VMIVME-3413
32-Channel Signal Conditioning Board

- 32 differential or single-ended low-level analog input channels
- Buffered high-level analog outputs
- Isolation from VMEbus; 500 VDC
- Analog current loop inputs (optional)
- Full-scale input ranges from 5 mV to 10 V (VMIC's 64-channel scanning A/D boards)
- Each channel provides individual
  - — 3-pole low pass filters 10 Hz, 100 Hz, or 1 kHz
  - — Selectable as a factory option
  - — Gain selection of x1, x10, x100, or x1,000
  - — Configurability for RTD, strain gauge bridge, thermocouple, or direct analog input
  - — Half-bridge completion for strain gauge bridge
  - — Provision for RTD excitation; 0.1 to 10 mA per channel; 32 mA total
  - — Optional current loop terminators, 250 Ω
  - — Strain gauge bridge excitation; 2.5, 5, or 10 V at 150 mA
  - — Reference (cold) junction compensation for thermocouple types E, J, K, N, B, T, R, S; local or remote sensing
  - — Output cable matches inputs for VMIC's 64-channel scanning A/D boards
  - — Applied-wire or insulation displacement (IDC) input connectors
- Input connectors provide guard lines between signal pairs

APPLICATIONS

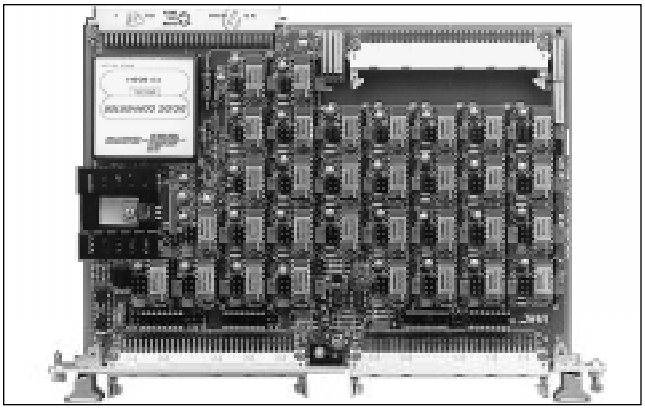
- Transducer input conditioning
- Low-level input filtering
- Pressure monitoring
- Temperature monitoring
- Analog current loops

GENERAL DESCRIPTION — The VMIVME-3413 (Figure 1) is a 32-channel signal conditioning board which is designed to accept low-level differential or single-ended inputs directly from temperature and pressure transducers, or from any other low-level analog signal source. Although the VMIVME-3413 board can be used with any high-level analog multiplexer, it is designed specifically as a companion to VMIC's 64-channel scanning A/D boards (VMIVME-3113A, -3122, etc. See *Related Products and Applications*.)

ANALOG INPUT DESCRIPTION — Each channel can be configured individually to accept RTD, strain gauge, thermocouple, or direct low-level analog inputs. Channel gain is individually jumper-selectable as x1, x10, x100, or x1,000, and when used in conjunction with the compatible ADC boards provide bipolar and unipolar full-scale input ranges from 5 mV to 10 V. Each channel includes a 3-pole low pass filter which can be specified as 10, 100, or 1,000 Hz, common-mode rejection is specified for 60 Hz and below. VMIVME-3413 inputs and outputs can be galvanically isolated from the VMEbus.

FUNCTIONAL CHARACTERISTICS

RTD and Strain Gauge Bridge Excitation:
Excitation for strain gauge bridges is selectable as 2.5, 5, or 10 VDC, with a total capacity of 150 mA. Remote sensing of both the drive and return lines ensures accurate control of bridge excitation voltages. Individual RTD excitation can be substituted for strain gauge excitation, in groups of eight channels and can be adjusted with



Ordering Options								
June 7, 1999 800-003413-000 J		A	B	C	–	D	E	F
VMIVME-3413	–				–			

A = Filter Frequency Option
0 = No Filters
1 = 10 Hz
2 = 100 Hz
3 = 1 kHz
4 = 250 Ω Current Loop Terminators
5 = Option Reserved

B = Gain Options
0 = Option Reserved
1 = x1, x10, x100, x1,000 Standard Accuracy
2 = Option Reserved
3 = x1, x10, x100, x1,000 Standard Accuracy

C = Input P3, P4 Mating Connector Style
0 = Applied (Discrete) Wire
1 = Insulation-Displacement (IDC)
2 = Option Reserved
3 = Option Reserved

