



Technologies/Applications

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7B31 Isolated, Voltage Input

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Functional Description

The 7B31 is a single-channel signal conditioning module that interfaces, amplifies and filters unipolar and bipolar voltage inputs and provides a protected precision output of either +1 V to +5 V or 0 V to +10 V. Model 7B31 features a nonlinearity of $\pm 0.02\%$ maximum and an accuracy of $\pm 0.1\%$ maximum ($\pm 0.01\%$ typical). To accurately measure low level signals in electrically noisy environments, 1500 V rms of galvanic transformer-based isolation with a common mode rejection (CMR) of 120 dB @ 50/60 Hz and a normal mode rejection (NMR) of 60 dB @ 50/60 Hz are provided. Rated to operate with a nominal +24 V DC supply, Model 7B31 is mix-and-match and hot-swappable with other 7B Series input modules, so it can be inserted or removed from any socket in the same [backplane](#) without disturbing system power.



Inside the 7B31 Series Module

The floating differential input of Model 7B31 is fully protected up to 120 V rms line voltage. A one-pole 3 Hz filter preconditions the input signal prior to amplification by a low drift input (1500 V rms input-to-output and power). Isolated front-end circuitry power is supplied by a DC/DC converter. The output section contains a two-pole low pass filter (-3 dB @ 3Hz), a buffer amplifier and a power oscillator. The two-pole output filter and subsequent buffer ensures that a low noise, low impedance ($<1 \Omega$) signal is available at the output to drive loads of 2 k Ω minimum.

