## ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE	BANDWIDTH
SCM5B39-01	0V to +5V	4mA to 20mA	400Hz
SCM5B39-02	-5V to +5V	4mA to 20mA	400Hz
SCM5B39-03	0V to +5V	0mA to 20mA	400Hz
SCM5B39-04	-5V to +5V	0mA to 20mA	400Hz
SCM5B39-05	0mA to 20mA	0mA to 20mA	400Hz
SCM5B39-07 <sup>†</sup>	-10V to +10V	-20mA to +20mA	400Hz

Refer to SCM5B392 specifications, p. 65, for additional current output models.

<sup>†</sup>CSA certification and FM Approval pending

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# SCM5B392

## Matched-Pair Servo/Motor Controller Modules

### FEATURES

- EXTENDS THE DISTANCE AND ISOLATES SERVO/MOTOR CONTROLLER SIGNALS
- PROVIDES ISOLATED CURRENT LOOP INTERFACE BETWEEN CONTROLLER AND MOTOR OR ACTUATOR
- ACCEPTS HIGH LEVEL VOLTAGE INPUTS UP TO  $\pm 10V$
- PROVIDES HIGH LEVEL VOLTAGE OUTPUTS UP TO  $\pm 10V$
- 1500 VOLT TRANSFORMER ISOLATION (3000V TOTAL LOOP)
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- CURRENT LOOP IS PROTECTED TO 240VAC CONTINUOUS
- 1kHz SIGNAL BANDWIDTH
- 110dB CMR
- $\pm 0.1\%$  ACCURACY
- $\pm 0.04\%$  LINEARITY
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT

### DESCRIPTION

The SCM5B392 servo/motor controller module set is designed to solve the problem of extending a servo or motor controller signal a long distance with the possibility for noise pickup and/or contacting hazardous voltages. Each SCM5B392 module set is made up of two modules: a voltage input/current output module and a current input/voltage output module (Figure 1).

The voltage input module connects to the servo or motor controller voltage output and provides an isolated 4 to 20mA output which connects to the input of the current input module. The current input module isolates and provides an output voltage identical to that of the servo or motor controller. Thus the original control signal has been isolated (twice) and extended via a 4 to 20mA current loop.

Several mounting options are available for the SCM5B392 module set. If a large number of channels are required, the SCMPB01 16 channel backpanel and SCMPB05 8 channel backpanel are available. Smaller channel numbers can be accommodated with the SCMPB03 single channel mounting panel and SCMPB04 dual channel mounting panel. These can be mounted on a DIN rail.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

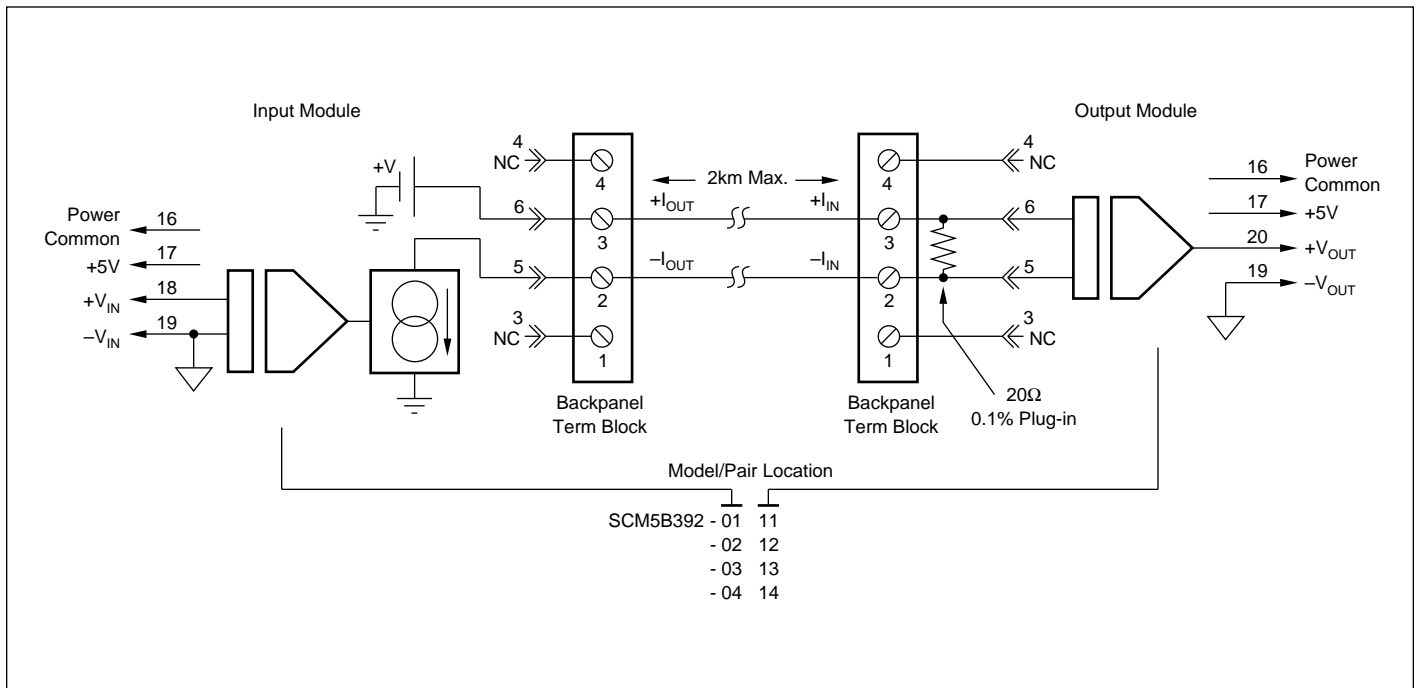


FIGURE 1. SCM5B392 Block Diagram.

**SPECIFICATIONS** Typical at TA= +25C and +5V Power

Module	SCM5B392-01,02,03,04 (INPUT)	SCM5B392-11,12,13,14 (OUTPUT)
Input Range Input Maximum Input Resistance	Up to $\pm 10V$ $\pm 36V$ (no damage) $50M\Omega$	4 to 20mA Protected to 240Vrms $20\Omega$
Output Range Loop Resistance Range Output Protection Continuous Transient	4 to 20mA 0 to $600\Omega$ 240Vrms max ANSI/IEEE C37.90.1-1989	Up to $\pm 10V$ NA * *
CMV Continuous Transient CMR (50 or 60Hz)	1500Vrms max, output to input ANSI/IEEE C37.90.1-1989 100dB	1500Vrms max, input to output * *
Accuracy <sup>(1)</sup> Nonlinearity Stability Zero Span Noise Input (0.1Hz to 10Hz) Output, 1kHz BW Bandwidth, -3dB	$\pm 0.05\%$ Span $\pm 0.02\%$ Span $\pm 0.5\mu A/^\circ C$ $\pm 20ppm/^\circ C$ NA $10\mu A$ -p 1kHz	* * $\pm 35\mu V/^\circ C$ $\pm 25ppm/^\circ C$ 10nArms 200 $\mu V$ rms *
Power Supply Voltage Power Supply Current Power Supply Sensitivity	+5VDC $\pm 5\%$ 170mA $\pm 0.25\mu A/\%$	* 55mA $\pm 20\mu V/\%$ RTI <sup>(2)</sup>
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)	*
Environmental Operating Temp. Range Storage Temp. Range Relative Humidity RFI Susceptibility	-40 $^\circ C$ to +85 $^\circ C$ -40 $^\circ C$ to +85 $^\circ C$ 0 to 95% noncondensing $\pm 0.5\%$ Span error at 400MHz, 5W, 3ft	* * * *

\*Same as input.

NOTES: (1) includes nonlinearity, hysteresis and repeatability. (2) RTI = Referenced to Input.

**ORDERING INFORMATION (for module pairs)**

MODEL	INPUT RANGE	INTERFACE	OUTPUT RANGE
SCM5B392-0111	0V to +5V	4 to 20mA	0V to +5V
SCM5B392-0212	-5V to +5V	4 to 20mA	-5V to +5V
SCM5B392-0313	0V to +10V	4 to 20mA	0V to +10V
SCM5B392-0414	-10V to +10V	4 to 20mA	-10V to +10V

**ORDERING INFORMATION (for single modules)**

MODEL	INPUT RANGE	OUTPUT RANGE	BANDWIDTH
SCM5B392-01	0 to +5V	4 to 20mA	1kHz
SCM5B392-02	$\pm 5V$	4 to 20mA	1kHz
SCM5B392-03	0 to +10V	4 to 20mA	1kHz
SCM5B392-04	$\pm 10V$	4 to 20mA	1kHz
SCM5B392-11	4 to 20mA	0 to +5V	1kHz
SCM5B392-12	4 to 20mA	$\pm 5V$	1kHz
SCM5B392-13	4 to 20mA	0 to +10V	1kHz
SCM5B392-14	4 to 20mA	$\pm 10V$	1kHz

## Analog Voltage Input Modules, Wide Bandwidth

### FEATURES

- ACCEPTS MILLIVOLT AND VOLTAGE LEVEL SIGNALS
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 100dB CMR
- 10kHz SIGNAL BANDWIDTH
- $\pm 0.05\%$  ACCURACY
- $\pm 0.02\%$  LINEARITY
- $\pm 1\mu\text{V}/^\circ\text{C}$  DRIFT
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

### DESCRIPTION

Each SCM5B40 and SCM5B41 wide bandwidth voltage input module provides a single channel of analog input which is amplified, isolated, and converted to a high level analog voltage output (Figure 1). This voltage output is logic-switch controlled, allowing these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50\text{V}$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The input signal is processed through a pre-amplifier on the field side of the isolation barrier. This pre-amplifier has a gain-bandwidth product of 5MHz and is bandwidth limited to 10kHz. After amplification, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the SCM5B40 and SCM5B41 modules provides protection against accidental connection of power-line voltages up to 240VAC.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

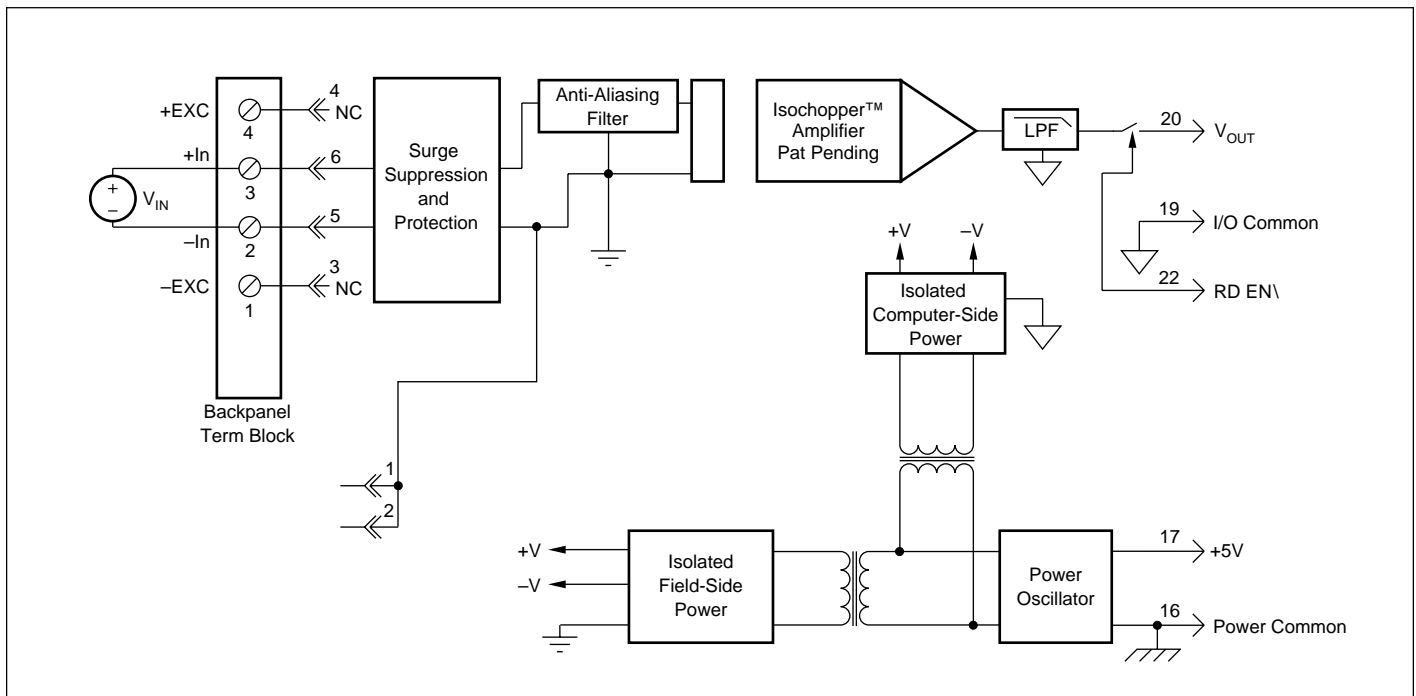


FIGURE 1. SCM5B40/41 Block Diagram.

## SPECIFICATIONS Typical at T<sub>A</sub> = +25°C and +5V Power.

Module	SCM5B40	SCM5B41
Input Range	±10mV to ±100mV	±1V to ±40V
Input Bias Current	±0.5nA	±0.05nA
Input Resistance		
Normal	200MΩ	650kΩ (minimum)
Power Off	40kΩ	650kΩ (minimum)
Overload	40kΩ	650kΩ (minimum)
Input Protection		
Continuous	240Vrms Max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMV, Input to Output		
Continuous	1500Vrms max	*
Transient	ANSI/IEEE C37.90.1-1989	*
CMR (50Hz or 60Hz)	100dB	*
NMR (-3dB at 10kHz)	120dB per Decade above 10kHz	*
Accuracy <sup>(1)</sup>	±0.05% Span ±10μV RTI <sup>(2)</sup> ±0.05%(V <sub>Z</sub> <sup>(3)</sup> )	±0.05% span ±0.2mV RTI <sup>(2)</sup> ±0.05% (V <sub>Z</sub> <sup>(3)</sup> )
Nonlinearity	±0.02% Span	*
Stability		
Input Offset	±1μV/°C	±20μV/°C
Output Offset	±40μV/°C	*
Gain	±25ppm/°C	±50ppm/°C
Noise		
Input, 0.1 to 10Hz	0.4μVrms	2μVrms
Output, 100kHz	10mVp-p	*
Bandwidth, -3dB	10kHz	*
Rise Time, 10 to 90% Span	35μs	*
Settling Time, to 0.1%	250μs	*
Output Range	±5V or 0V to +5V	*
Output Resistance	50Ω	*
Output Protection	Continuous Short to Ground	*
Output Selection Time (to ±1mV of V <sub>OUT</sub> )	6μs at C <sub>load</sub> = 0 to 2000pF	*
Output Current Limit	±8mA	*
Output Enable Control		
Max Logic "0"	+0.8V	*
Min Logic "1"	+2.4V	*
Max Logic "1"	+36V	*
Input Current, "0", "1"	0.5μA	*
Power Supply Voltage	+5VDC ±5%	*
Power Supply Current	30mA	*
Power Supply Sensitivity	±2μV/% RTI <sup>(2)</sup>	±200μV/% RTI <sup>(2)</sup>
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)	*
Environmental		
Operating Temp. Range	-40°C to +85°C	*
Storage Temp. Range	-40°C to +85°C	*
Relative Humidity	0 to 95% Noncondensing	*
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)	*
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)	*

\* Same specification as SCM5B40.  
 NOTES: (1) Includes nonlinearity, hysteresis and repeatability.  
 (2) RTI = Referenced to input.  
 (3) V<sub>Z</sub> is the input voltage that results in 0V output.

## ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B40-01	-10mV to +10mV	-5V to +5V
SCM5B40-02	-50mV to +50mV	-5V to +5V
SCM5B40-03	-100mV to +100mV	-5V to +5V
SCM5B40-04	-10mV to +10mV	0V to +5V
SCM5B40-05	-50mV to +50mV	0V to +5V
SCM5B40-06	-100mV to +100mV	0V to +5V
SCM5B41-01	-1V to +1V	-5V to +5V
SCM5B41-02	-5V to +5V	-5V to +5V
SCM5B41-03	-10V to +10V	-5V to +5V
SCM5B41-04	-1V to +1V	0V to +5V
SCM5B41-05	-5V to +5V	0V to +5V
SCM5B41-06	-10V to +10V	0V to +5V
SCM5B41-07	-20V to +20V	-5V to +5V
SCM5B41-08	-20V to +20V	0V to +5V
SCM5B41-09	-40V to +40V	-5V to +5V
SCM5B41-10	-40V to +40V	0V to +5V

Call 800-444-7644  
 For Information and Assistance



# SCM5B42

## 2-Wire Transmitter Interface Modules

### FEATURES

- ISOLATED +20VDC CURRENT LOOP SUPPLY
- PROVIDES ISOLATION FOR NON-ISOLATED 2-WIRE TRANSMITTERS
- HIGH LEVEL VOLTAGE OUTPUT: +1V to +5V or +2V to +10V
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 100dB CMR
- 100Hz SIGNAL BANDWIDTH
- $\pm 0.05\%$  ACCURACY
- $\pm 0.02\%$  LINEARITY
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

### DESCRIPTION

Each SCM5B42 2-wire transmitter interface module provides a single channel which accepts a 4 to 20 mA process current input and provides a standard +1 to +5V or +2 to +10V output signal (Figure 1). An isolated +20VDC regulated power supply is provided to power the current trans-

mitter. This allows a 2-wire loop powered transmitter to be directly connected to the SCM5B42 without requiring an external power supply. The regulated supply will provide a nominal +20VDC at a loop current of 4mA to 20mA.

The SCM5B42 will provide a 1500V isolation barrier for non-isolated 2-wire field transmitters. It can also be used when additional isolation is required between an isolated 2-wire transmitter and the input stage of the control room computer.

The voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

A precision  $20\Omega$  current conversion resistor is supplied with the module. Sockets are provided on the SCMPB01/02/03/04/05/06 backpanels to allow installation of this resistor. Extra resistors are available under part number SCMXR1. All field inputs are fully protected from accidental connection of power-line voltages up to 240VAC. The module has a 3dB bandwidth of 100Hz. Signal filtering is accomplished with a six-pole filter, with two poles on the field side of the isolation barrier, and the other four on the computer side.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

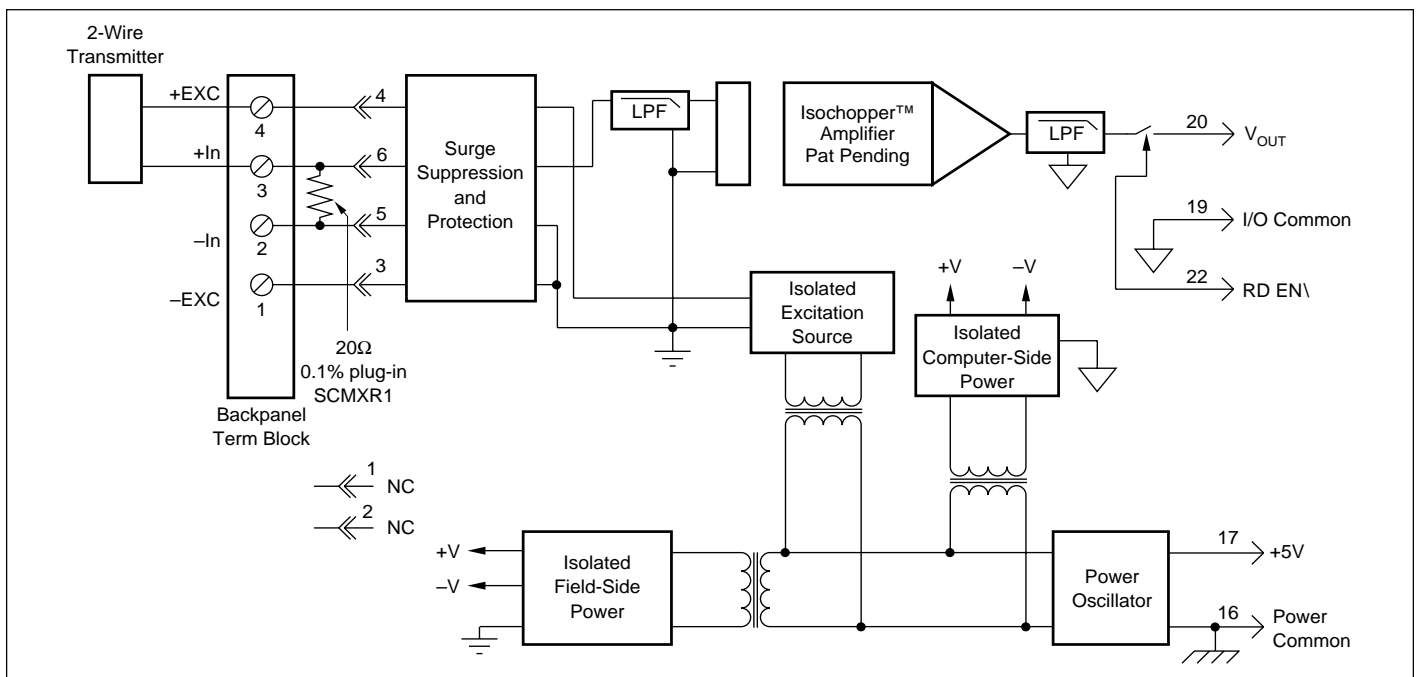


FIGURE 1. SCM5B42 Block Diagram.

