ANALOG DEVICES

Complete Signal Conditioning I/O Subsystem

3B Series

FEATURES/BENEFITS

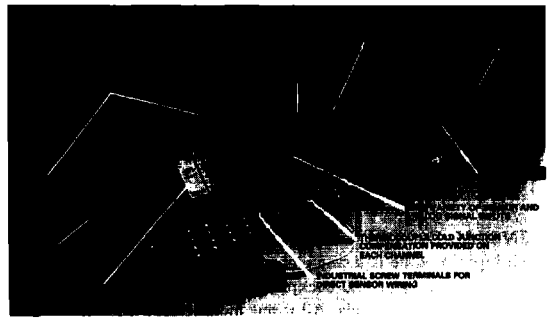
Low Cost, Completely Integrated 16-Channel Modular Signal Conditioning Subsystem
- **Wide Selection of Functionally Complete Input and Output Plug-In Modules**
- **Rugged Industrial Chassis, Rack or Surface Mounted**
- **On-Board Power Supplies Available**

Analog Input Modules Available for Direct Interface to a Wide Variety of Signal Sources
- **Thermocouples, RTDs, AC and DC Strain Gages, Torque Transducers, LVDTs**
- **Millivolt, Voltage and Frequency Sources,**
- **4-20mA/0-20mA Process Current Inputs**

Current Output Modules
- **4-20mA/0-20mA Outputs**

Complete Signal Conditioning Function
- **Input Protection, Filtering, Amplification,**
- **Galvanic Isolation to ± 1500V,**
- **Wide-Range Zero Suppression,**
- **High Noise Rejection and RFI/EMI Immunity,**
- **Simultaneous Voltage and Current Outputs**

FM Approved for Use in Class I, Division 2, Groups A, B, C and D Locations



GENERAL DESCRIPTION

The 3B Series Signal Conditioning I/O Subsystem provides a low cost, versatile method of interconnecting real-world analog signals to a data acquisition, monitoring or control system. It is designed to interface directly to analog signals such as thermocouple, RTD, ac and dc strain gage, torque transducer, or AD590/AC2626 solid state temperature sensor outputs or millivolt or process current signals and convert the inputs to standardized analog outputs compatible with high level analog I/O subsystems.

The 3B Series Subsystem consists of a 19" relay rack compatible 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 connector for high level single ended outputs to the user's equipment.

The input and output modules are offered in both isolated (± 1500V peak) and nonisolated versions. The input modules feature complete signal conditioning circuitry optimized for specific sensors or analog signals and provide high level analog outputs. Each input module provides two simultaneous outputs: 0 to 10V (or ± 10V) and 4-20mA (or 0-20mA). Output modules accept high level single ended signals and provide an isolated or nonisolated 4-20mA (or 0-20mA) process signal. All modules feature a universal pin-out and may be readily "mixed and matched" and interchanged without disrupting field wiring.

Each backplane contains the provision for a subsystem power supply. The 3B Series Subsystem can operate from a dc/dc converter or ac power supply mounted on each backplane or from externally provided dc power. Two LEDs are used to indicate that power is being applied.

APPLICATIONS

The Analog Devices 3B Series Signal Conditioning Subsystem is designed to provide an easy and convenient solution to signal conditioning problems in measurement and control applications. Some typical uses are in mini- and microcomputer based systems, standard data acquisition systems, programmable controllers, analog recorders, dedicated control systems, and any other applications where monitoring and control 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.

DESIGN FEATURES AND USER BENEFITS

Ease of Use: Direct sensor interface via screw terminals, standardized high level outputs, factory precalibration of each unit and the modular design make the 3B Series Subsystem extremely easy to use. The subsystem features rugged packaging for the industrial environment and can be easily installed and maintained.

High Protection and Reliability: All field wired terminations offer 130V or 220V rms normal-mode protection. To assure connection reliability, gold plated pin and socket connections are used throughout the system. The isolated modules offer protection against high common-mode voltages and are designed to meet the IEEE Standard for Transient Voltage Protection (472–1974: SWC).

High Performance: The high quality signal conditioning features ± 0.1% calibration accuracy and chopper-based amplification which assures low drift (± 1μV/°C) and excellent long-term stability. For thermocouple applications, high accuracy cold junction sensing is provided in the backplane on each channel. Low drift sensor excitation is provided for RTD, strain gage, LVDT and AD590 models. RTD models and the 3B47 thermocouple model linearize the input signal to provide an output which is linear with temperature.