Example

Part number VMIVME-3413-211 specifies:
100 Hz input filters
Standard accuracy
Insulation-displacement mating for P3 and P4

I/O Connector Component Data for P3 and P4 for the Applied (Discrete) Wire Connector Option

Component Description	Part Number	Manufacturer
PC Board Connector	100-964-033	Panduit
Compatible Mating Connector	09-03-096-3214	Harting
Female Crimp Contacts (Individual)	09-02-000-8484	Harting
Recommended Crimp Tool	09-99-000-0075	Harting
Connector Shell Housing	09-03-096-0501	Harting

I/O Connector Component Data for P3 and P4 for the Insulation-Displacement (IDC) Option

Component Description	Part Number	Manufacturer
PC Board Connector	120-964-033A	Panduit
Compatible Mating Connector	120-964-435	Panduit
Strain Relief Device	100-000-072	Panduit

I/O Connector Data for P5

Component Description	Part Number	Manufacturer
PC Board Connector	120-964-1470	Panduit
Compatible Mating Connector	120-964-435	Panduit
Strain Relief Device	100-000-072	Panduit

Note

Panduit is also known as ITW/Pancon.

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

header-mounted resistors, from 0.1 to 10 mA. Total RTD excitation available from the board is 32 mA. RTD bridge completion, if required, is provided externally.

Thermocouple Cold Junction Compensation: Reference (cold) junction compensation is provided for thermocouple types E, J, K, N, B, T, R, and S, and is jumper-selectable as originating either at the VMIVME-3413 input connectors (P3 and P4 have a common isothermal strip), or at a remote thermocouple termination location.

Calibration: To support system-level calibration, the board can be jumpered to supply either analog ground, or a precision calibration voltage of +10.000 VDC, at all excitation pins in the P3 and P4 input connectors. Calibration of the VMIVME-3413 board, and of the associated multiplexer/converter board, can be verified by using appropriately wired jumper connectors at P3 and P4 to connect the calibration pin to all 16 inputs of each input connector. All channels are jumpered for unity gain to use this feature for gain calibration.

Compatibility: Standard 6U double height VME board with front panel. VMEbus electrical connectivity is limited to the 5 VDC power bus. No VMEbus control functions are supported.

ELECTRICAL CHARACTERISTICS

(At 25 °C, with rated power supply.)

Number of Channels: 32

INPUT CHARACTERISTICS (Each Channel)

Configuration: Differential, single-ended or half-bridge, noninverting. Jumper configurable.

Input Ranges: Ordering options -A1C, -A3C: ±10 mV, ±100 mV, ±1 V, ±10 V, for ±10 V full-scale output; ±5 mV, ±50 mV, ±500 mV, ±5 V, for ±5 V full-scale output.

Low Pass Filters: Three-pole passive filters (no switching noise). Standard options of 10 Hz, 100 Hz, or 1 kHz. See the Ordering Options.

Current Loop Termination: Optional 250 Ω 0.01 percent resistor replaces the input section of the low pass filter. See the Ordering Options. ±40 mA maximum input.

Input Offset Voltage: Maximum channel offset, referred to input:

x1,000:	±60 µV maximum
x100:	±200 µV
x10:	±800 µV
x1:	±3.0 mV

Offset Voltage Stability: Maximum drift with temperature and time, referred to input:

x1,000:	±1.5 µV/°C	±8 µV/1,000 hr
x100:	±8.0 µV/°C	±30 µV/1,000 hr
x10:	±45 µV/°C	±250 µV/1,000 hr
x1:	±600 µV/°C	±1.5 mV/1,000 hr

Input Resistance: 10 MΩ minimum, line-to-line and line-to-common

Common-Mode Voltage (CMV): ±11 V, zero input signal

Common-Mode Rejection (CMRR): DC-60 Hz, minimum, 350 Ω unbalance, filter option - 0BC (10 Hz); 6 dB less for all other filter options.

Referred to 4-channel group common:

GAIN	-A1C, -A3C
x1,000:	120 dB
x100:	108
x10:	96
x1:	78

Referred to VMEbus power supply common; all gains: 125 dB.

Input Noise, 10 to 1,000 Hz: Maximum noise at 3 σ[1], R_{source}<100 Ω, referred to inputs.

Gain	-1BC (10 Hz) Filter	All Other Filters
x1,000:	6 µVp-p	11 µV p-p
x100:	25 µV p-p	55 µV p-p
x10:	100 µV p-p	200 µV p-p
x1:	1.0 mV p-p	2.0 mV p-p

Offset Configuration: Jumper-selectable as: Zero (no offset), thermocouple CJC, or bridge completion (50 percent of strain gauge bridge excitation voltage)[2].

