5B38 Isolated, Wide-Bandwidth Strain Gage Input

Functional Description

The 5B38 is a wide-bandwidth single-channel signal conditioning module that interfaces, amplifies, and filters signals from full-bridge and half-bridge strain-gage transducers between 300 Ω and 10 kΩ. The module provides an isolated bridge excitation of +10 V and a protected, isolated precision output of -5 V to +5 V. The 10 kHz bandwidth of the module ideally suits to measure signals that vary rapidly with time, such as strain on an automobile chassis during a crash test.

The 5B38 protects the computer side from damage due to field-side overvoltage faults. The module withstands 240 V rms at its input terminals without damage, thereby shielding computer-side circuitry from field-side overvoltage conditions. In addition, the 5B38 is mix-and-match and hot-swappable with all 5B Series modules, so can be inserted or removed from any socket in the same backplane without disrupting system power.

The 5B38-04 contains bridge completion circuitry, so can function with half-bridge strain gages. For quarter-bridge requirements, the user must complete the bridge input to the half-bridge level externally. The factory can configure the module for a wide range of input ranges (sensitivities).

Inside the 5B38 Module

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. A chopper-stabilized input amplifier provides low drift and stable gain.

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. An additional benefit, the output section acts as a third floating port, eliminating possible problems from ground loops and power-supply noise. 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, as on the 5B01 and 5B08 backplanes.