## SPECIFICATIONS Typical at T<sub>A</sub> = +25°C and +5V power.

Module	SCM5B42
Input Range	4mA to 20mA
Input Resistor	
Value	20.00Ω
Accuracy	±0.1%
Stability	±10ppm/°C
Loop Supply Voltage	Nominal 20V at 4mA to 20mA
Isolated Excitation Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50 or 60Hz)	100dB
NMR (-3dB at 100Hz)	120dB per decade above 100Hz
Accuracy <sup>(1)</sup>	±0.05% span ±4μA RTI <sup>(2)</sup>
Nonlinearity	±0.02% span
Stability	
Input Offset	±1μV/°C
Output Offset	±40μV/°C
Gain	±25ppm/°C of reading
Noise	
Input, 0.1 to 10Hz	10nArms
Output, 100KHz	500μVrms
Bandwidth, -3dB	100Hz
Response Time, 90% span	4mS
Output Range	+1V to +5V or +2V to +10V
Output Resistance	50Ω
Output Protection	Continuous short to gnd
Output Selection Time (to ±1mV of V <sub>OUT</sub> )	6μs at C <sub>load</sub> = 0 to 2000pF
Output Current Limit	+8mA
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0, 1"	0.5μA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	180mA at transmitter load of 20mA 100mA at transmitter load of 4mA
Power Supply Sensitivity	±10μV/% RTI <sup>(2)</sup>
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	-40°C to +85°C
Storage Temp. Range	-40°C to +85°C
Relative Humidity	0 to 95% noncondensing
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)

NOTES: (1) Includes nonlinearity, hysteresis and repeatability.  
(2) RTI = Referenced to input.

## ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B42-01	4mA to 20mA	+1V to +5V
SCM5B42-02	4mA to 20mA	+2V to +10V

## General Purpose Input Modules, with DC Excitation

### FEATURES

- INTERFACES TO DC DISPLACEMENT TRANSDUCERS AND OTHER DEVICES REQUIRING A STABLE DC SUPPLY
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- FULLY ISOLATED EXCITATION SUPPLY
- 100dB CMR
- 1KHz SIGNAL BANDWIDTH
- $\pm 0.10\%$  ACCURACY
- $\pm 0.02\%$  LINEARITY
- $\pm 20\mu\text{V}/^\circ\text{C}$  DRIFT
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

### DESCRIPTION

Each SCM5B43 general purpose input module provides a single channel of transducer input which is filtered, isolated, scaled, and converted to a high level analog voltage output (Figure 1). This voltage output is logic switch

controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50\text{V}$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The SCM5B43 can interface to devices which require a precision 10VDC excitation supply. The 1KHz bandwidth significantly reduces ripple and noise inherent in these devices.

Transducer excitation is provided from the module by a very stable 10V source. The excitation supply is fully isolated, allowing the amplifier inputs to operate over the full range of the excitation voltage. This feature offers significant flexibility in real world applications. Eight full scale input ranges are provided, from  $\pm 1\text{V}$  to  $\pm 10\text{V}$ , producing  $\pm 5\text{V}$  full scale output.

The input signal is processed through a pre-amplifier on the field side of the isolation barrier. This pre-amplifier has a gain-bandwidth product of 5MHz and is bandwidth limited to 1kHz. After amplification, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

Special input circuits on the SCM5B43 module provide protection of the signal inputs and the isolated excitation supply up to 240VAC.

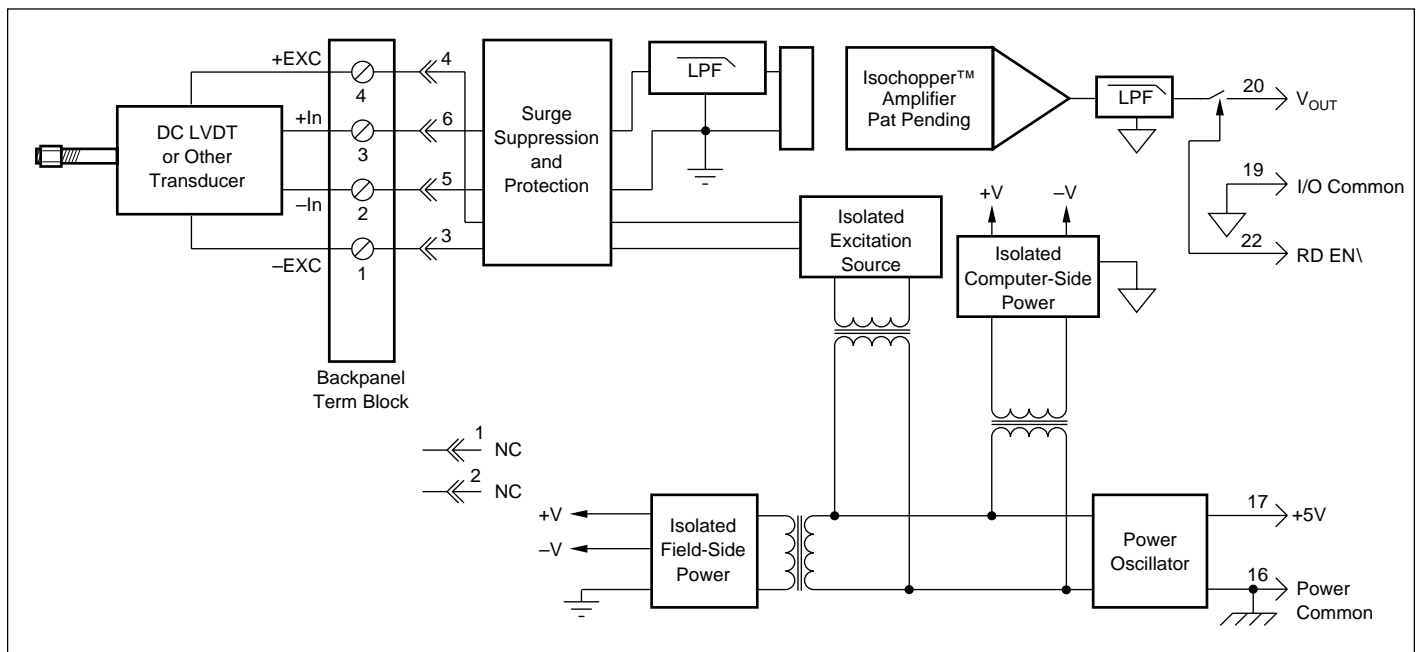


FIGURE 1. SCM5B43 Block Diagram.

## SPECIFICATIONS

Typical at  $T_A = +25^\circ\text{C}$  and +5V power.

Module	SCM5B43
Input Range	$\pm 1\text{V}$ to $\pm 10\text{V}$
Input Bias Current	$\pm 0.05\text{nA}$
Input Resistance	
Normal	$2\text{M}\Omega$ (minimum)
Power Off	$2\text{M}\Omega$ (minimum)
Overload	$2\text{M}\Omega$ (minimum)
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989 (formerly IEEE-472)
Excitation Voltage, $V_{\text{EXC}}$	+10.0VDC $\pm 2\text{mV}$
Excitation current	40mA (maximum)
Excitation Load Regulation	$\pm 5\text{ppm}/\text{mA}$
Excitation Stability	$\pm 15\text{ppm}/^\circ\text{C}$
Isolated Excitation Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989 (formerly IEEE-472)
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989 (formerly IEEE-472)
CMR (50 or 60Hz)	100dB
NMR ( $-3\text{dB}$ at 1kHz)	120dB per decade above 1kHz
Accuracy <sup>(1)</sup>	$\pm 0.1\%$ span, $\pm 0.2\text{mV}$ RTI <sup>(2)</sup>
Nonlinearity	$\pm 0.02\%$ span
Stability	
Input Offset	$\pm 20\mu\text{V}/^\circ\text{C}$
Output Offset	$\pm 40\mu\text{V}/^\circ\text{C}$
Gain	$\pm 50\text{ppm}/^\circ\text{C}$
Noise	
Input, 0.1 to 10Hz	$0.4\mu\text{V}/\text{rms}$
Output, 100KHz	5mVpp
Bandwidth, $-3\text{dB}$	1kHz
Response Time (to 90% final value)	750 $\mu\text{s}$
Output Range	$\pm 5\text{V}$
Output Resistance	$50\Omega$
Output Protection	Continuous short to ground
Output Selection Time (to $\pm 1\text{mV}$ of $V_{\text{OUT}}$ )	6.0 $\mu\text{s}$ at $C_{\text{load}} = 0$ to 2000pF
Output Current Limit	$\pm 8\text{mA}$
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0, 1"	0.5 $\mu\text{A}$
Power Supply Voltage	+5VDC $\pm 5\%$
Power Supply Current	200mA @ Full Exc. load, 100mA @ No Exc. Load
Power Supply Sensitivity	$\pm 200\mu\text{V}/\%$ RTI <sup>(2)</sup>
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	$-40^\circ\text{C}$ to $+85^\circ\text{C}$
Storage Temp. Range	$-40^\circ\text{C}$ to $+85^\circ\text{C}$
Relative Humidity	0 to 95% noncondensing
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)

### NOTES:

- (1) Includes excitation error, nonlinearity, hysteresis and repeatability.  
 (2) RTI = Referenced to input.

## ORDERING INFORMATION

MODEL	MAXIMUM INPUT	OUTPUT
SCM5B43-01	$\pm 1\text{V}$	$\pm 5\text{V}$
SCM5B43-02	$\pm 2\text{V}$	$\pm 5\text{V}$
SCM5B43-03	$\pm 3\text{V}$	$\pm 5\text{V}$
SCM5B43-04	$\pm 4\text{V}$	$\pm 5\text{V}$
SCM5B43-05	$\pm 5\text{V}$	$\pm 5\text{V}$
SCM5B43-06	$\pm 6\text{V}$	$\pm 5\text{V}$
SCM5B43-07	$\pm 7\text{V}$	$\pm 5\text{V}$
SCM5B43-08	$\pm 8\text{V}$	$\pm 5\text{V}$
SCM5B43-09	$\pm 9\text{V}$	$\pm 5\text{V}$
SCM5B43-10	$\pm 10\text{V}$	$\pm 5\text{V}$

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# SCM5B45

## Frequency Input Modules

### FEATURES

- ACCEPTS FREQUENCY INPUTS OF 0 to 100kHz
- PROVIDES HIGH LEVEL VOLTAGE OUTPUTS
- TTL LEVEL INPUTS
- 1500 VOLT TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- $\pm 0.05\%$  ACCURACY
- MIX AND MATCH SCM5B TYPES ON BACKPANEL
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT

### DESCRIPTION

Each SCM5B45 frequency input module provides a single channel of frequency input which is isolated and converted to a high level analog voltage output. This voltage output is logic switch controlled, which allows these modules to share a common analog bus without the requirement of external multiplexers (Figure 1).

The frequency input signal can be a TTL level signal or a zero-crossing signal. Terminal 3 (+In) on the field-side terminal block is the "common" or ground connection for input signals. A TTL signal is connected from terminal 2 (-In) to terminal 3 (+In), while a zero-crossing signal is connected from terminal 4 (+EXC) to terminal 3 (+In). Input circuitry for each of the signal types has hysteresis built in. An input signal must cross entirely through the hysteresis region in order to trigger the threshold comparator.

A 5.1V excitation is available for use with magnetic pick-up or contact-closure type sensors. The excitation is available on pin 1 (-EXC) and the excitation common is pin 3 (+In).

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

A special circuit in the input stage of the module provides protection against accidental connection of power-line voltages up to 240VAC.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

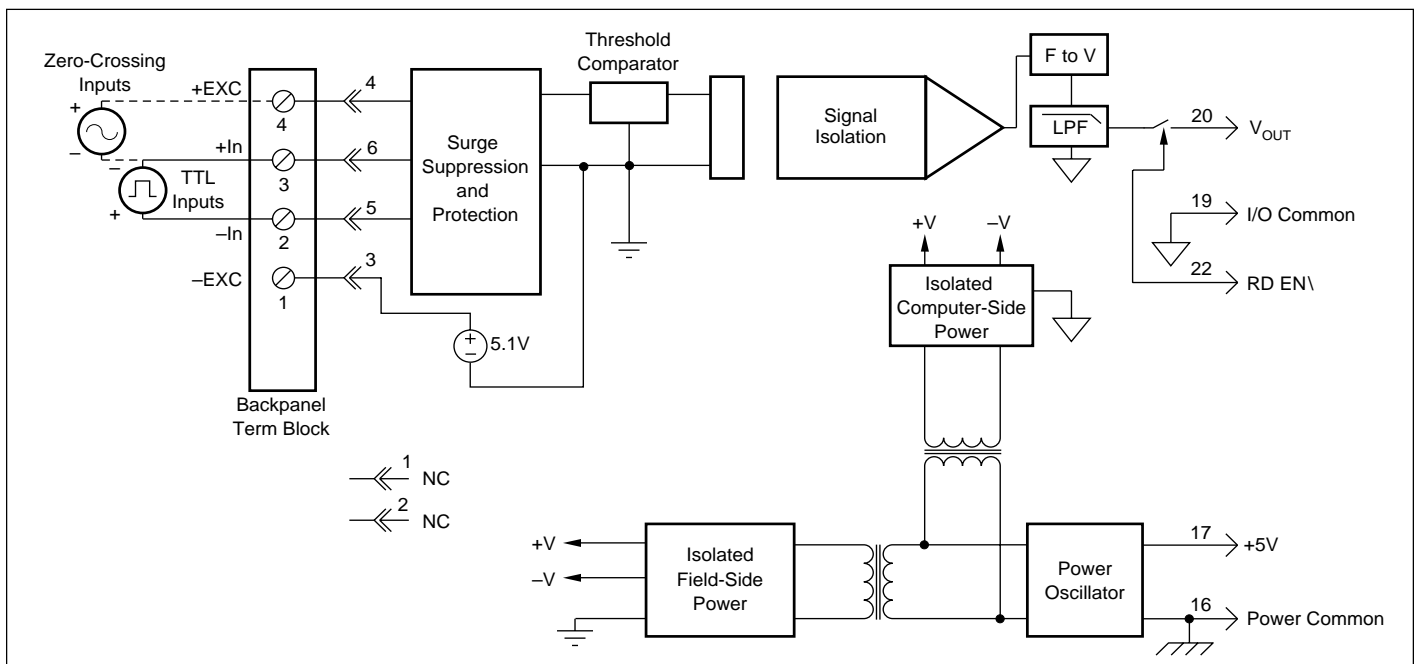


FIGURE 1. SCM5B45 Block Diagram.

## SPECIFICATIONS Typical at Ta = +25°C and +5V Power

Module	SCM5B45
Input Range	0 to 100kHz
Input Threshold	Zero Crossing
Minimum Input	60mVp-p
Maximum Input	350Vp-p
Minimum Pulse Width	4µs
TTL Input Low	0.8V max
TTL Input High	2.4V min
Input Hysteresis	
Zero Crossing	0.04V
TTL	1.5V
Input Resistance	
Normal	100KΩ
Power Off	100KΩ
Overload	100KΩ
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
Excitation	+5.1V @ 8mA max
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50 or 60Hz)	120dB
Accuracy <sup>(1)</sup>	±0.05% span
Nonlinearity	±0.02% span
Stability	
Offset	±40ppm/°C
Gain	±40ppm/°C
Noise	
Output Ripple	<10mVp-p @ Input >2% span
Response Time (0 to 90%)	
SCM5B45-01, -02	300 ms
SCM5B45-03	170 ms
SCM5B45-04, -05	90 ms
SCM5B45-06, -07, -08	20 ms
Output Range	0V to +5V
Output Resistance	50Ω
Output Protection	Continuous short to ground
Output Selection Time (to ±1mV of V <sub>OUT</sub> )	6µs at C <sub>load</sub> = 0 to 2000pF
Output Current Limit	+8mA
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+3.6V
Input Current, "0,1"	0.5µA
Power Supply Voltage	+5VDC ±5%
Power Supply Current	110mA
Power Supply Sensitivity	±150µV/% RTO <sup>(2)</sup>
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	-40°C to +85°C
Storage Temp. Range	-40°C to +85°C
Relative Humidity	0 to 95% noncondensing
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)

NOTES: (1) Includes nonlinearity, hysteresis and repeatability.

(2) RTO = Referenced to Output.

## ORDERING INFORMATION

MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B45-01	0 to 500Hz	0V to +5V
SCM5B45-02	0 to 1kHz	0V to +5V
SCM5B45-03	0 to 3kHz	0V to +5V
SCM5B45-04	0 to 5kHz	0V to +5V
SCM5B45-05	0 to 10kHz	0V to +5V
SCM5B45-06	0 to 25kHz	0V to +5V
SCM5B45-07	0 to 50kHz	0V to +5V
SCM5B45-08	0 to 100kHz	0V to +5V



# SCM5B47

## Linearized Thermocouple Input Modules

### FEATURES

- INTERFACES TO TYPES J, K, T, E, R, S, N, AND B THERMOCOUPLES
- LINEARIZES THERMOCOUPLE SIGNAL
- HIGH LEVEL VOLTAGE OUTPUTS
- 1500Vrms TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1-1989 TRANSIENT PROTECTION
- INPUT PROTECTED TO 240VAC CONTINUOUS
- 160dB CMR
- 95dB NMR AT 60Hz, 90dB at 50Hz
- $\pm 1\mu\text{V}/^\circ\text{C}$  DRIFT
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT
- MIX AND MATCH SCM5B TYPES ON BACKPANEL

### DESCRIPTION

Each SCM5B47 thermocouple input module provides a single channel of thermocouple input which is filtered, isolated, amplified, linearized and converted to a high level analog voltage output (Figure 1). This voltage output is logic-switch controlled, allowing these modules to share a common analog bus without the requirement of external multiplexers.

The SCM5B modules are designed with a completely isolated computer side circuit which can be floated to  $\pm 50\text{V}$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the output switch. If desired, the output switch can be turned on continuously by simply connecting pin 22, the Read-Enable pin to I/O Common, pin 19.

The SCM5B47 can interface to eight industry standard thermocouple types: J, K, T, E, R, S, N, and B. Its corresponding output signal operates over a 0V to +5V range. Each module is cold-junction compensated to correct for parasitic thermocouples formed by the thermocouple wire and screw terminals on the mounting backpanel. Upscale open thermocouple detect is provided by an internal pull-up resistor. Downscale indication can be implemented by installing an external  $47\text{M}\Omega$  resistor,  $\pm 20\%$  tolerance, between screw terminals 1 and 3 on the SCMPB01/02/03/04/05/06 backpanels.

Signal filtering is accomplished with a six-pole filter which provides 95dB of normal-mode-rejection at 60Hz and 90dB at 50Hz. Two poles of this filter are on the field side of the isolation barrier, and the other four are on the computer side.

After the initial field-side filtering, the input signal is chopped by a proprietary chopper circuit. Isolation is provided by transformer coupling, again using a proprietary technique to suppress transmission of common mode spikes or surges. The module is powered from +5VDC,  $\pm 5\%$ .

