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VMIVME-4105
8-Channel 12-bit Multiplying Digital-to-Analog Converter Board

- 8-channel analog output (D/A per channel)
- Jumper-selectable P2 or front panel outputs
- 12-bit resolution
- 2- or 4-quadrant multiplier jumper-selectable option
- Jumper option to support eight independent or one shared AC or DC voltage reference
- ±10 V or 0 to -10 V jumper-selectable options
- Double Eurocard format with front panel fail LED
- Requires VMIVME-31xx for Built-in-Test
- Multiplexed programmable outputs for testing analog outputs
- Internal DC reference to support Built-in-Test

FUNCTIONAL CHARACTERISTICS

Analog Output Channels: Eight multiplying analog output channels. For unipolar operation (two-quadrant multiplier), the analog output equation is:

$$V_{OUT} = -V_{REF} \frac{(\text{Digital Code}_{10})}{4{,}096}$$

The analog output equation for offset binary bipolar operation (four-quadrant multiplier) is:

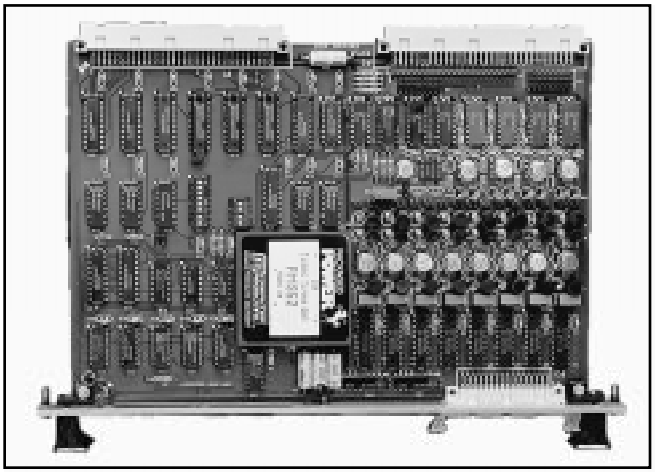
$$V_{OUT} = -V_{REF} + V_{REF} \frac{(\text{Digital Code}_{10})}{4{,}096} \times 2$$

Analog outputs are jumper selectable to the P2 or P3 connector.

Test Mode: The DAC board may be used in conjunction with other VMIC boards and the VMIC AMXbus™ backplane for extensive fault detection and isolation. There are two dedicated analog buses that are used by the DAC board.

Tests may be performed by utilizing any one of the eight DAC outputs. While in a test mode the eight DAC outputs may be isolated from the P3 connector so that user-connected devices are not affected by worst-case testing in an off-line mode. Real-time fault detection and isolation is not supported if the multiplying DAC option is used. Built-in-Test is not supported if P2 outputs are used.

Analog Input Test Mode: Any one of the eight analog outputs may be switched to an analog test bus (Test Bus 1). This analog bus may be used to verify the operation of a VMIC Multiplexer Expansion Board (VMIVME-3200A) that is designed to support Built-in-Test. The interconnecting of the analog bus between boards may be accomplished by using one of VMIC's 5-, 9-, or 19-slot AMXbus backplanes.



Analog Output Testing: Any one of the eight analog outputs may be switched to the analog output test bus (Test Bus 2). This bus is routed through the P2 AMXbus analog backplane to an Analog-to-Digital Converter (ADC) board which is used to verify each DAC channel on the VMIVME-4105 board.

Compatibility: The VMIVME-4105 Analog Output Board is a standard, double height, printed circuit board which is compatible with the VMEbus specification.

Board Address: The physical address for the board may be selected through a 12-bit DIP switch. VMEbus address lines A04 through A15 are decoded for board selection.

Ordering Options

October 9, 1995 800-004105-000 G	A	B	C	–	D	E	F
VMIVME-4105 –	0		0	–			

A = 0 (Option reserved for future use)
B = Channel/Built-in-Test Options
1 = 4-Channel, 12-bit Multiplying Analog Outputs without Built-in-Test
2 = 8-Channel, 12-bit Multiplying Analog Outputs without Built-in-Test
3 = 8-Channel, 12-bit Multiplying Analog Outputs with Built-in-Test
C = 0 (Option reserved for future use)

Connector Data

Compatible Cable Connector	Panduit No. 120-332-435E
Strain Relief	Panduit No. 100-000-042
PC Board Header Connector	Panduit No. 120-332-033A

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
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VMEbus Access: Address modifier bits are decoded to support nonprivileged short I/O or supervisory short I/O access. A single jumper is provided to support the option.

Data Transfer: When a board write operation is executed, the destination of the data is controlled by data bit 15. If data bit 15 is a *one*, the word is written to the Control Register. When data bit 15 is a *zero*, the data is written to the Digital-to-Analog Converter (DAC) that is addressed. Executing a read access to any valid board address will allow the user to read the board status. Digital data to the DAC is contained in data bits D00 through D11. Unipolar binary code is used for unipolar operation (0 to -10 V output). Bipolar operation (-10 to +10 V output) may use either offset binary or two's complement code.

