AC Strain Gage, Torque Transducer Input

3B20

FEATURES

Interfaces, amplifies, & filters signals from 4-arm AC bridge transducer signals ranging between 1.5mV rms & 150mV rms.

Module provides an AC excitation voltage of 2V rms to 10V rms at frequencies between 1kHz & 10kHz..

Module provides simultaneous precision voltage and current outputs.

Module circuitry can withstand 130v rms at its current output terminals without damage.

All 3B20 series modules are mix-and-match and Hot Swappable

APPLICATIONS

Industrial signal conditioning

Industrial signal isolation

Industrial signal filtering

PRODUCT OVERVIEW

The 3B Series of Signal Conditioning I/o Subsystems provide a low-cost, versatile method of transferring analog transducer signals to a data acquisition, monitoring or control system without the inherent noise, non-linearity, drift and extraneous voltages. The modules are designed to directly accept analog signals from Thermocouples, RTD's, AC and DC Strain Gages, Torque Transducers, Frequency Transducers, LVDTs, millivolt or process current signals. The modules amplify, isolate, linearize and convert the transducer output signals to standardized analog inputs for high-level analog I/O subsystems. The 3B Series Subsystem consists of a 10" relay rack with universal mounting backplane and a family of plug-in (up to 16 per rack) input and output signal conditioning modules.

Eight and four channel backplanes are also available. Each backplane incorporates screw terminals for sensor inputs and current outputs and a 26-pin connector for high-level single-ended voltage outputs to the user's equipment.

The input modules feature complete signal conditioning circuitry optimized for specific sensors or analog signals and provide two simultaneous high-level analog outputs: 0 to +10V (or ±10V) and 4-20 mA (or 0-20 mA).

FUNCTIONAL BLOCK DIAGRAM

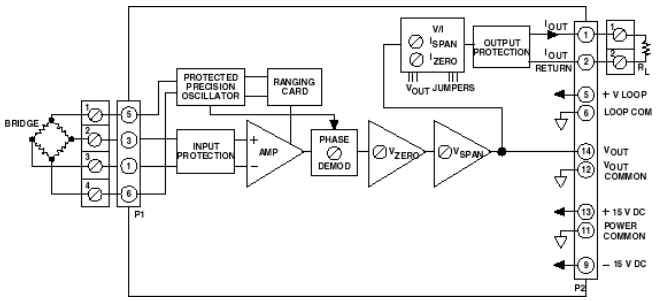


Figure 1. 3B20 Functional Block Diagram

Output modules accept 0 to +10V (or ±10V) single-ended signals and provide an isolated 4-20 mA (or 0-20 mA) process signal. All modules feature a universal pin-out and may be readily hot-swapped under full power and interchanged without disrupting field wiring.

The Analog Devices 3B Series Signal Conditioning Subsystem is designed to easily handle signal conditioning problems in measurement and control applications. Some typical uses are in microcomputer-based data acquisition systems, programmable controllers, analog recorders, dedicated control systems, and any other applications where monitoring of temperature, pressure, flow and analog signals are required. Since each input module features two simultaneous outputs, the voltage output can be used to provide an input to a microprocessor-based data acquisition or control system while the current output can be used for analog transmission, operator interface, or an analog backup system.

Each input module is a single-channel signal conditioner which plugs into a socket on the backplane and accepts its signal from the input screw terminals. All input modules provide input protection, amplification and filtering of the input signal, accuracy of ±0.1%, low drift of ±1 uV/°C (low-level input modules), and feature two high-level analog outputs that are compatible with most process instrumentation. The isolated input modules also provide ±1500 V peak isolation.

The choice of a specific 3B module depends upon the type of input signal. Input modules are available to accept millivolt, volt, process current, thermocouple, RTD, AC and DC strain gage, frequency and LVDT inputs. The voltage output of each module is available from the system I/O connector while the current output is available on the output screw terminals.

Rev. 0

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GENERAL DESCRIPTION

The 3B20 is a wideband single-channel signal-conditioning module which interfaces 4-arm AC bridge transducer signals ranging between 1.5mV rms and 150mV rms, providing simultaneous precision voltage and current outputs. In addition, the module provides an AC excitation voltage of 2V rms to 10V rms at frequencies between 1kHz and 10kHz. The module withstands 130V rms at its current output terminals without damage thereby shielding computer-side circuitry from field-side over-voltage conditions. The 3B20 is a plug-in, mix-and-match, hot-swappable module and is easily field calibrated via front-panel zero and span adjustments for both voltage and current outputs.