A special input circuit on the SCM5B47 modules provides protection against accidental connection of power-line voltages up to 240VAC.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

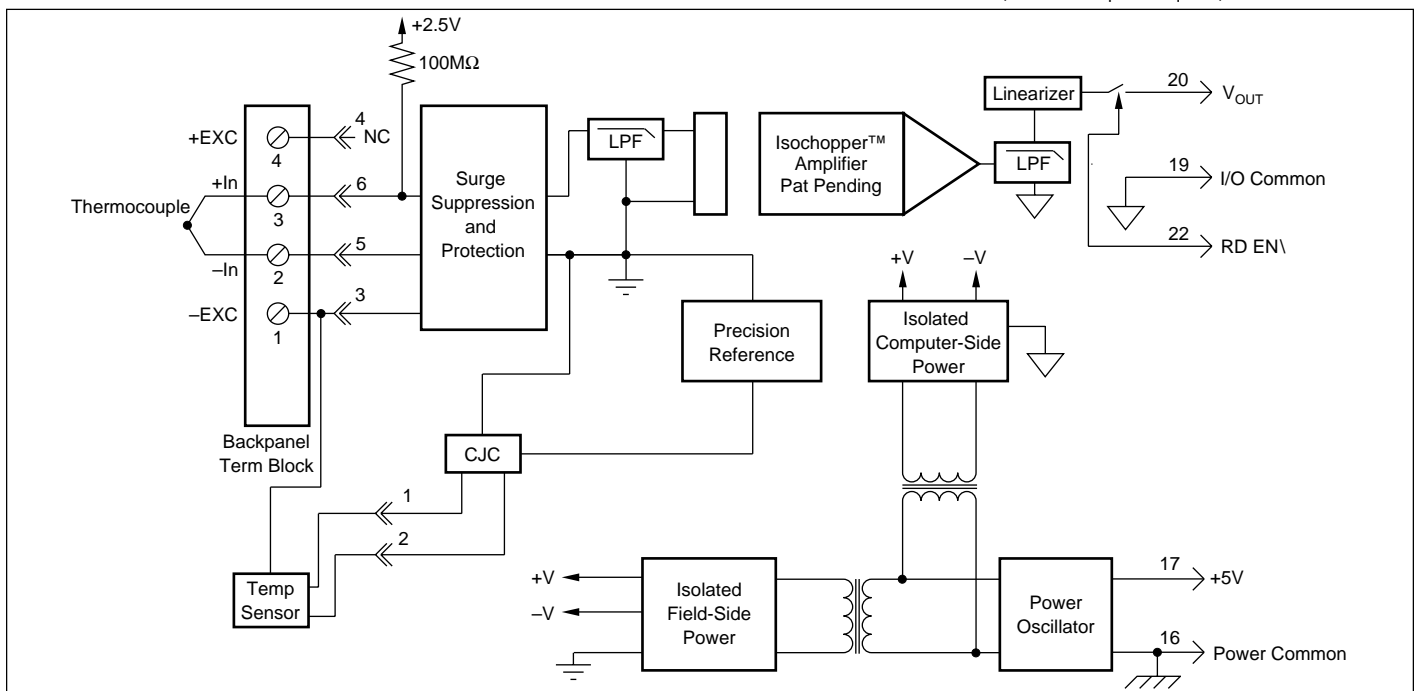


FIGURE 1. SCM5B47 Block Diagram.

## SPECIFICATIONS Typical at T<sub>A</sub> = +25°C and +5V power.

Module	SCM5B47
Input Range	-0.1V to +0.5V
Input Bias Current	-25nA
Input Resistance	
Normal	50M $\Omega$
Power Off	40k $\Omega$
Overload	40k $\Omega$
Input Protection	
Continuous	240Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMV, Input to Output	
Continuous	1500Vrms max
Transient	ANSI/IEEE C37.90.1-1989
CMR (50Hz or 60Hz)	160dB
NMR	95dB at 60Hz, 90dB at 50Hz
Accuracy	See Ordering Information
Stability	
Input Offset	$\pm 1\mu\text{V}/^{\circ}\text{C}^{(1)}$
Output Offset	$\pm 20\mu\text{V}/^{\circ}\text{C}$
Gain	$\pm 25\text{ppm}/^{\circ}\text{C}$
Noise	
Input, 0.1 to 10Hz	0.2 $\mu\text{Vrms}$
Output, 100kHz	300 $\mu\text{Vp-p}$ , 150 $\mu\text{Vrms}$
Bandwidth, -3dB	4Hz
Response Time, 90% Span	0.2s
Output Range	0V to +5V
Output Resistance	50 $\Omega$
Output Protection	Continuous Short to Ground
Output Selection Time (to $\pm 1\text{mV}$ of V <sub>OUT</sub> )	6 $\mu\text{s}$ at C <sub>load</sub> = 0 to 2000pF
Output Current Limit	+8mA
Output Enable Control	
Max Logic "0"	+0.8V
Min Logic "1"	+2.4V
Max Logic "1"	+36V
Input Current, "0", "1"	0.5 $\mu\text{A}$
Open Input Response	Upscale
Open Input Detection Time	10s
Cold Junction Compensation	
Accuracy, 25°C	$\pm 0.25^{\circ}\text{C}$
Accuracy, +5°C to +45°C	$\pm 0.5^{\circ}\text{C}$
Accuracy, -40°C to +85°C	$\pm 1.25^{\circ}\text{C}$
Power Supply Voltage	+5VDC $\pm 5\%$
Power Supply Current	30mA
Power Supply Sensitivity	$\pm 2\mu\text{V}/\% \text{ RTI}^{(2)}$
Mechanical Dimensions	2.28" x 2.26" x 0.6" (58mm x 57mm x 15mm)
Environmental	
Operating Temp. Range	-40°C to +85°C
Storage Temp. Range	-40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
Emissions	EN50081-1, ISM Group 1, Class A (Radiated, Conducted)
Immunity	EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)

NOTES: (1) This is equivalent to  $^{\circ}\text{C}$  as follows:  
Type J 0.020  $^{\circ}\text{C}/^{\circ}\text{C}$ , Types K, T 0.025  $^{\circ}\text{C}/^{\circ}\text{C}$ ,  
Type E 0.016  $^{\circ}\text{C}/^{\circ}\text{C}$ , Types R, S 0.168  $^{\circ}\text{C}/^{\circ}\text{C}$ ,  
Type N 0.037  $^{\circ}\text{C}/^{\circ}\text{C}$ , Type C 0.072  $^{\circ}\text{C}/^{\circ}\text{C}$ .  
(2) Referenced to input.

## ORDERING INFORMATION

MODEL	TYPE	INPUT RANGE	OUTPUT RANGE	ACCURACY <sup>†</sup>	
SCM5B47J-01	Type J	0°C to +760°C (+32°F to +1400°F)	0V to +5V	$\pm 0.08\%$	$\pm 0.61^{\circ}\text{C}$
SCM5B47J-02	Type J	-100°C to +300°C (-148°F to +572°F)	0V to +5V	$\pm 0.08\%$	$\pm 0.32^{\circ}\text{C}$
SCM5B47J-03	Type J	0°C to +500°C (+32°F to 932°F)	0V to +5V	$\pm 0.07\%$	$\pm 0.36^{\circ}\text{C}$
SCM5B47K-04	Type K	0°C to +1000°C (+32°F to +1832°F)	0V to +5V	$\pm 0.08\%$	$\pm 0.80^{\circ}\text{C}$
SCM5B47K-05	Type K	0°C to +500°C (+32°F to +932°F)	0V to +5V	$\pm 0.08\%$	$\pm 0.38^{\circ}\text{C}$
SCM5B47T-06	Type T	-100°C to +400°C (-148°F to +752°F)	0V to +5V	$\pm 0.16\%$	$\pm 0.80^{\circ}\text{C}$
SCM5B47T-07	Type T	0°C to +200°C (+32°F to +392°F)	0V to +5V	$\pm 0.13\%$	$\pm 0.25^{\circ}\text{C}$
SCM5B47E-08	Type E	0°C to +1000°C (+32°F to +1832°F)	0V to +5V	$\pm 0.10\%$	$\pm 1.0^{\circ}\text{C}$
SCM5B47R-09	Type R	+500°C to +1750°C (+932°F to +3182°F)	0V to +5V	$\pm 0.10\%$	$\pm 1.3^{\circ}\text{C}$
SCM5B47S-10	Type S	+500°C to +1750°C (+932°F to +3182°F)	0V to +5V	$\pm 0.10\%$	$\pm 1.3^{\circ}\text{C}$
SCM5B47B-11	Type B	+500°C to +1800°C (+932°F to +3272°F)	0V to +5V	$\pm 0.15\%$	$\pm 2.0^{\circ}\text{C}$
SCM5B47J-12	Type J	-100°C to +760°C (-148°F to +1400°F)	0V to +5V	$\pm 0.08\%$	$\pm 0.70^{\circ}\text{C}$
SCM5B47K-13	Type K	-100°C to +1350°C (-148°F to +2462°F)	0V to +5V	$\pm 0.08\%$	$\pm 1.20^{\circ}\text{C}$
SCM5B47K-14	Type K	0°C to +1200°C (+32°F to +2192°F)	0V to +5V	$\pm 0.08\%$	$\pm 0.96^{\circ}\text{C}$
SCM5B47N-15	Type N	-100°C to +1300°C (-148°F to +2372°F)	0V to +5V	$\pm 0.08\%$	$\pm 1.15^{\circ}\text{C}$

<sup>†</sup>Includes conformity, hysteresis and repeatability. Does not include CJC accuracy.

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# SCM5B49

## Voltage Output Modules

### FEATURES

- ACCEPTS HIGH LEVEL VOLTAGE INPUTS TO  $\pm 10V$
- PROVIDES HIGH LEVEL VOLTAGE OUTPUTS TO  $\pm 10V$
- 1500 VOLT TRANSFORMER ISOLATION
- ANSI/IEEE C37.90.1e-1989 TRANSIENT PROTECTION
- 5 POLES OF FILTERING
- 110dB CMR
- 400Hz SIGNAL BANDWIDTH
- $\pm 0.05\%$  ACCURACY
- $\pm 0.02\%$  LINEARITY
- MIX AND MATCH SCM5B TYPES ON BACKPANEL
- CSA CERTIFIED, FM APPROVED, CE COMPLIANT

### DESCRIPTION

Each SCM5B49 voltage output module provides a single channel of analog output. The track-and-hold circuit in the input stage can be operated in a hold mode where one DAC can supply many output modules, or a track mode where one DAC is dedicated to each module. In addition to the track-and-hold circuit, each module provides signal buffering, isolation, filtering, and conversion to a high level voltage output.

Setting of the track or hold mode is controlled by the logic state of WR EN\, module pin 23. When pin 23 is low, the track mode is enabled. If pin 23 is open or high, the hold mode is enabled. The module is designed with a completely isolated computer side circuit which can be floated to  $\pm 50V$  from Power Common, pin 16. This complete isolation means that no connection is required between I/O Common and Power Common for proper operation of the track and hold circuit. For a low state, simply connect pin 23, the Write-Enable pin, to I/O Common, pin 19.

The SCMPB02 and SCMPB06 backpanels allow host computer control of the WR EN\ control line, which allows multiplexing of one host DAC to up to 64 SCM5B49 output modules. During power up, the output remains 0V output for 100ms, which allows the track-and-hold circuit to be initialized.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

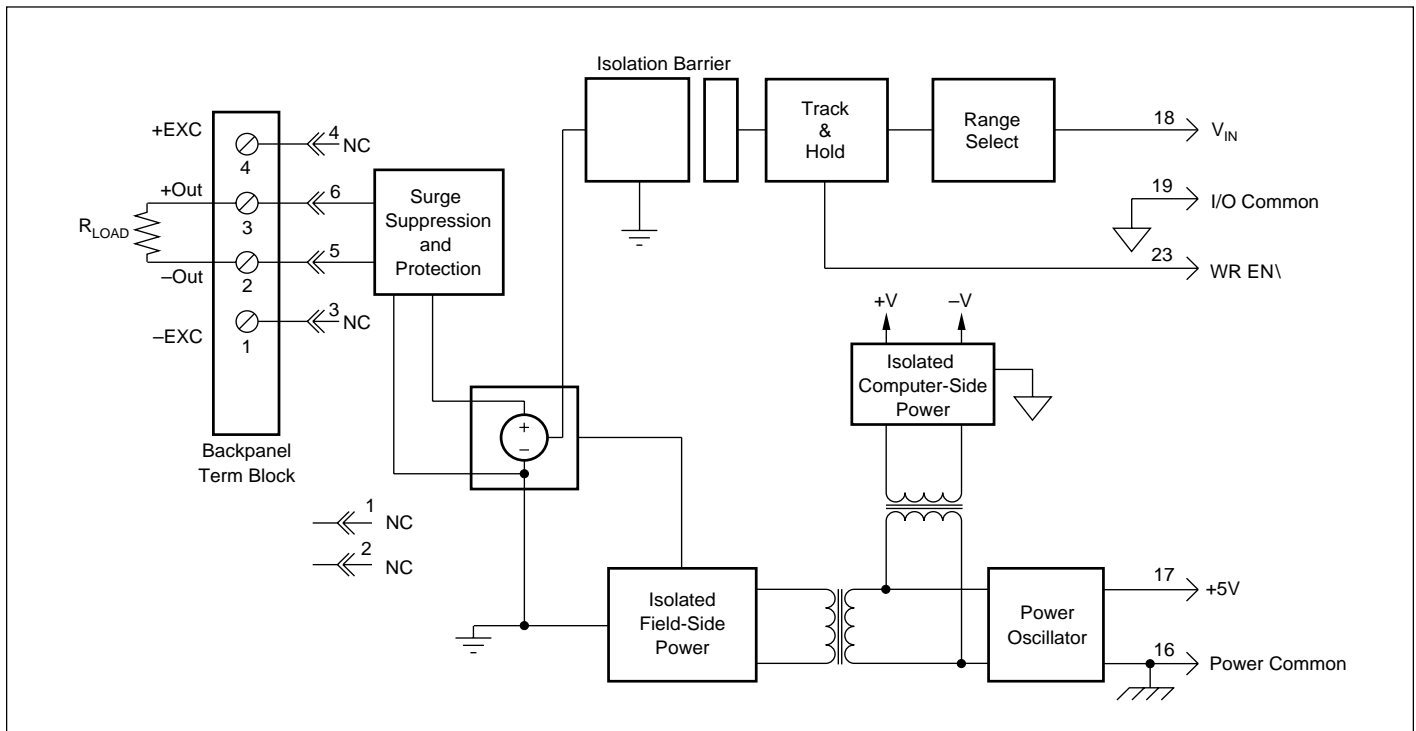


FIGURE 1. SCM5B49 Block Diagram.

## SPECIFICATIONS Typical at TA= +25C and +5V Power

Module	SCM5B49
Input Voltage Range Input Voltage Maximum Input Resistance	$\pm 5V$ , 0 to +5V, $\pm 10V$ , 0 to +10V $\pm 36V$ (no damage) 50M $\Omega$
Output Voltage Range Over Range Capability Output Drive Output Resistance Output I Under Fault, Max Output Protection Transient	$\pm 5V$ , 0 to +5V, $\pm 10V$ , 0 to +10V 5% @ 10V output 50mA max 0.5 $\Omega$ 75mA ANSI/IEEE C37.90.1-1989
CMV, Output to Input Continuous Transient CMR (50 or 60Hz) NMR (-3dB at 400Hz)	1500Vrms max ANSI/IEEE C37.90.1-1989 110dB 100dB per Decade above 400Hz
Accuracy <sup>(1)</sup> Nonlinearity Stability Zero Span Noise Output Ripple, 1kHz bandwidth Bandwidth, -3dB	$\pm 0.05\%$ span (0-5mA load) $\pm 0.02\%$ span  $\pm 25$ ppm/ $^{\circ}C$ $\pm 20$ ppm/ $^{\circ}C$  2mVp-p 400Hz
Sample and Hold Output Droop Rate Acquisition Time	0.2% Span/s 50 $\mu$ s
Track-and-Hold Enable Control Max Logic "0" Min Logic "1" Max Logic "1" Input Current, "0"	+0.8V +2.4V +36V 0.5 $\mu$ A
Power Supply Voltage Power Supply Current Power Supply Sensitivity	+5VDC $\pm 5\%$ 350mA Full load, 135mA No load $\pm 12.5$ ppm/%
Mechanical Dimensions	2.28" x 2.26" x 0.60" (58mm x 57mm x 15mm)
Environmental Operating Temp. Range Storage Temp. Range Relative Humidity RFI Susceptibility Emissions Immunity	-40 $^{\circ}C$ to +85 $^{\circ}C$ -40 $^{\circ}C$ to +85 $^{\circ}C$ 0 to 95% noncondensing $\pm 0.5\%$ Span error at 400MHz, 5W, 3ft EN50081-1, ISM Group 1, Class A (Radiated, Conducted) EN50082-1, ISM Group 1, Class A (ESD, RF, EFT)

NOTES: (1) Includes nonlinearity, hysteresis and repeatability.

## ORDERING INFORMATION

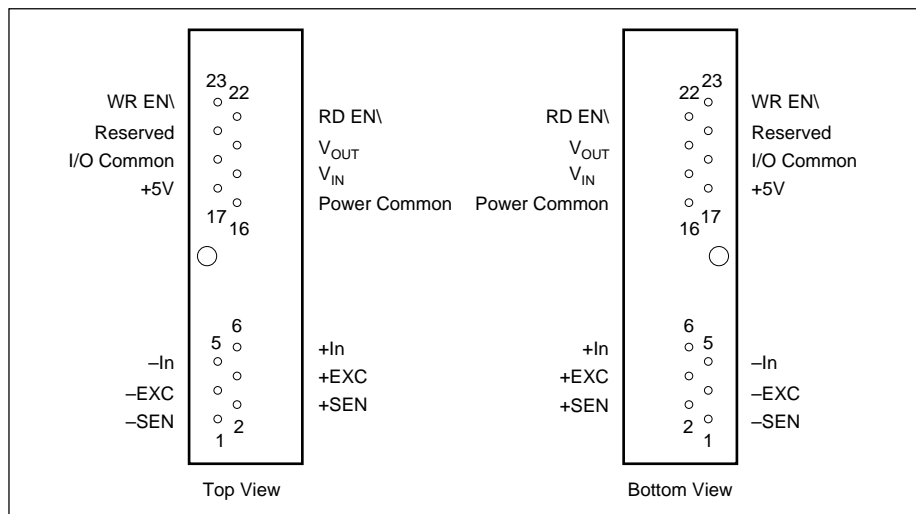
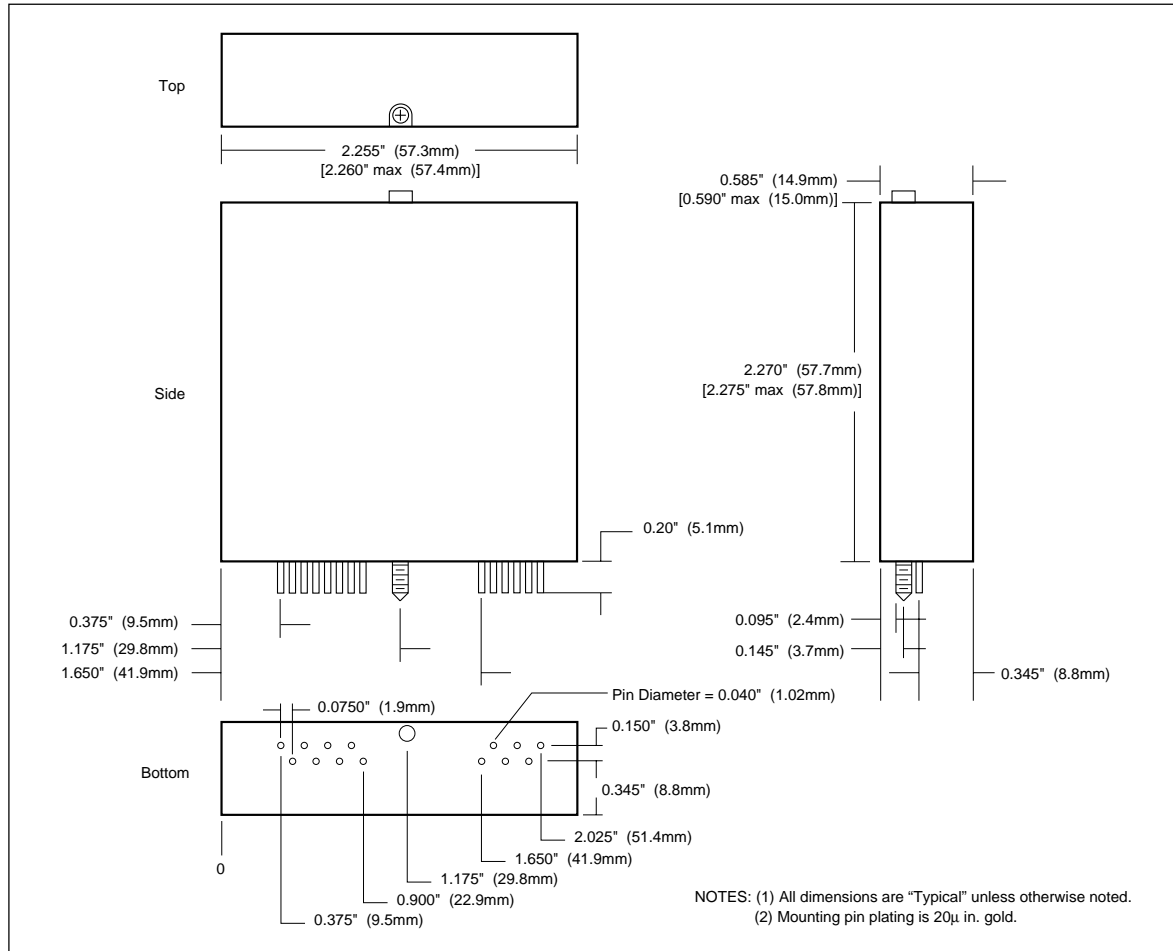
MODEL	INPUT RANGE	OUTPUT RANGE
SCM5B49-01	0V to +5V	-5V to +5V
SCM5B49-02	-5V to +5V	-5V to +5V
SCM5B49-03	-5V to +5V	0V to +5V
SCM5B49-04	0V to +10V	-10V to +10V
SCM5B49-05	-10V to +10V	-10V to +10V
SCM5B49-06	-10V to +10V	0V to +10V
SCM5B49-07	-5V to +5V	-10V to +10V

# SCM5B

## Module Dimensions and Pinouts

The following mechanical drawing is useful if designing circuit boards to mount the SCM5B modules. Many sockets are available which accept the mounting pins. As an example, AMP Inc. provides a socket with part

number 50865-5. The captive nut for the 3mm mounting screw can be obtained from PEM (Penn Engineering and Manufacturing), part number KFS2-M3.



