

## Product Datasheet - Technical Specifications



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# SCM5B30/31

## Analog Voltage Input Modules, Narrow Bandwidth



### 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  $\pm 50V$  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.

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.

### Features

- Accepts Millivolt and Voltage Level Signals
- High-Level Voltage Outputs
- 1500Vrms Transformer Isolation
- ANSI/IEEE C37.90.1 Transient Protection
- Input Protected to 240VAC Continuous
- 160dB CMR
- 95dB NMR at 60Hz, 90dB at 50Hz
- $\pm 0.03\%$  Accuracy
- $\pm 0.005\%$  Linearity
- $\pm 1\mu V/^\circ C$  Drift
- CSA C/US Certified
- CE and ATEX Compliant
- Mix and Match SCM5B Types on Backpanel

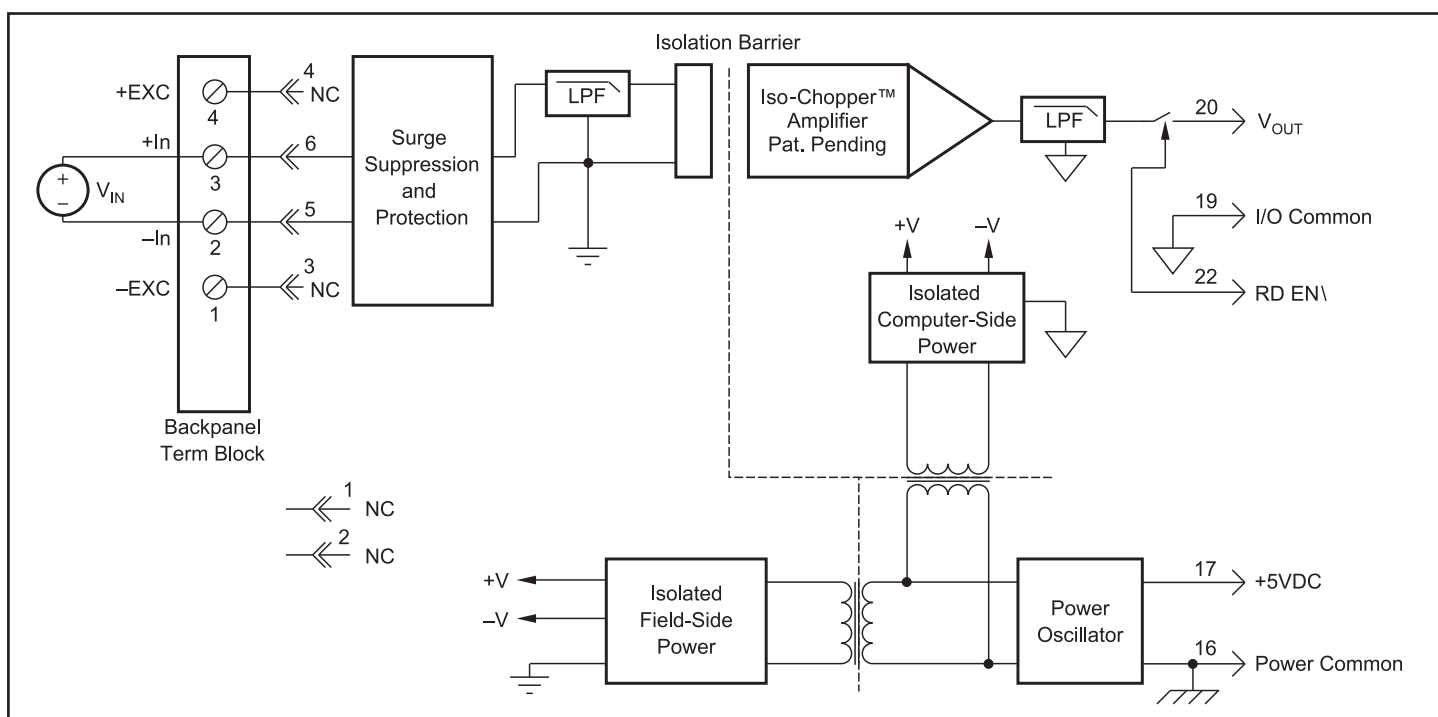


Figure 1: SCM5B30/31 Block Diagram

## Specifications

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

Module	SCM5B30	SCM5B31
Input Range	$\pm 10\text{mV}$ to $\pm 1\text{V}$	$\pm 1\text{V}$ to $\pm 40\text{V}$
Input Bias Current	$\pm 0.5\text{nA}$	$\pm 0.05\text{nA}$
Input Resistance		
Normal	50M $\Omega$	650k $\Omega$ (-01 thru -06) 2M $\Omega$ (-07 thru -10)
Power Off	40k $\Omega$	650k $\Omega$ (-01 thru -06) 2M $\Omega$ (-07 thru -10)
Overload	40k $\Omega$	650k $\Omega$ (-01 thru -06) 2M $\Omega$ (-07 thru -10)
Input Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1	*
CMV, Input to Output		
Continuous	1500Vrms max	*
Transient	ANSI/IEEE C37.90.1	*
CMR (50Hz or 60Hz)	160dB	*
NMR	95dB at 60Hz, 90dB at 50Hz	*
Accuracy <sup>(1)</sup>	$\pm 0.03\%$ Span	*
Linearity	$\pm 0.005\%$ Span	*
Stability		
Input Offset	$\pm 1\mu\text{V}/^{\circ}\text{C}$	$\pm 20\mu\text{V}/^{\circ}\text{C}$
Output Offset	$\pm 20\mu\text{V}/^{\circ}\text{C}$	*
Gain	$\pm 25\text{ppm}/^{\circ}\text{C}$	$\pm 50\text{ppm}/^{\circ}\text{C}$
