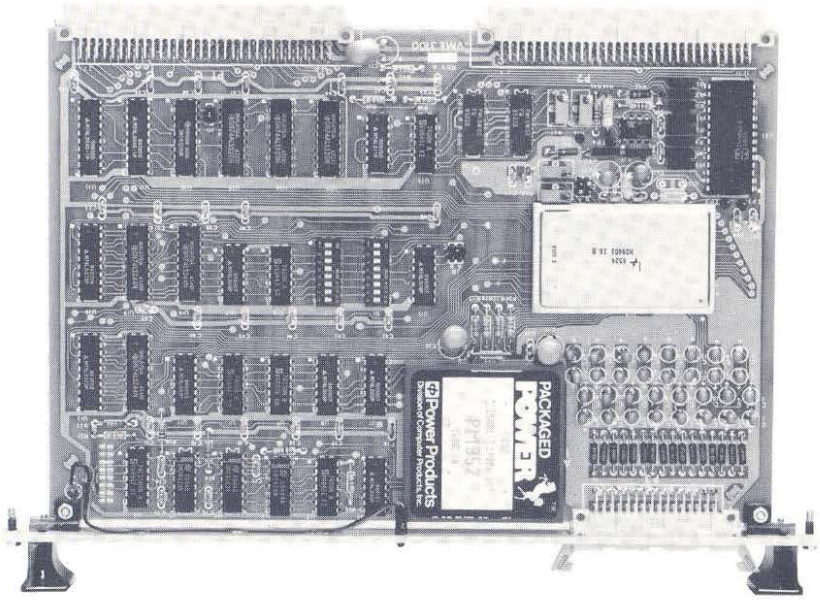
VMIVME-3100

12-bit ANALOG-TO-DIGITAL CONVERTER BOARD WITH 16 SINGLE-ENDED OR 8 DIFFERENTIAL CHANNELS



FEATURES

- 12-bit RESOLUTION
- 9 µsec CONVERSION TIME
- USER-SELECTABLE ACQUISITION TIME (9 to 288 µsec)
- 16-CHANNEL SE/8 DIFFERENTIAL FRONT PANEL INPUTS
- OVERVOLTAGE PROTECTED INPUTS
- Fail SAFE WITH POWER-OFF
- FULL SCALE INPUT RANGE SELECTION 0 to + 5 V, 0 to +10 V, ±2.5 V, ± 5 V, ±10 V
- ON-BOARD BUILT-IN-TEST LOGIC FOR FAULT DETECTION
- SUPPORTS COMPLETE PRODUCT LINE OF VMIC MULTIPLEXER EXPANSION BOARDS
- REQUIRES VMIC ANALOG BACKPLANE (AMXbus™) FOR MULTIPLEXER EXPANSION
- FRONT PANEL Fail LED
- EXTERNAL TRIGGER INPUT OPTION
- DEDICATED MULTIPLEXER INPUT FOR TESTING ANALOG OUTPUT BOARDS (VMIVME-41XX)
- COMPATIBLE WITH INTELLIGENT I/O CONTROLLERS

VMIC VME®

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VMIVME-3100

12-bit ANALOG-TO-DIGITAL CONVERTER BOARD WITH 16 SINGLE-ENDED OR 8 DIFFERENTIAL CHANNELS

SPECIFICATIONS

FUNCTIONAL CHARACTERISTICS

COMPATIBILITY:

The VMIC Analog-to-Digital Converter (ADC) Board is a standard, double height, printed circuit board which is compatible with the VMEbus.

BOARD ADDRESS:

The address for the board is determined by a 15-bit DIP Switch. This board can be plugged into any available slot (except slot 1) in the backplane.

CHANNEL SELECTION:

Data bits D00 through D03 are used to select which of the 16 channels on the ADC is to be sampled in the normal mode. In the test mode, these same bits select which of several test voltages are to be sampled. In the external multiplexer sampling mode, the channel being sampled is determined by control data previously sent to an expansion multiplexer board (VMIVME-32XX Series or VMIVME-4500) in the same backplane. The four data lines have no effect in this mode.

When utilizing the external multiplexer mode, the ADC and up to 16 multiplexer boards share an Analog Multiplexer Bus (AMXbus™). The AMXbus™ utilizes the user I/O pins on the P2 expansion bus and is available in 5-, 9-, 14-, and 19-slot backplanes.

