

5B30/5B31 Millivolt and Voltage Input

Functional Description

The 5B30 and 5B31 are single-channel signal conditioning modules that amplify, protect, filter and isolate analog input voltages.

The 5B30 and 5B31 protect the computer side from damage due to field-side overvoltage faults. All models withstand 240 V rms at their input terminals without damage thereby shielding computer-side circuitry from field-side overvoltage conditions. In addition, 5B30 and 5B31 Series modules are mix-and-match and hot swappable, so can be inserted or removed from any socket in the same backplane without disrupting system power.



Inside 5B30/5B31 Modules

A chopper-stabilized input amplifier provides low drift and stable gain. At the amplifier input, a stable, laser-trimmed zero-scale input voltage is subtracted from the input signal to set the zero-scale value. For user convenience, the zero can be optionally factory-set to meet custom needs. This allows suppression of a zero-scale input value many times larger than the total span for precise expanded-scale measurements.

Internal multi-pole lowpass filtering with a four-Hz cutoff (-3dB) enhances normal-mode (noise on signal) and common-mode (noise on signal return) rejection at 50/60 Hz, enabling accurate measurement of small signals in high electrical noise. Signal isolation by transformer coupling uses a proprietary modulation technique for linear, stable and reliable performance. The differential input circuit on the field side is fully floating, eliminating the need for any input grounding. 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. The output common must be kept within ± 3 V of power common.

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. The enable input should be grounded to power common if the output need not be switched.

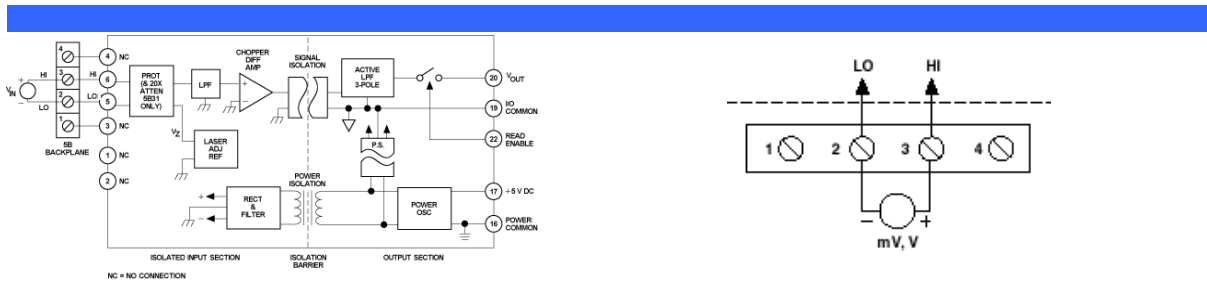


Figure 1. 5B30 and 5B31 Functional Block Diagram

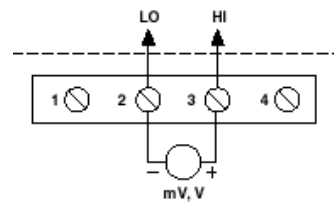


Figure 2. 5B30 and 5B31 Input Field Connections

Input Ranges
 5B30 mV Input:
 ± 10 to ± 100 mV
 (± 5 to ± 500 mV custom)
 5B31 V Input:
 ± 1 to ± 20 V
 (± 0.5 to ± 20 V custom)

Output Ranges
 5B30/5B31:
 -5 V to +5 V or 0 to +5 V

5B30 and 5B31 Models Available

Model	Input Range	Output Range
5B30-01	-10 mV to +10 mV	-5 V to +5 V
5B30-02	-50 mV to +50 mV	-5 V to +5 V
5B30-03	-100 mV to +100 mV	-5 V to +5 V
5B30-04	-10 mV to +10 mV	0 V to +5 V
5B30-05	-50 mV to +50 mV	0 V to +5 V
5B30-06	-100 mV to +100 mV	0 V to +5 V
5B30-Custom	*	*

Model	Input Range	Output Range
5B31-01	-1 V to +1 V	-5 V to +5 V
5B31-02	-5 V to +5 V	-5 V to +5 V
5B31-03	-10 V to +10 V	-5 V to +5 V
5B31-04	-1 V to +1 V	0 V to +5 V
5B31-05	-5 V to +5 V	0 V to +5 V
5B31-06	-10 V to +10 V	0 V to +5 V
5B31-07	-20 V to +20 V	-5 V to +5 V
5B31-Custom	*	*

5B30 and 5B31 Specifications

Description	Model 5B30	Model 5B31
Input Ranges		
Standard Ranges	± 10 mV to ± 100 mV	± 1 V to ± 20 V
Custom Ranges	± 5 mV to ± 500 mV	± 0.5 V to ± 20 V
Output Ranges ($R_L > 50$ k Ω) ⁴	-5 V to +5 V or 0 V to +5 V	*

Accuracy ²		
Initial @ +25°C	±0.05% Span ±10 µV RTI ±0.05% (Vz ¹)	±0.05% Span ±0.2 mV RTI ±0.05% (Vz ¹)
Nonlinearity	±0.02% Span	*
Input Offset vs. Temperature	±1 µV/°C	±20 µV/°C
Output Offset vs. Temperature	±20 µV/°C	*
Gain vs. Temperature	±25 ppm of Reading/°C	±50 ppm of Reading/°C
Input Bias Current	±3 nA	±0.2 nA
Input Resistance		
Power On	5 MΩ	650 kΩ
Power Off	40 kΩ	650 kΩ
Overload	40 kΩ	650 kΩ
Noise		
Input, 0.1 Hz to 10 Hz Bandwidth	0.2 µV rms	2 µV rms
Output, 100 kHz Bandwidth	200 µV rms	*
Bandwidth, -3 dB	4 Hz	*
Output Rise Time, 10% to 90% Span	200 ms	*
Common-Mode Voltage (CMV) ³		
Input-to-Output, Continuous	1500 V rms maximum	*
Output-to-Power, Continuous	±3 V maximum	*
Transient	ANSI/IEEE C37.90.1-1989	*
Common-Mode Rejection (CMR)		
1 kΩ Source Imbalance, 50/60 Hz	160 dB (all ranges)	160 dB (span < ±2 V) 150 dB (span = ±10 V)
Normal Mode Rejection, 50/60 Hz	60 dB	*
Input Protection		
Continuous	240 V rms maximum	*
Transient	ANSI/IEEE C37.90.1-1989	*
Output Resistance ⁴	50 Ω	*
Voltage Output Protection	Continuous Short to Ground	*
Output Selection Time	6 µs @ C _{load} = 0 to 2,000 pF	*
Output Enable Control		
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 Current	30 mA	*
Power Supply Sensitivity, RTI	±2 µV/Vs%	±0.4 mV/Vs%
Mechanical Dimensions	2.275" x 2.375" x 0.595" (57.8 mm x 59.1 mm x 15.1 mm)	*
Environmental		
Temperature Range		
Rated Performance	-25°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	±0.5% Span error @ 400 MHz, 5 Watt, 3 ft	*