Noise		
Input, 0.1 to 10Hz	0.2 $\mu\text{Vrms}$	2 $\mu\text{Vrms}$
Output, 100kHz	200 $\mu\text{Vrms}$	*
Bandwidth, -3dB	4Hz	*
Response Time, 90% Span	0.2s	*
Output Range	See Ordering Information	*
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	30mA	*
Power Supply Sensitivity	$\pm 2\mu\text{V}/\%$ RTI <sup>(2)</sup>	$\pm 200\mu\text{V}/\%$ RTI <sup>(2)</sup>
Mechanical Dimensions (h)(w)(d)	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 EN61000-6-4	ISM, Group 1	*
Radiated, Conducted	Class A	*
Immunity EN61000-6-2	ISM, Group 1	*
RF	Performance A $\pm 0.5\%$ Span Error	*
ESD,EFT	Performance B	*

### NOTES:

\*Contact factory or your local Dataforth sales office for maximum values.

\*Same specification as SCM5B30.

(1) Includes linearity, hysteresis and repeatability.

(2) RTI = Referenced to input.

(3) Same as SCM5B31-01 with 50M $\Omega$  input resistance.

## Ordering Information

Model	Input Range	Output Range <sup>†</sup>
SCM5B30-01	$-10\text{mV}$ to $+10\text{mV}$	1, 2
SCM5B30-02	$-50\text{mV}$ to $+50\text{mV}$	1, 2
SCM5B30-03	$-100\text{mV}$ to $+100\text{mV}$	1, 2
SCM5B30-04	$-10\text{mV}$ to $+10\text{mV}$	3, 4
SCM5B30-05	$-50\text{mV}$ to $+50\text{mV}$	3, 4
SCM5B30-06	$-100\text{mV}$ to $+100\text{mV}$	3, 4
SCM5B30-07 <sup>(3)</sup>	$-1\text{V}$ to $+1\text{V}$	1, 2
SCM5B31-01	$-1\text{V}$ to $+1\text{V}$	1, 2
SCM5B31-02	$-5\text{V}$ to $+5\text{V}$	1, 2
SCM5B31-03	$-10\text{V}$ to $+10\text{V}$	1, 2
SCM5B31-04	$-1\text{V}$ to $+1\text{V}$	3, 4
SCM5B31-05	$-5\text{V}$ to $+5\text{V}$	3, 4
SCM5B31-06	$-10\text{V}$ to $+10\text{V}$	3, 4
SCM5B31-07	$-20\text{V}$ to $+20\text{V}$	1, 2
SCM5B31-08	$-20\text{V}$ to $+20\text{V}$	3, 4
SCM5B31-09	$-40\text{V}$ to $+40\text{V}$	1, 2
SCM5B31-10	$-40\text{V}$ to $+40\text{V}$	3, 4