Mode Selection: The operation modes of the board may be selected by writing to the Control Register. Only data bits D08 through D14 are utilized for the Control Register. Data bits D08 through D14 contain information to select the different DAC operation modes. The function of each bit is as follows:

D08	–	Enables DAC outputs to the P3 connector
D09	–	Selects internal +10 V reference or external user-supplied reference
D10 to D13	–	Test mode control bits
D14	–	Operates Fail LED
D15	–	Routes data to the Control and Status Register (CSR) (if D15 = *one*) or to selected DAC channel (if D15 = *zero*)

Note the CSR can be accessed from any of the eight-word locations.

When the board is written to, the destination of the data is controlled by data bit 15. If data bit 15 is a *one*, the word is written to the Control Register. When data bit 15 is a *zero* the data is written to the DAC which is addressed. Executing a read access to any valid board address will allow the user to read the board status.

System Reset: Application of the system reset signal through the VMEbus initializes the board into a state with all analog outputs disconnected from the output connector (P3) and the analog test outputs disconnected from the P2 connector.

Front Panel Fail LED: If an error condition is detected, a front panel Fail LED may be illuminated under software control for a visual failure indication. The Fail LED is illuminated upon power up clear and is extinguished upon successful diagnostic execution.

DAC Reference: All eight DAC channels may share a high precision, low drift, reference that is buffered and available for external use at the P2 connector. A user-supplied reference may be selected for the reference for eight DAC channels. This reference may be input to the board by either the P2 or P3 connector. An individual reference per channel is available through the P2 connector which provides the capability for eight independent multiplying analog output channels.

ELECTRICAL CHARACTERISTICS

Data Transfer: A16/D16

Analog Output (Voltage Output @ R_{LOAD} = 2 kΩ and V_{REF} = +10 V):
Unipolar: 0 to -10 V
Bipolar: -10 to +10 V at 5 mA

DAC Input Code:
Unipolar: Unipolar binary code
Bipolar: Offset binary or two's complement code

Resolution: 12 bits

Accuracy at (25 °C): *
Gain Error: Adjusted to ±1/2 LSB
Offset: ±0.5 mV
Relative Accuracy: ±1 LSB

Gain Temperature Coefficient:
±10 PPM/°C
Δ Gain/ Δ Temperature

* Accuracy stated without analog output isolation switches installed. The Built-in-Test hardware features analog output isolation switches for all eight channels. These switches are in series with the analog output and the user-connected device at the P3 connector and may be switched under software control. These switches have an ON resistance of approximately 100 Ω (maximum). If the user-connected load does not have a high impedance input, then a possible voltage division error is introduced. For example, if R(LOAD) is 10 kΩ, then a 1 percent error is introduced. R(LOAD) should be 1 MΩ or greater for an error of .01 percent or less.

External DAC Reference Input:
±10 VDC input (maximum)
±10 V p-p AC input (maximum)

Output Accuracy Versus Frequency (AC Reference Input Sine Wave):
1 percent of FSR up to 10 kHz

Reference Output:
Voltage Output: 0 V (±0.5 mV)
Temperature Coefficient: 5 PPM/°C
Long-Term Stability: 25 PPM/1,000 hr
Current Available for External Use: 10 mA

Settling Time: 6 µs (maximum) to $\pm^1/_2$ LSB

Monotonicity: Monotonic over full temperature range

Output Isolation Resistance:
Resistance of output switch — 100 Ω (maximum)
Field isolation switches are optional

PHYSICAL/ENVIRONMENTAL

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

Humidity: 20 to 80 percent relative, noncondensing

Altitude: Operation to 10,000 ft

Cooling: Forced air convection

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

VMEbus Connector: Two 96-pin DIN connectors. VMIC utilizes the user I/O pins on the P2 connector to support an optional analog bus (AMXbus). A wide variety of AMXbus backplanes are available from VMIC as a standard product.

Output Connector:
Board Connector (P3) — Panduit male connector type 120-332-033A
Input cable connector — female type 120-332-435E

Power Requirement: 2.5 A (maximum) at +5 VDC

TRADEMARKS

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APPLICATION AND CONFIGURATION GUIDES — The following Application and Configuration Guides are available to assist the user in configuring systems based on VMIC's products:

Title	Document No.
Digital Input Board Application Guide	825-000000-000
Change-of-State Board Application Guide	825-000000-002
Digital I/O (with Built-in-Test) Product Line Description	825-000000-003
Synchro/Resolver (Built-in-Test) Subsystem Configuration Guide	825-000000-004
Analog I/O Products (with Built-in-Test) Configuration Guide	825-000000-005
Connector and I/O Configuration Guide	825-000000-006