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. The board is factory configured for supervisory short I/O access.

DATA TRANSFER TYPE:

D16, D08 (EO).

DATA CONVERSION:

Conversion is initiated by program control or upon receipt of an externally generated trigger pulse. Mode selection control is available to enable or disable the external trigger feature.

MODE SELECTION:

Other operational modes of the board may be selected as follows:

D00 to D03	-	Selects channel or test input*.
D04 and D05	-	Enables on-board multiplexers.
D06	-	Initiates analog-to-digital conversion.
D07	-	Not used.
D08 and D09	-	Selects one of three analog input modes.
D10	-	Enables external start control trigger.
D11 to D12	-	Not used.
D13	-	Enables a special test input that supports testing of VMIC's VMIVME-41XX analog output boards.
D14	-	Operates Fail LED.
D15	-	Selects between ADC read or CSR read operations.

*Eight differential front panel inputs are selected by D00 to D02.

TEST MODE:

In the test mode, the ADC may be programmed to convert one of nine test voltages. It may also be programmed to support fault detection and isolation of VMIC's Model VMIVME-41XX Digital-to-Analog Converter (DAC) boards by converting any selected analog output channel through an analog test bus (AMXbus™) on the P2 backplane.

BOARD FAILURE:

The front panel Fail LED is illuminated at power-up and is extinguished under program control after successful execution of diagnostics.

DIGITAL DATA:

Twleve-bit digital data format is determined by two sets of jumpers. The data is jumper-selectable for offset binary or straight binary and can represent either an unipolar or bipolar range. A jumper is provided to support two's complement output coding.

CHANNELS:

Sixteen single-ended analog input channels are available on the board. An 8-channel differential option is available. Front panel differential inputs are supported by the installation of an optional hybrid converter module. Installation of this module is made at the factory based upon the manufacturing options specified in the Board's ordering code.

MULTIPLEXER EXPANSION:

The ADC board supports VMIC's full line of external multiplexer boards which include the 32-channel VMIVME-3200A, the 64-channel VMIVME-3210, and the 16-channel Analog I/O (AIO) VMIVME-4500A. Models VMIVME-3200A and VMIVME-3210 multiplexer expansion boards support differential and single-ended input and include on-board filters. The VMIVME-3210 supports current sense inputs. Additional multiplexer boards are in development.

ELECTRICAL SPECIFICATIONS

RESOLUTION:

12-bit.

ANALOG INPUT RANGES: (RESISTOR SELECTABLE)

0 to +5, 0 to +10 V.
±2.5, ±5, ±10 V.

CONVERSION TIME:

9 µsec.

ACQUISITION TIME:

Selectable from 9 to 288 µsec.

INPUT IMPEDANCE:

10 MΩ (minimum).

MONOTONICITY:

Monotonic over full temperature range.

COMMON MODE RANGE:

±11 V (maximum).

CMRR, G = 1 @ 60 Hz:

-82 dB (typical).

ACCURACY:

System error (typical @ 25 °C) ±1 LSB.

PRECISION TEST VOLTAGES:

-10.00 , -7.5, -5.00 V.
-2.50, 0.00, +2.50 V.
+5.00, +7.50, +10.00 V.

INPUT OVERVOLTAGE PROTECTION:

±25 V.

OPTIONAL SINGLE POLE ANALOG INPUT FILTER (1) (3 dB ATTENUATION):

6, 9, 36 Hz.

POWER REQUIREMENTS

+5 V @ 1.8 A (maximum).

(1) Contact VMIC for other filter requirements.

PHYSICAL/ENVIRONMENTAL SPECIFICATIONS

DIMENSIONS:	Standard VME double height board . 160 x 233.5 mm.
VMEbus CONNECTOR:	Two 96-pin DIN connectors. VMIC utilizes the user I/O pins on the P2 connector to support an Analog Multiplexer Bus (AMXbus™). A variety of AMXbus™ backplanes are available from VMIC as a standard product.
ANALOG CONNECTOR (16 SE ANALOG INPUTS):	Board connector (P3) - Panduit male connector type 120-332-033A. Input cable connector - Female type 120-332-453E.
TEMPERATURE:	0 to +55 °C, operating. -20 to +85 °C, storage.
HUMIDITY:	20 to 80 percent relative, noncondensing.