# Accessories for SCM5B Analog Modules

## FEATURES

- 1-, 2-, 8-, 16-POSITION BACKPANELS
- 19-INCH MOUNTING RACK FOR BACKPANELS
- MULTIPLEXED AND NON-MULTIPLEXED BACKPANELS
- INTERFACE CABLES
- MODULE EVALUATION BOARD
- CABLE-TO-SCREW-TERMINAL INTERFACE BOARD



## SCMPB01 16 POSITION ANALOG I/O BACKPANEL, NON-MULTIPLEXED

## DESCRIPTION

The SCMPB01 16 channel backpanel (Figure 1) can accept any of the SCM5B analog modules in any mixture. It can be mounted on the SCMXRK-002 19-inch metal rack. The SCMPB01 has 16 non-addressable analog I/O signal channels which provides each module with its own analog bus. The module output switch is continuously "on" when using this backpanel and all sixteen module outputs are simultaneously accessible to high-speed data acquisition (ADC) boards. A set of inter-channel bridge jumpers permits connecting an input module's output to an output module's input, providing two levels of isolation. A temperature sensor is mounted on each channel to provide cold junction compensation for thermocouple input modules (See Figure 2 for schematic). Field connections are terminated with four screw terminals

at each module site. Use system interface cable SCMXA004-XX for connection to the host system.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

## SPECIFICATIONS

Operating Temperature:	-40°C to +85°C 95% relative humidity, non-condensing
Interface Connector:	High Density Screw Clamp, 14 AWG Max 26-pin, male header connector

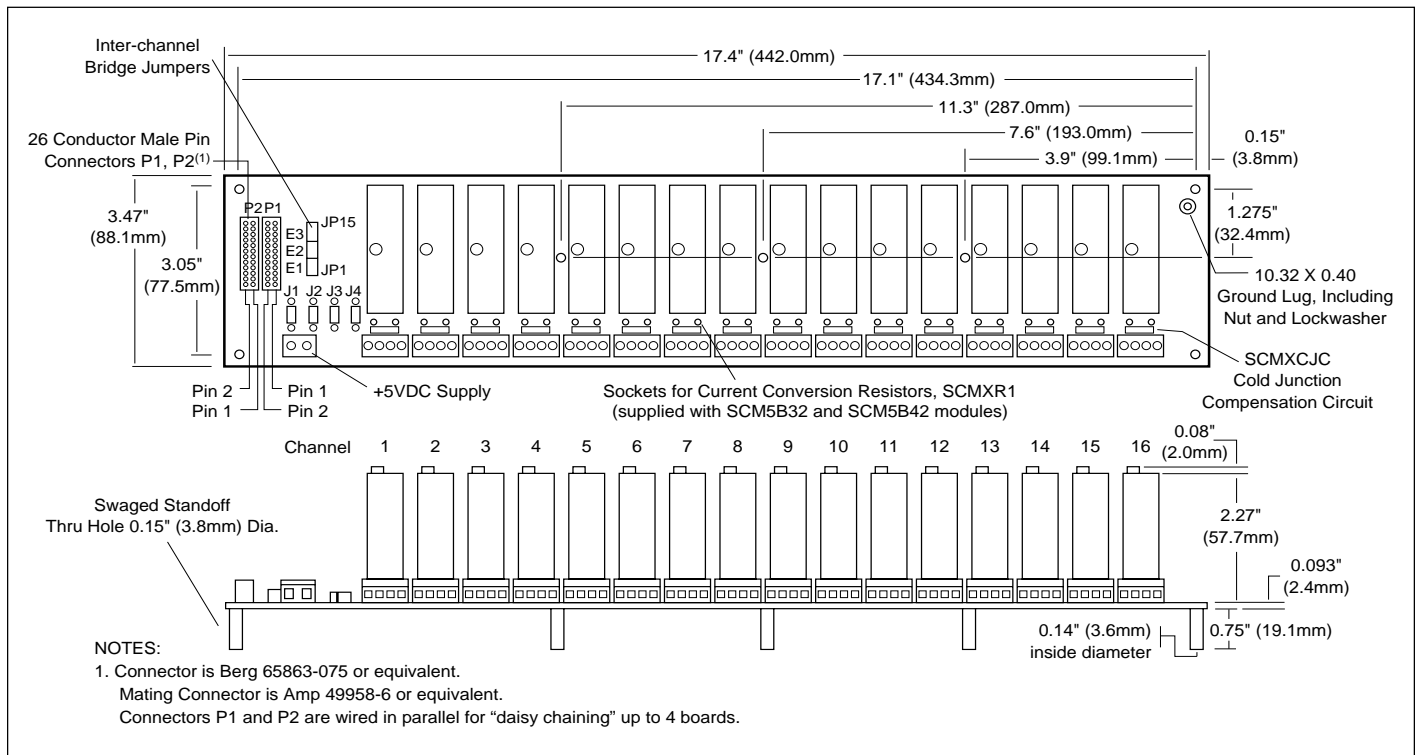
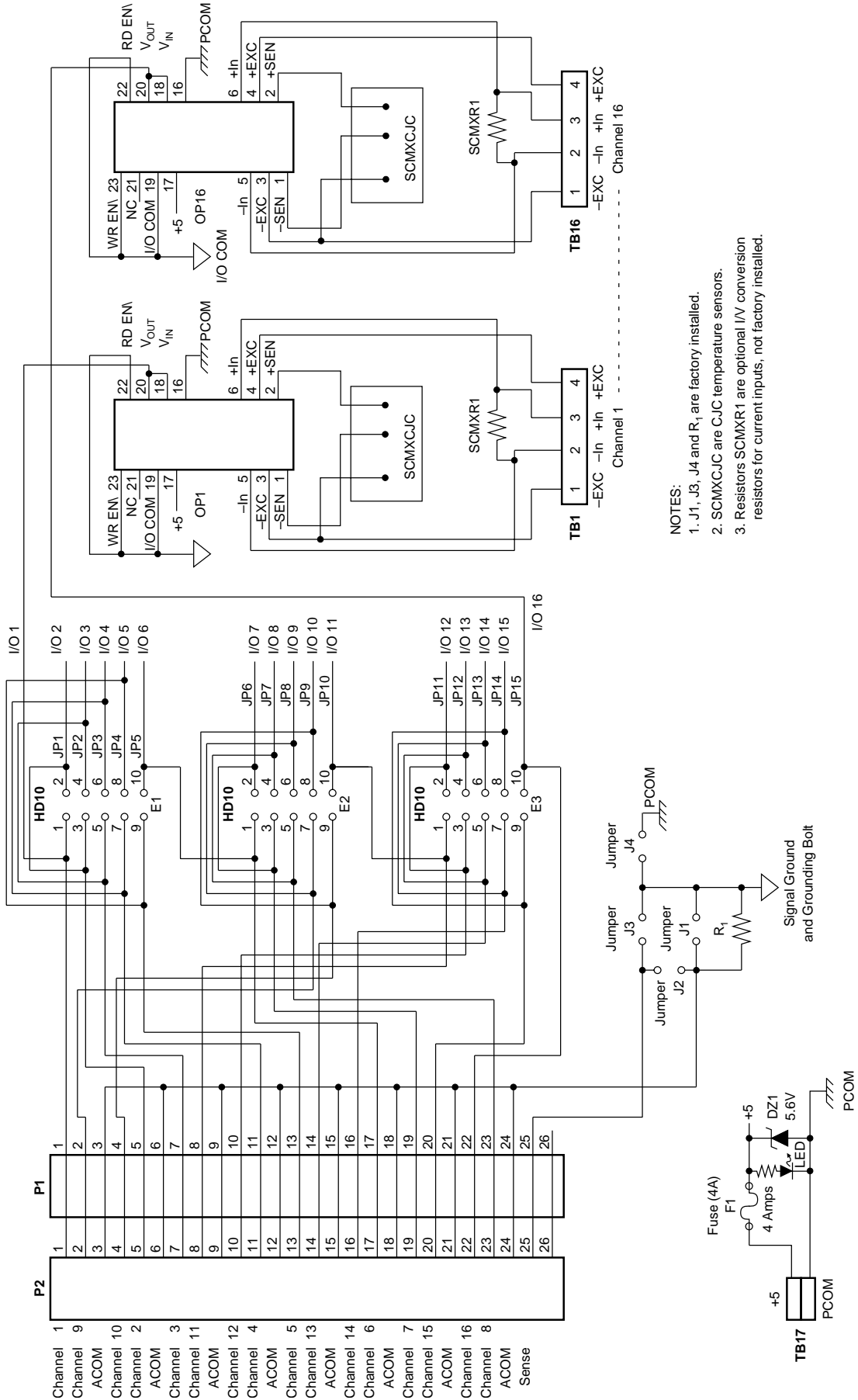


FIGURE 1. SCMPB01 Analog I/O Backpanel Dimensions.



- NOTES:
1. J1, J3, J4 and R<sub>1</sub> are factory installed.
  2. SCMXCJC are CJC temperature sensors.
  3. Resistors SCMXR1 are optional I/V conversion resistors for current inputs, not factory installed.

FIGURE 2. SCMPB01 Schematic.

## ELECTRICAL

### P1 AND P2 CONNECTOR

Connection to the host system is made at connectors P1 and P2. These connectors are electrically equivalent. Two connectors are provided to allow both analog input and analog output from host systems having individual input and output connectors.

### ADJACENT CHANNEL JUMPERS

Adjacent channels may be connected together to provide an isolated output signal from an isolated input module, providing two levels of 1500V isolation. This capability is provided with the 15 jumpers labeled JP1 through JP15 on headers E1, E2, and E3. A simplified drawing of the SCMPB01 schematic for Channel 1 through 4 is shown in Figure 3.

Example: Assume an SCM5B30 input module is installed in Channel 1 position and an SCM5B39 output module is installed in Channel 2 position. If JP1 is installed, the output of Channel 1 is connected to the input of Channel 2, which provides two levels of 1500V isolation.

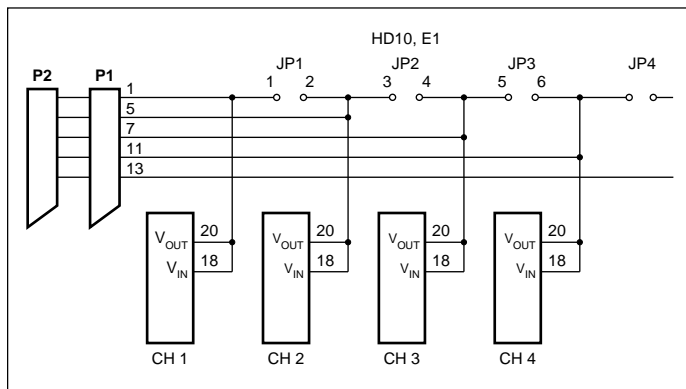


FIGURE 3. SCMPB01 Adjacent Channel Jumpers.

### POWER

The SCMPB01 backpanel requires external +5VDC  $\pm 5\%$  power. The chassis mounted SCMXPRE-003 or SCMXPT-003 power supplies have adequate capacity to power any combination of modules.

### FUSING

The SCMPB01 backpanel power is fuse protected through F1. This is a Littelfuse type 252004, 4 amp fuse. Zener diode DZ1 provides extra protection by clamping the input power voltage to +5.6V. If the input supply voltage connection is reversed, this zener diode will be forward biased and fuse F1 will be blown.

### GROUNDING

Figure 4 details the optional ground jumper configuration available on the SCMPB01 backpanel. Jumpers J1, J3, and J4 are factory installed.

Jumper J1 connects the AGND shield wires (pins 3, 6, 9, 12, 15, 18, 21, and 24) to the backpanel signal ground. This provides a ground connection between the host system and backpanel. Jumper J1 is required if output modules (SCM5B39, SCM5B49) are used, or if there is no high impedance sense input (input low of a differential or pseudo-differential system) on the host measurement system.

Jumper J3 connects the SENSE line (pin 25) to the backpanel signal ground. If the host system has the capability, this allows measuring the SCMPB01 ground potential.

For proper operation of the output switch or track-and-hold circuit when using the SCMPB01/05 backpanels, a current path must exist between the host control logic power common and module I/O Common (module pin 19). This path can be established on the SCMPB01 via jumper J4. If this connection exists elsewhere in the system, jumper J4 should be removed since possible ground loops could exist. Other connections of power ground

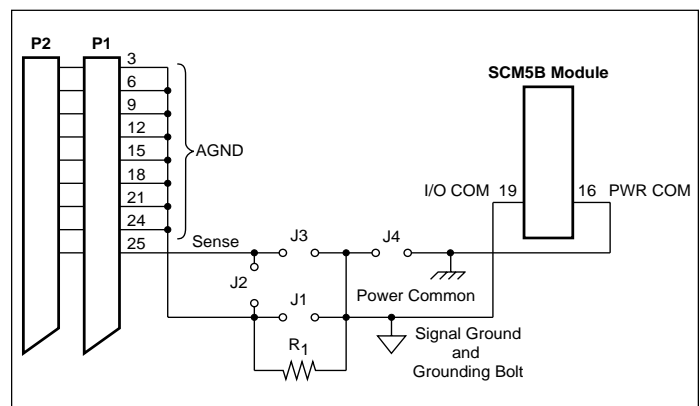


FIGURE 4. SCMPB01 Grounding Diagram.

and signal ground usually occur at the A/D or D/A converter of the host measurement system. More information on grounding can be found in Application Note AN502.

If the connection of power common and AGND shield wires exist in the host measurement system, an optional resistive connection between AGND and the backpanel signal ground can be made via  $R_1$ .  $R_1$  can be as large as 10K ohms; 100 ohms is a recommended value. Jumper J2 can be used to connect the SENSE line to  $R_1$  when this ground configuration is used.

For full protection against large electrical disturbances on the field-side of the SCM5B modules, a #10-32 ground stud is provided on the backpanel. An electrical connection between this ground stud and system ground should be provided with a large gauge wire of the shortest possible length. When this connection is made, a possible ground loop could result through the AGND shield wires and backpanel signal ground. If the application involves only input modules and a differential input is used by the host measurement system, J1 should be removed. Remember that J1 is required if output modules are used or if the host system does not have differential inputs.



# SCMPB02 16 POSITION ANALOG I/O BACKPANEL, MULTIPLEXED

## DESCRIPTION

The SCMPB02 16 channel backpanel (Figure 5) can accept any of the SCM5B analog modules in any mixture. It can be mounted on the SCMXRK-002 19-inch metal rack. The SCMPB02 has two analog buses; one for analog input and one for analog output. This two-bus configuration takes advantage of the switch controlled outputs on the input modules and the track-and-hold inputs on the output modules. A temperature sensor is mounted on each channel to provide cold junction compensation for thermocouple input modules (See Figure 6 for schematic). Field connections are terminated with four screw terminals at each module site. Up to four SCMPB02 backpanels may be daisy-chained. Use SCMXA005 cable for daisy chaining and SCMXA004-XX cable for connecting to host computer.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

## SPECIFICATIONS

Operating Temperature:	-40°C to +85°C 95% relative humidity, non-condensing
Interface Connector: Field Logic	High Density Screw Clamp, 14 AWG Max 26-pin, male header connector
Address Input Logic Levels: Max Logic "0" Min Logic "1"	0.8V 2.0V

I <sub>i</sub> Input Current, "0" or "1"	0.1µA max at 25°C 1.0µA max -25°C to +85°C
RD EN <sub>i</sub> or WR EN <sub>i</sub> Signal Delay from Connector P1 to Channels 1-16 Standalone (address 0-15)  Expanded (address 16-63)	51ns at 25°C 64ns at -25°C to +85°C 100ns at 25°C 126ns at -25°C to +85°C

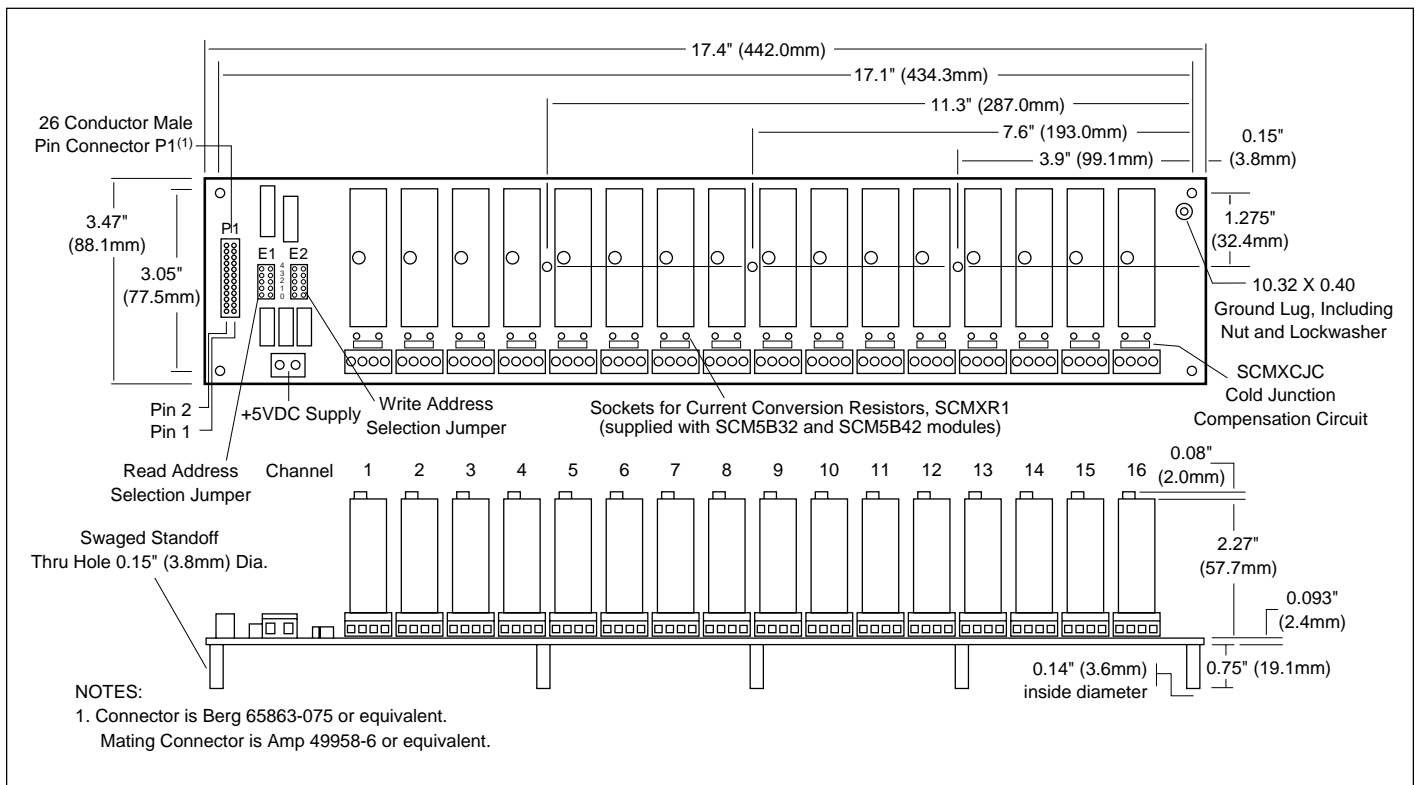
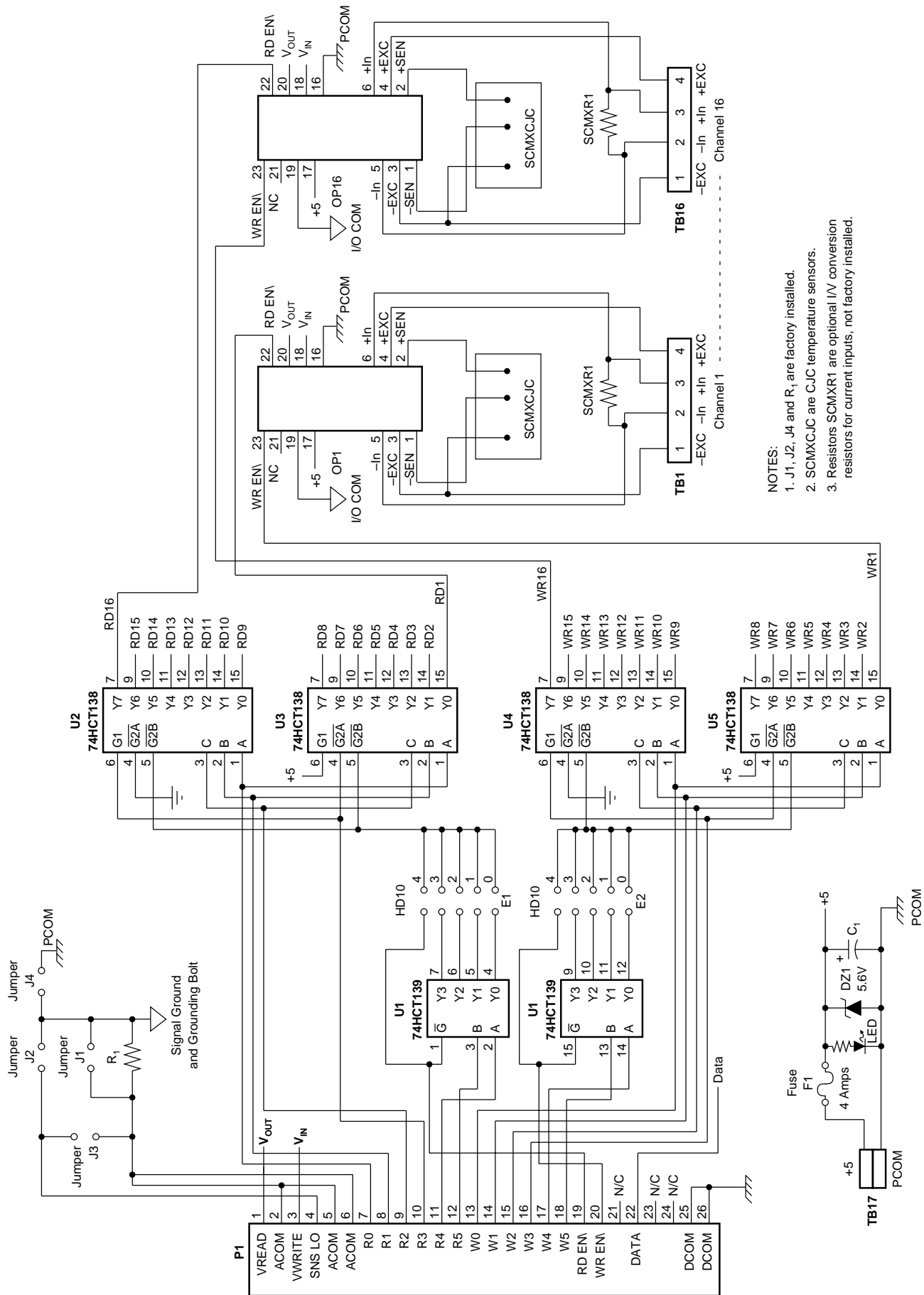


FIGURE 5. SCMPB02 Analog I/O Backpanel.