This four-page data summary contains key specifications to speed your selection of the proper solution for your application. Additional information on this product can be obtained from your local sales office.

13

FEATURES

Wide Variety of Sensor Inputs
- **Thermocouples, RTDs, AC and DC Strain Gages, Torque Transducers, LVDTs, AD590/AC2626**

Dual High Level Outputs
- **Voltage: 0 to +10V or ±10V**
- **Current: 4-20mA/0-20mA**

Mix and Match Input Capability
- **Sensor Signals, mV, V, 4-20mA, 0-20mA**

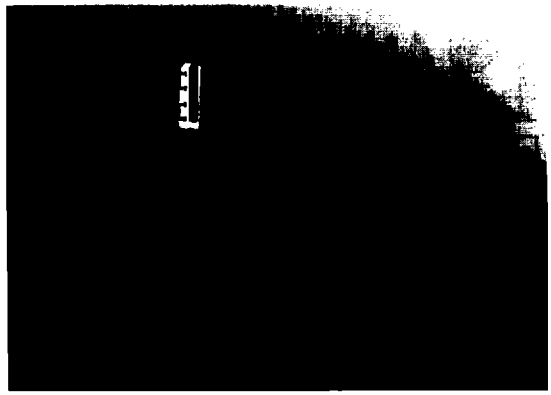
High Accuracy: ±0.1%

Low Drift: ±1μV/°C

Reliable Transformer Isolation:
- **±1500V CMV, CMR = 160dB**
- **Meets IEEE-STD 472: Transient Protection (SWC)**

Input Protection: 130V or 220V rms Continuous

Low Cost Per Channel



GENERAL DESCRIPTION

Each input module is a single channel signal conditioner that plugs into sockets 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 1μV/°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 ±1500V isolation.

The choice of specific 3B module depends on the type of input signal and also whether an isolated or nonisolated interface is required. Input modules are available to accept millivolt, volt, process current, thermocouple, RTD, ac and dc strain gage, torque transducers and AD590 inputs. The voltage output of each module is available from the voltage I/O connector while the current output is available on the output screw terminals.

THERMOCOUPLE INPUT MODELS 3B37, 3B47

The isolated thermocouple models incorporate cold junction compensation circuitry which provides an accuracy of ±0.5°C over the +5°C to +45°C ambient temperature range. Open thermocouple detection (upscale) is also provided. Standard models are available for thermocouple types J, K, T, E, R, S and B. Factory configured custom ranges are also available. The 3B37-X-00 can be user configured with the AC1310 ranging card. The 3B47 internally linearizes the thermocouple signal. All screw terminals have a 220V rms protection.

RTD INPUT MODELS 3B14, 3B15, 3B34

Each RTD model provides a sensor excitation current and produces an output signal that is linear with temperature with a conformity error of ±0.05% of span and accuracy of ±0.1% span. The lead resistance effect for the three models is ±0.02°C/Ω for the 3B14 and the 3B34, and ±.00001°C/Ω for the 3B15. All excitation input and output screw terminal connections have at least 130V rms protection.

STRAIN GAGE INPUT MODEL 3B16

Models 3B16 accepts inputs from full four arm bridge strain gage-type transducers. It provides a constant +10V bridge excitation and can be used with a bridge resistance of 300Ω or greater. All excitation input and output screw terminal connections have 130V rms protection.

WIDEBAND STRAIN GAGE MODEL 3B18

Model 3B18 accepts inputs from full four arm bridge strain gage-type transducers. It provies a switch selectable excitation of +3.3V or +10.0V and can be used with 100Ω to 1000Ω strain gage bridges. The module has a 20kHz bandwidth to interface to dynamic signals.

AC STRAIN GAGE/TORQUE TRANSDUCER INPUT MODEL 3B20

Model 3B20 is a nonisolated wideband input module that is designed to interface to four arm bridge transducers or transformer coupled torque transducers. The 3B20 provides an ac excitation of 2-10V rms at frequencies ranging from 1kHz to 10kHz. This module can accept inputs from 1.5mV rms to 150mV rms.

MILLIVOLT AND VOLTAGE INPUT MODELS 3B10, 3B11, 3B30, 3B31

Models 3B10 and 3B11 are nonisolated modules that accept mV and V signals respectively. Models 3B30 and 3B31 are isolated modules that accept mV and V signals respectively. All screw terminal connections have at least 130V rms protection.

