VMIVME-3418
8-Channel Strain Gauge and RTD Isolated Signal Conditioning Board

- 8 isolated strain gauge and RTD signal conditioning channels
- Isolated to 1,000 VDC or 700 VRMS in two groups of four channels
- Full, half, or quarter strain gauge bridges, with on-board bridge completion
- Four-, three-, or two-wire resistance temperature detectors (RTDs); prescaled RTD ranges available
- Open sensor detection
- Individual sensor excitation for each channel
- Constant current or constant voltage bridge excitation
- Input ranges selectable from ±10 mV to ±10 V
- Optional low pass input filters; 4, 40, or 400 Hz
- Buffered high-level analog outputs
- Outputs compatible with VMIVME-3113A/-3122 scanning A/D converter boards
- Built-in-Test (BIT) verifies input bridge calibration
- MTBF: 92,100 hours (217F)

APPLICATIONS

- System analog input isolation
- Strain gauge and RTD signal conditioning
- Temperature monitoring
- Low-level voltage measurements
- Low frequency vibration and shock analysis
- Pressure monitoring

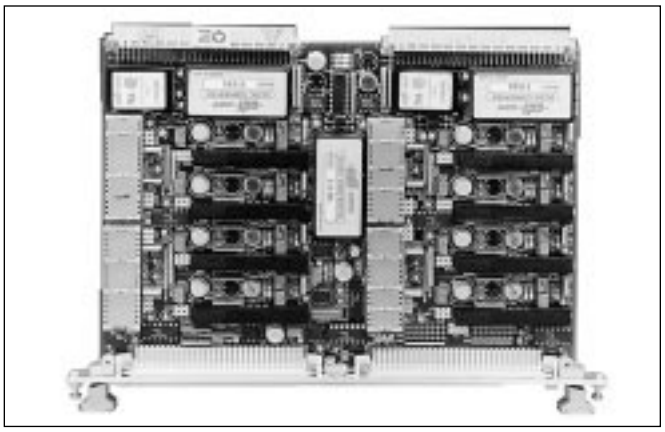
GENERAL DESCRIPTION — The VMIVME-3418 board (Figure 1) is an isolated, 8-channel analog input board which provides complete excitation and signal conditioning for strain gauges and resistance temperature detectors (RTDs). Isolation is provided up to 1,000 VDC in two groups of four channels with each group isolated from the other group and from the VMEbus.

Excitation is provided individually for each channel and is factory configured for either constant current or constant voltage. Constant current excitation is user-programmable from 0 to 70 mA. Voltage excitation is programmable in three ranges from +2 to +10 VDC.

On-board bridge completion headers accommodate full, half, and quarter strain gauge bridges, and 2-, 3-, or 4-wire RTDs. Both strain gauge channels and RTD channels can be configured simultaneously on a single board. Prescaled RTD ranges are available for specific temperature ranges.

When used in conjunction with 64-channel A/D boards, such as VMIVME-3113A/-3122, the VMIVME-3418 provides full-scale input ranges from ±5 mV to ±10 V. Low pass input filters are available with cutoff frequencies of 4, 40, or 400 Hz.

VMIVME-3418 outputs are common to each other, but are isolated from the VMEbus. The output isolation can be disabled if not required. For total cable compatibility with the 64-channel A/D Converter boards, the eight output channels can be jumper-designated as Channels 0 to 7, 8 to 15, 16 to 23, or 24 to 31 if installed at P3, or as Channels 32 to 39, 40 to 47, 48 to 55, or 56 to 63 if installed at P4. This feature permits as many as four VMIVME-3418 boards to



be connected to either of the 32-channel input connectors on the A/D Converter board, with a single 64-wire multidrop ribbon cable, as shown in Figure 2.

Ordering Options

January 6, 1998 800-003418-000 B	A	B	C	–	D	E	F
VMIVME-3418 –				–			

A = Input Filter Options
0 = No Filters
1 = 4 Hz Filters
2 = 40 Hz Filters
3 = 400 Hz Filters

BC = Excitation and RTD Scaling Options
00 = Not Used
01 = Constant Voltage Excitation
02 = Constant Current Excitation
(Refer to Table 1 for Scaled RTD Inputs)

Examples

Example No. 1 Part number VMIVME-3418-202 specifies a VMIVME-3418 board with 40 Hz input filters, configured for constant current excitation.

Example No. 2 Part Number VMIVME-3418-120 specifies a VMIVME-3418 board with 4 Hz input filters, configured to accept inputs from 100 Ω Platinum RTDs (American response) with the outputs scaled as 0 to +6 V for a temperature range of 0 to +500 ˚F.