P3/P4 Calibration Pins: Excitation outputs for all channels are jumper-selectable as ground or +10.000 ±0.005 VDC.

Electrical Connections: Front panel, P3 and P4. Mating cable connectors can be 64-pin IDC or applied (discrete) wire. See the Ordering Options.

Overvoltage Protection: ±15 V indefinitely; ±35 V for one second

1. Three standard deviations (3 σ) includes 99.7 percent of all noise in a normal distribution.
2. Offset for thermocouple cold junction compensation (CJC) uses a gain of x100.

TRANSFER CHARACTERISTICS

Transfer Function:

$E_{out} = E_{in} \times GAIN$,

where:

E_{out} = Output voltage, output pin to output common

E_{in} = Input voltage, input HI to input LO

GAIN = Selected channel gain

Channel Gain: Jumper-selectable for each channel individually as:

Options -A1C, A3C: x1, x10, x100, x1,000

Gain Accuracy: Maximum GAIN error (±percent) at +25 °C. Typical gain error is 0.25 times the indicated value:

	Error	
Gain	**-A1C**	**-A3C**
x1:	0.06	0.03
x10:	0.26	0.11
x100:	0.51	0.26
x1,000:	2.0	0.51

Gain Stability: Maximum GAIN drift (±PPM) with temperature and time. Typical drift is 0.2 times the indicated value:

	Drift	
Gain	**-A1C**	**-A3C**
x1:	20/°C ±50/100 hr	10/°C ±30/1,000 hr
x10:	20/°C ±50/1,000 hr	10/°C ±30/1,000 hr
x100:	40/°C ±75/1,000 hr	30/°C ±80/1,000 hr
x1,000:	100/°C ±200/1,000 hr	55/°C ±120/1,000 hr

Nonlinearity: 0.01 percent maximum (-A1C and -A3C options)

Interchannel Crosstalk: Maximum crosstalk, DC to 1,000 Hz, all filter options:

x1,000:	-120 dB
x100:	-108 dB
x10:	-96 dB
x1:	-78 dB

CHANNEL OUTPUT CHARACTERISTICS

Output Voltage Range: ±10 V maximum full scale

Output Impedance, DC to 1.0 kHz: 25 Ω maximum, in parallel with 50 pF

Loading: ±2 mA, 3000 pF, maximum

STRAIN GAUGE BRIDGE EXCITATION SUPPLY

Output Voltage: Jumper-selectable as +2.5, +5, or +10 VDC

Loading: 0 to 150 mA maximum; 10 µF maximum capacitance

Remote Sensing: Remote sensing for both output and return lines through P3

Accuracy, No Load: ±0.03 percent of nominal output.

Output Resistance:

Local Sensing:	0.2 Ω maximum
Remote Sensing:	1 percent of total line resistance, maximum

Output Noise: 10 mV p-p, 10 Hz to 10 kHz, at 3 σ[1]

Electrical Connections: Front access through P3 and P4

RTD EXCITATION OUTPUTS

Configuration: Provision for individual series resistor per channel from internal +10.00 ±0.01 VDC precision bus

Current Range: 0.1 to 10 mA per output; 32 mA maximum per board

THERMOCOUPLE REFERENCE JUNCTION COMPENSATION

Reference Temperature: Jumper-selectable as either the P3, P4 input connector isotherm, or as a remotely located reference signal through P4[3].

Junction Types: Local (P3, P4) compensation is jumper-selectable for thermocouple types E, J, K, N, B, T, R, and S. External compensation can be provided for any thermocouple type[3].

Accuracy: Maximum reference (*cold*) junction compensation error over the specified operating temperature, after calibration at +25 °C, excluding external sensor errors if remote sensing is implemented:

TC Type	Maximum Error
B	±0.5 °C
J, K, T	±1.5 °C
E, N, R, S	±2.5 °C

3. Remote compensation input is scaled to +1 µA per degree Kelvin. +15 VDC is available at P3 for remote sensor power.

PHYSICAL/ENVIRONMENTAL

Temperature: 0 to +55 °C, operating
-20 to 85 °C, storage

Dimensions: Double height Eurocard (6U) Board, 160 x 233.35 mm

Altitude: Operation to 10,000 ft (3,048 M)

Cooling: Forced air convection

Humidity: 10 to 80 percent relative, noncondensing

Power Requirements: 2.5 A typical at +5 VDC, 3.0 A maximum. Bridge excitation supply fully loaded.