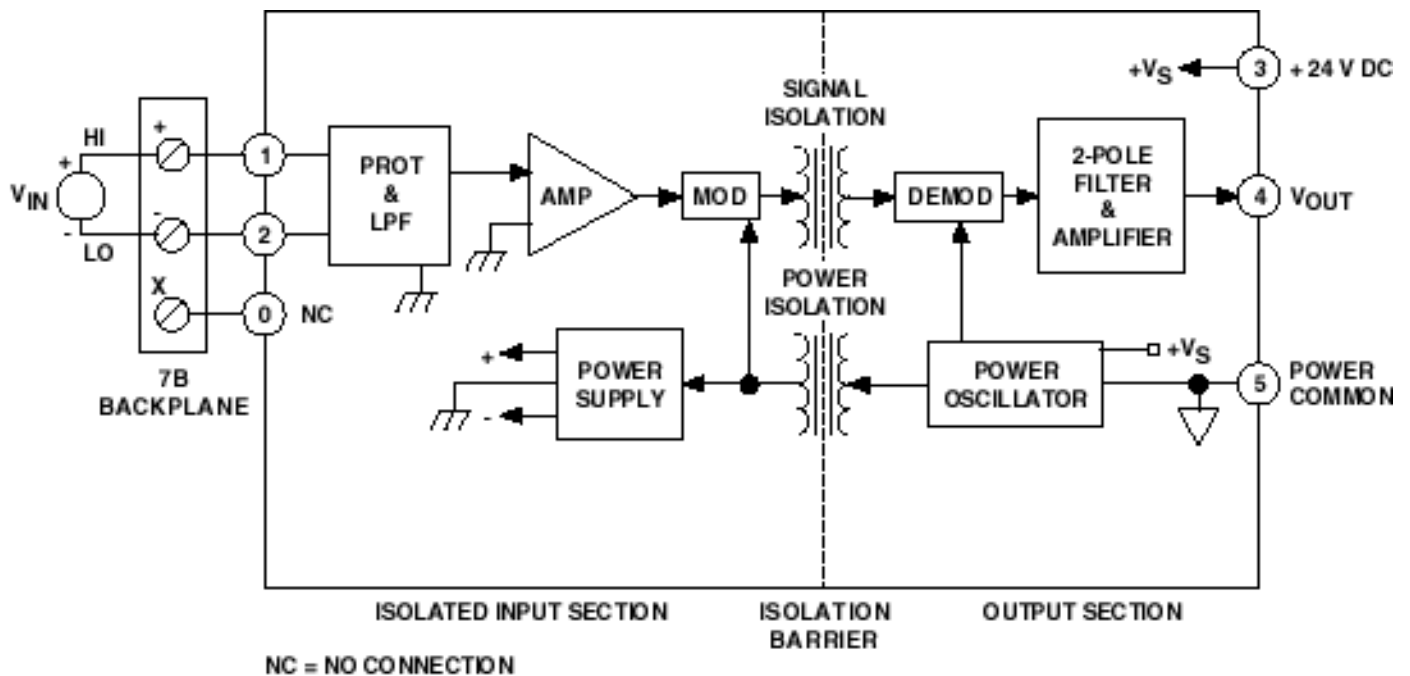


Figure 1. 7B31 Functional Block Diagram

Inputs

- ± 5 V to ± 50 V

Output Options

- +1 V to +5 V
- 0 V to +10 V

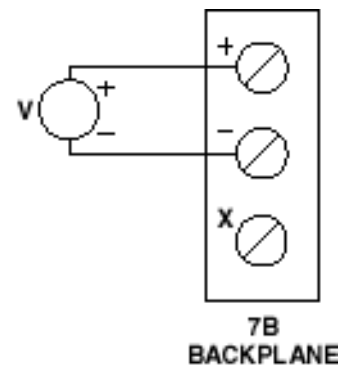


Figure 2. 7B31 Input Field Connections

7B31 Models Available

Model	Input Range	Output Range
7B31-01-1	0 V to +10 V	+1 V to +5 V
7B31-01-2	0 V to +10 V	0 V to +10 V
7B31-02-1	-5 V to +5 V	+1 V to +5 V
7B31-02-2	-5 V to +5 V	0 V to +10 V
7B31-03-1	-10 V to +10 V	+1 V to +5 V
7B31-03-2	-10 V to +10 V	0 V to +10 V
7B31-04-1	0 V to +5 V	+1 V to +5 V
7B31-04-2	0 V to +5 V	0 V to +10 V
7B31-05-1	0 V to +20 V	+1 V to +5 V
7B31-05-2	0 V to +20 V	0 V to +10 V

7B31-06-1	-20 V to +20 V	+1 V to +5 V
7B31-06-2	-20 V to +20 V	0 V to +10 V
7B31-07-1	0 V to +50 V	+1 V to +5 V
7B31-07-2	0 V to +50 V	0 V to +10 V
7B31-08-1	-50 V to +50 V	+1 V to +5 V
7B31-08-2	-50 V to +50 V	0 V to +10 V

7B31 Specifications

(typical @ +23°C ±5°C and $V_s = +24$ V dc)

Description	Model 7B31
Input Ranges	(Refer to Model Table)
Standard Unipolar Ranges	0 V to: +5 V or +10 V or +20 V or +50 V
Standard Bipolar Ranges	±5 V or ±10 V or ±20 V or ±50 V
Custom Ranges	Not Available*
Output Range Options ($R_L > 2$ kΩ)	+1 V to +5 V or 0 V to +10 V
Accuracy¹	
Initial @ +25°C	±0.01% Span (±0.1% Span, maximum)
Nonlinearity ²	±0.02% Span, maximum
Input Offset vs. Temperature	±0.5 μ V/°C
Zero Suppression vs. Temperature	±0.005% (V_z) ³ /°C
Span vs. Temperature	±35 ppm/°C
Output Offset vs. Temperature	±0.002% span/°C
Input Resistance	
Power ON	
7B31-01 to 7B31-04	100 k Ω
7B31-05 to 7B31-08	1 M Ω
Power OFF	30 k Ω , minimum
Output Noise	
5 MHz Bandwidth	6 mV peak
10 Hz to 100 kHz Bandwidth	0.4 mV rms
0.1 Hz to 10 Hz Bandwidth	3 μ V peak
Bandwidth, -3 dB	3 Hz
Output Rise Time, 10% to 90% Span	150 ms
Common-Mode Voltage (CMV)	
Input-to-Output and Power	1500 V rms continuous

Common Mode Rejection (CMR)	
Input-to-Output and Power @ 50/60 Hz	120 dB
Normal Mode Rejection @ 50/60 Hz	120 dB
Input Protection	120 V rms, continuous ±35 V dc, continuous
Input Transient Protection	ANSI/IEEE C376.90.1-1989 IEEE-STD 472 IEC 255-4, Class II
Output Resistance	< 1 Ω
Voltage Output Protection	Continuous Short to Ground
Power Supply	
Voltage Range, Operating	+14 V dc to +35 V dc
Current	+25 mA, maximum
Sensitivity	±0.0001%/ % of V_s
Mechanical Dimensions	1.663" x 2.11" x 0.563" (42.24 mm x 53.6 mm x 14.3 mm)
Weight	60 grams
Environmental	
Temperature Range	
Operating	-40°C to +85°C
Storage	-40°C to +85°C
Relative Humidity, 24 hours	0 to 90% @ +60°C noncondensing
ESD Sensitivity	IEC 801-2, Level 2
RFI Susceptibility	±0.5% Span error @ 400 MHz, 5 Watt, 3 ft

Warm-up time required to meet specifications is approximately 10 minutes.

* Contact factory for OEM requirements.

¹Includes the combined effects of repeatability, hysteresis, and nonlinearity.

²Nonlinearity is calculated using best-fit straight line method.

³ V_z is the nominal input voltage that results in a 0 V output.

Specifications subject to change without notice.

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