## †Output Ranges Available

Output Range	Part No. Suffix	Example
1. $-5\text{V}$ to $+5\text{V}$	NONE	SCM5B30-01
2. $-10\text{V}$ to $+10\text{V}$	D	SCM5B30-01D
3. $0\text{V}$ to $+5\text{V}$	NONE	SCM5B30-04
4. $0\text{V}$ to $+10\text{V}$	D	SCM5B30-04D

# SCMVAS

## Voltage Attenuator System



### Description

The SCMVAS (Signal Conditioning Modular Voltage Attenuator System) is an analog signal conditioning system designed to safely monitor and accurately measure voltage potentials up to 495VAC (1400V peak-to-peak). These high-level voltages are typically found in industrial applications such as induction heaters or electric-motor drive controllers. The system reduces the input signal to a level suitable for interface to data acquisition systems, while at the same time providing various filter characteristics and 1500Vrms isolation (Figure 1).

For each channel of analog input, an attenuator module, SCMVAS-Mnnn, pre-conditions the signal which is then filtered, isolated, and converted to a high-level voltage output using an SCM5B30-07 or SCM5B40-07 module. The SCM5B40-07 module with a 10kHz bandwidth is recommended for common 50/ 60Hz signals low in harmonics where the user is interested in measuring only AC voltage. The SCM5B30-07 module is used for low frequency AC signals below 4Hz. The attenuator and signal conditioning modules have excellent stability over time and do not require recalibration. Overall system accuracy is  $\pm 0.06\%$ .

Input signal connections to the SCMVAS-Mnnn attenuator module are made using a pluggable terminal block for ease of system assembly and reconfiguration. For safety purposes, the terminal block has a cover over the screws and there are no other exposed high-voltage points on the SCMVAS-Mnnn series modules, SCM5B30-07 or SCM5B40-07 module, or the mounting backpanel.

The SCMVAS system has two specially designed backpanels for mounting the attenuator and signal conditioning modules. The SCMVAS-PB8 high density, 8- channel backpanel (Figures 2, 3) can be panel mounted or DIN rail mounted and provides the conditioned output signal on screw terminal blocks. Jumpers are provided on each channel to optionally connect or isolate each module's I/O Common from other channel's I/O Common and/or Power Common. The SCMVAS-PB16 (Figures 4, 5) has 16 channels of analog I/O simultaneously available to high-speed data acquisition (ADC) boards through a 26-conductor ribbon cable. Refer to the SCMPB01 Data Sheet in this catalog and Application Note AN502 at [www.dataforth.com](http://www.dataforth.com) for recommended ground connections and host system interfaces. Both the SCMVAS-PB8 and SCMVAS-PB16 backpanels can be mounted on the SCMXRK-002 19-inch metal rack.

### Features

- Accepts High Voltage Signals up to 495VAC (1400V Peak-to-Peak)
- 5 or 10 Volt Output for A/D Systems
- 1500Vrms Transformer Isolation
- True 3-Way Isolation
- Up to 160dB CMR
- $\pm 0.06\%$  Accuracy
- Panel or DIN Rail Mounting Options
- CSA Certified
- CE Compliant
- ATEX Compliant (all models except SCMVAS-M400, -M500, -M600, -M650)