APPLICATION AND CONFIGURATION GUIDES

The following application and configuration guides are available from VMIC to assist the user in the selection, specification, and implementation of systems based in VMIC's products.

TITLE	DOCUMENT NO.
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 Cable Application Guide	825-000000-006

FUNCTIONAL DESCRIPTION

INTRODUCTION

The VMIVME-3100 offers a data acquisition system with superior performance and reliability, combined with low cost. The VMIVME-3100 ADC may be manufactured with a variety of options as shown by the ordering information on page 9. Acquisition and conversion time combined without the expansion multiplexers is approximately 20 µsec maximum, giving a maximum throughput rate of approximately 50 kHz for high-level inputs. Output coding is straight binary, offset binary, or two's complement.

The successive approximation ADC circuitry includes a built-in multiplexer, a programmable gain instrumentation amplifier, and a sample-and-hold circuit. The instrumentation amplifier is programmed with a single resistor for gains of 1 to 1,000. This key feature is useful in low-level signal applications involving bridge amplifiers, transducers, strain gage, and thermocouple interfaces.

PROTECTION

The 16 front panel analog inputs are overvoltage protected. Protection is assured to 20 V beyond the ±15 V supply voltages. With the +15 V power ON, the maximum input voltage range is ±35 V. If the power supply is OFF, the maximum input voltage is ±20 V.

VMIVME-3100 THROUGHPUT

The throughput time for operation with front panel inputs is the sum of the amplifier settling time and the A/D conversion time. The A/D conversion time is 9 µsec. The amplifier settling time is a function of the input voltage range and the gain setting. When the gain exceeds 10, the amplifier needs more than the allotted 9 µsec for settling to within 12-bit accuracy. Even though the signal inputs may change slowly, the amplifier must have enough time to settle fully in response to the abrupt change before a conversion takes place.

Table 1 provides a matrix of throughput as a function of input voltage ranges and gain settings.

Table 1. Input Range Parameters (Typical)

INPUT RANGE	GAIN	RGAIN (Ω)	AMPLIFIER SETTLING TIME	RDELAY (Ω)	THROUGHPUT	SYSTEM ACCURACY
±10 V	1	NONE	9 µsec	NONE	55.5 kHz	0.009%
±5 V	2	20.0 k	9 µsec	NONE	55.5 kHz	0.009%
±2.5 V	4	6.667 k	9 µsec	NONE	55.5 kHz	0.009%
±1 V	10	2.222 k	9 µsec	NONE	55.5 kHz	0.009%
±200 mV	50	408.2	16 µsec	7 k	40.0 kHz	0.010%
±100 mV	100	202.0	30 µsec	21 k	25.6 kHz	0.011%
±50 mV	200	100.5	60 µsec	51 k	14.5 kHz	0.016%
±20 mV	500	40.08	144 µsec	135 k	6.5 kHz	0.035%
±10 mV	1000	20.02	288 µsec	279 k	3.3 kHz	0.069%

S3100/T-1

System Throughput

The VMIVME-3100 supports a wide variety of multiplexer expansion boards which affect the total system throughput. The total system throughput may be calculated from Table 2 using the formula as shown below:

$$Fs = \frac{1}{N\,(T1 + T2 + T3)}$$ Samples per second, where

N is the number of channels
T1 is the remote multiplexer acquisition time
T2 is the VMIVME-3100 amplifier settling time
T3 is the VMIVME-3100 A/D conversion time

Table 2. System Throughput with Expansion Multiplexer Boards

GAIN	T_1	T_2	T_3
1	X	9 µs	9 µs
2	X	9 µs	9 µs
4	X	9 µs	9 µs
10	X	9 µs	9 µs
50	X	16 µs	9 µs
100	X	30 µs	9 µs
200	X	60 µs	9 µs
500	X	144 µs	9 µs
1000	X	288 µs	9 µs

S3100/T-2

T_1 is a variable on each multiplexer expansion board data sheet.

