

# 5B36 Isolated, Potentiometer Input

## Functional Description

The 5B36 is a single-channel signal conditioning module that amplifies, isolates, filters, buffers a wide variety of three-wire potentiometers and two-wire rheostats (slidewires). The module provides an accurately scaled, low-noise low-impedance output of 0 to +5 V.

### Accurate and Stable Performance

The 5B36 supplies protected potentiometer/slidewire excitation from a pair of closely matched precision current sources designed to cancel errors due to lead resistances. A low-drift chopper-stabilized differential amplifier allows use of a very low excitation current to minimize error due to potentiometer self-heating. The amplifiers low input offset drift ( $\pm 0.004 \Omega/^\circ\text{C}$ ) and gain drift of 30 ppm/ $^\circ\text{C}$  assure accuracy over the full operating temperature range.

### True Three-Port Isolation

The floating, differential input circuit on the field side eliminates the need for any input grounding. Signal and power isolation by transformer coupling uses a proprietary modulation technique for linear, stable and reliable performance. A demodulator on the computer side of the signal transformer recovers the original signal, which is then filtered and buffered to provide a low-noise, low-impedance output signal. True three-port isolation (Input-Output-Power) includes common-mode ratings of : 1500 V rms between input-output and input-power; 250 V rms between power and output - no return path is required between the power and signal output commons.

### Filtering and Protection

An optimized five-pole Butterworth filter (with a 4-Hz bandwidth) provides 116 dB of normal-mode rejection (noise on signal) at 60 Hz and 108 dB at 50 Hz. Output noise is an exceptionally low 0.3 mV pk-pk in a 100 kHz bandwidth and 6 mV pk-pk in a 5 MHz bandwidth. The 5B36 protects the computer side from damage due to field-side overvoltage faults. The module withstands 240 V rms at the input terminals without damage, thereby shielding the internal computer-side circuitry from field-side overvoltage conditions. In addition, the 5B36 is mix-and-match and hot swappable with all other 5B Series modules, so can be inserted or removed from any socket in the same backplane without disrupting system power.

### Convenience Features

A series output switch eliminates the need for external multiplexing in many applications. The switch is turned on by an active-low enable input. If the switch is to be on at all times, the enable-input should be grounded to output common as it is on the 5B01 and 5B08 backplanes.

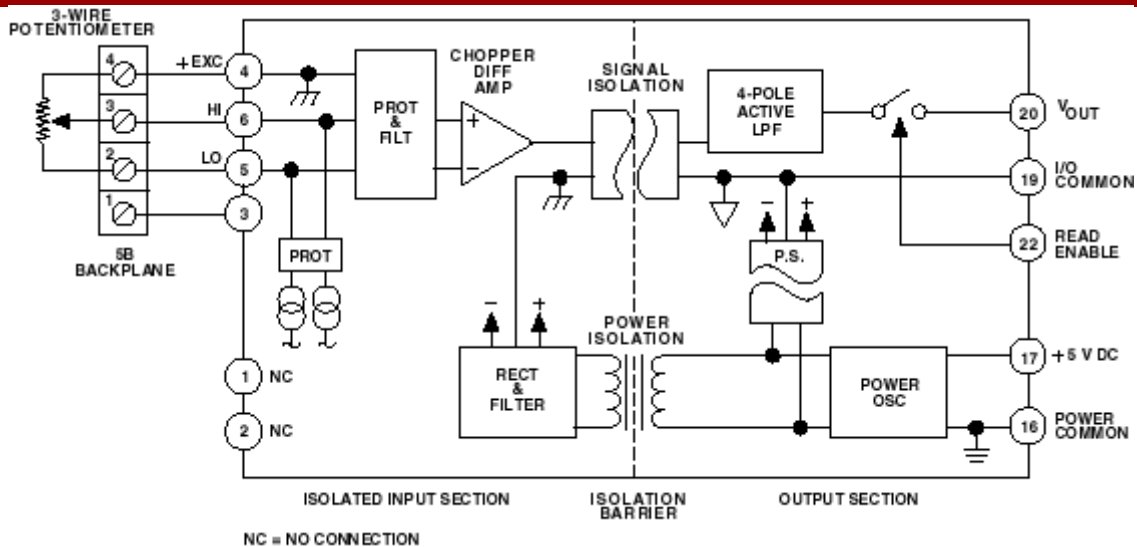


Figure 1. 5B36 Functional Block Diagram

### Input Types

Potentiometers/  
Slidewires to 10k  $\Omega$

### Output Range

0 to +5 V

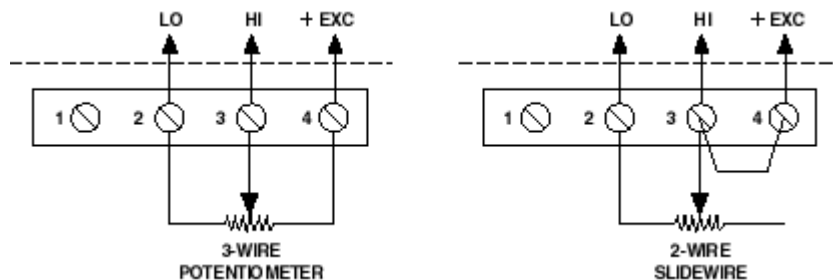


Figure 2. 5B36 Input Field Connections

Model	Input Range	Output Range
5B36-01	0 $\Omega$ to 100 $\Omega$	0 V to +5 V
5B36-02	0 $\Omega$ to 500 $\Omega$	0 V to +5 V
5B36-03	0 $\Omega$ to 1 k $\Omega$	0 V to +5 V
5B36-04	0 $\Omega$ to 10 k $\Omega$	0 V to +5 V
5B36-Custom	*	*

\* Custom Input/Output ranges are available.