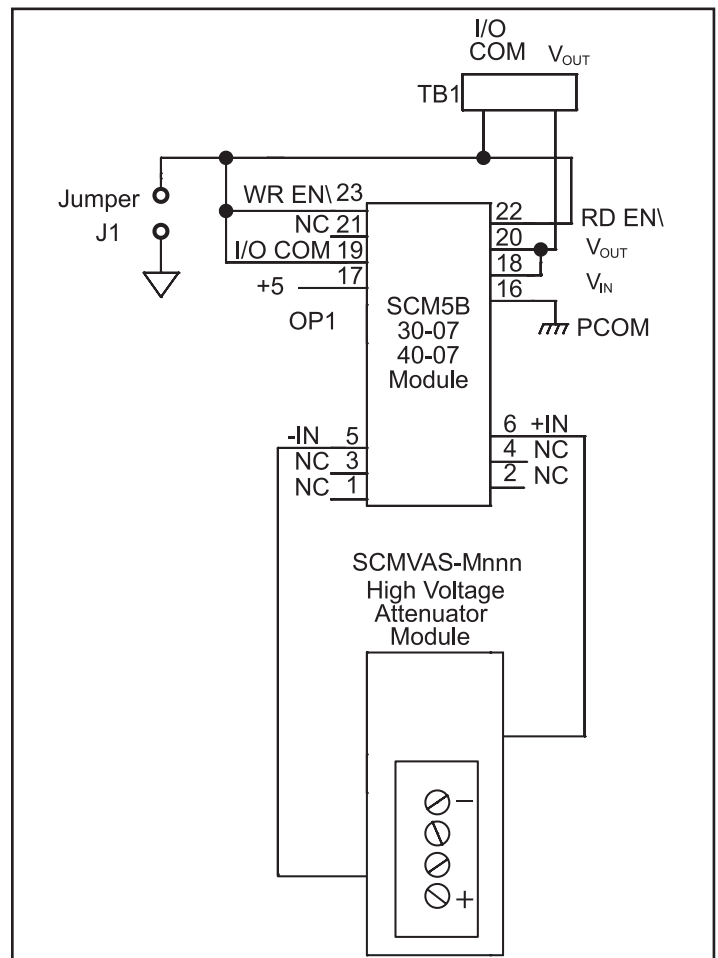


Figure 1: SCMVAS Schematic

# SCM5B30/40-07

## Isolated Analog Voltage Input Modules



### Specifications Typical\* at T<sub>A</sub> = +25°C and +5VDC power

Module	SCM5B30-07	SCM5B40-07
Input Range	−1.0V to +1.0V	*
Input Bias Current	±0.5nA	*
Input Resistance		
Normal	50MΩ	200MΩ
Power Off	40kΩ	*
Overload	40kΩ	*
Input Protection		
Continuous	240Vrms max	*
Transient	ANSI/IEEE C37.90.1	*
CMV, Input to Output		
Continuous	1500Vrms max	*
Transient	ANSI/IEEE C37.90.1	*
CMR (50 or 60Hz)	160dB	100dB
NMR	95dB at 50Hz, 90dB at 60Hz	120dB per Decade above 10kHz
Accuracy <sup>(1)</sup>	±0.03% Span	*
Linearity	±0.005% Span	±0.01% Span
Stability		
Input Offset	±20μV/°C	*
Output Offset	±20μV/°C	*
Gain	±50ppm/°C	*
Noise		
Input, DC to 10Hz	2μVrms	*
Output, 100kHz	200μVrms	2mVp-p
Bandwidth, −3dB	4Hz	10kHz
Response Time (to 90% final value)	0.2s	35μs
Output Range	−5V to +5V (−10V to +10V, D model versions)	*
Output Resistance	50Ω	*
Output Protection	Continuous Short to Ground	*
Output Selection Time (to ±1mV of V <sub>OUT</sub> )	6.0μs 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	±200μV/% RTI <sup>(2)</sup>	*
Mechanical Dimensions (h)(w)(d)	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 EN61000-6-4	ISM, Group 1	*
Radiated, Conducted	Class A	*
Immunity EN61000-6-2	ISM, Group 1	*
RF	Performance A ±0.5% Span Error	*
ESD,EFT	Performance B	*

### Ordering Information

Model	Description
SCM5B30-07	V Isolation Module, ±5V Output, 4Hz Bandwidth
SCM5B40-07	V Isolation Module, ±5V Output, 10kHz Bandwidth
SCM5B30-07D	V Isolation Module, ±10V Output, 4Hz Bandwidth
SCM5B40-07D	V Isolation Module, ±10V Output, 10kHz Bandwidth

#### NOTES:

\*Contact factory or your local Dataforth sales office for maximum values.

(1) Includes linearity, hysteresis and repeatability.

(2) RTI = Referenced to input.