Recommended Connector Components for Cabling to P3 and P4

Style	Recommended Connecting Component	I/O Connectors
96-pin IDC	Mating Connector (96-pin Mass Terminated)	ERNI No. 913.031
96-pin Discrete Wire	0.033-inch Pitch Ribbon Cable (96-pin Mass Terminated)	ERNI No. 913.049
	Mating Connector (96-pin Discrete)	Harting No. 09 03 096 3214
	Female Crimp Contacts* (For 96-pin Discrete Connectors)	Harting No. 09 02 000 8484
	Connector Shell Housing (For 96-pin Connectors)	Harting No. 09 03 096 0501
	PC Board Connector Part Number	ERNI No. 913.216

* The Harting crimp tool part number is 09 99 000 0075.

For Ordering Information, Call:
1-800-322-3616 or 1-256-880-0444 • FAX (256) 882-0859
E-mail: info@vmic.com Web Address: www.vmic.com

Built-in-Test (BIT) is supported by turning OFF the excitation supply for verifying ZERO calibration, or by applying a calibration resistor (R-CAL) for verifying SPAN calibration. R-CAL is applied across one arm of the bridge for strain gauges, or replaces the sensor for RTD channels. BIT is controlled by two TTL inputs from the P2 connector. These BIT functions facilitate fault isolation to the board level.

FUNCTIONAL CHARACTERISTICS

Compliance: 6U double height form factor. The VMIVME-3418 board uses the VMEbus J1 backplane for +5 VDC electrical power only, and has no VMEbus communications functions.

ELECTRICAL CHARACTERISTICS

(At 25 °C, with rated power supply and 40 Hz filters.)

Number of Channels: Eight

EXCITATION OUTPUTS

Constant Voltage: +2.5 V, +5.0 V, +10.0 V; jumper-selectable, 70 mA maximum loading.

Constant Current: User selected as 1.1, 3.3, 10 mA, or USER. In the USER mode, a user-supplied resistor determines the current from 0 to 70 mA.

Output Noise: At 3 σ[1], 10 Hz-10 kHz:
Constant Voltage: 20 mVp-p
Constant Current: 50 µAp-p

Output Resistance:
Constant Voltage: 0.5 Ω maximum
(0.1 Ω with remote sensing)
Constant Current: 1.0 MΩ minimum

Accuracy[2]:
Constant Voltage: ±0.05 percent (no load)
Constant Current: ±1.0 percent

BRIDGE COMPLETION

Standard Configurations: Headers accommodate user-supplied resistors, and support full, half, or quarter strain gauge bridges, or 2-, 3-, or 4-wire RTDs.

Optional Scaled RTD Outputs: Factory-supplied bridge completion for specific RTD types and temperature ranges. See the Ordering Options.

Scaled RTD Accuracy: ±1.0 °C plus RTD error

1. Three standard deviations (3 σ) includes 99.7 percent of all noise in a normal distribution.
2. Excitation error is corrected with channel GAIN and OFFSET adjustments.

AMPLIFIER INPUT CHARACTERISTICS

Configuration: Differential and isolated

Input Ranges, Full Scale: Field-selectable as ±10 mV, ±100 mV, ±1 V, or ±10 V full-scale input range (for ±10 V output range). Extended to ±5 mV input range for ±5 output range.

Input Offset Voltage (Adjustable to Zero):
10 mV Range: ±30 µV
100 mV Range: ±100 µV
1 V Range: ±400 µV
10 V Range: ±10 mV

Input Offset Voltage Drift:
10 mV Range: ±2.0 µV/°C maximum, 10 mV range
100 mV Range: ±3.0 µV/°C
1 V Range: ±10 µV/°C
10 V Range: ±60 µV/°C

Input Noise, 10 to 1,000 Hz; 3 σ[1]:

	4 Hz filter	No filter
10 mV Range:	5 µVp-p	30 µVp-p
100 mV Range:	20 µVp-p	250 µVp-p
1 V Range:	0.3 mVp-p	2.5 mVp-p
10 V Range:	3 mVp-p	20 mVp-p

Input Impedance: 10 MΩ minimum, 20 pF

Input Bias Current: 80 nA maximum

Common-Mode Voltage (CMV): Maximum of ±1,000 VDC or 700 VRMS for isolated 4-channel input groups, referenced to VMEbus power supply return. ±11 V within each group.

Common-Mode Rejection (CMRR): 120 dB minimum, DC to 60 Hz, 350 Ω unbalance, referenced to VMEbus power supply return. CMRR within each 4-channel group is:
x1: 72 dB
x10: 85 dB
x100: 100 dB
x1,000: 100 dB

Low Pass Filters: Two-pole passive filters (no switching noise), available with a cutoff frequency of 4, 40, or 400 Hz (at 25 °C varying with a Z5U temperature coefficient). See the Ordering Options.

Open Input Detection:
Offscale negative for thermocouple inputs.
Offscale positive for 3- and 4-wire RTD inputs.
Offscale positive or negative for strain gauges.