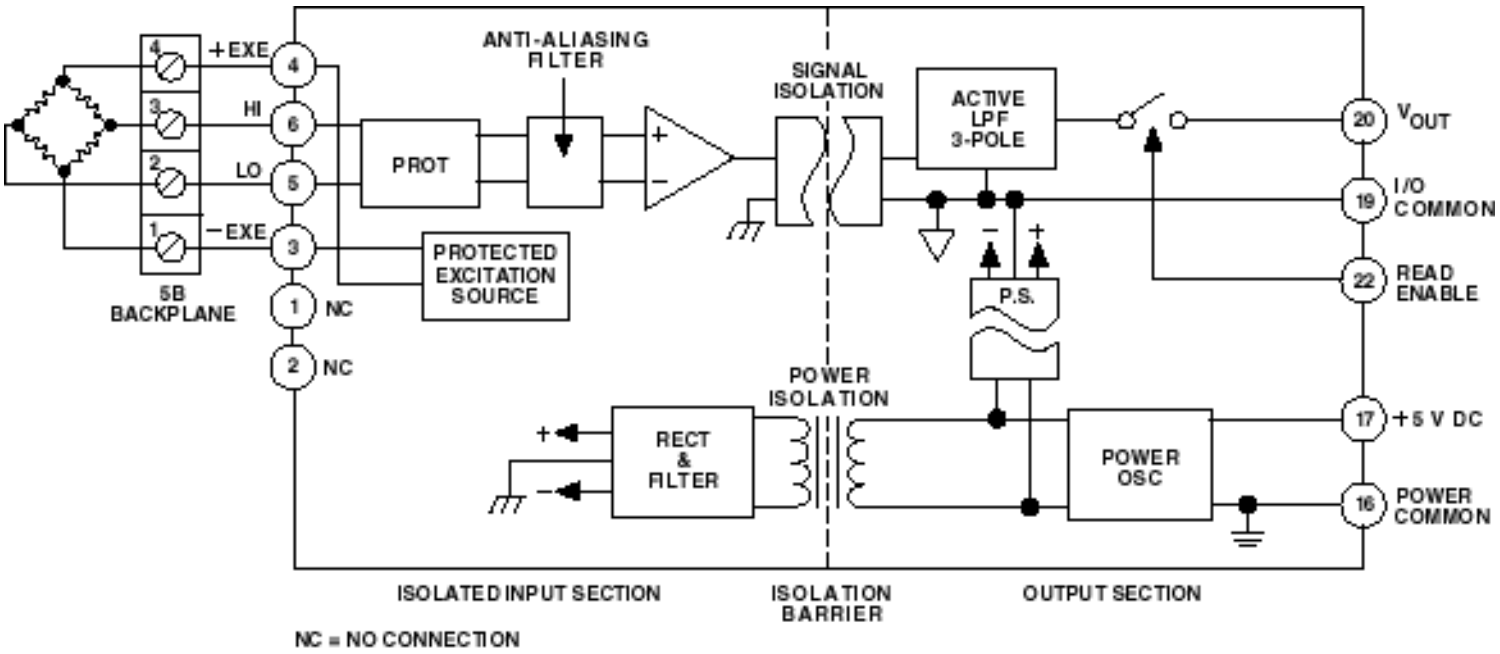

Figure 1. 5B38 Functional Block Diagram

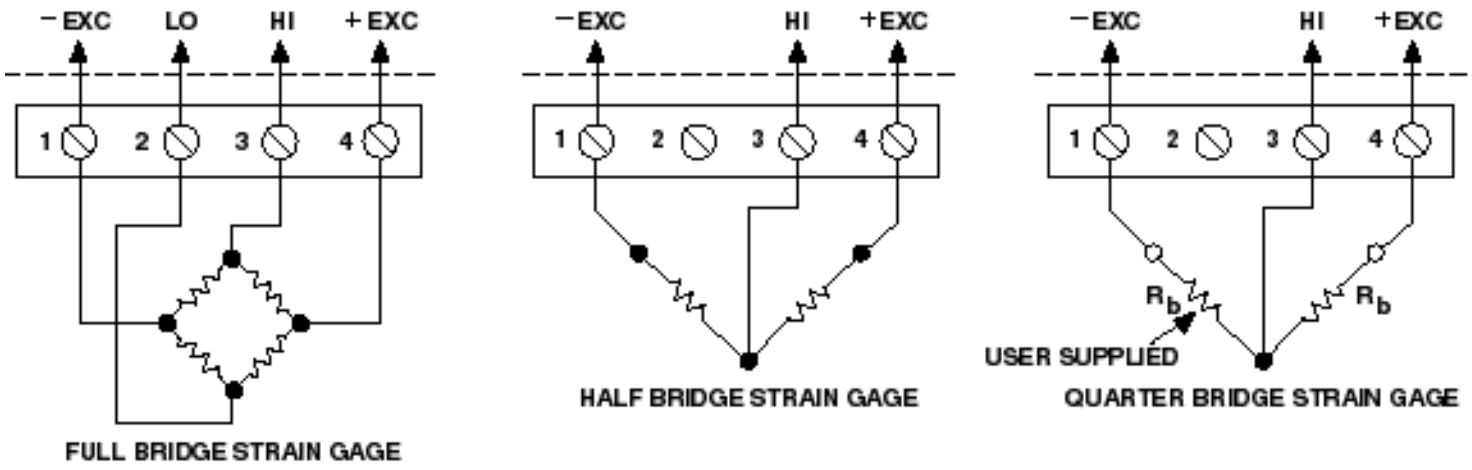

Figure 2. 5B38 Input Field Connections

Input Type

- Strain Gage: Full-Bridge/Half-Bridge

Output Ranges

- -5 V to +5 V

5B38 Models Available

Model	Input Bridge Type	Bridge Range	Excitation	Sensitivity	Output Range
5B38-02	Full Bridge	300 Ω to 10 kΩ	+10.0 V	3 mV/V	-5 V to +5 V
5B38-04	Half Bridge	300 Ω to 10 kΩ	+10.0 V	3 mV/V	-5 V to +5 V
5B38-05	Full Bridge	300 Ω to 10 kΩ	+10.0 V	2 mV/V	-5 V to +5 V
5B38-Custom	*	300 Ω to 10 kΩ	+10.0 V	*	-5 V to +5 V

* Custom Input/sensitivity ranges are available. Refer to ordering guide.

5B38 Specifications

Description	Model 5B38 Full Bridge	Model 5B38 Half Bridge
Input Ranges		
Standard Ranges	±20 mV (2 mV/V Sensitivity) ±30 mV (3 mV/V Sensitivity)	±30 mV (3 mV/V Sensitivity)
Custom Ranges	±10 mV to ±500 mV	*
Output Ranges (R_L > 50 kΩ)	-5 V to +5 V	*
Accuracy[2]		
Initial @ +25°C	±0.08% Span ±10 µV RTI	±0.08% Span ±1 mV RTI
Nonlinearity	±0.02% Span	*

Input Offset vs. Temperature	±1 µV/°C	*
Output Offset vs. Temperature	±40 µV/°C	*
Gain vs. Temperature	±25 ppm of Reading/°C	*
Excitation Voltage Output @ full load	+10 V ±3 mV	*
Load Range	10 kΩ, minimum; 300 Ω, maximum	*
Load Regulation	±5 ppm/mA	*
vs. Temperature	±15 ppm/°C	*
Half Bridge Voltage Level	N/A	+5 V ±1 mV
Half Bridge Voltage vs. Temperature	N/A	±15 ppm/°C
Input Bias Current	±3 nA	*
Input Resistance		
Power On	20 MΩ, minimum	*
Power Off	40 kΩ, minimum	*
Overload	40 kΩ, minimum	*
Noise		
Input, 0.1 Hz to 10 Hz Bandwidth	0.4 µV rms	2 µV rms
Input, 10 kHz Bandwidth	±70 nV/√Hz	±250 nV/√Hz
Output, 100 kHz Bandwidth	10 mV peak-peak	*
Bandwidth, -3 dB	10 kHz	*
Output Rise Time, 10% to 90% Span	40 µs	*
Output Settling Time, to 0.1%	250 µs	7 ms
Common-Mode Voltage (CMV)		
Input-to-Output, Continuous	1500 V rms, maximum	*
Output-to-Power, Continuous[2]	±3 V, maximum	*
Transient	ANSI/IEEE C37.90.1-1989	*
Common-Mode Rejection (CMR)		
1 kΩ Source Imbalance, 50/60 Hz	100 dB	*
Normal Mode Rejection, 50/60 Hz	-3 dB @ 10 kHz	*
Input Protection, Signal and Excitation Voltage		
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 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	200 mA, Full Load; 120 mA, No Load	*
Power Supply Sensitivity	25 ppm reading/% ±2.5µV RTI/%	*
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	*

* Same as full-bridge version.

[1] Includes the combined effects of repeatability, hysteresis, and nonlinearity. Loads heavier than 50 kΩ will degrade nonlinearity and gain temperature coefficient.

[2] The output common must be kept within ±3 V of power common.

Specifications subject to change without notice.