3B Series Custom-Ranging Program – Externally-programmable Model 3B20-00, enables the user to configure a special input range, including tare weight suppression, by using the optional plug-on AC1310 ranging card, which houses user-supplied resistors to determine zero and span. To facilitate selecting resistors, a Windows program, 3B-CUSTOM, calculates resistor values based on the user-desired input/output ranges.

The 3B20 input and AC bridge excitation output terminals are protected for up to 130V rms. The excitation amplitude and frequency can be specified with the Model 3B20 CUSTOM or user configured with Model 3B20-00 and an optional plug-on Model AC1310 ranging card. Both the voltage and current outputs can be independently adjusted for a minimum of $\pm$1V for the zero and 25% of the span range with front-panel user-accessible potentiometers. In addition, phase shifts of up to 37.25° between excitation signal and the output signal from the strain gauge or torque transducer can be compensated via front-panel screw terminal adjustments.



Figure 2

3B20 Models Available

Model	Excitation Voltage	Excitation Frequency	Input Range	Sensitivity	Output Ranges[1]
3B20-00	Externally Programmable[2]	Externally Programmable[2]	Externally Programmable[2]	Externally Programmable[2]	-10 V to +10 V & 0 mA to 20 mA
3B20-01	5 V rms	3 kHz	20 mV rms	2 mV rms/V	-10 V to +10 V & 0 mA to 20 mA
3B20-Custom	*	*	*	*	*

[1] Output current range may be user programmed to 4 mA to 20 mA using jumper supplied.
[2] Requires AC1310 ranging card.
* Custom Input/Output ranges are available. Refer to configuration guide.

3B20 Specifications
(typical @ +25°C and ±15 V dc, and +24 V dc Power)

Description	Model 3B20
Input Range	
Standard Range	Refer to Model Table
Custom Ranges	V_{in} = 1.5 mV rms to 150 mV rms V_{exc} = 2 V rms to 10 V rms V_{exc} freq. = 1 kHz to 10 kHz
Output Range	
Voltage (R_L > 2 KΩ)	-10 V to +10 V
Current (R_L = 0 to 850Ω)[1]	4 mA to 20 mA or 0 mA to 20 mA
With Input Overload	40 mA, maximum
Accuracy[2]	
Initial @ +25°C	±0.1% Span
Nonlinearity[2]	±0.05% Span
Stability vs. Temperature	
Voltage Output	
Zero	±0.005% of Span/°C
Span	±0.01% of Span/°C
Current Output[3]	
Zero	±25 ppm of Span/°C
Span	±25 ppm of Reading/°C
Bridge Excitation	
Voltage[4]	2 V rms to 10 V rms
Voltage, tolerance	±2.5%
Frequency[4]	1 kHz to 10 kHz, ±15%
Drive	Up to 20 mA rms, minimum
Harmonic Distortion	< 0.5%
Span Calibration Adjustment Range[4]	±25% of span, minimum

Zero Calibration Adjustment Range[4]	±1 V, minimum
Phase Adjustment Range[5]	0 to 4.25° minimum @ 1 kHz 0 to 14° minimum @ 3.28 kHz 0 to 37.25° minimum @ 10 kHz
Input Bias Current	+10 nA
Input Resistance	100 MΩ
Bandwidth, -3 dB	100 Hz
Output Rise Time, 10% to 90% Span	200 ms

Input Protection, Signal and Excitation Voltage

Continuous	130 V rms maximum
Transient	ANSI/IEEE C37.90.1-1989
Voltage Output Protection	Continuous Short to Ground
Current Output Protection	130 V rms, continuous

Supply

±15 V dc Supplies	
Rated Operation	±(13 V dc to 18 V dc)
Current	±65 mA
Sensitivity	±0.03% span/V
+24 V dc Loop Supply	
Rated Operation	+13.5 V dc to +30 V dc
Current	+27 mA @ I_{out} = 20 mA
Sensitivity	±0.001% span/V
Mechanical Dimensions	3.15" x 3.395" x 0.775" (80.0 mm x 86.2 mm x 19.7 mm)

Environmental

Temperature Range	
Rated Performance	-25°C to +85°C
Storage	-55°C to +85°C
Relative Humidity, 24 hours	0 to 95% @ +60°C non-condensing
RFI Susceptibility	±0.5% Span error @ 400 MHz, 5 Watt, 3 ft

[1] For a 0 mA to 20 mA range, a typical minimum output current is 10 µA.
[2] Includes the combined effects of repeatability, hysteresis, and nonlinearity.
[3] With respect to the voltage output.
[4] A wide range of custom zero suppression and span is available with the 3B20-00 model, using the AC1310 ranging card.
[5] +24 V dc loop power is required for driving the current output at loads up to 850Ω. If a current output load of 400Ω or less is applied, +15 V dc is sufficient for loop power. If only voltage output is used, loop power is not required.
Specifications subject to change without notice.