- NOTES:
1. J1, J2, J4 and R<sub>1</sub> are factory installed.
  2. SCMXCJC are C-JC temperature sensors.
  3. Resistors SCMXR1 are optional I/V conversion resistors for current inputs, not factory installed.

FIGURE 6. SCMPB02 Schematic.

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# ELECTRICAL

## P1 CONNECTOR

The 26 pin P1 connector provides the signal interface between the SCMPB02 backpanel and the host measurement system. Two separate analog bus connections are provided; one for analog input signals and one for analog output signals. Two sets of six address lines and an enable pin allow input and output modules to be independently multiplexed onto their respective analog signal bus. R0 thru R5 and RDNAB are used for input modules, and W0 thru W5 and WRENAB are used for output modules.

## ADDRESS SELECTION

The SCMPB02 backpanel has address decoding circuitry to allow multiplexing any combination of up to 16 input or output modules. Capability is also provided in the address decode circuitry to expand the system to 64 channels (four SCMPB02 backpanels) of multiplexed input or output. Jumpers on HD10 header, E1 and E2 group, select which set of 16 addresses are assigned to a particular backpanel. The E1 group assigns a set of 16 addresses for input modules, and the E2 group assigns a set of 16 addresses for output modules. The table below shows the correlation of jumper position to address range.

E1 Jumper Pos	E2 Jumper Pos	Address Range/Mode
4	4	0-15, STAND ALONE
3	3	48-63, EXPANDED
2	2	32-47, EXPANDED
1	1	16-31, EXPANDED
0	0	0-15, EXPANDED

To connect multiple SCMPB02 backpanels in this expanded configuration, use interconnect cable SCMXCA005.

## POWER

The SCMPB02 backpanel requires external +5VDC  $\pm 5\%$  power. The chassis mounted SCMXPRE-003 or SCMXPRT-003 power supplies have adequate capacity to power any combination of modules.

## FUSING

The SCMPB02 backpanel power is fuse protected through F1. This is a Littelfuse type 252004, 4 amp fuse. Zener diode DZ1 provides extra protection by clamping the input power voltage to +5.6V. If the input supply voltage connection is reversed, this zener diode will be forward biased and fuse F1 will be blown.

## GROUNDING

Figure 7 below details the optional ground jumper configuration available on the SCMPB02 backpanel. Jumpers J1, J2, and J4 are factory installed.

Jumper J1 connects the SIG COM shield wires (pins 2, 5, and 6) to the backpanel signal ground. This provides a ground connection between the host system and backpanel. Jumper J1 is required if output modules (SCM5B39, SCM5B49) are used, or if there is no high impedance sense input (input low of a differential or pseudo-differential system) on the host measurement system.

Jumper J2 connects the SNS LO line (pin 4) to the backpanel signal ground. If the host system has the capability, this allows measuring the SCMPB02 ground potential.

For proper operation of the output switch or track-and-hold circuit when using the SCMPB02/06 backpanels, a current path must exist between the host control logic power common and module I/O Common (module pin 19). This path can be established on the SCMPB02 via jumper J4. If this connection exists elsewhere in the system, jumper J4 should be removed since possible ground loops could exist. Other connections of power ground and signal ground usually occur at the A/D or D/A converter of the host measurement system. More information on grounding can be found in Application Note AN502.

If the connection of power common and SIG COM shield wires exist in the host measurement system, a resistive connection between SIG COM and the backpanel signal ground can be made via R<sub>1</sub>. R<sub>1</sub> can be as large as 10K ohms; 100 ohms is a recommended value. Jumper J3 can be used to connect the SNS LO line to R<sub>1</sub> when this ground configuration is used.

For full protection against large electrical disturbances on the field-side of the SCM5B modules, a #10-32 ground stud is provided on the backpanel. An electrical connection between this ground stud and system ground should be provided with a large gauge wire of the shortest possible length. When this connection is made, a possible ground loop could result through the SIG COM shield wires and backpanel signal ground. If the application involves only input modules and a differential input is used by the host measurement system, J1 should be removed. Remember that J1 is required if output modules are used or if the host system does not have differential inputs.

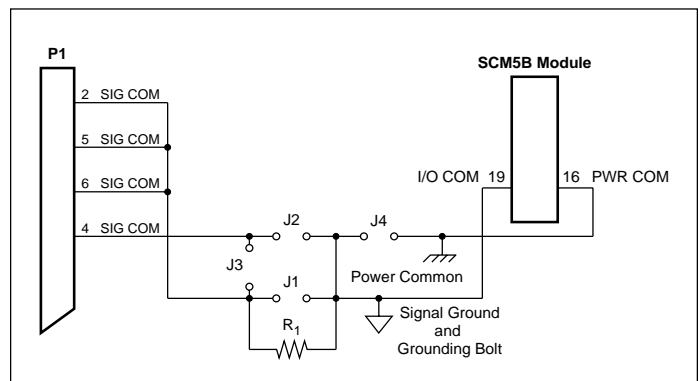


FIGURE 7. SCMPB02 Grounding Diagram.



# SCMPB03/SCMPB04 ONE/TWO POSITION ANALOG I/O BACKPANELS

## DESCRIPTION

The SCMPB03 is a single channel mounting panel for the SCM5B modules. The SCMPB04 is a dual channel mounting panel for the SCM5B modules. They both are DIN rail compatible.

See Figures 9 and 10 for wiring diagrams, Figures 11 and 12 for schematics.

The following accessories are required for mounting one SCMPB03/04 panel (Figure 8):

Qty	Model	Description
1	SCMXBEFE	Base element with snap foot
2	SCMXSE	Side element

The following accessories are required for mounting two or more SCMPB03/04 panels:

Qty	Model	Description
2	SCMXBEFE	Base element with snap foot
2	SCMXSE	Side element
(# panels)-2	SCMXBE	Base element without snap foot
(4 x (# panels))-4	SCMXVS	Connection pins

The following DIN rail styles are available. Specify length in meters (-XX)

SCMX RAIL 1-XX	EN 50022-35x7.5 (slotted steel)
SCMX RAIL 2-XX	EN 50035-G32 (slotted steel)
SCMX RAIL 3-XX	EN 50022-35x15 (slotted steel)

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

## SPECIFICATIONS

Operating Temperature:	-40°C to +85°C 95% relative humidity, non-condensing
Interface Connector: Field Logic	High Density Screw Clamp, 14 AWG Max High Density Screw Clamp, 14 AWG Max

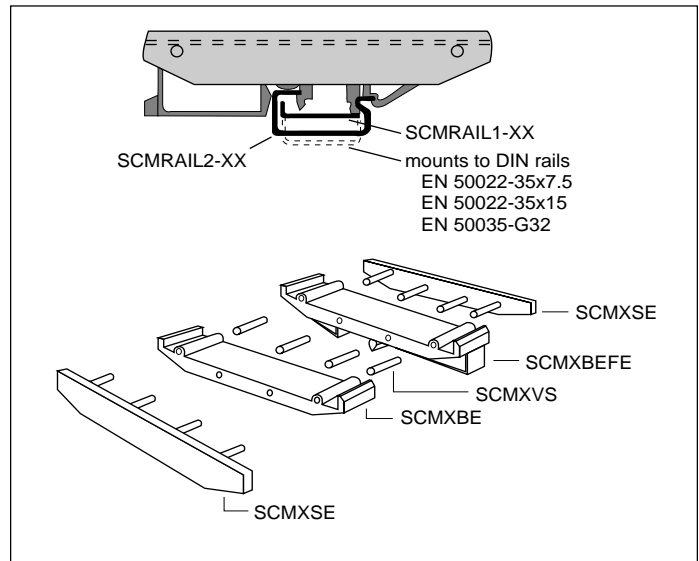


FIGURE 8. DIN Rail Mounting Elements.

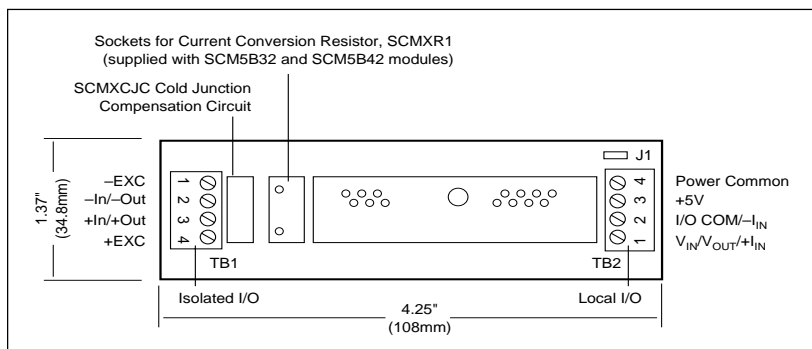


FIGURE 9. SCMPB03 Wiring Diagram.

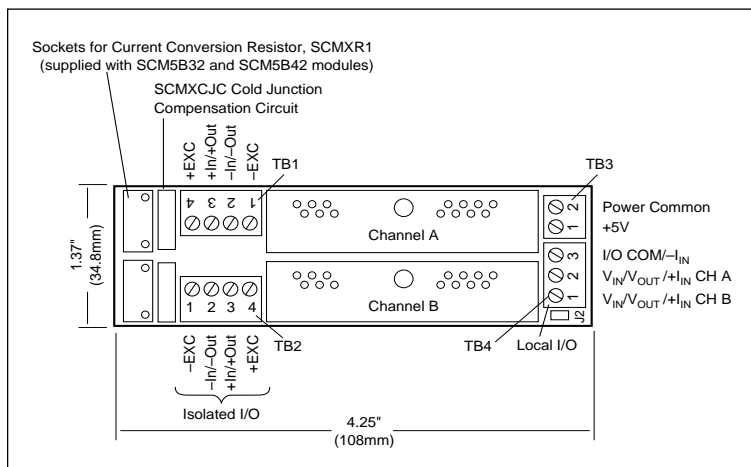


FIGURE 10. SCMPB04 Wiring Diagram.

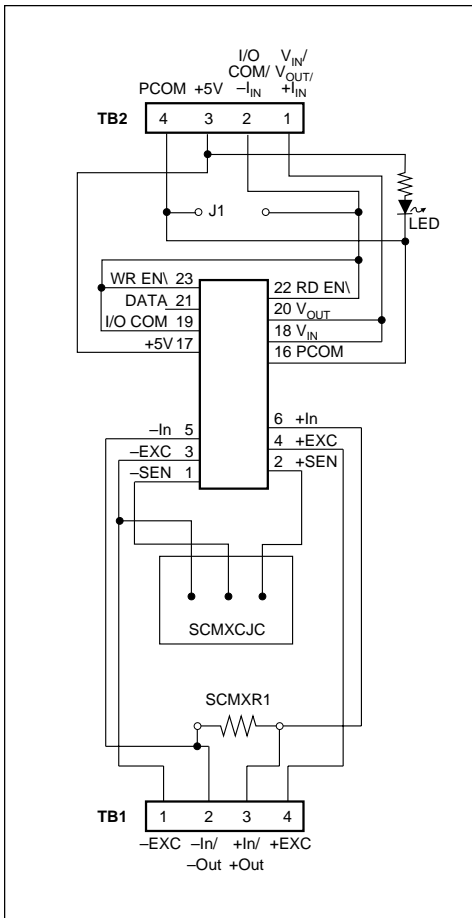


FIGURE 11. SCMPB03 Schematic.

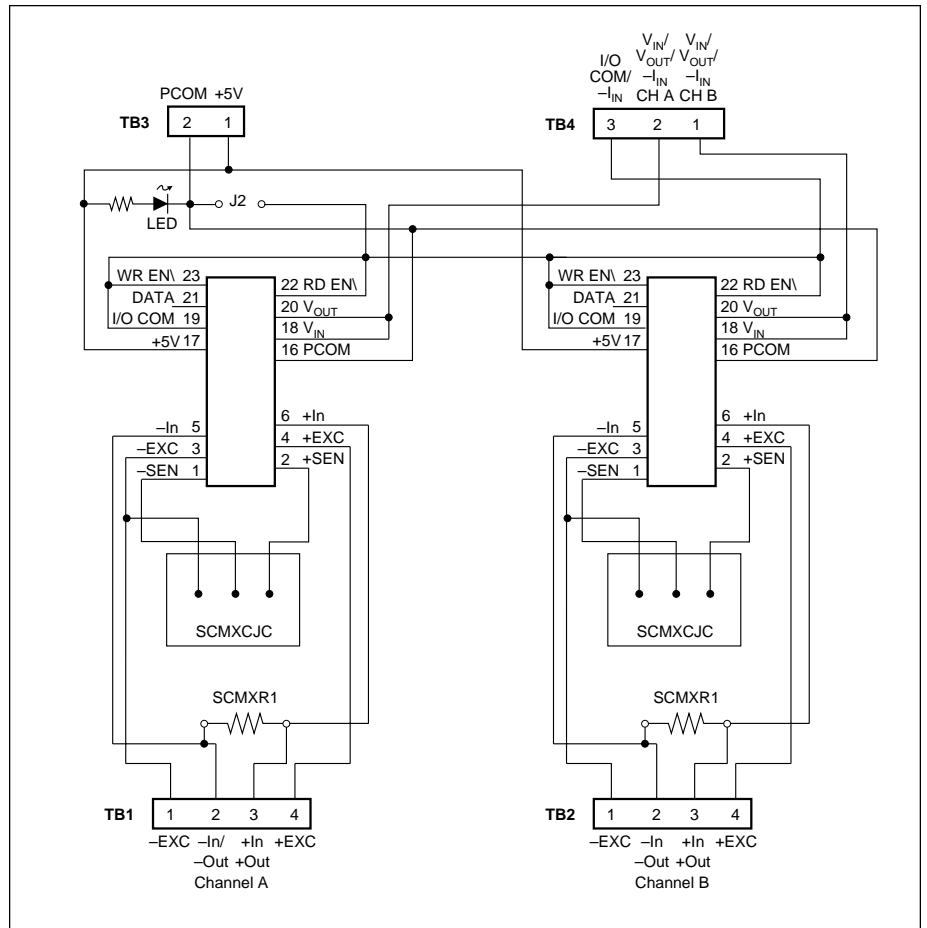


FIGURE 12. SCMPB04 Schematic.

\*NOTE: SCMXR1 resistors are not installed at factory.



# SCMPB05 8 POSITION ANALOG I/O BACKPANEL, NON-MULTIPLEXED

## DESCRIPTION

The SCMPB05 analog module mounting board has a capacity of eight analog input and/or output modules in any combination. It can be mounted on the SCM XRK-002 19-inch metal rack. A separate analog signal path is provided for each channel and each channel's signal is accessible at redundant 26-pin connectors. The module output switch is continuously "on" when using this backpanel and all eight module outputs are simultaneously accessible to high-speed data acquisition (ADC) boards.

On-board jumpers permit paralleling two SCMPB05 boards to form a SCMPB01 equivalent. An additional set of inter-channel bridge jumpers permits connecting an input module's output to an output module's input, providing two levels of isolation (Figures 13, 14).

Jumpers on the SCMPB05 permit user selection of low (i.e. channels 0-7) or high (i.e. channels 8-15) addresses.

A temperature sensor is mounted on each channel to provide cold junction compensation for thermocouple input modules (See Figure 14 for Schematic ). Field connections are terminated with four screw terminals at each module site. Use system interface cable SCM XCA004-XX for connection to the host system.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

## SPECIFICATIONS

Operating Temperature:	-40°C to +85°C 95% relative humidity, non-condensing
Interface Connector:	High Density Screw Clamp, 14 AWG Max 26-pin, male header connector

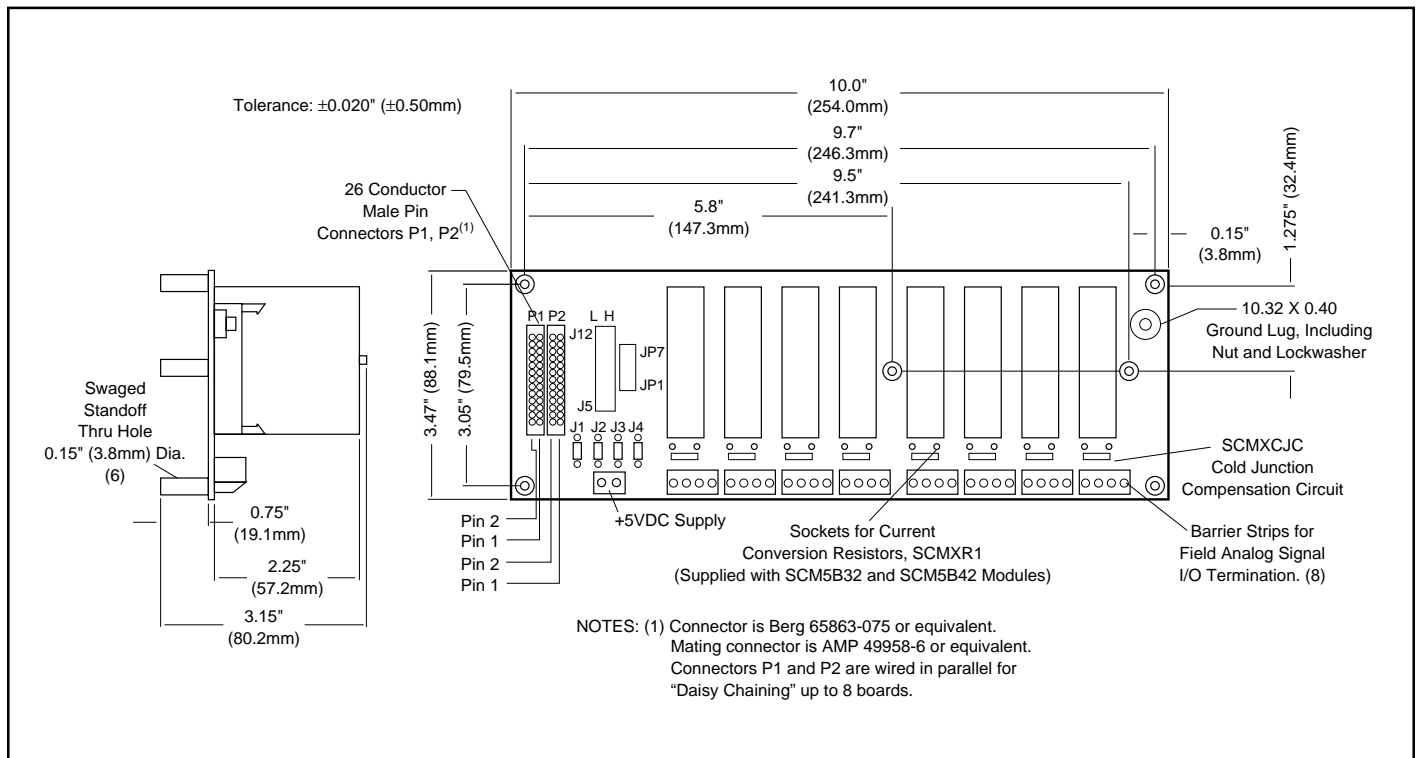


FIGURE 13. SCMPB05 Analog I/O Backpanel.