# SCMVAS-Mnnn

## High Voltage Attenuator Modules



### Specifications Typical\* at T<sub>A</sub> = +25°C

Module	SCMVAS-Mnnn
Input Range	±100Vpeak to ±700Vpeak (70VAC to 495VAC)
Input Voltage Maximum	±750Vpeak
Input Resistance	10MΩ
Accuracy	±0.03%
Stability	±50ppm/°C
Output Range	±1V
Output Resistance	<100kΩ
Mechanical Dimensions (h)(w)(d)	1.70" x 1.98" x 0.69" (44mm x 51mm x 18mm)
Environmental	
Operating Temp. Range	-40°C to +85°C
Storage Temp. Range	-40°C to +85°C
Relative Humidity	0 to 95% Noncondensing
HazLoc	
CSA	All models except SCMVAS-M700
ATEX	All models except SCMVAS-M400, -M500, -M600, -M650, -M700

\*Contact factory or your local Dataforth sales office for maximum values.

### Ordering Information

Model	Description	Input Range with V Isolation Module
SCMVAS-M100	Attenuator Module	±100V Input (70VAC)
SCMVAS-M200	Attenuator Module	±200V Input (141VAC)
SCMVAS-M300	Attenuator Module	±300V Input (212VAC)
SCMVAS-M400	Attenuator Module	±400V Input (282VAC)
SCMVAS-M500	Attenuator Module	±500V Input (353VAC)
SCMVAS-M600	Attenuator Module	±600V Input (424VAC)
SCMVAS-M650	Attenuator Module	±650V Input (460VAC)
SCMVAS-M700	Attenuator Module	±700V Input (495VAC)
SCMVAS-MPT	Attenuator Module, Pass-Thru 1-to-1	

### Accessories

Model	Description
SCMVAS-PB8	Backpanel, 8-Channel
SCMVAS-PB8D	Backpanel, 8-Channel, DIN Rail Mount
SCMVAS-PB16	Backpanel, 16-Channel
SCMVAS-PB16D	Backpanel, 16-Channel, DIN Rail Mount