PIN CONFIGURATIONS AND FUNCTIONAL DESCRIPTIONS

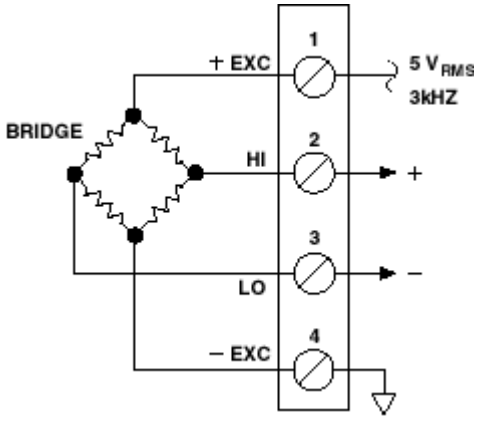


Figure 3 3B20 Input Field Connections

Table 1. Pin Function Descriptions—

Pin No.	Description
1	+EXC
2	HI
3	LO
4	-EXC

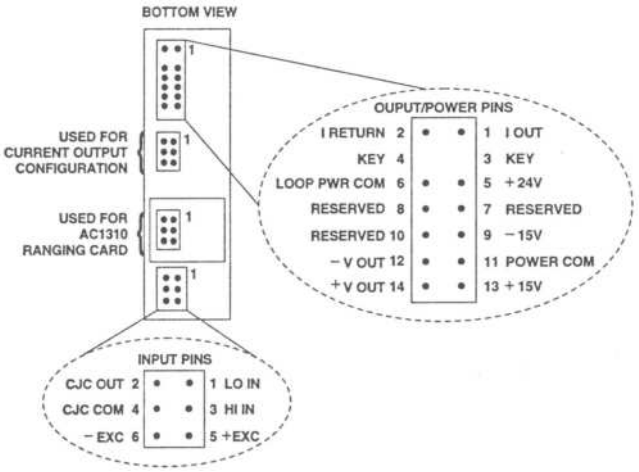


Figure 4 . Model 3B Series Module, with pin-out assignments.

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



OUTLINE DIMENSIONS

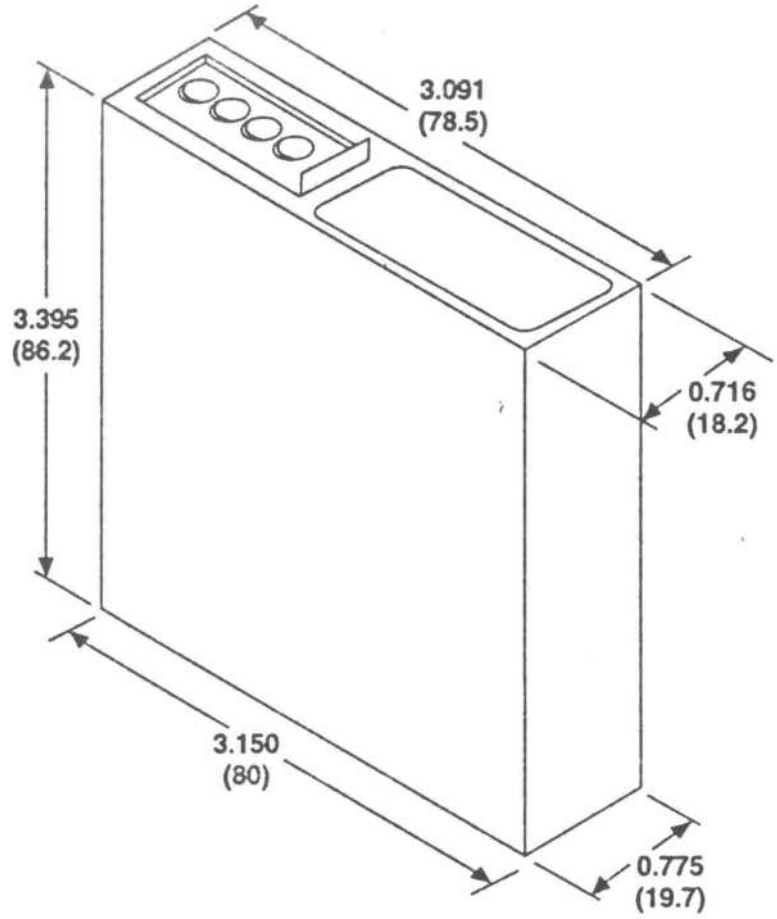


Figure 5. Outline Dimensions

NOTES

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