Open Input Delay:
Maximum delay to ±10 V at channel output:

Delay	(Seconds at Filter Frequency)		
Gain	4 Hz	40 Hz	400 Hz
x1,000	3	1	0.30.3
x100		25	5
x10	200	30	5

x1 (x1 gain not applicable for low-level sensors)

AMPLIFIER TRANSFER CHARACTERISTICS

Channel Gain: Field-selectable as x1, x10, x100, or x1,000

Gain Accuracy: Adjustable to ±0.025 percent on all ranges

Gain Drift: 35 PPM/°C maximum, all ranges

Nonlinearity: ±0.024 percent maximum

Nonlinearity Drift: ±22 PPM/°C

Interchannel Crosstalk:
DC to 1,000 Hz:
x1: -80 dB
x10: -100 dB
x100: -120 dB
x1,000: -120 dB

Controls: Potentiometer adjustments for ZERO and SPAN; ±3 percent of range, referred to output.

AMPLIFIER OUTPUT CHARACTERISTICS

Output Voltage Range: ±10 V maximum full-scale output range

Output Resistance: 25 Ω maximum

Output Loading: 2 mA maximum over ±10 V output range

BUILT-IN-TEST (BIT)

Zero BIT: Excitation supply OFF

RTD Span BIT: RTD input is replaced with a user-supplied calibration resistor (R-CAL)

Strain Gauge Span BIT: A user-supplied calibration resistor (R-CAL) is connected across the low side of the bridge

BIT Control Loading: 1.5 mA maximum for low input, open-collector HIGH input

ELECTRICAL CONNECTIONS

Power:	P1; 96-pin DIN connector
Inputs:	P3; 64-pin DIN connector
Outputs:	P4; 64-pin DIN connector
BIT Control:	P2; 2 user inputs
BIT:	I_{IN} = 1.2 mA Not 0.5 mA

PHYSICAL/ENVIRONMENTAL

Ambient Temperature: 0 to +65 °C, operating
-20 to +85 °C, storage

Relative Humidity: 10 to 80 percent, noncondensing

Altitude: Operation to 10,000 ft

Input Power: +5 VDC at 2.0 A typical; 4.0 A maximum, with all excitation supplies fully loaded

Dimensions: Standard VME 6U double height board; 160 x 233.35 mm

RELATED PRODUCTS AND APPLICATIONS — VMIC offers a broad range of Analog Input/Output (AIO) products for VMEbus systems, and supports these products with comprehensive applications information. Contact VMIC for a description of the current products and a list of application guides.