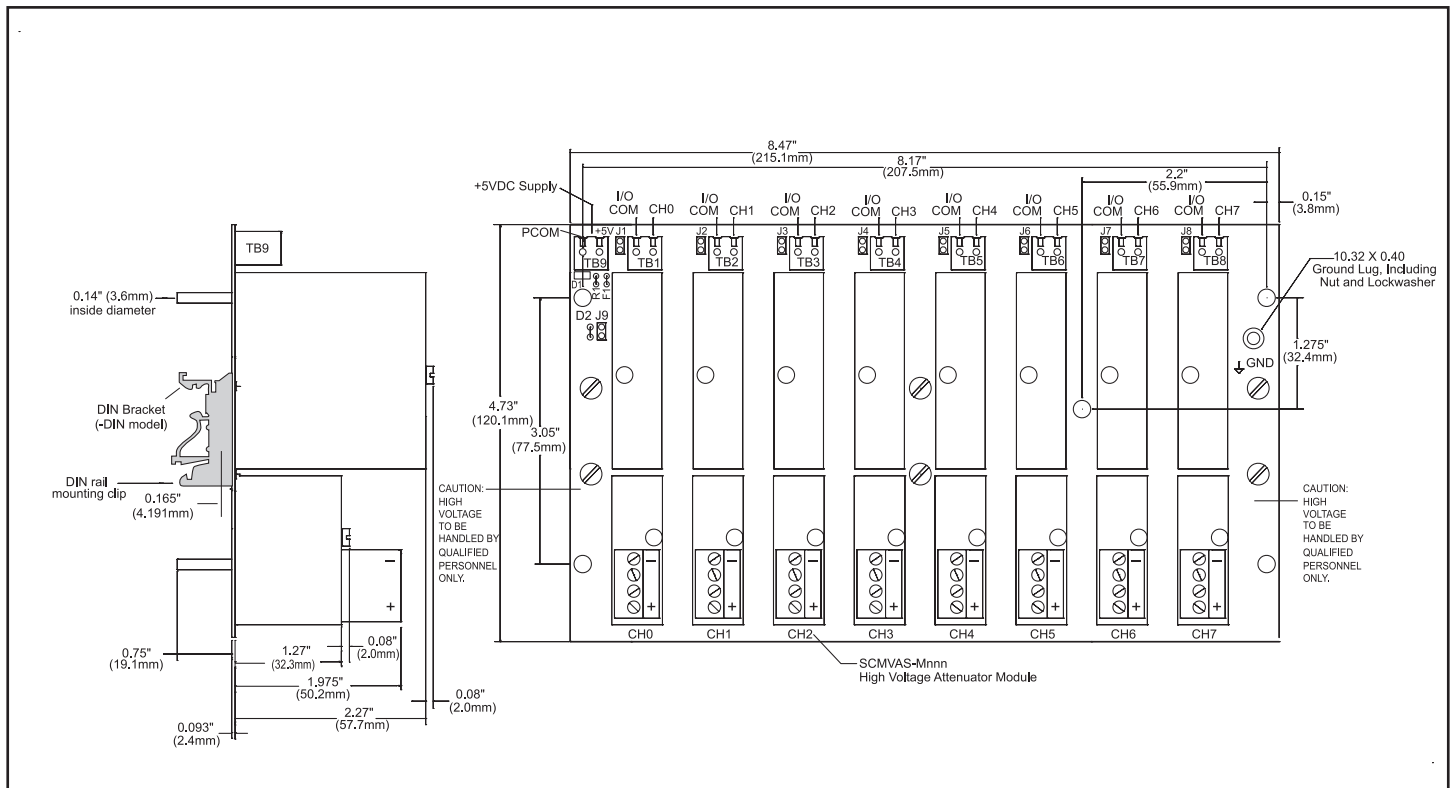


Figure 2: SCMVAS-PB8 Analog I/O Backpanel

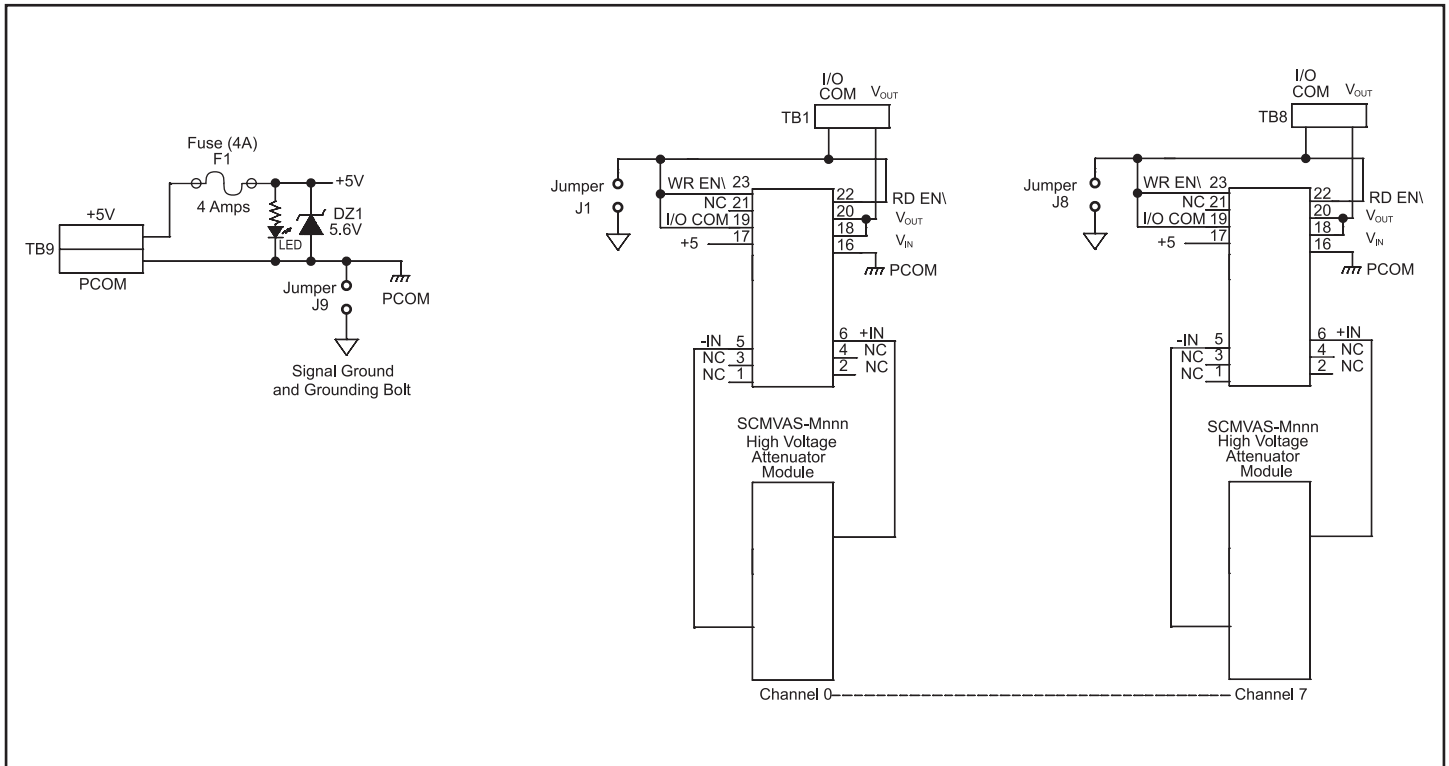


