

### FEATURES

AC averaging technique used to rectify, amplify, and filter 50 Hz to 400 Hz sine-wave signals.

Accepts inputs of between 20 mV to 550 V rms to give an rms output reading.

Module provides simultaneous precision voltage and current outputs.

Module circuitry can withstand 130v rms at the input screw-terminals.

All 3B42, 3B43, & 3B44 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  $\pm 10V$ ) and 4-20 mA (or 0-20 mA).

#### Rev. 0

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### FUNCTIONAL BLOCK DIAGRAM

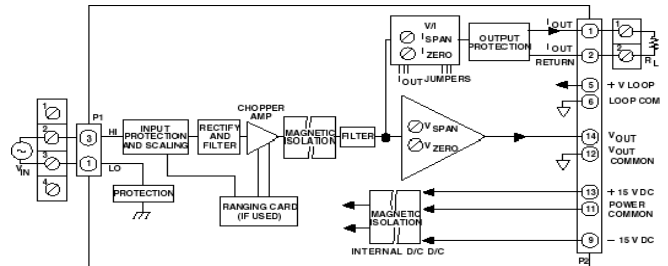


Figure 1. 3B42, 3B43, & 3B44 Functional Block Diagram

Output modules accept 0 to +10V (or  $\pm 10V$ ) 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  $\pm 0.1\%$ , low drift of  $\pm 1 \mu V / ^\circ C$  (low-level input modules), and feature two high-level analog outputs that are compatible with most process instrumentation. The isolated input modules also provide  $\pm 1500 V$  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.

### GENERAL DESCRIPTION

The 3B42, 3B43, and 3B44 are single-channel AC sine wave signal conditioning modules which use an AC averaging technique to rectify, amplify, and filter 50 Hz to 400 Hz sine-wave signals ranging from 20 mV to 550 V rms to give an rms output reading. Simultaneous precision voltage and current outputs are provided including isolation ( $\pm 1500$  V peak input-to-output and power). The 3B42 and 3B43 modules withstand 220 V rms, and Model 3B44 withstands 550 V rms at its input terminals without damage, thereby shielding computer-side circuitry from field-side over-voltage conditions. Each plug-in, mix-and-match, hot-swappable module is easily field calibrated via front-panel zero and span adjustments for both voltage and current outputs.

3B Series Custom-Ranging Program – Externally-

programmable versions, Models 3B42-00, 3B43-00, and 3B44-00, enable the user to configure a special input range 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.

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.



Figure 2

## 3B42, 3B43 and 3B44 Models Available

Model	Input Range	Output Ranges <sup>1</sup>
<b>3B42-00</b>	Externally Programmable <sup>2</sup>	0 V to +10 V & 0 mA to 20 mA
<b>3B42-01</b>	0 mV to +50 mV rms	0 V to +10 V & 0 mA to 20 mA
<b>3B42-02</b>	0 mV to +100 mV rms	0 V to +10 V & 0 mA to 20 mA
<b>3B42-Custom</b>	*	*
Model	Input Range	Output Ranges <sup>1</sup>
<b>3B43-00</b>	Externally Programmable <sup>2</sup>	0 V to +10 V & 0 mA to 20 mA
<b>3B43-01</b>	0 V to +10 V rms	0 V to +10 V & 0 mA to 20 mA
<b>3B43-Custom</b>	*	*
Model	Input Range	Output Ranges <sup>1</sup>
<b>3B44-00</b>	Externally Programmable <sup>2</sup>	0 V to +10 V & 0 mA to 20 mA
<b>3B44-01</b>	0 V to +150 V rms	0 V to +10 V & 0 mA to 20 mA
<b>3B44-02</b>	0 V to +250 V rms	0 V to +10 V & 0 mA to 20 mA
<b>3B44-Custom</b>	*	*

<sup>1</sup> Output current range may be user programmed to 4 mA to 20 mA using jumper supplied.

<sup>2</sup> Requires AC1310 ranging card.

\* Custom Input/Output ranges are available. Refer to configuration guide.