TRADEMARKS

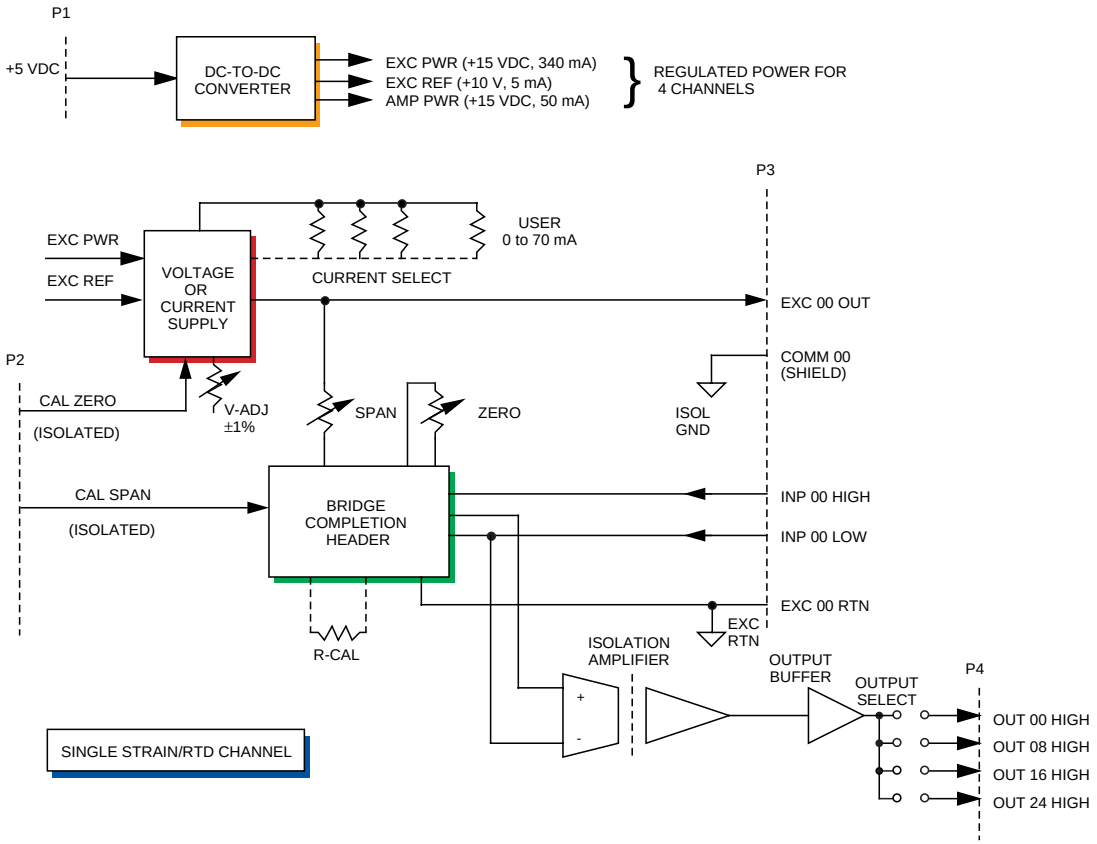
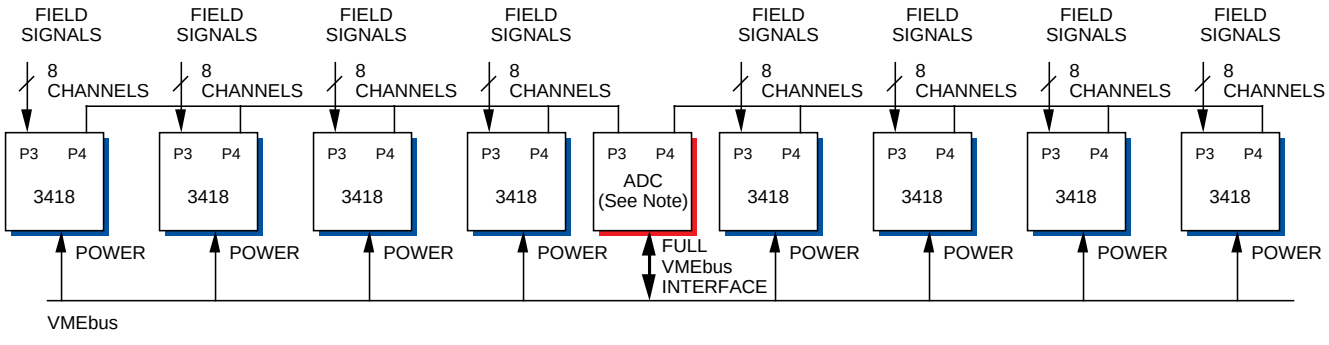


Figure 1. VMIVME-3418 Block Diagram; One of Eight Channels



Note: The ADC board may be a VMIVME-3113A or VMIVME-3122.

Figure 2. Typical System Implementation of VMIVME-3418

Table 1. Scaled 3-Wire RTD Ordering Codes

OPTION CODE (NOTE 1)	RTD TYPE		TEMP RANGE	OUTPUT RANGE (NOTE 4)
	ALLOY (NOTE 2)	RESISTANCE (Ω) (NOTE 3)		
-X10	Platinum-Euro	100	0-100 Deg-C	0 to +6 V
-X11	Platinum-Euro	100	0-200 Deg-C	0 to +6 V
-X12	Platinum-Euro	100	0-400 Deg-C	0 to +6 V
-X13	Platinum-Amer	100	0-100 Deg-C	0 to +6 V
-X14	Platinum-Amer	100	0-200 Deg-C	0 to +6 V
-X15	Platinum-Amer	100	0-400 Deg-C	0 to +6 V
-X16	Platinum-Euro	100	0-250 Deg-F	0 to +6 V
-X17	Platinum-Euro	100	0-500 Deg-F	0 to +6 V
-X18	Platinum-Euro	100	0-1,000 Deg-F	0 to +6 V
-X19	Platinum-Amer	100	0-250 Deg-F	0 to +6 V
-X20	Platinum-Amer	100	0-500 Deg-F	0 to +6 V
-X21	Platinum-Amer	100	0-1,000 Deg-F	0 to +6 V
-X22	Copper-Amer	10	0-150 Deg-C	0 to +3 V
-X23	Copper-Amer	10	0-300 Deg-C	0 to +3 V
-X24	Copper-Amer	10	0-300 Deg-F	0 to +3 V
-X25	Copper-Amer	10	0-500 Deg-F	0 to +3 V

NOTES

1. *A single option code applies to all channels. ("X" indicates the filter option code).*
2. *Temperature coefficients: Platinum-Euro... 0.00385 Ω/Ω/˚C*
   Platinum-Amer...0.00392 Ω/Ω/˚C
   Copper-Amer.....0.00427 Ω/Ω/˚C
3. *RTD resistance shown is for platinum at 0 ˚C, and for copper at +25 ˚C.*
4. *Indicated output range assumes a channel gain of x100.*