## ELECTRICAL

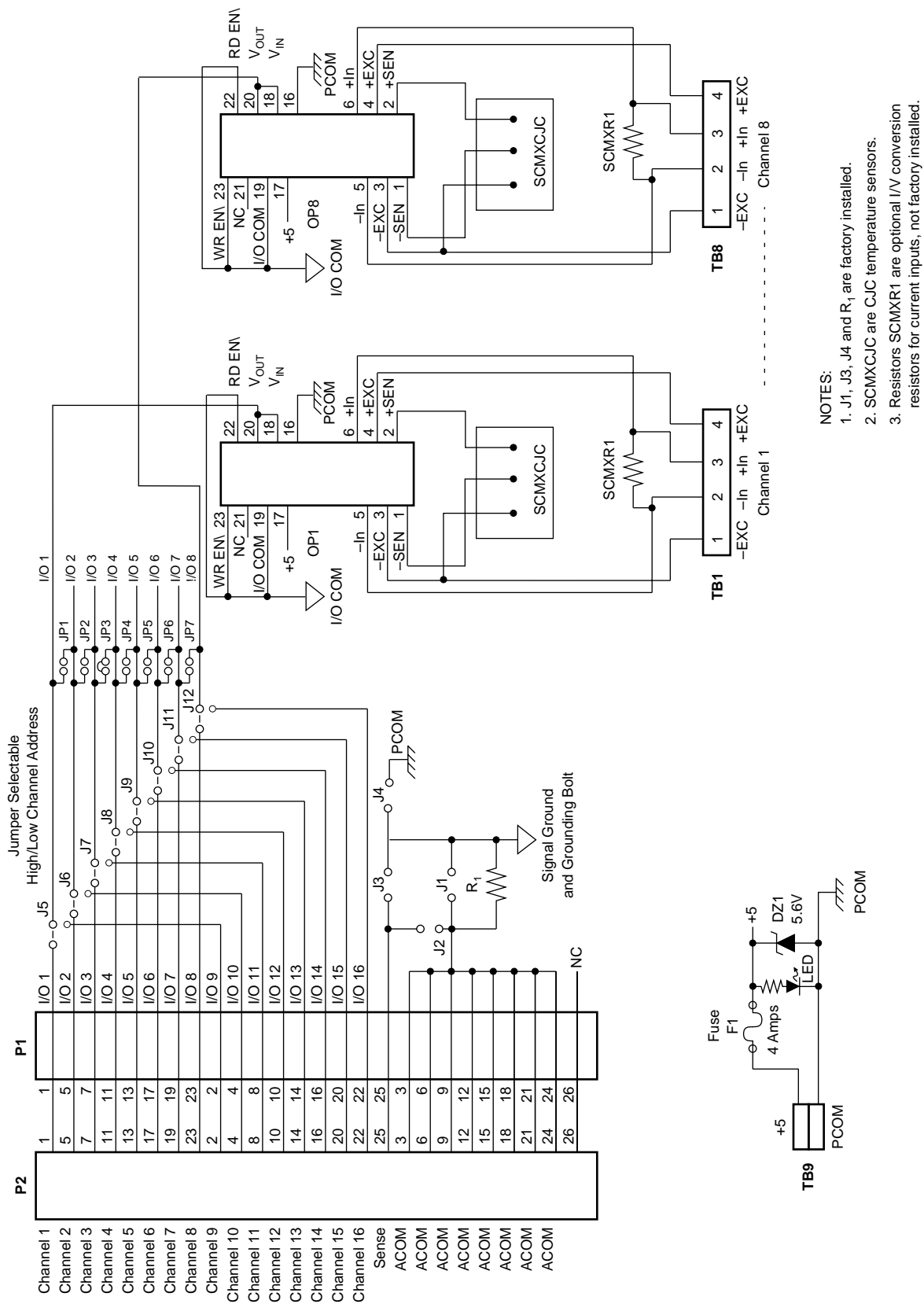
### ADDRESS SELECTION

Module addresses may be selected as low (channels 0-7) or high (channels 8-15) using the sets of 3 pins labeled J5 through J12. Place a jumper over the two pins closest to the ribbon cable connectors, P1 and P2, to select a low address (factory configuration) or over the two pins furthest from the ribbon cable connectors, P1 and P2, to select a high address.

### ADJACENT CHANNEL JUMPERS

Adjacent channels may be connected together to provide an isolated output signal from an isolated input module, providing two levels of 1500V isolation. This capability is provided with the seven jumpers labeled JP1-JP7. See page 39 for an example.

Refer to page 39 for additional notes on the P1 and P2 connectors, power requirements, fusing and grounding issues.



- NOTES:
1. J1, J3, J4 and R<sub>1</sub> are factory installed.
  2. SCMXCJC are CJC temperature sensors.
  3. Resistors SCMXR1 are optional I/V conversion resistors for current inputs, not factory installed.

FIGURE 14. SCMPB05 Schematic.



# SCMPB06 8 POSITION ANALOG I/O BACKPANEL, MULTIPLEXED

## DESCRIPTION

The SCMPB06 backpanel (Figure 15) can accept up to eight SCM5B modules in any combination. It can be mounted on the SCMXRK-002 19-inch metal rack. The SCMPB06 has two analog buses; one for analog input and one for analog output. This two-bus configuration takes advantage of the switch controlled outputs on the input modules and the track-and-hold inputs on the output modules. A temperature sensor is mounted on each channel to provide cold junction compensation for thermocouple input modules (See Figure 16 for schematic). Field connections are terminated with four screw terminals at each module site. Up to eight SCMPB06 backpanels may be daisy-chained. Use SCMCA005 cable for daisy chaining and SCMXCA004-XX cable for connecting to host computer.

Jumpers on the SCMPB06 permit user selection of low (i.e. channels 0-7) or high (i.e. channels 8-15) addresses.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

## SPECIFICATIONS

Operating Temperature:	-40°C to +85°C 95% relative humidity, non-condensing
Interface Connector: Field Logic	High Density Screw Clamp, 14 AWG Max 26-pin, male header connector
Address Input Logic Levels: Max Logic "0" Min Logic "1"	0.8V 2.0V

I <sub>i</sub> Input Current, "0" or "1"	0.1µA max at 25°C 1.0µA max -25°C to +85°C
RD EN\ or WR EN\ Signal Delay from Connector P1 to Channels 0-7 Standalone (address 0-7)  Expanded (address 8-63)	51ns at 25°C 64ns at -25°C to +85°C 100ns at 25°C 126ns at -25°C to +85°C

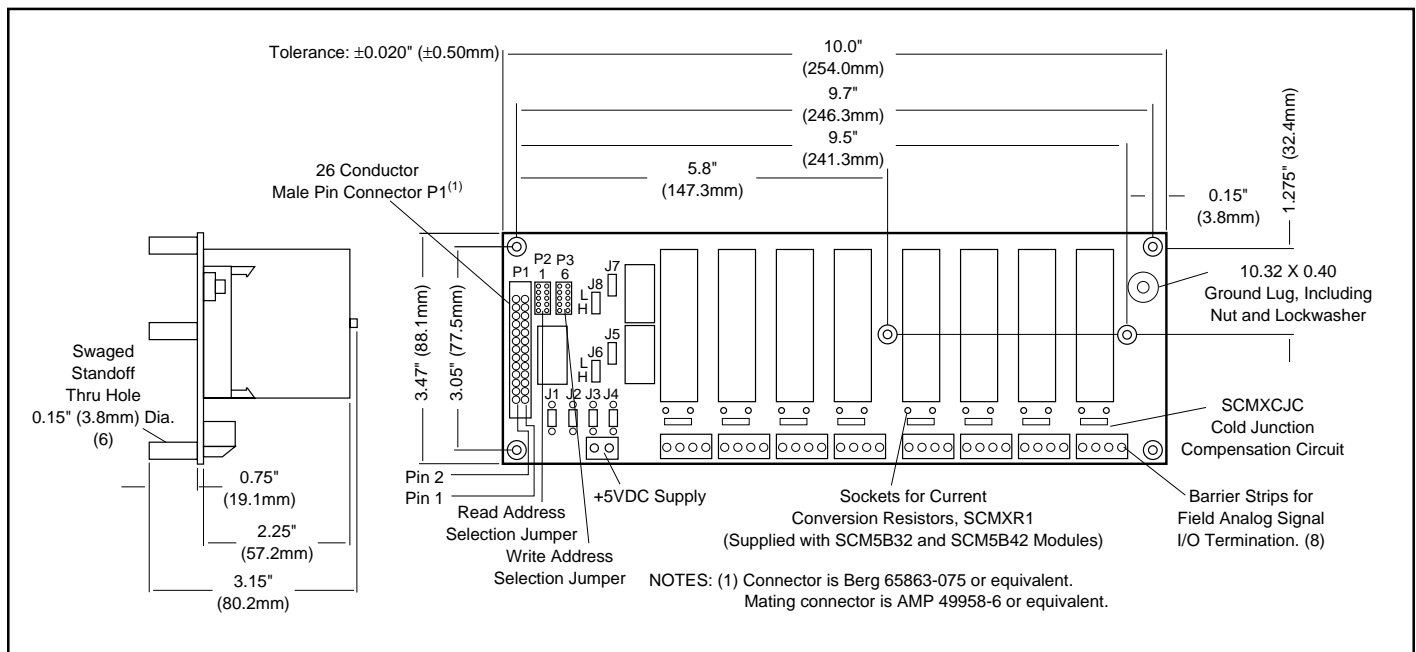


FIGURE 15. SCMPB06 Analog I/O Backpanel.

## ELECTRICAL

### ADDRESS SELECTION

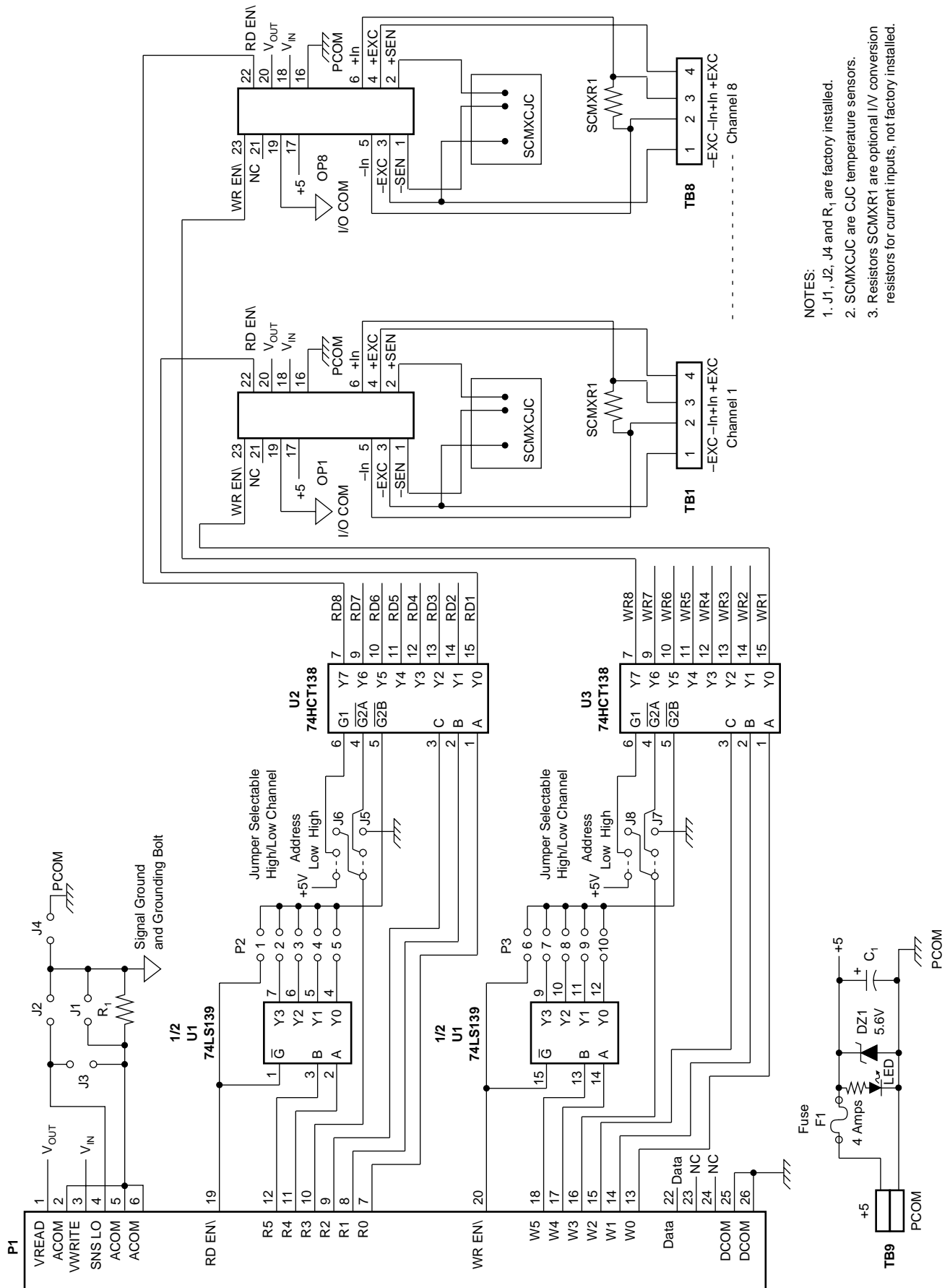
Module read and write addresses may be selected as low (channels 0-7) or high (channels 8-15) using the four sets of 3 position jumpers labeled J5 through J8. Place a jumper over the two pins furthest from the field I/O termination blocks on all four sets to select a low address (factory configuration) or over the two pins closest to the field I/O termination blocks on all four sets to select a high address.

The SCMPB06 backpanel has address decoding circuitry to allow multiplexing any combination of up to 8 input or output modules. Capability is also provided in the address decode circuitry to expand the system to 64 channels (eight SCMPB06 backpanels) of multiplexed input or output. Jumpers select which set of 16 addresses are assigned to a particular backpanel. The Read

Address group assigns a set of 16 addresses for input modules, and the Write Address group assigns a set of 16 addresses for output modules. The table below shows the correlation of jumper position to address range. Refer to page 42 for additional notes on the P1 connector, power requirements, fusing, and grounding issues.

### Address Selection Jumpers

Read Address Jumper (P2)	Write Address Jumper (P3)	Address Range
1	6	0-15 Stand alone
2	7	48-63 Expanded
3	8	32-47 Expanded
4	9	16-31 Expanded
5	10	0-15 Expanded



- NOTES:
1. J1, J2, J4 and R<sub>1</sub> are factory installed.
  2. SCMXCJC are CJC temperature sensors.
  3. Resistors SCMXR1 are optional I/V conversion resistors for current inputs, not factory installed.

FIGURE 16. SCMPB06 Schematic.



# SCMPB01-1, SCMPB02-1, SCMPB04-1, SCMPB05-1, SCMPB06-1

## DESCRIPTION

The SCMPBOX-1 is identical in all respects to the SCMPBOX except it does not have CJC circuits installed. Use only when thermocouple input modules, SCM5B37 or SCM5B47, will not be installed.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).



# SCMPB01-2, SCMPB02-2, SCMPB05-2, SCMPB06-2

## DESCRIPTION

The SCMPBOX-2 is the SCMPBOX backpanel with a DIN rail mounting option. The SCMPBOX backpanel is attached to a 0.062" thick piece of black anodized aluminum, which in turn is captured using the SCMXBEFE and

SCMXSE DIN rail mounting elements. The SCMPBOX-2 comes fully assembled.



# SCMPB01-3, SCMPB02-3, SCMPB05-3, SCMPB06-3

## DESCRIPTION

The SCMPBOX-3 is the SCMPBOX-1 backpanel (no CJC circuits installed) with the DIN rail mounting option as outlined in the SCMPBOX-2 description.

## SCMXRK-002 19 INCH METAL MOUNTING RACK

## DESCRIPTION

The SCMXRK-002 is a 19-inch metal rack for mounting the SCMPB01/02/05/06 backpanels. It also provides capability to mount the SCMXPRT-001, SCMXPRE-001, SCMXPRT-003 or SCMXPRE-003 power supplies, and the SCMXIF interface board (See Figure 17 for dimensions).

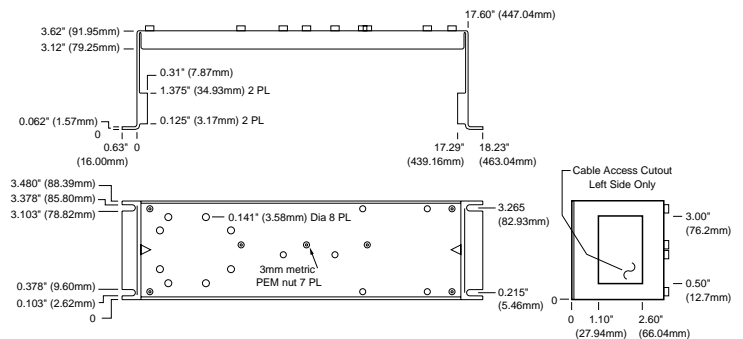


FIGURE 17. SCMXRK-002 Analog Rack Dimensions.

## SCMXIF UNIVERSAL INTERFACE BOARD

## DESCRIPTION

The SCMXIF is a universal interface board which converts a 26-pin ribbon cable input to 26 screw terminals for discrete wire. It can be mounted on the back of the SCMXRK-002 mounting rack (SCMXIF) or on a DIN rail (SCMXIF-DIN). Required mounting hardware is included. Use SCMXCA004-XX cable (See Figure 18 for dimensions).

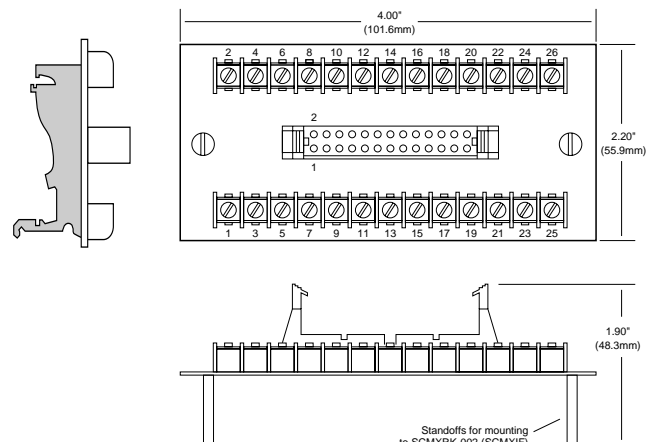


FIGURE 18. SCMXIF Universal Interface Board Dimensions.

# SCMXEV ANALOG MODULE EVALUATION BOARD

## DESCRIPTION

The SCMXEV is a single channel board with a test socket for SCM5B module evaluation (Figure 19). All signal input/output, control, and power connections are connected to terminal blocks for ease of user access. A cold junction temperature sensor circuit is included for evaluation of thermocouple modules. (See Figure 20 for schematic).

The SCMXEV is mechanically compatible with DIN rail mounting. Phoenix brand Universal Module (UM) elements may be used. The following Phoenix parts would be used to mount one SCMXEV.

- 2, UM-BEFE base elements with snap foot
- 2, UM-SE side elements
- 4, UM-VS connection pins

Two jumpers are provided for customer use. The first, J1, provides a current path between +5V Power Common (module pin 16) and I/O Common (module pin 19). A path must exist between the host control logic power common and module I/O Common for proper operation of the module output switch or track-and-hold circuit. If this connection exists elsewhere in the system, jumper J1 should be removed since possible ground loops could exist. Other connections of power ground and signal ground usually occur at the A/D or D/A converter of the host measurement system.

Jumper J2 is used in the cold junction compensation circuit. If it is installed, the compensation circuit is enabled and will provide the proper compensation voltage to correct for the thermoelectric effect at the +In and -In screw terminals. If an external simulation voltage is desired for cold junction compensation, J2 should be removed. The external voltage is applied at the sockets labeled CJC+ and CJC-. An external voltage of 510.0 mV corresponds to an ambient temperature of +25 °C. The transfer function of the onboard compensation circuit is  $V_{CJC} = 0.510 - 0.0025(T-25)V$ .