## 3B42, 3B43 and 3B44 Specifications

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

Description	Model 3B42	Model 3B43	Model 3B44
<b>Input Ranges</b>			
Standard Ranges, 50 Hz to 400 Hz	Refer to Model Table	Refer to Model Table	Refer to Model Table
Custom Ranges, 50 Hz to 400 Hz	20 mV rms to 1 V rms	1 V rms to 50 V rms	50 V rms to 550 V rms
<b>Output Ranges</b>			
Voltage ( $R_L > 2 \text{ k}\Omega$ )	0 V to +10 V	*	*
Current ( $R_L + 0$ to 850 $\Omega$ ) <sup>1</sup>	4 mA to 20 mA or 0 mA to 20 mA	*	*
<b>Accuracy<sup>2</sup></b>			
Initial @ +25°C	±0.05% Span	*	*
Nonlinearity	±0.02% Span	*	*
<b>Stability vs. Temperature</b>			
Voltage Output			
Zero	±0.005% of Span/°C	*	*
Span	±0.005% of Reading/°C	*	*
Current Output <sup>3</sup>			
Zero	±25 ppm of Span/°C	*	*
Span	±25 ppm of Reading/°C	*	*
<b>Zero and Span Adjustment Range<sup>4</sup></b>	±5% of Span	*	*

<b>Input Bias Current</b>	+1 nA	+5 nA	+3 nA
<b>Input Resistance</b>	100 M $\Omega$	250 k $\Omega$	1 M $\Omega$
<b>Noise</b>			
Input, 0.1 Hz to 10 Hz Bandwidth	5 $\mu$ V rms	*	*
Output, Ripple and Noise	50 $\mu$ V rms	*	*
<b>Bandwidth, -3 dB</b>	3 Hz	*	*
<b>Output Rise Time, 10% to 90% Span</b>	200 ms	*	*
<b>Common-Mode Voltage (CMV)</b>			
Input-to-Output, Continuous	$\pm$ 1500 V peak, maximum	*	*
Transient	ANSI/IEEE C37.90.1-1989	*	*
<b>Common Mode Rejection (CMR)</b>			
1 k $\Omega$ Source Imbalance, 50/60 Hz	100 dB	*	*
<b>Input Protection</b>			
Continuous	220 V rms, maximum	*	550 V rms, continous
Transient	ANSI/IEEE C37.90.1-1989	*	*
<b>Voltage Output Protection</b>	Continuous Short to Ground	*	*
<b>Current Output Protection</b>	130 V rms, continuous	*	*
<b>Power Supply Voltages <sup>5</sup></b>			
$\pm$ 15 V dc Supplies			
Rated Operation	$\pm$ (11.5 V dc to 16.5 V dc)	*	*
Current	$\pm$ 10 mA	*	*
Sensitivity	$\pm$ 0.01% span/V	*	*
+24 V dc Loop Supply			
Rated Operation	+12 V dc to +30 V dc	*	*
Current	+27 mA @ $I_{out} = 20$ mA	*	*
Sensitivity	$\pm$ 0.0002% span/V	*	*
<b>Mechanical Dimensions</b>	3.15" x 3.395" x 0.775" (80.0 mm x 86.2 mm x 19mm)	*	*
<b>Environmental</b>			
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	$\pm$ 0.5% Span error @ 400 MHz, 5 Watt, 3 ft	*	*

\* Specifications same as model 3B42.

<sup>1</sup> For a 0 to 20 mA range, a typical minimum output current is 10  $\mu$ A.

<sup>2</sup> Includes the combined effects of repeatability, hysteresis, and nonlinearity.

<sup>3</sup> With respect to the voltage output.

<sup>4</sup> A wide range of custom zero suppression and span is available with Models 3B42-00, 3B43-00 and 3B44-00, using the AC1310 ranging card.

