



Technologies/Applications

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5B40/5B41 Isolated, Wide Bandwidth Millivolt and Voltage Input

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Functional Description

The 5B40 and 5B41 are wide-bandwidth single-channel signal conditioning modules that amplify, protect, filter and isolate analog input voltages. Both modules provide a 10 kHz bandwidth which ideally suits them to measuring signals that vary rapidly with time. Examples include pressure inside a plastic injection molding machine, strain on an automobile chassis during a crash test and vibrations on a machine bearing shortly before failure.



The 5B40 and 5B41 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, 5B40 and 5B41 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 5B40/5B41 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.

A single-pole anti-aliasing filter resides at each modules input. A three-pole, low-pass filter in the output stage sets the bandwidth and yields optimal noise performance for 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 Vdc 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.

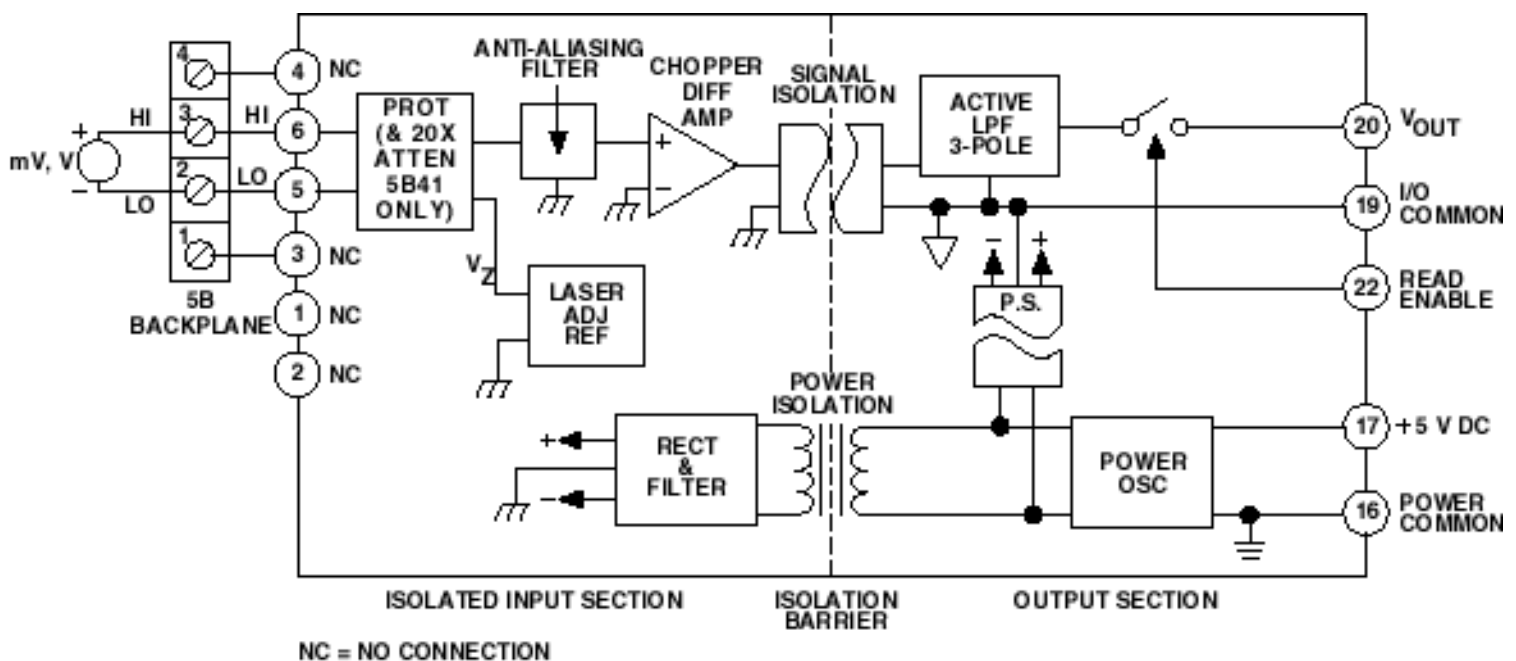


Figure 1. 5B40 and 5B41 Functional Block Diagram

Input Ranges

- 5B40 mV Input:
±10 mV to ±100 mV
(±5 mV to ±500 mV - custom)
- 5B41 V Input:
±1 V to ±20 V
(±0.5 V to ±20 V - custom)