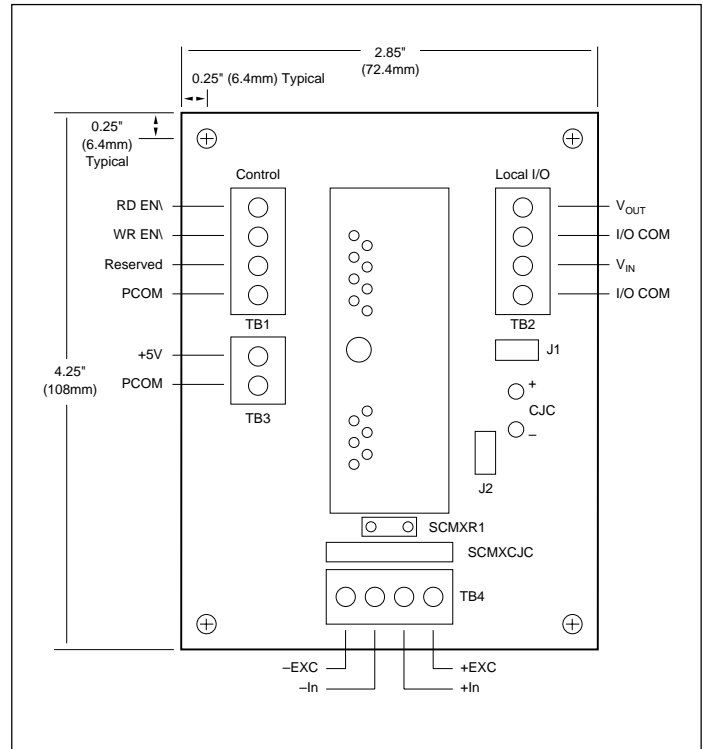


FIGURE 19. SCMXEV Evaluation Board Dimensions And Pin Layout.

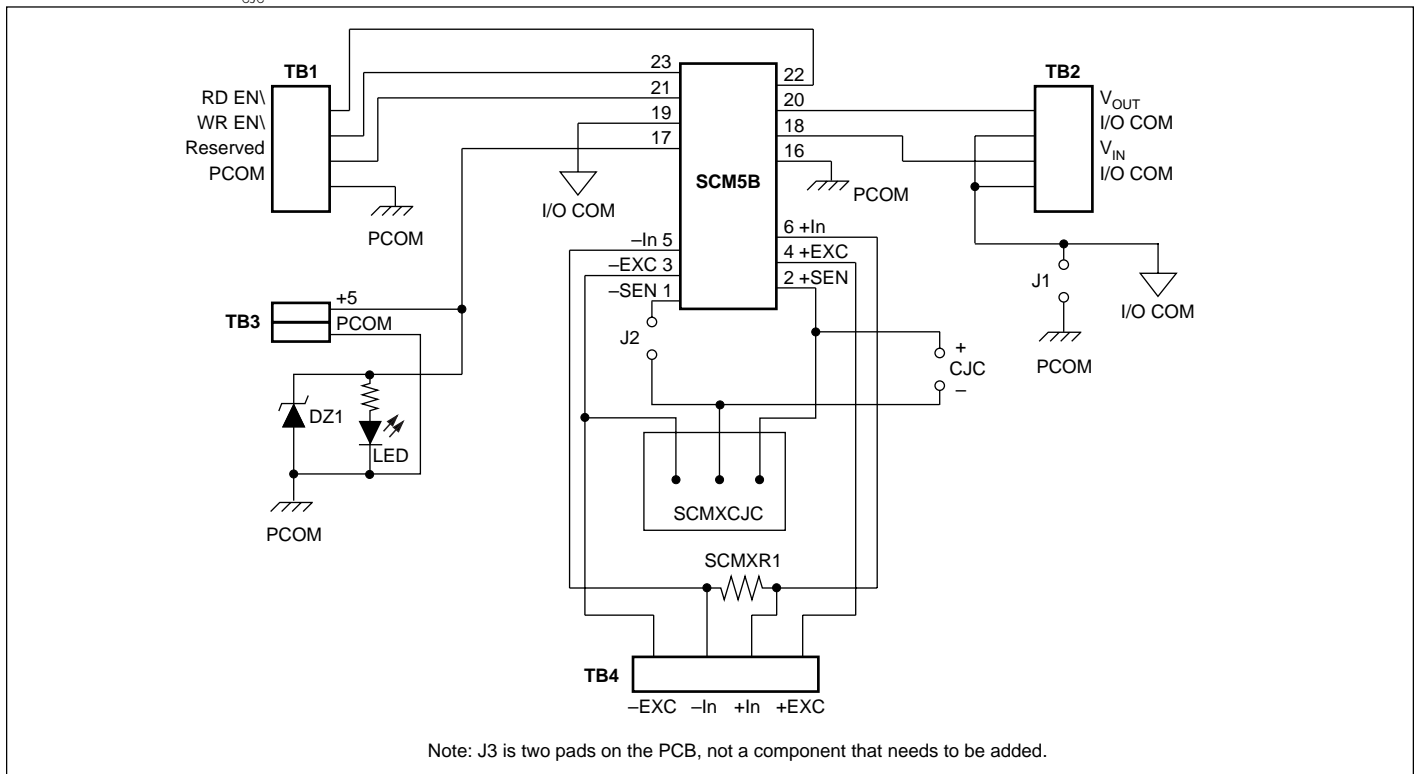


FIGURE 20. SCMXEV Evaluation Board Schematic.

# SCMXCA004-XX, SCMXCA005 INTERFACE CABLES

## DESCRIPTION

### SCMXCA004-XX

System interface cable for the SCMPB01/02/05/06 backpanels. This is a 26 conductor ribbon cable with a mass-terminated socket connector installed on each end. It can be ordered in any length; -xx denotes required length in meters (Figure 21).

### SCMXCA005

Daisy-chain cable for the SCMPB02/06 backpanels (Figure 22). Provides interconnection between a maximum of four SCMPB02 and eight SCMPB06 backpanels (See Figure 22).

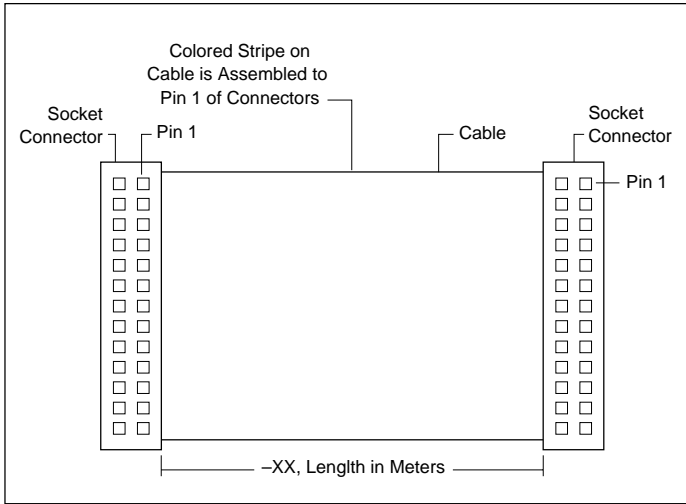


FIGURE 21. SCMXCA004-XX System Interface Cable.

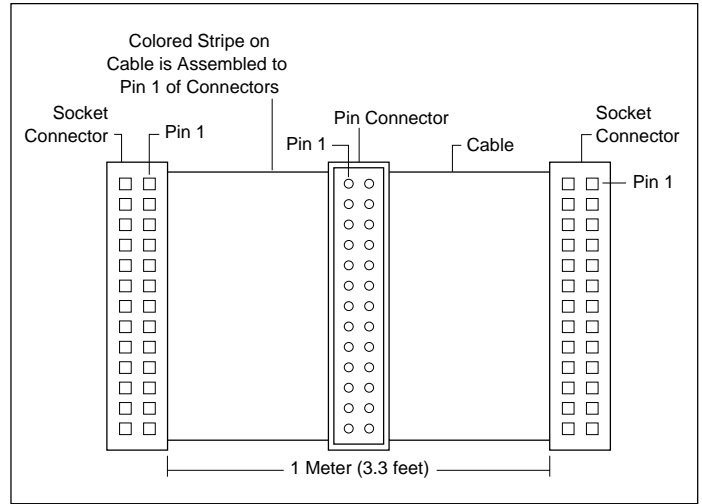


FIGURE 22. SCMXCA005 Daisy-Chain Cable.

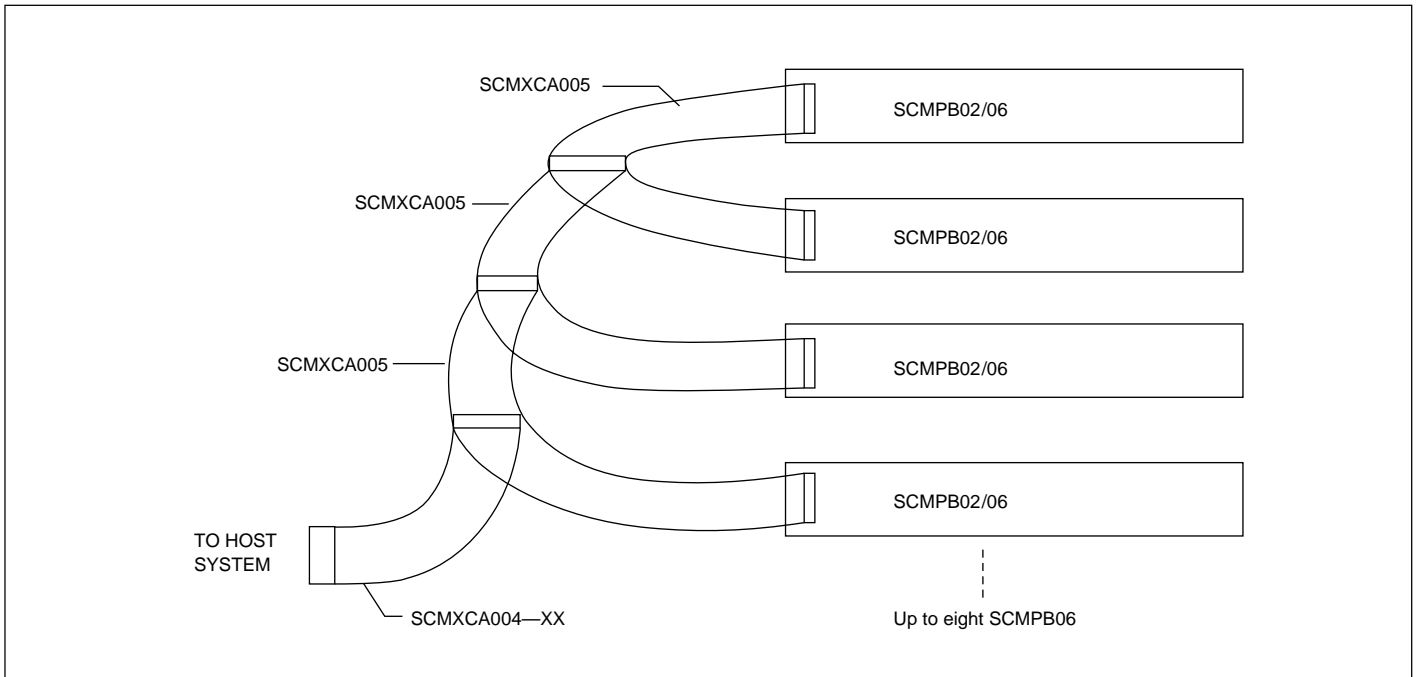


FIGURE 23. Application Of SCMXCA005 Daisy-Chain Cable.



# SCMXCJC ENCAPSULATED COLD JUNCTION COMPENSATION

## DESCRIPTION

The SCMXCJC is the identical circuit used on the SCMPB01/02/03/04/05/06 backpanels except it is packaged as a component for use in customer designed mounting boards (Figure 24). When interfaced to an SCM5B37 or 47 module the transfer function of the voltage across the +SEN and -SEN pins is  $V_{CJC} = 0.510 - 0.0025(T - 25)V$ .

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

## SPECIFICATIONS

Accuracy	+25°C	±0.25°C
	+5°C to +45°C	±0.5°C
	-40°C to +85°C	±1.25°C

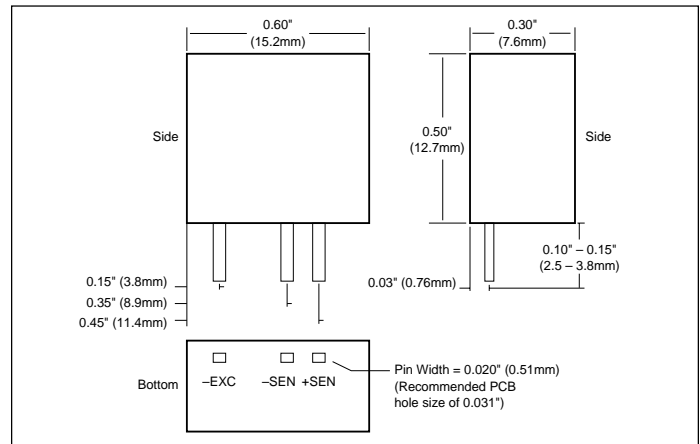


FIGURE 24. SCMXCJC Physical Dimensions And Pin Layout.

## SCM5BDS DEAD SHORT

### DESCRIPTION

This accessory is a pass through module used to establish a direct connection between the field-side and the system-side. It has unity gain and no

isolation. Internally, the +IN pin (pin 6) is connected to the VOUT pin (pin 20) and the -IN pin (pin 5) is connected to the I/O COM pin (pin 19).

## SCMXFS-003 FUSE

### DESCRIPTION

Package of 10, 4 amp fuses for use on the SCMPB01 or SCMPB02 backpanel. This is a series fuse in the five volt power line. It provides protection against

inadvertent reverse connection of five volt power.

## SCMXJP-003 JUMPER STRAP

### DESCRIPTION

Package of 10 jumpers for connecting adjacent input/output modules on the SCMPB01 backpanel. This connection is made if it is desired to direct the

output of any input module to the input of an adjacent output module. The jumpers can also be used for configuring I/O addresses on the SCMPB02 backpanel.



## SCMXR1 CURRENT CONVERSION RESISTOR

### DESCRIPTION

A precision 20Ω, 0.1%, 10ppm/°C resistor used with the SCM5B32 current input module or SCM5B42 two-wire transmitter interface module (Figure 25). Sockets are provided on the SCMPB01/02/03/04/05/06 and SCM5EV backpanels to allow installation of this resistor. One SCMXR1 is shipped with each SCM5B32 or SCM5B42 module.

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

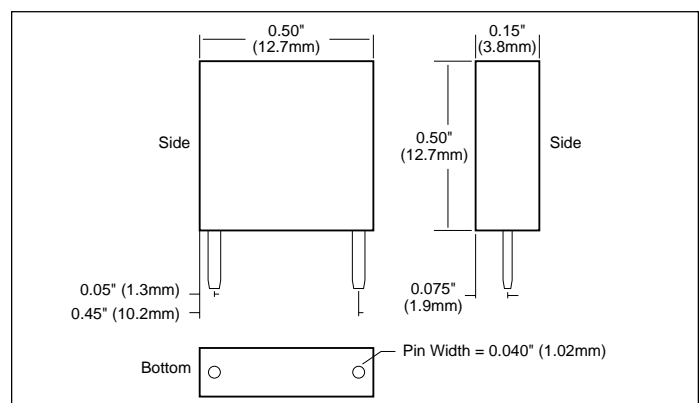


FIGURE 25. SCMXR1 Physical Dimensions.



Call 800-444-7644  
For Information and Assistance



# SCMXPRT-001, SCMXPRE-001 POWER SUPPLIES

## DESCRIPTION

The SCMXPRT-001 and SCMXPRE-001 encapsulated power supplies are available in 120VAC or 220VAC input voltage ranges and provide 5VDC outputs suitable for all SCM5B modules. They are designed to mount on the SCMXRK-002 metal rack. The supplies are UL-recognized and CSA certified. Their compact size and low weight are ideal for high-density applications (see Figure 25.)

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

## SPECIFICATIONS

	SCMXPRT-001	SCMXPRE-001
Input Voltage Range	105-125VAC	200-240VAC
Output Voltage	5VDC	5VDC
Output Current, +50°C (derate 2.5%/°C above +50°C)	1A	1A
Operating Temp	-25°C to +71°C	-25°C to +71°C
Dielectric Withstand Voltage (Input to Ground)	2500VRMS	2500VRMS
Line Regulation	±0.05%	±0.05%
Load Regulation	±0.15%	±0.15%
Output Ripple, max	2mVRMS	2mVRMS
Overvoltage Protection, nominal	6.2V	6.2V
Weight	1.25 lbs (567 grams)	1.25 lbs (567 grams)

Supplies are UL recognized, File No. E65890, and CSA certified, File No. LR59996.

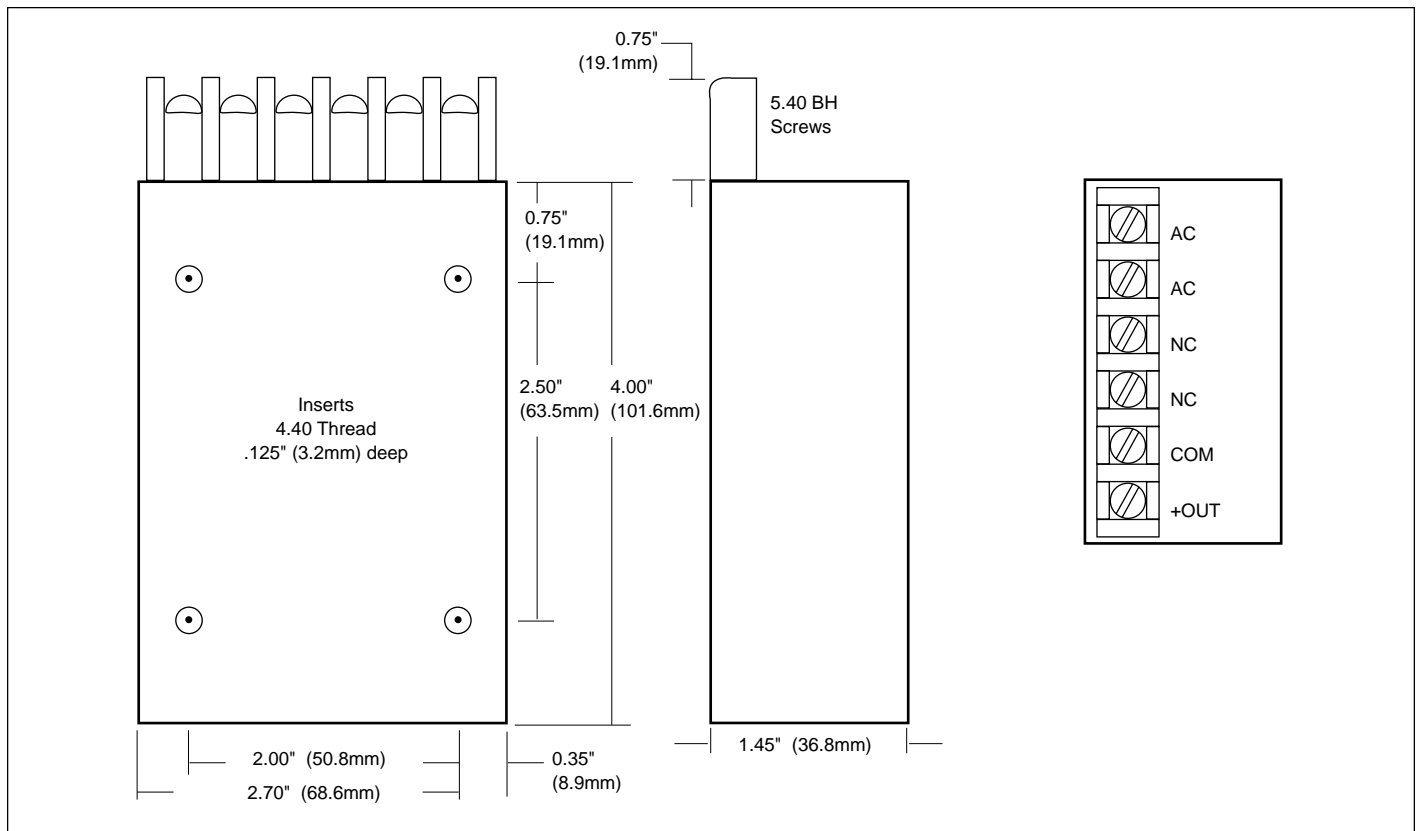


FIGURE 25. SCMXPRT-001/E-001 Physical Dimensions.



# SCMXPRT-003, SCMXPRE-003 POWER SUPPLIES

## DESCRIPTION

The SCMXPRT/E-003 Linear Power Supplies are available in 120VAC or 220VAC input. They have sufficient output current capacity to supply any combination of SCM5B modules. The SCMXRK-002 metal rack provides mounting capability for the SCMXPRT/E-003 power supplies (See Figure 26).

For Class I, Division 2 hazardous location applications, refer to Dataforth installation manual MA1146 (available upon request).