<sup>5</sup> +24 V dc loop power is required for driving the current output at loads up to 850 $\Omega$ . If a current output load of 400 $\Omega$  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. .Bottom of Form

## PIN CONFIGURATIONS AND FUNCTIONAL DESCRIPTIONS

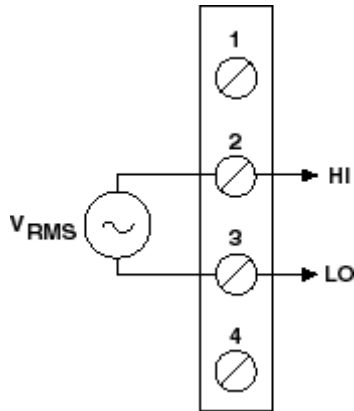


Figure 3 3B42, 3B43, & 3B44 Input Field Connections

Table 1. Pin Function Descriptions—

Pin No.	Description
1	N/C
2	HI
3	LO
4	N/C

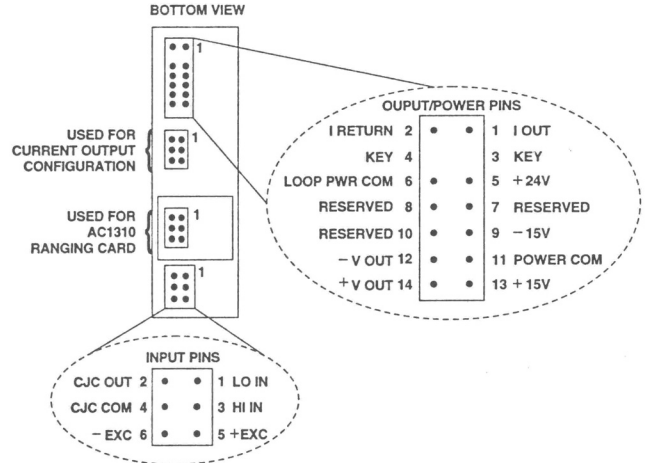


Figure 4 . Model 3B Series Module, with pin-out assignments.

### 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

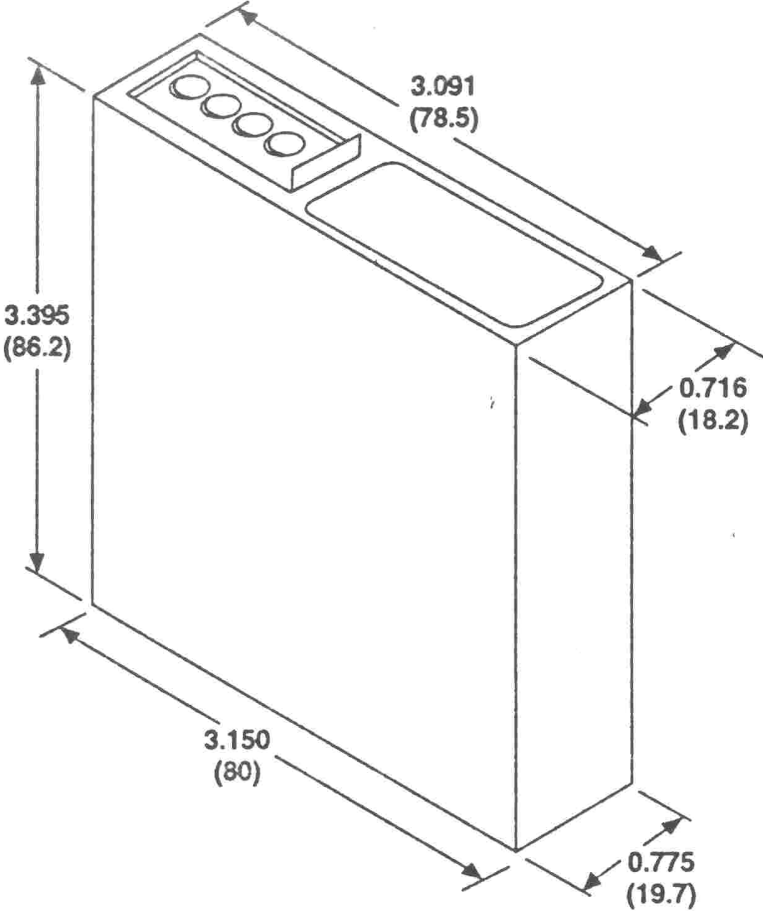


Figure 5. Outline Dimensions

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