Figure 3: SCMVAS-PB8 Schematic

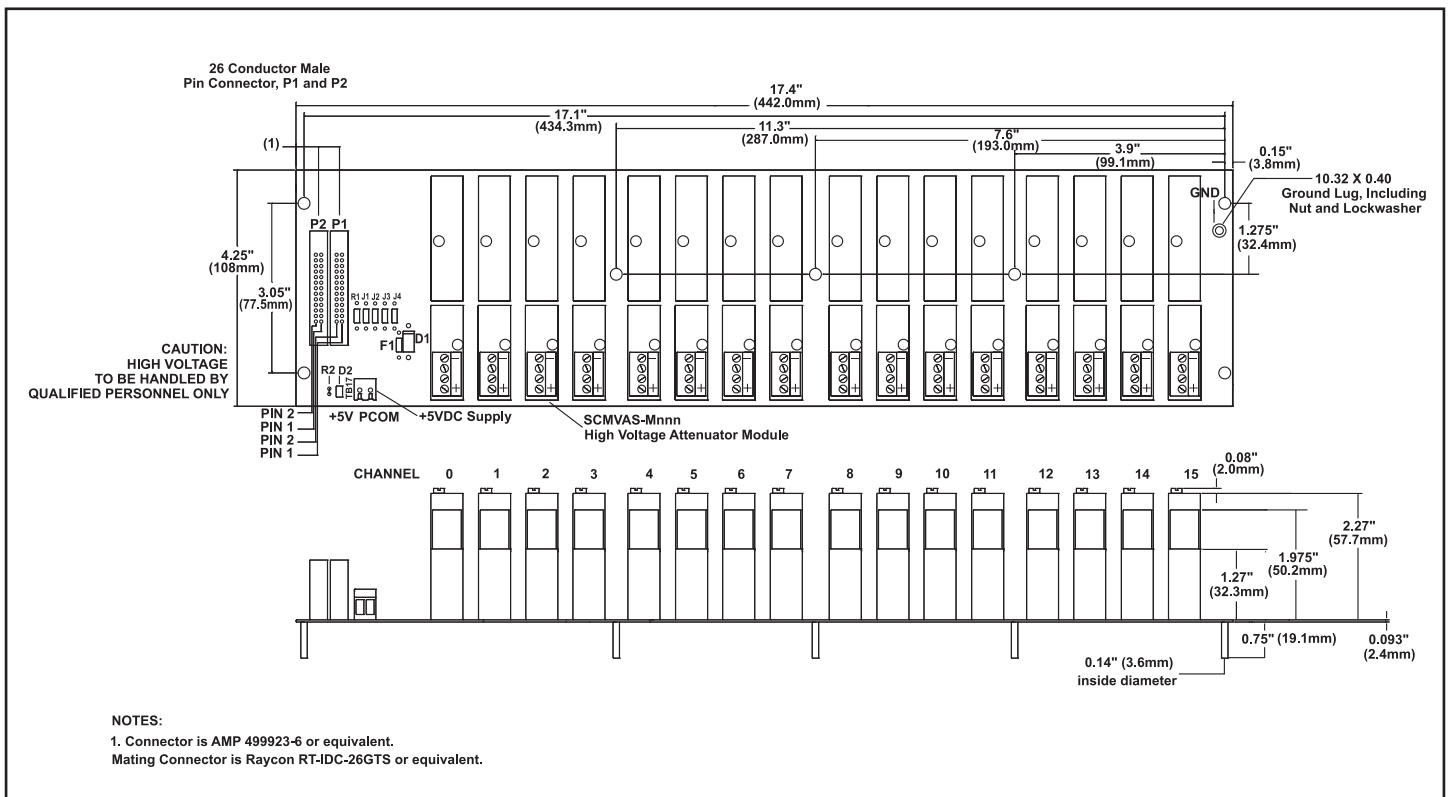