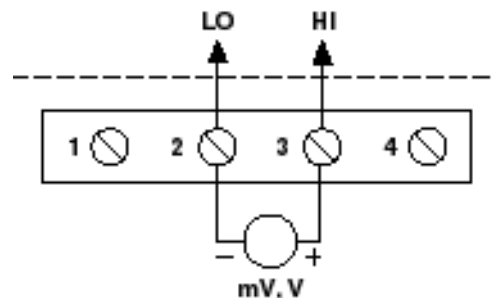


Figure 2. 5B40 and 5B41 Input Field Connections

Output Ranges

- 5B40/5B41:

-5 V to +5 V or 0 to +5 V

5B40 and 5B41 Models Available

Model	Input Range	Output Range
5B40-01	-10 mV to +10 mV	-5 V to +5 V
5B40-02	-50 mV to +50 mV	-5 V to +5 V
5B40-03	-100 mV to +100 mV	-5 V to +5 V
5B40-04	-10 mV to +10 mV	0 V to +5 V
5B40-05	-50 mV to +50 mV	0 V to +5 V
5B40-06	-100 mV to +100 mV	0 V to +5 V
5B40-Custom	*	*

Model	Input Range	Output Range
5B41-01	-1 V to +1 V	-5 V to +5 V
5B41-02	-5 V to +5 V	-5 V to +5 V
5B41-03	-10 V to +10 V	-5 V to +5 V
5B41-04	-1 V to +1 V	0 V to +5 V
5B41-05	-5 V to +5 V	0 V to +5 V
5B41-06	-10 V to +10 V	0 V to +5 V
5B41-07	-20 V to +20 V	-5 V to +5 V
5B41-Custom	*	*

* Custom Input/Output ranges are available. Refer to [ordering guide](#).

5B40 and 5B41 Specifications

Description	Model 5B40	Model 5B41
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 ($R_L > 50$ kΩ)⁴	-5 V to +5 V or 0 V to +5 V	*
Accuracy²		
Initial @ +25°C	$\pm 0.05\%$ Span ± 10 μ V RTI $\pm 0.05\%$ (V_Z^1)	$\pm 0.05\%$ Span $\pm 0.05\%$ (V_Z^1)
Nonlinearity	$\pm 0.02\%$ Span	*
Input Offset vs. Temperature	± 1 μ V/°C	± 20 μ V/°C
Output Offset vs. Temperature	± 40 μ V/°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	200 M Ω	650 k Ω
Power Off	40 k Ω	650 k Ω
Overload	40 k Ω	650 k Ω
Noise		
Input, 0.1 Hz to 10 Hz Bandwidth	0.4 μ V rms	2 μ V rms

Output, 100 kHz Bandwidth	10 mV peak-peak	*
Bandwidth, -3 dB	10 kHz	*
Output Rise Time, 10% to 90% Span	35 μ s	*
Common-Mode Voltage (CMV)³		
Input-to-Output, Continuous	1500 V rms, maximum	*
Output-to-Power, Continuous	\pm 3 V maximum	*
Transient	ANSI/IEEE C37.90.1-1989	*
Common-Mode Rejection (CMR)		
1 k Ω Source Imbalance, 50/60 Hz	100 dB	90 dB
Normal Mode Rejection	-3 dB @ 10 kHz	*
Input Protection		
Continuous	240 V rms, maximum	*
Transient	ANSI/IEEE C37.90.1-1989	*
Output Resistance	50 Ω	*
Voltage Output Protection	Continuous Short to Ground	*
Output Selection Time	6 μ s @ 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 \pm 5%	*
Power Supply Current	30 mA	*
Power Supply Sensitivity, RTI	\pm 2 μ V/Vs%	\pm 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	\pm 0.5% Span error @ 400 MHz, 5 Watt, 3 ft	*

* Specifications same as model 5B40.

¹ V_Z is the nominal input voltage that results in a 0 V output.

² Includes the combined effects of repeatability, hysteresis, and nonlinearity and assumes $R_L > 50 \text{ k}\Omega$. Loads heavier than $50 \text{ k}\Omega$ will degrade nonlinearity and gain temperature coefficient.

³ The output common must be kept within $\pm 3 \text{ V}$ of power common.

Specifications subject to change without notice.

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