A wide variety of multiplexer expansion boards are supported by the VMIVME-3100 ADC Board. An AMXbus™ is available as a standard product to support the low-cost expansion concept. A list of multiplexer expansion products is provided in Table 3.

Table 3. Multiplexer Expansion Products

MODEL NO. (VMIVME-)	DESCRIPTION	AVAILABILITY
3200A	32 S/16 D Multiplexer with Built-in-Test	Now
3210	64 S/32 D Multiplexer with current sense option	Now
3220	8-channel thermocouple Multiplexer	*
3230	8-channel RTO/strain gage Multiplexer	*
4500B	16 single-ended Multiplexer with 16 analog outputs	Now
A05	5-slot P2 analog backplane	Now
A09	9-slot P2 analog backplane	Now
A19	19-slot P2 analog backplane	Now

*Call factory for availability.

S3100/T-3

BUILT-IN-TEST

The VMIVME-3100 Board supports a wide variety of VMIC's Analog I/O (AIO) products that are designed to support fault detection and isolation to the board level. The VMIVME-3100 employs an internal voltage divider to support testing the VMIVME-3100 as a stand-alone board. The VMIVME-3100 also contains a dedicated input test multiplexer that supports loopback testing of a variety of VMIC's analog output boards. A summary of analog output products that support this loopback concept is shown in Table 4.

Table 4. Analog Output Products with Built-in-Test

MODEL NO. (VMIVME-)	DESCRIPTION	AVAILABILITY
4100	16-channel, 12-bit D/A	Now
4116	8-channel, 16-bit D/A	Now
4105	8-channel, 12-bit multiplying	Now
4500B	12-bit D/A, dual port memory, 16 S&H outputs, and 16 single-ended analog input multiplexer channels	Now

S3100/T-4

INTELLIGENT I/O CONTROLLER (IIOC)

The VMIVME-3100 ADC is compatible with VMIC's family of Intelligent I/O Controllers (IIOCs) (VMIVME-9015, -9016A, -9017, -9027, 9065, -9066, -9067, and -9068) which provide the user with a turnkey I/O subsystem when used with a variety of VMIC's board level products. The front panel inputs are not supported by the IIOC product line.

INTERFACING TO VMIC'S 3V/5V SERIES SIGNAL CONDITIONERS

The 3V/5V Series modular signal conditioners convert a wide variety of low-level voltages, thermocouples, RTDs, etc., to high-level voltages. In addition, many of the modules provide up to ± 1,500 Vrms continuous isolation. Up to 16 of these modules may be installed in a signal conditioning backplane with an optional 19-inch rack mount kit. The high-level outputs are routed to a 32-pin connector, from which a ribbon-cable connects the signal conditioning backplane to the front panel of the VMIVME-3100 ADC Board.

The 3V/5V Series signal conditioning subsystem, in conjunction with the VMIVME-3100 ADC Board, provides a complete solution enabling almost any type of sensor data to be available to the VMEbus. The following input modules are available: low-level voltage (mV), AC, thermocouple, RTD, current, frequency, strain gage, LVDT, and high-level voltage (V) inputs.