### 5B36 Specifications

(typical @ +25°C and  $V_s = +5$  V dc)

Description	Model 5B36
<b>Input Ranges</b>	
Standard Ranges	0 $\Omega$ to 10 k $\Omega$ (Refer to Model Table)
Custom Ranges	0 $\Omega$ to 10 k $\Omega$ (Refer to Ordering Section)
Output Range ( $R_L > 50$ k $\Omega$ )	0 V to +5 V
<b>Accuracy<sup>1</sup></b>	
Initial @ +25°C	±0.08% Span
<b>Input Offset vs. Temperature</b>	
100 $\Omega$ , 500 $\Omega$ , 1 k $\Omega$ Sensors	±0.004 $\Omega$ /°C
10 k $\Omega$ Sensor	±0.01 $\Omega$ /°C
Output Offset vs. Temperature	±20 $\mu$ V/°C
Gain vs. Temperature	±0.003% of Reading/°C
<b>Input Resistance</b>	
Power On	> 1000 M $\Omega$
Power Off	200 k $\Omega$
Overload	200 k $\Omega$
<b>Noise</b>	
Input, 0.1 Hz to 10 Hz Bandwidth	0.2 $\mu$ V rms
Output, 100 kHz Bandwidth	100 $\mu$ V rms (0.3 mV peak-peak)
Output, 1 MHz Bandwidth	1.5 mV peak-peak
Output, 5 MHz Bandwidth	6 mV peak-peak
Bandwidth, -3 dB	4 Hz
Output Rise Time, 10% to 90% Span	100 ms
<b>Common-Mode Voltage (CMV)</b>	
Input-to-Output, Continuous	1500 V rms, maximum
Input-to-Power, Continuous	1500 V rms, maximum
Output-to-Power, Continuous <sup>2</sup>	250 V rms, maximum
Transient	ANSI/IEEE C37.90.1-1989
<b>Common Mode Rejection (CMR)</b>	
1 k $\Omega$ Source Imbalance, 50/60 Hz	170 dB
Normal Mode Rejection (NMR)	116 dB @ 60 Hz; 108 dB @ 50 Hz
<b>Sensor Excitation Current</b>	
100 $\Omega$ , 500 $\Omega$ , 1 k $\Omega$ Sensors	0.25 mA
10 k $\Omega$ Sensor	0.1 mA
<b>Lead Resistance Effect</b>	

100 $\Omega$ , 500 $\Omega$ , 1 k $\Omega$ Sensors	$\pm 0.005$ $\Omega/\Omega$
10 k $\Omega$ Sensor	$\pm 0.01$ $\Omega/\Omega$
<b>Input Protection</b>	
Continuous	240 V rms, maximum
Transient	ANSI/IEEE C37.90.1-1989
Output Resistance	25 $\Omega$
Voltage Output Protection	Continuous Short to Ground
Output Current Limit	$\pm 9$ mA
Output Selection Time	6 $\mu$ s to $\pm 1$ mV of $V_{out}$ @ $C_{load} = 0$ to 2,000 pF
<b>Output Enable Control<sup>2</sup></b>	
Max Logic "0"	+0.8 V
Min Logic "1"	+2.4 V
Max Logic "1"	+100 V
Input Current "0", "1"	0.5 $\mu$ A
Power Supply Voltage	+5 V dc $\pm 5\%$
Power Supply Current	15 mA
Power Supply Sensitivity, RTI	$\pm 2$ $\mu$ V/% of $V_s$
Mechanical Dimensions	2.275" x 2.375" x 0.595" (57.8 mm x 59.1 mm x 15.1 mm)
<b>Environmental</b>	
<b>Temperature Range</b>	
Rated Performance	-40°C to +85°C
Operating	-40°C to +85°C
Storage	-40°C to +85°C
Relative Humidity	0 to 93% @ +40°C noncondensing
RFI Susceptibility	$\pm 0.5\%$ Span error @ 400 MHz, 5 Watt, 3 ft

- $\pm 0.025$   $\Omega$  For Cu RTD's;  $\pm 0.1$   $\Omega$  For Ni RTD's.  
<sup>1</sup>Includes the combined effects of repeatability, hysteresis, and nonlinearity error. Loads heavier than 50 k  $\Omega$  will degrade nonlinearity and gain temperature coefficient.
- <sup>2</sup>The user's board layout must separate Power Common from Output Common. When the output switch is not used, connect the Enable Input to the Output Common. Output Common is connected to power common when the 5B36 is installed on a 5B Series backplane.