WIDEBAND MILLIVOLT AND VOLT INPUT MODELS 3B40, 3B41

Models 3B40 and 3B41 are isolated modules that accept mV and V signals respectively. The modules have a 10kHz bandwidth to interface to dynamic signals. All screw terminal connections have at least 130V rms protection.

CURRENT INPUT MODELS 3B12, 3B32

Models 3B12 (nonisolated) and 3B32 (isolated) accept process current signals. Both models use a 100Ω sensing resistor that is mounted on backplane terminals 2 and 3. All screw terminal connections have at least 130V rms protection.

AD590 INPUT MODEL 3B13

Model 3B13 accepts an AD590 as its input signal. Sensor excitation is provided and a 2kΩ sensing resistor is mounted on backplane terminals 2 and 3. All excitation input and output screw terminal connections have 130V rms protection.

LVDT OR RVDT INPUT MODEL 3B17

Model 3B17 accepts signals from 4, 5 and 6 wire LVDT or RVDT transducers. It provides an ac excitation of 1-5V rms at frequencies ranging from 1kHz to 10kHz and has a 100Hz bandwidth. All screw terminal connections have 130V rms protection.

AC INPUT MODELS 3B42, 3B43 AND 3B44

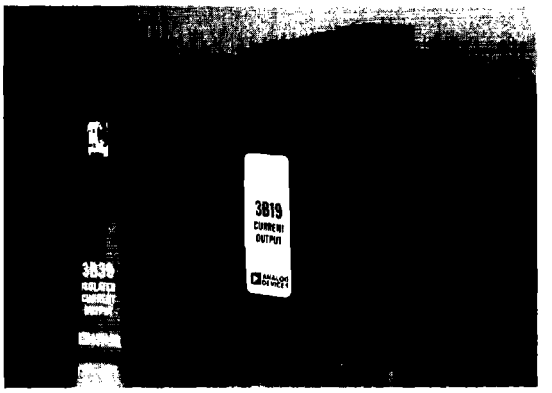
Models 3B42, 3B43, and 3B44 accept ac signals from 20mV to 450V rms. The modules are rms calibrated for sinusoidal inputs, such as ac power lines. All screw terminal connections have at least 130V rms protection.

FREQUENCY INPUT MODELS 3B45, 3B46

Models 3B45 and 3B46 accept frequency input signals from 25Hz to 25kHz. User selectable thresholds of 1.6V and 0V (for zero crossing) are available. All screw terminal connections have at least 130V rms protection.

Output Modules – 3B Series

FEATURES
High Level Voltage Input (0 to +10V, ±10V)
Process Current Output (4-20mA/0-20mA)
High Accuracy: ±0.1%
Reliable Transformer Isolation: ±1500V CMV, CMR = 90dB
Meets IEEE-STD 472: Transient Protection (SWC)
Output Protection: 130V or 220V rms Continuous
Reliable Pin and Socket Connections
Low Cost Per Channel



GENERAL DESCRIPTION

Each output module accepts a high level analog signal from the system connector and provides a current output on the output screw terminals. When a +24V loop supply is used, loads up to 850Ω can be driven. If desired, +15V can be used to power the output modules with a smaller load (up to 400Ω). Each output module features high accuracy of ±1%. If isolation is required, the 3B39 provides ±1500V peak common-mode voltage isolation protection.

NONISOLATED OUTOUT MODEL 3B19

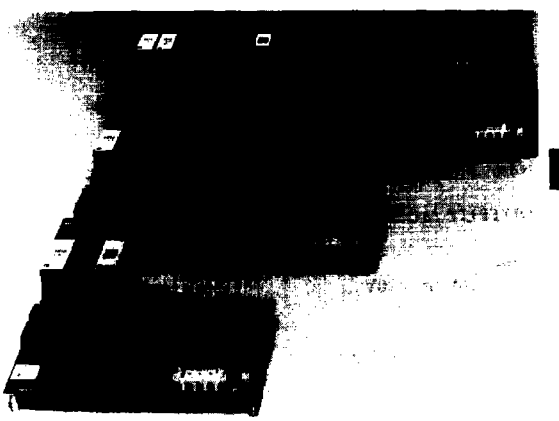
The 3B19 output module accepts a 0 to +10V or ±10V input signal and converts it to a proportional current output. Output ranges are jumper selectable for either 0-to 20mA or 4-to-20mA. The current output is protected to 130V rms continuous.