Figure 4: SCMVAS-PB16 Analog I/O Backpanel

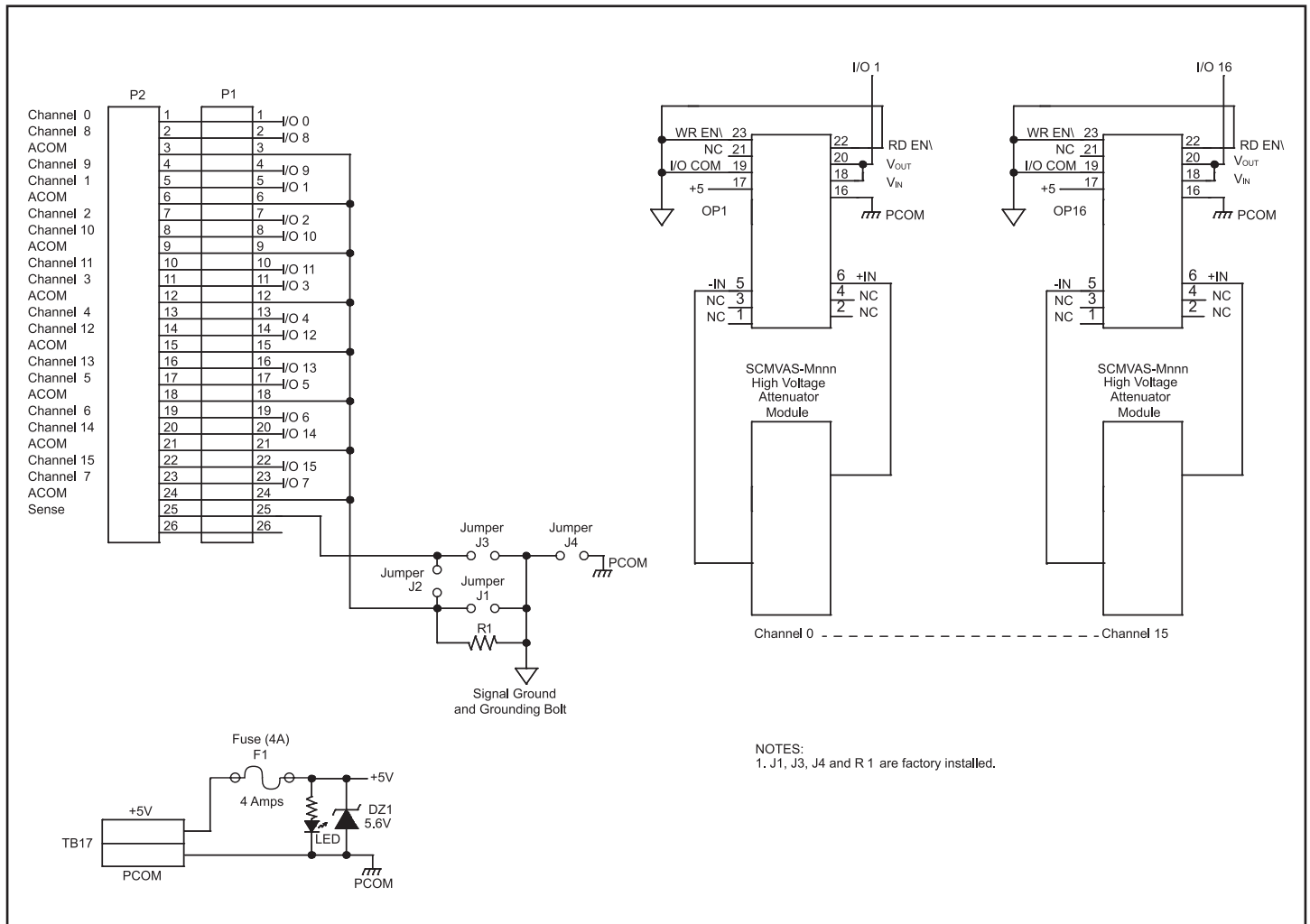


Figure 5: SCMVAS-PB16 Schematic