

FEATURES

Interfaces, isolates, & filters a 0 to +10V or -10V to +10V input signal and provides an isolated process current output across loads of 0 to 850Ω.

Intended for high-accuracy process control and monitoring applications requiring total galvanic isolation.

Module circuitry can withstand 220v rms at the output screw-terminals.

All 3B39 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).

FUNCTIONAL BLOCK DIAGRAM

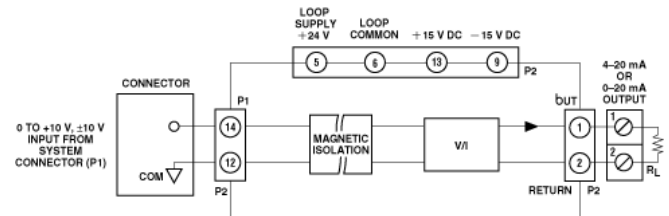


Figure 1. 3B39 Functional Block Diagram

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 $\pm 1 \text{ uV/}^\circ\text{C}$ (low-level input modules), and feature two high-level analog outputs that are compatible with most process instrumentation. The isolated input modules also provide $\pm 1500 \text{ V}$ 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.

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GENERAL DESCRIPTION

The 3B39 is a single-channel signal conditioning current output module that interfaces, isolates and filters a 0 to +10V or -10V to +10V input signal and provides an isolated process current output across loads of 0 to 850 Ω . The output current appears at the 3B Series backplane current output screw terminal block. It is intended for high-accuracy process control and monitoring applications requiring complete galvanic isolation and protection against damage from transients and faults between systems or separated system elements. Either of the two input voltage ranges can be converted to either of the two output current ranges via programming jumpers provided on the bottom of the module. Model 3B39 features a nonlinearity of $\pm 0.01\%$ and an accuracy of $\pm 0.1\%$. Providing +1500V peak of galvanic transformer based isolation output-to-input and power, the 3B39 offers a common mode rejection (CMR) of 90 dB @ 50/60 Hz to preserve the integrity of low level signals in noisy environments. The 3B39 is mix-and-match and hot-swappable with other 3B Series modules, so it can be inserted or removed from any socket in the same backplane without disturbing system power.

Signal isolation by transformer coupling uses a proprietary

modulation technique for linear, stable and reliable performance. A demodulator on the output side of the signal transformer recovers the original signal, which is then filtered and converted to an accurate current output by a current (V-to-I) converter output stage. Output protection enables the 3B39 to withstand accidental connection to 220V rms power lines without damage, isolating computer-side circuitry. The 3B39 provides total ground isolation and transient protection when interfacing DACs to standard 4-20 mA current loops, common requirement in microcomputer based control system.

Figure 2



3B39 Specifications

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

Description	Model 3B39
Input Voltage Standard Ranges¹	0 V to +10 V or -10 V to +10 V
Input, Without Damage	-20 V to +20 V, maximum
Input Resistance	10 k Ω
Output Ranges	
Standard Ranges ($R_L = 0$ to 850 Ω)	4 mA to 20 mA or 0 mA to 20 mA
Custom Ranges	Not Available
Accuracy²	
Initial @ +25°C	$\pm 0.1\%$ Span + CJC Sensor Error
Nonlinearity	$\pm 0.01\%$ Span
Stability vs. Temperature	
Current Output	
Zero	± 25 ppm of Span/ $^{\circ}$ C
Span	± 25 ppm of Reading/ $^{\circ}$ C
Zero and Span Adjustment Range	$\pm 5\%$ of Span
Noise	
Input, 0.1 Hz to 10 Hz Bandwidth	0.2 μ V rms
Output, 100 kHz Bandwidth	50 μ V rms
Bandwidth, -3 dB	3 Hz
Output Rise Time, 10% to 90% Span	2 ms
Common-Mode Voltage (CMV)	
Input-to-Output, Continuous	± 1500 V peak, maximum
Transient	ANSI/IEEE C37.90.1-1989
Common Mode Rejection (CMR)	
1 k Ω Source Imbalance, 50/60 Hz	90 dB
Output Protection	
Continuous, Normal Mode	220 V rms, maximum
Transient	ANSI/IEEE C37.90.1-1989
Power Supply Voltages³	
± 15 V dc Supplies	
Rated Operation	$\pm (11.5$ V dc to 16.5 V dc)
Current	± 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

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 noncondensing

RFI Susceptibility $\pm 0.5\%$ Span error @ 400 MHz, 5 Watt, 3 ft

¹ Input and Output Range may be selected using jumpers supplied.

² Includes the combined effects of repeatability, hysteresis, and nonlinearity.

³ +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

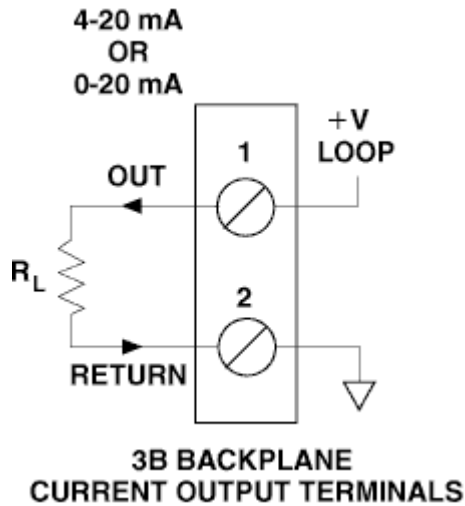


Figure 3 3B39 Input Field Connections

Table 1. Pin Function Descriptions—

Pin No.	Description
1	OUT
2	RETURN
3	
4	

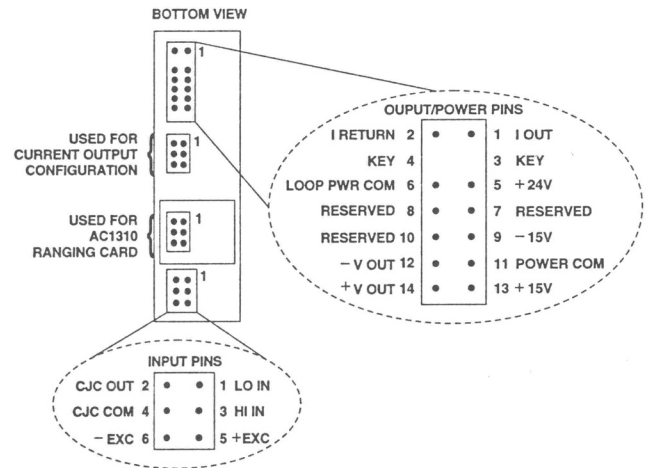


Figure 4 . Model 3B Series Module, with pin-out assignments.

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.



NOTES