ISOLATED OUTPUT MODEL 3B39

Model 3B39 is an isolated module that accepts a 0 to +10V or ±10V input signal and converts it to a proportional current output. Output ranges are jumper selectable for either 0-to-20mA or 4-to-20mA. Input to output isolation is rated to 1500V pk continuous.

Backplanes

FEATURES
4-, 8-, or 16-Channel Versions Available
ac or dc Power Supply Options



GENERAL DESCRIPTION

The three backplane models, 3B01, 3B02 and 3B03 are designed for 16, 8 and 4 channels, respectively, to give users the flexibility to match the size of a system to specific applications. The 16-channel backplane can be mounted in a 19" × 5.25" panel space. The backplanes can be surface mounted, mounted on a rack or mounted in a NEMA enclosure.

POWER SUPPLY

The 3B Series Subsystem can operate from a common ac power supply or dc/dc (+24V input) power supply mounted on the backplane or an externally provided ±15V and +24V supply. The power supply is bussed to all signal conditioners in the system. The current consumption is a function of the modules that are actually used.

3B Series Subsystem Specifications

INPUT MODULES

Input Types
Thermocouples: J, K, T, E, R, S, B
Thermocouples: J, K, T, E, R, S, B (Linearized)
RTDs: 100Ω Platinum, 10Ω Copper, 120ΩNickel (Linearized)
DC Strain Gage Transducers: ±30mV and ±100mV spans
AC Strain Gage/Torque Transducers: 1.5mV to 150mV rms
LVDT or RVDT: 4, 5, 6 Wire
Solid State Temperature Transducers: AD590 or AC2626
DC Voltage: ±10mV, ±50mV, ±100mV ±1V, ±5V, ±10V
DC Current: 4-to-20mA, 0-to-20mA
AC Voltage: 0-50mV rms, 0-100mV rms, 0-10V rms, 0-150V rms, 0-250V rms
Frequency: 0-25Hz, 0-300Hz, 0-1500Hz, 0-3000Hz, 0-25kHz

Outputs (Simultaneous)
0 to +10V or ±10V and
4-to-20mA or 0-to-20mA*

Performance
Accuracy: ±0.1% of span
Nonlinearity: ±0.01% of span
Bandwidth: 3Hz (−3dB)

Isolated Modules
Common-Mode Voltage, Input to Output: ±1500V pk continuous
Transient Protection: Meets IEEE-Std 472 (SWC)
Normal-Mode Input Protection: 220V rms continuous
Current Output Protection: 130V rms continuous
Common-Mode Rejection @ 50Hz or 60Hz: 160dB
Normal-Mode Rejection @ 50Hz or 60Hz: 60dB

Nonisolated Modules
Common-Mode Voltage: ±6.5V
Normal-Mode Input Protection: 130V rms continuous
Current Output Protection: 130V rms continuous
Common-Mode Rejection @ 50Hz or 60Hz: 90dB
Normal-Mode Rejection @ 50Hz or 60Hz: 60dB

OUTPUT MODULES

Input
0 to +10V or ±10V

Output
4-to-20mA or 0-to-20mA

Performance
Accuracy: ±0.1% of span
Nonlinearity: ±0.01% of span

Isolated Module
Common-Mode Voltage,
Input to Output: ±1500V pk continuous
Current Output Protection
Transient: Meets IEEE-Std 472 (SWC)
Continuous: 220V rms

Nonisolated Module
Current Output Protection: 130V rms continuous

*There is no current output on the 3B47.
Specifications subject to change without notice.

BACKPLANES

Channel Capacity
3B01: 16 channels
3B02: 8 channels
3B03: 4 channels

POWER SUPPLIES

Backplane Mounted:
100, 115, 220, 240V ac, 50/60Hz
or +24V dc
External Power Option
±15V dc and +24V dc

MECHANICAL

Input or Output Modules:
3.150" × 0.775" × 3.395"
(80.0mm × 19.7mm × 86.2mm)
Backplanes:
3B01: 17.40" × 5.20" × 4.37"
(442.0mm × 132.1mm × 111.1mm)
3B02: 11.00" × 5.20" × 4.37"
(279.4mm × 132.1mm × 111.1mm)
3B03: 7.80" × 5.20" × 4.37"
(198.1mm × 132.1mm × 111.1mm)

ENVIRONMENTAL

Temperature Range, Rated Performance:
−25°C to +85°C
Storage Temperature Range:
−55°C to +85°C
Relative Humidity: Conforms to MIL-STD 202, Method 103
RFI Susceptibility: ±0.5% span error, 5W @ 400MHz @ 3 ft.