MTBF: 89,800 hours (217F)

RELATED PRODUCTS AND APPLICATIONS — The VMIVME-3413 is designed to be a companion signal conditioner for VMIC's 64-channel scanning A/D boards (VMIVME-3113A, -3122, etc.). For the best overall performance, the A/D board should be ordered with the highest frequency filter option available.

TRADEMARKS

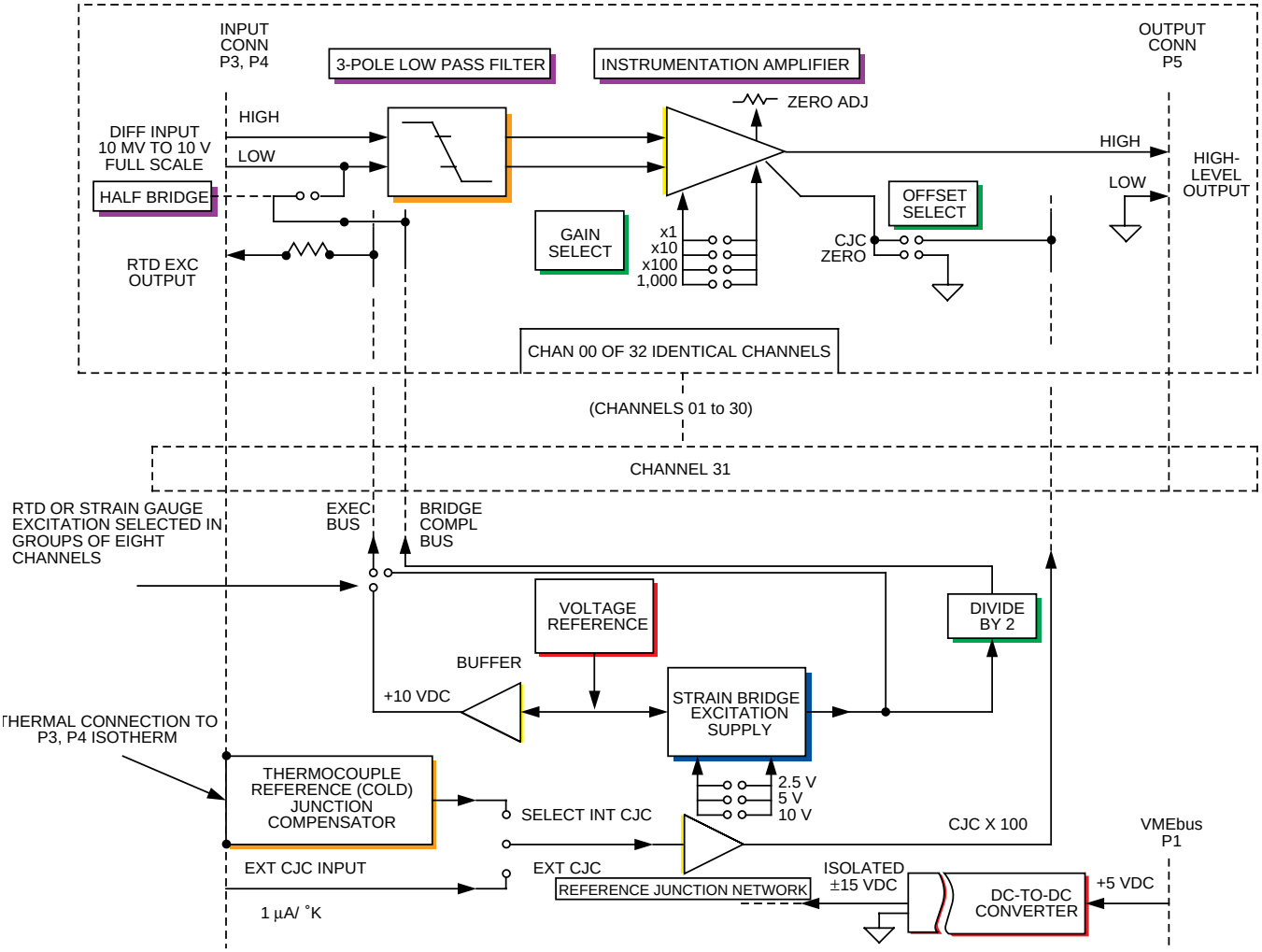


Figure 1. VMIVME-3413 32-Channel Signal Conditioning Board