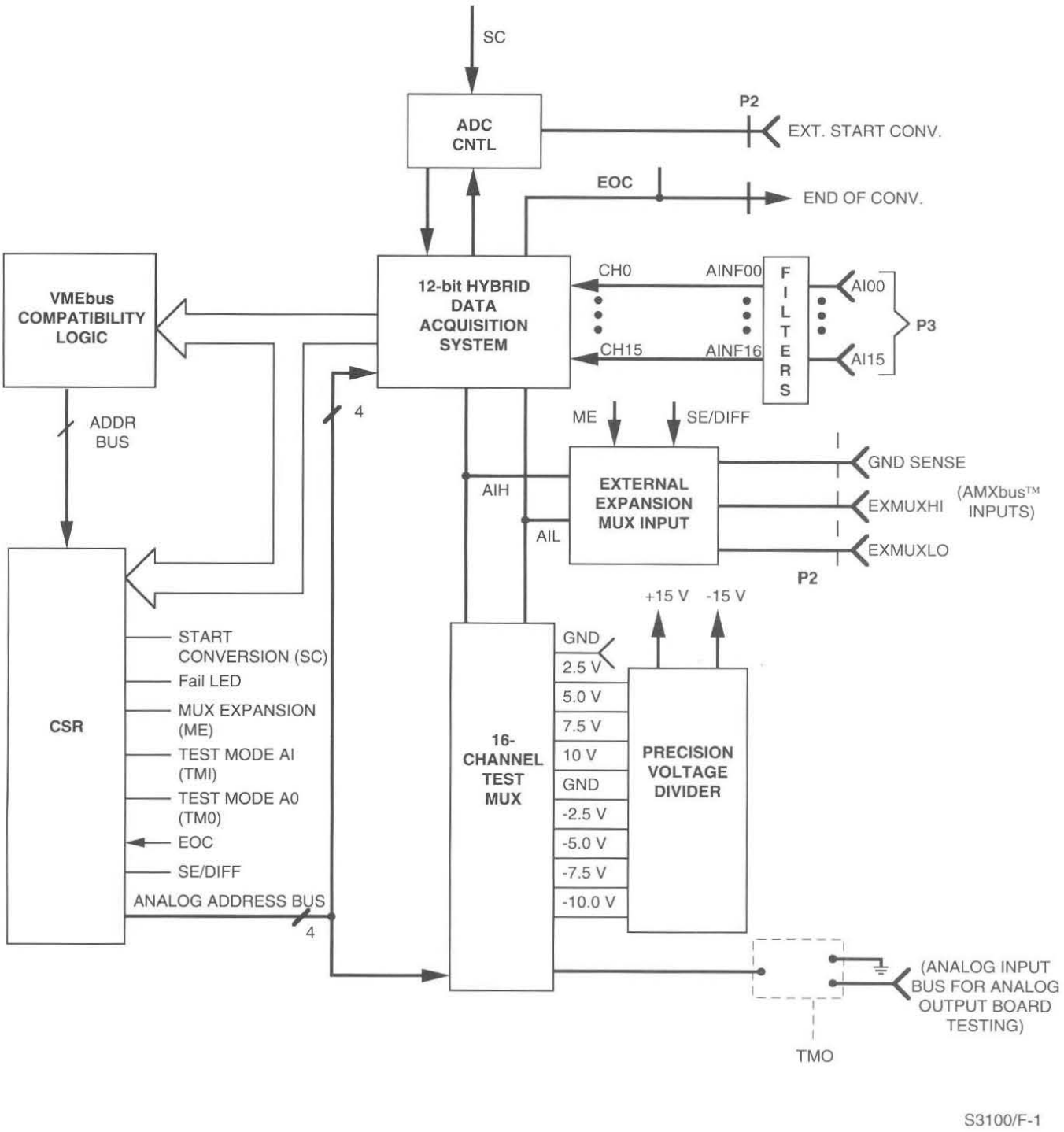
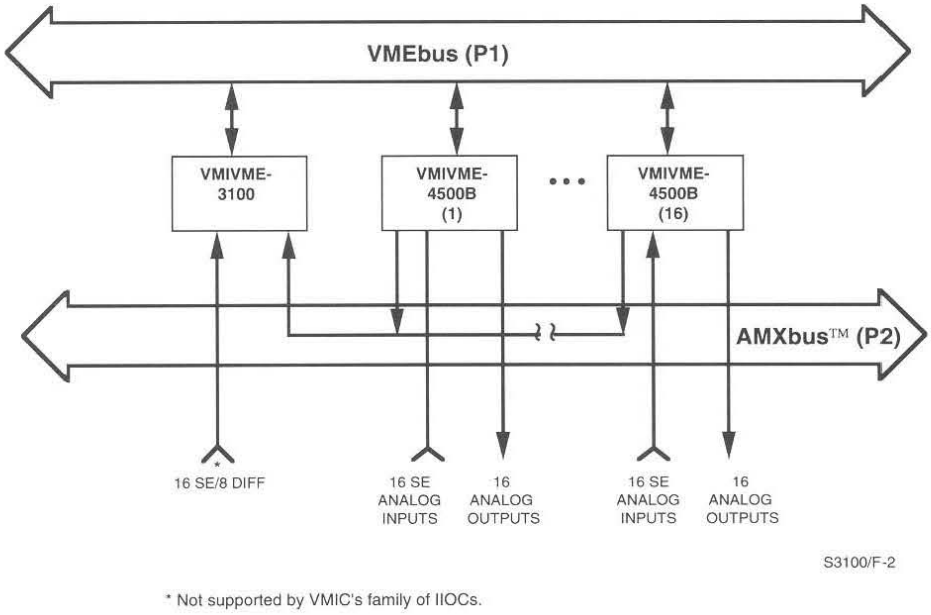


Figure 1. VMIVME-3100 Functional Block Diagram



* Not supported by VMIC's family of IIOCs.