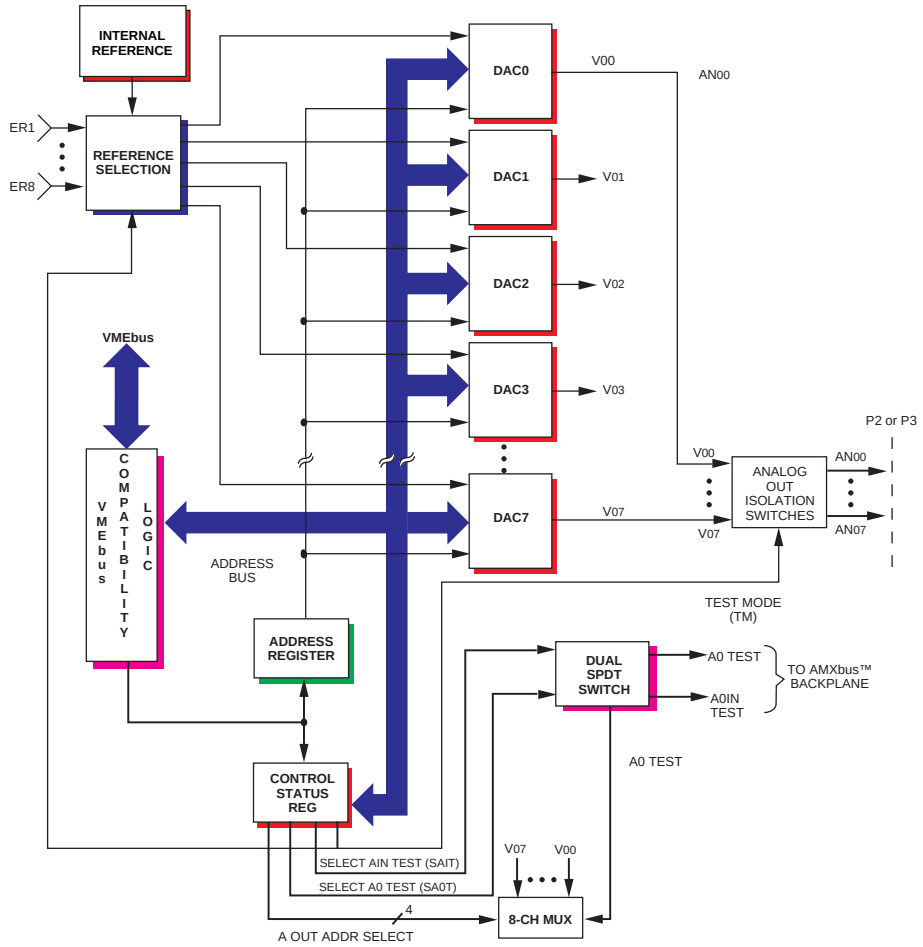


Figure 1. VMIVME-4105 8-Channel Multiplying Analog Output Board

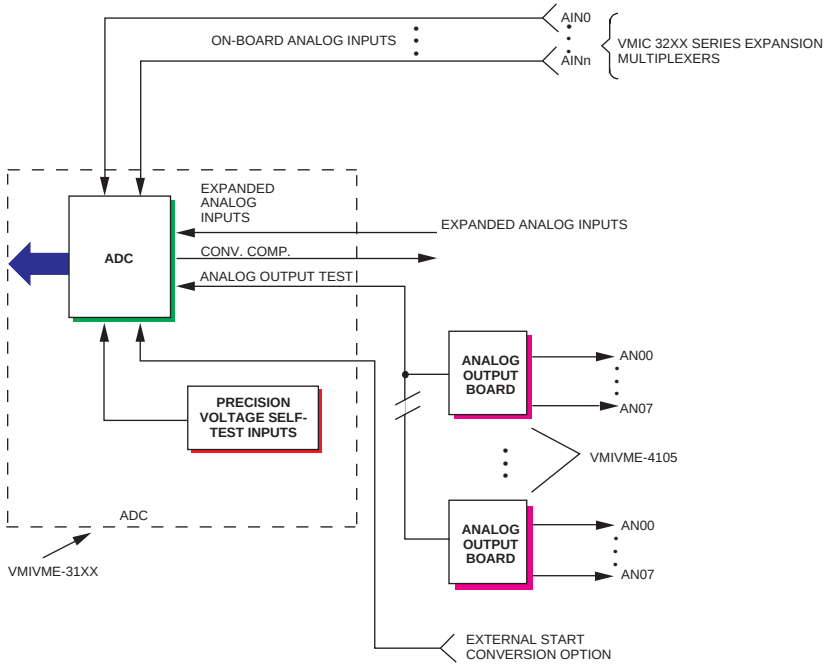


Figure 2. Simplified Functional Multiplying DAC Subsystem Configuration with Built-in-Test

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