## SPECIFICATIONS

	SCMXPRT-003	SCMXPRE-003
Input Voltage Range	104-132VAC	207-265VAC
Output Voltage	5VDC	5VDC
Output Current (at +70°C)	3A	3A
Output Current (at +50°C)	6A	6A
Operating Temp	0 to +70°C	0 to +70°C
Dielectric Withstand Voltage (input to ground)	3750VAC	3750VAC
Line Regulation (10% line change)	±0.05%	±0.05%
Load Regulation (50% load change)	±0.05%	±0.05%
Output Ripple (max)	5 mV <sub>p-p</sub>	5 mV <sub>p-p</sub>
Overvoltage Protection (factory set)	6.2 V ±0.4V	6.2 V ±0.4V

Both supplies are tested and certified by TUV to VDE 0806 and IEC 380. They are UL Recognized (File Number E55974) and CSA Certified (CSA File Number LR38879).

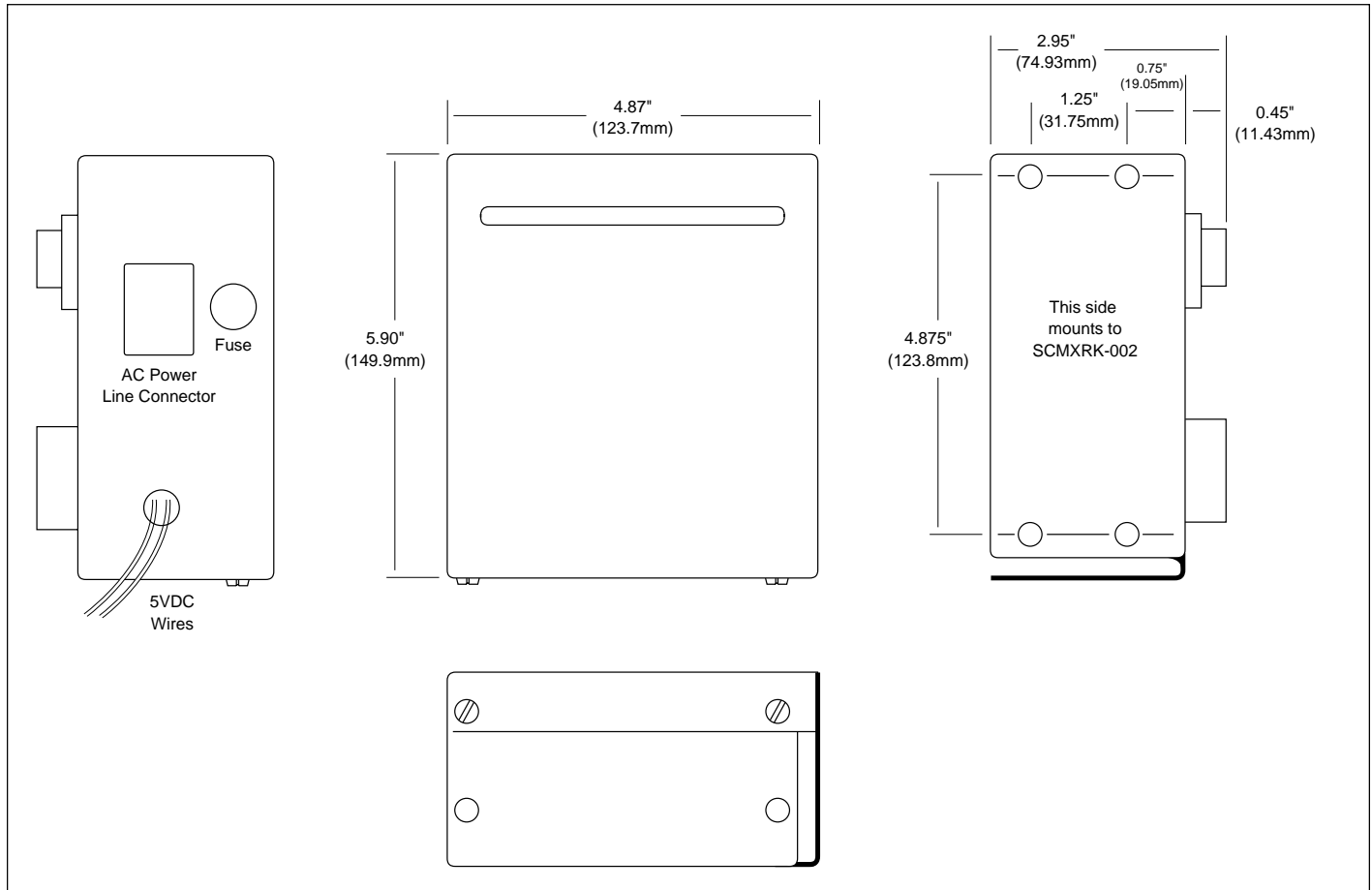


FIGURE 26. SCMXPRT-003/E-003 Physical Dimensions.

## 5B38 Strain Gage Input Module

The 5B38 wide bandwidth strain gage input module accepts signals from full bridge and half bridge 300  $\Omega$  to 10 k $\Omega$  transducers. The 5B38 provides +10 V excitation and produces an output of -5 V to +5 V. This module features a bandwidth of 10 kHz.

Figure 2.6 is a functional block diagram of the 5B38. A protection circuit assures safe operation even if a 240 Vrms power line is connected to the input screw terminals. The excitation section provides +10 V. Since the excitation lines are not sensed at the strain gage, care should be taken to minimize any IR loss in these wires. This can be accomplished by the use of heavy gage wires or the shortest length of wire possible. A one pole anti-aliasing filter is located at the module's input, while a three pole low pass filter in the output stage sets the bandwidth and yields optimum noise performance. A low drift amplifier provides the module's gain.

Signal isolation is provided by transformer coupling, using a proprietary modulation technique for linear, stable performance. A demodulator on the output side of the signal transformer recovers the original signal, which is then filtered and buffered to provide a clean, low-impedance output. A series output switch is included to eliminate the need for external multiplexing in many applications. This switch is controlled by an active-low enable input. In cases where the output switch is not used, the enable input should be grounded to power common to turn on the switch, as it is on the 5B01 backplane.

The single +5 V supply powers a clock oscillator, which drives power transformers for the input and output circuits. The input circuit is fully floating. In addition, the output section acts as a third floating port, eliminating

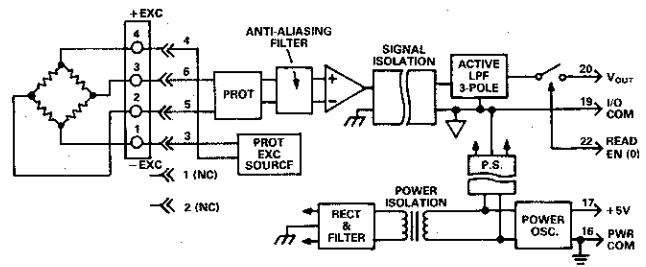


Figure 2.6. 5B38 Functional Block Diagram

many problems that might be created by ground loops and supply noise. The common-mode range of the output circuit is limited; however, output common must be kept within  $\pm 3$  V of power common.

The 5B38 can be used with half-bridge transducers since the module contains bridge completion circuitry. The module can be factory configured for wide input ranges to accommodate the DC offset created by mismatches in the transducer. There is no provision for use with quarter or three-quarter-bridge strain gages. However, the user may complete the bridge to the half or full-bridge level external to the module and use the 5B38 module.

### Note:

A current path must exist between power common and output common for proper operation of the demodulator and output switch. See Chapter 4 for details.

## 5B38 Ordering Information

Input Bridge	Range and Excitation	Output Range	Model
Full Bridge	10.0 V excitation, @ 3 mV/V Sensitivity, 300 $\Omega$ to 10 k $\Omega$	-5 V to +5 V	5B38-02
Half Bridge	10.0 V excitation, @ 3 mV/V Sensitivity, 300 $\Omega$ to 10 k $\Omega$	-5 V to +5 V	5B38-04
Full Bridge	10.0 V excitation, @ 2 mV/V Sensitivity, 300 $\Omega$ to 10 k $\Omega$	-5 V to +5 V	5B38-05

## 5B38 Specifications (typical @ 25°C and +5 V Power)

	Full Bridge	Half Bridge
Models	5B38-02, 5B38-05	5B38-04
Input Span Limits	±30 mV @ 3 mV/V Sensitivity ±20 mV @ 2 mV/V Sensitivity	±30 mV @ 3 mV/V Sensitivity
Output Range	-5 V to +5 V	*
Accuracy <sup>1</sup>	±0.08% span ±10 µV RTI	±0.08% span ±1 mV RTI
Nonlinearity	±0.02% span	*
Excitation Output <sup>2</sup>	+10 V ± 3 mV	*
Excitation Load Regulation	±5 ppm/mA	*
Half Bridge Voltage Level	N/A	(Excitation Voltage/2) ±1 mV
Stability vs. Ambient Temperature		
Input Offset	1 µV/°C	*
Output Offset	±40 µV/°C	*
Gain	±25 ppm of reading/°C	*
Excitation Voltage	±15 ppm/°C	*
Half Bridge	N/A	±15 ppm/°C
Input Bias Current	±3 nA	*
Input Resistance		
Normal	20 MΩ minimum	*
Power Off	40 kΩ minimum	*
Overload	40 kΩ minimum	*
Noise		
Input, bandwidth = 10 Hz	0.4 µVrms RTI	±2 µVrms RTI
Input, bandwidth = 10 kHz	±70 nV/√Hz RTI	±250 nV/√Hz RTI
Output, bandwidth = 100 kHz	10 mV p-p RTO	*
Bandwidth, -3 dB	10 kHz	*
Rise Time, 10% to 90% Span	40 µs	*
Settling Time (to 0.1%)	250 µsec	7 msec
CMV, Input to Output		
Continuous	1500 Vrms max	*
Transient	meets IEEE-STD 472 (SWC)	*
CMR (50 or 60 Hz)	100 dB	*
1 kΩ in Either or Both Input Leads		
Input Protection		
Continuous	240 Vrms max continuous	*
Output Resistance	50 Ω	*
Voltage Output Protection	Continuous Short to Ground	*
Output Selection Time (C <sub>L</sub> = 0 to 2,000 pF)	6 µs	*
Output Selection Input		
Max Logic "0"	+1 V	*
Min Logic "1"	+2.5 V	*
Max Logic "1"	+36 V	*
Input Current "0"	0.4 mA	*
Power Supply Voltage	+5 V ±5%	*
Power Supply Sensitivity	25 ppm reading/% ± 2.5 µV RTI/%	*
Power Consumption	1 W full load, .6 W no load	*
Size	2.25" x 2.25" x 0.60" (52 mm x 52 mm x 15 mm)	*
Environmental		
Temperature Range, Rated Performance	-25°C to +85°C	*
Temperature Range, Storage	-40°C to +85°C	*
Temperature Range, Operating	-40°C to +85°C	*
Relative Humidity (MIL 202)	0 to 95% @ 60°C noncondensing	*
RFI Susceptibility	±0.5% span error @ 400 MHz, 5W, 3'	*

<sup>1</sup>Includes the combined effects of gain, offset and excitation errors, repeatability, hysteresis, and nonlinearity.

<sup>2</sup>At full load (300 Ω).

\*Same as full-bridge versions.

Specifications subject to change without notice.

## 5B39 Current Output Module

The 5B39 current output module accepts a high level analog signal at its input and provides a galvanically isolated 4-20 mA or 0-20 mA process current signal at its output. The module features high accuracy of  $\pm 0.05\%$ ,  $\pm 0.02\%$  nonlinearity and 1500 Vrms common mode voltage isolation protection.

Figure 2.7 is a functional block diagram of the 5B39 current output module. The voltage input, usually from a digital-to-analog converter, is buffered and a quarter scale offset is added if a 4-20 mA output is specified.

The signal is latched in a track and hold circuit. This track-and-hold allows one DAC to serve numerous output channels. The output droop rate is  $80 \mu\text{A/s}$ , which corresponds to a refresh interval of 25 ms for 0.01% FS droop. The track-and-hold is controlled by an active-low enable input. On power-up, the output of the 5B39 remains at 0 mA for approximately 100 ms, allowing the user to initialize the track-and-hold.

In conventional applications where one DAC is used per channel and the track-and-hold is not used, the enable input should be grounded to power common, as it is on the 5B01 backplane. This keeps the module in tracking mode.

The signal is sent through an isolation barrier to the current output (V-to-I converter) stage. Signal isolation is provided by transformer coupling using a proprietary modulation technique for linear, stable performance. A demodulator on the output side of the signal transformer recovers the original signal, which is then filtered and converted to a current output. Output protection allows safe operation even in the event of a 240 Vrms power line being connected to the signal terminals.

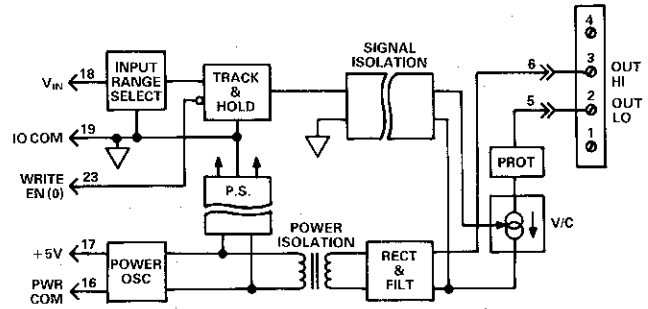


Figure 2.7. 5B39 Functional Block Diagram

A single +5 V supply powers a clock oscillator, which drives power transformers for the input circuit and the output's high-compliance, current loop supply. The output current loop is, of course, fully floating. In addition, the input section acts as a third floating port, eliminating many problems that might be created by ground loops and supply noise. The common-mode range of the input circuit is limited; however, input common must be kept within  $\pm 1$  V of power common.

### Notes:

- (1) A current path must exist between input common and power common at some point for proper operation of the module. See Chapter 4 for details.
- (2) The 0 to 20 mA output of a 5B39-04 can be converted to a 0 to 10 V output by dropping a  $500 \Omega$  resistor across the output terminals.

This voltage output should be used cautiously. Since it is not a true voltage source, the tolerance of the resistor and load impedances that are not large relative to the conversion resistor will introduce errors. A load impedance  $> 500 \text{ k}\Omega$  would contribute  $< 0.1\%$  error.

## 5B39 Ordering Information

Input Range	Output Range	Model
0 to +5 V	4-20 mA	5B39-01
-5 V to +5 V	4-20 mA	5B39-02
0 to +5 V	0-20 mA	5B39-03
-5 V to +5 V	0-20 mA	5B39-04

## 5B39 Specifications (typical @25°C and +5 V Power)

Standard Input Ranges	0 to +5 V or -5 V to +5 V
Standard Output Ranges	4-20 mA or 0-20 mA
Load Resistance Range <sup>1</sup>	0 to 650 $\Omega$
Accuracy <sup>2</sup>	$\pm 0.05\%$ span
Nonlinearity	$\pm 0.02\%$ span
Stability vs. Ambient Temperature Zero Span	$\pm 0.5 \mu\text{A}/^\circ\text{C}$ $\pm 20 \text{ ppm of reading}/^\circ\text{C}$
Output Ripple, 100 Hz bandwidth	30 $\mu\text{A}$ peak-peak
Common Mode Voltage Output to Input and Power Supply	1500 Vrms continuous
Common Mode Rejection	90 dB
Normal Mode Output Protection	240 Vrms continuous
Output Transient Protection	Meets IEEE-STD 472 (SWC)
Sample & Hold: Output Droop Rate Acquisition Time	80 $\mu\text{A}/\text{s}$ 50 $\mu\text{s}$
Overrange Capability	10%
Maximum Output Under Fault	26 mA
Input Resistance	10 M $\Omega$
Bandwidth, -3 dB	400 Hz
Rise Time, 10% to 90% Span	2 ms
Track-and-Hold Enable Max Logic "0" Min Logic "1" Max Logic "1" Input Current "0"	+1 V +2.5 V +36 V 1.5 mA
Power Supply	+5 V dc $\pm 5\%$
Power Supply Sensitivity	$\pm 0.25 \mu\text{A}/\text{Vs}\%$
Power Consumption	0.85 W (170 mA)
Maximum Input Voltage Without Damage	-10 V to +10 V
Size	2.25" x 2.25" x 0.60" (52 mm x 52 mm x 15 mm)
Environmental Temperature Range, Rated Performance Temperature Range, Operating Temperature Range, Storage Relative Humidity (MIL 202) RFI Susceptibility	-25°C to +85°C -40°C to +85°C -40°C to +85°C 0 to 95% @ 60°C noncondensing $\pm 0.5\%$ span error @ 400 MHz, 5W, 3'

<sup>1</sup>With a minimum power supply voltage of 4.95 V,  $R_L$  can be up to 750  $\Omega$ .

<sup>2</sup>Includes the combined effects of repeatability, hysteresis, and nonlinearity.

*Specifications subject to change without notice.*

## 5B45 and 5B46 Frequency Input Modules

The 5B45 is an isolated frequency input module that accepts full scale input frequency signals ranging from 500 Hz to 20 kHz. Model 5B46 is an isolated frequency input module that accepts full scale input signals ranging from 20 kHz to 275 kHz. Both modules have a user selectable threshold of either 0 V or +1.4 V, and a user selectable hysteresis of either  $\pm 25$  mV or  $\pm 400$  mV.

**Circuit Description:** Figure 2.9 shows a functional block diagram for models 5B45 and 5B46. Input protection of up to 240 Vrms is provided on the four input screw terminals. The input signal is compared to the selected threshold ( $V_T$ ) and hysteresis ( $V_H$ ). Signals of virtually any waveshape which exceed the combined threshold and hysteresis levels ( $V_T \pm V_H$ ), will trigger the comparator. The comparator's output frequency is transmitted across a proprietary isolation barrier and converted into a high level analog signal. The signal is then filtered by a two-pole low pass butterworth filter and buffered to provide a clean, low impedance output signal.

**Output Switch:** A series output switch is included to eliminate the need for external multiplexing in many applications. This switch has a low output resistance (50 ohms) and is controlled by an active-low enable input. In cases where the output switch is not used, the enable input should be grounded to power common to turn the switch ON, as it is done on the 5B01 Backplane.

**Threshold Selection:** The threshold is determined by user wiring on the input backplane screw terminals. If the input signal is a zero crossing voltage input, the input signal should be connected to the backplane screw terminals 4 and 3 to implement a 0 V threshold. When the input signal is connected to screw terminals 3 and 2, the threshold is +1.4 V (see Figure 2.9).

**Hysteresis Selection:** Hysteresis is set at  $\pm 400$  mV for signals connected to either terminals 3 & 4 or 3 & 2. However, the user can change the hysteresis to  $\pm 25$  mV by the addition of a jumper between screw terminals 1 and 4. (see Figure 2.9)

**Response Time:** Response time is a function of the input frequency range and the module bandwidth. The table below indicates the output rise/fall time and settling time for a step change input over the rated input ranges of the 5B45 and 5B46. Other ranges would have response times in between these values.

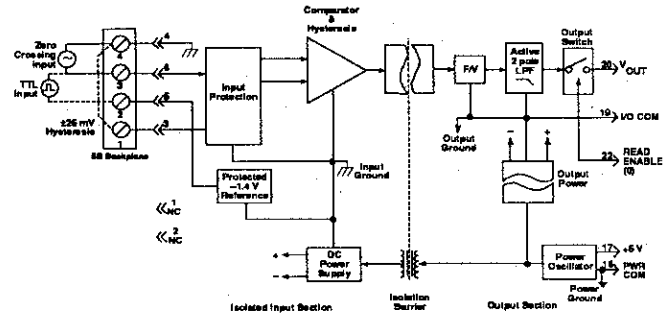


Figure 2.9 5B45 and 5B46 Functional Block Diagram

### 5B45 and 5B46 Response Time

Model	Rise/Fall Time 10% to 90% ms	Step Response to $\pm 0.1\%$ ms
5B45-01	80	150
5B45-02	60	140
5B45-03	50	130
5B45-04	50	130
5B45-05	50	130
5B46-01	15	44
5B46-02	7	22
5B46-03	4	12
5B46-04	4	9

**Output Common Connection:** The single +5 V supply powers a clock oscillator, which drives power transformers for both the input and output circuits. The input circuit is fully floating and isolated from the output common and the power common. In addition, the output section acts as a third floating port, eliminating many problems that might be created by ground loops and power supply noise. The common mode range of the output circuit is limited and the output common must be kept within  $\pm 3$  V of power common.

**Note:** A current path must exist between power common (Pin 16) and output common (Pin 19) for proper operation of the output switch. See Chapter 4 for details.

### 5B45 and 5B46 Ordering Information

Model	Input Range	Output Range
5B45-01	0 to 500 Hz	0 to +5 V
5B45-02	0 to 1 kHz	0 to +5 V
5B45-03	0 to 2.5 kHz	0 to +5 V
5B45-04	0 to 5 kHz	0 to +5 V
5B45-05	0 to 10 kHz	0 to +5 V
5B46-01	0 to 25 kHz	0 to +5 V
5B46-02	0 to 50 kHz	0 to +5 V
5B46-03	0 to 100 kHz	0 to +5 V
5B46-04	0 to 250 kHz	0 to +5 V