Figure 2. Typical Low-Cost AIO Configuration with Built-in-Test

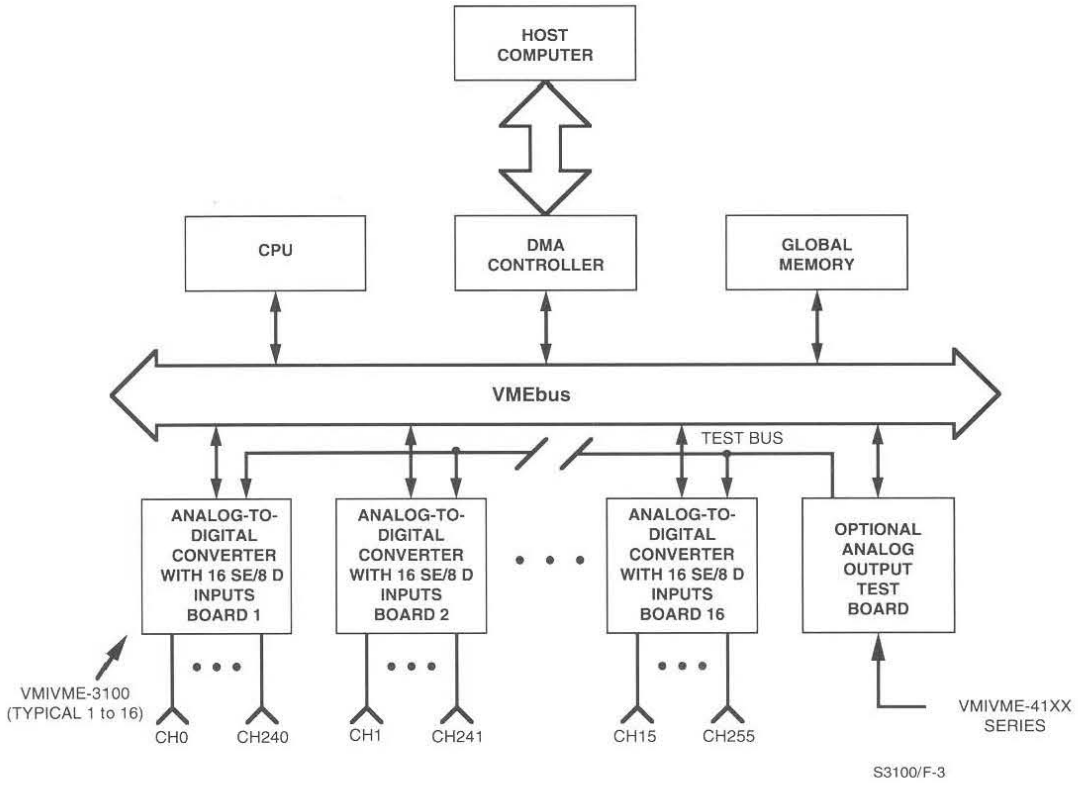


Figure 3. VMIC High Performance Analog-to-Digital Subsystem with Built-in-Test (ADC per 16 SE Channels up to 640,000 Samples/sec) 256 Analog Input Channels

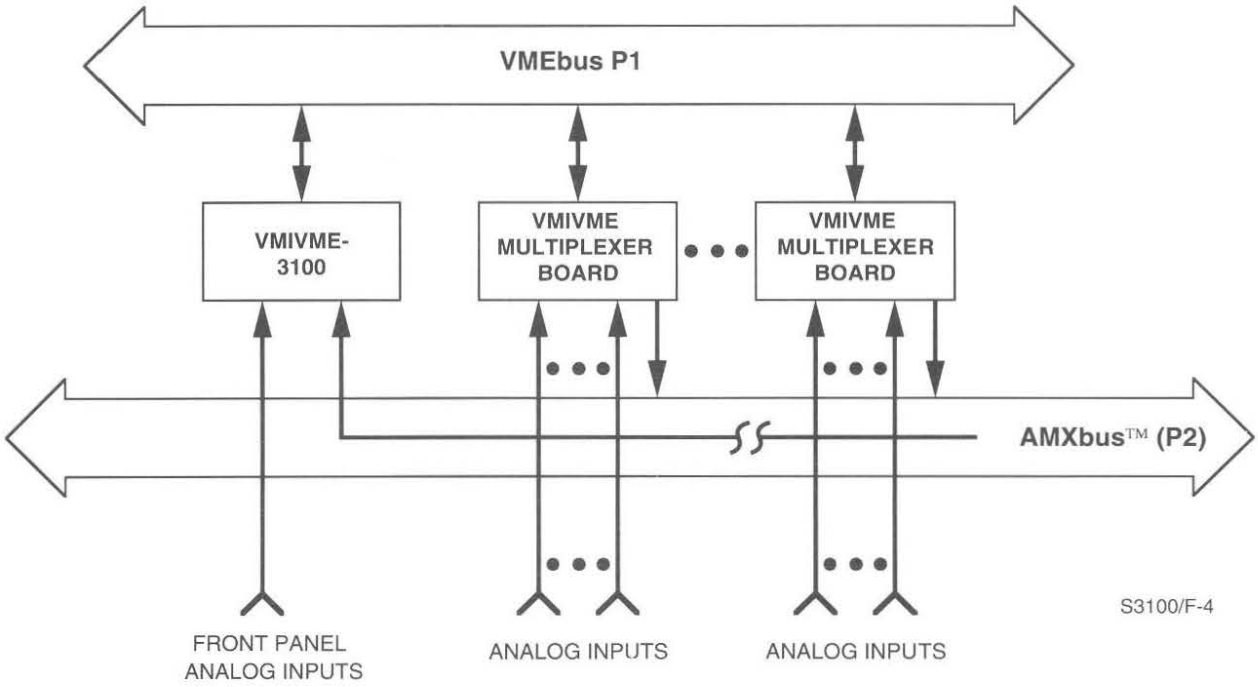


Figure 4. VMIVME-3100 Typical Configuration with Multiplexer Expansion

The following ordering information is provided for users who require compatibility with VMIC's line of Intelligent I/O Controllers.

12-bit ANALOG-TO-DIGITAL CONVERTER BOARD WITH 16 SINGLE-ENDED OR 8 DIFFERENTIAL CHANNELS

VMIVME - 3100 -A B C

FILTER OPTIONS
0 = No Filter
1 = 6 Hz
2 = 9 Hz
3 = 36 Hz

OPERATIONAL OPTIONS
0 = No Built-in-Test Logic (Single-Ended Inputs)
1 = Built-in-Test Logic and AMXbus™ Support (Single-Ended Inputs)
2 = No Built-in-Test or AMXbus™ Support Logic (Single-Ended Inputs)
3 = Differential Inputs with No Built-in-Test Logic
4 = Differential Inputs with No Built-in-Test or AMXbus™ Support Logic
5 = Differential Inputs with Built-in-Test Logic and AMXbus™ Support

INPUT VOLTAGE* AND LOGIC POLARITY
0 = 0 to +5 V, ±5 V Negative True**
1 = 0 to +10 V, ±10 V Negative True**
2 = ±2.5 V, Negative True**
3 = 0 to +5 V, ±5 V Positive True***
4 = 0 to 10 V, ±10 V Positive True***
5 = ±2.5 V, Positive True***

MODEL NO.

CONNECTOR DATA

COMPATIBLE CABLE CONNECTOR	PANDUIT NO. 120-332-435E
STRAIN RELIEF	PANDUIT NO. 100-000-042
P.C. BOARD HEADER CONNECTOR	PANDUIT NO. 120-332-033A

* Where bipolar and unipolar input ranges are shown, user selects with on-board jumper. IIOCs require 41x option.

** A logic "zero" on the VMEbus equals a logic "one" on the ADC Board.
A logic "one" on the VMEbus equals a logic "one" on the ADC Board.