GE
Intelligent Platforms

VMIVME-9081* Specifications

Intelligent I/O Controller

Features:

- Intel® Ultra Low Voltage Celeron® 650 MHz processor
- 128 Mbyte PC100 SDRAM
- Host interface options:
  - GE's Reflective Memory (5550, 5576, 5565 and 5588)
  - 10/100 Mbit Ethernet
  - Embedded (IIOC as slave CPU)
- Firmware provides all required support for scanning inputs, updating outputs, EU and data-type conversions, fault detection, fault isolation, and error reporting
- Optional host software support utilities
  - I/O point manager
  - Report generator
  - Configuration downloader
  - Real time interface software
  - Source code available in C
- Supports a wide variety of GE's Built-in-Test I/O modules (BITMODULES™)
- Available CRT-based control panel
- Low cost expansion

imagination at work

Ordering Options							
Oct 3, 2011 800-009081-000 D		A	B	C	D	E	F
VMIVME-9081/S	–	0	0	1	0	0	1

A = 0 (Reserved for future use)
B = 0 (Reserved for future use)
C = Processor
1 = VMIVME-7700-111-000
D = 0 (Reserved for future use)
E = 0 (Reserved for future use)
F = 1 (Reserved for future use)

Note

A total of 12 I/O chassis (numbered 1 through 12) are supported with a maximum of 228 I/O boards. With this option, all board models listed on the I/O boards and support page are allowed. If the master chassis contains I/O boards, it is identified as chassis 1. Otherwise, the master chassis may be identified as chassis 0, and 12 slave I/O chassis may be used.

For Ordering Information, Call:
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Email: info.embeddedsystems@ge-ip.com
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Functional Characteristics

Introduction: The VMIVME-9081* provides a flexible, compact solution including user-friendly software utilities for the user who requires I/O products coupled with a preprogrammed single board computer (SBC) for effective turnkey operation. Multiple VMIVME-9081 can reside on a single Reflective Memory (RFM) link.

Subsystem Description: GE provides a complete product line of I/O interface equipment designed specifically for the simulation and training industry. This equipment utilizes state of the art building blocks organized around the VMEbus architecture, providing a high density, high throughput, low cost solution to the I/O control problem. The real time interface equipment includes an Intelligent I/O Controller (IIOC) that is designed to operate in parallel with customer-furnished/programmed SBCs and other customer-furnished hardware.

GE's I/O board-level product line, trademarked BITMODULES, is comprised of digital input/output boards, analog input/output boards and synchro/resolver input/output boards. Some of GE's products are designed with extensive Built-in-Test capability and a front panel Fail LED to enable quick fault detection and isolation. These products support both offline and real time fault detection and isolation.

GE's real time interface equipment supports configuration data, generated by a customer-furnished host computer, that allows user-definable scan lists, data conversion formats and service order of each I/O type. The system is expandable through the use of building block board-level products. As requirements change, the I/O system can be easily reconfigured. This configuration concept allows independent mapping of I/O points to memory, thus enabling the hardware configuration to change without changing the software interfaces.

The system provides extensive data type and engineering unit conversions. Digitals may be represented as bit, byte, word or longword logicals. In addition, the host's definition of logical true may be designated as least significant bit (LSB) on, most significant bit (MSB) on or all bits on for byte, word and longword digital points. Analog and synchro values may be represented as host floating-point format or integer numbers. Engineering unit conversions for analogs include: offset binary, scaled, first-, second- and third-order polynomial, two's complement integer, sine, cosine, arcsine, arccosine, table lookup, natural log and common log. Engineering unit conversions for synchros include: offset binary, degrees +180 to -180, degrees 0 to 360, scaled bipolar, unscaled unipolar and first-order polynomial.

The system supports an available user-friendly CRT-based control panel that allows an engineer or maintenance technician to monitor all I/O points during real time, examine and modify all I/O points in nonreal-time and initiate and control offline diagnostics. The control panel can also display the current status of the system, errors found during real time or offline diagnostics and the current system configuration. The control panel provides a maintenance and test interface that will facilitate integration and checkout of the I/O system independent of other customer-furnished/programmed hardware.

GE's real time I/O configuration can be organized as a star network, as shown in Figure 1. The central node of the I/O subsystem is the IIOC, responsible for all communications, CRT control, data format, engineering unit conversion and communication with the satellite or slave nodes. The slave nodes contain the I/O boards. For small I/O systems (less than 14 boards; approximately 900 digital points), only the IIOC chassis is required. Although the IIOC is designed to support up to 12 slave chassis, typical applications will involve only one to three chassis including the master chassis. Each slave node supports up to 19 I/O boards. GE's high performance VMEbus multidrop repeater link (VMIVME-5504L*) provides a 32-bit parallel data path between the IIOC and a slave node up to 1,000 feet from the IIOC, reducing cable requirements and cost.

A Host Software Support Package (HSSP) is available that provides the user the basis for interactive tools to diagnose, configure, document and communicate with the IIOC. The software package also includes sample real time source code to aid the user in generating project-specific software. For additional information on host software utilities, the reader should refer to GE's IIOC HSSP Specification (GE's Document Number 820-900000-000).

GE's real time interface equipment is an established product line with catalog prices available to any governmental or industrial user. GE provides complete system support, including technical manuals, systems configuration manuals, training material, training classes, field support, depot repair and board swap-out services. GE has established a worldwide network of sales representatives to provide customer support before and after the sale.

GE offers a highly flexible I/O system configuration designed for high reliability requirements. The system building blocks provide high performance solutions at low cost and the IIOC provides the user with the capability of configuring an I/O scanning

device based entirely on the industry standard VMEbus architecture.

Reflective Memory Communications Protocol: The VMIVME-9081 IIOC communications protocol utilizes a simple, memory-mapped control window and interrupt scheme to simplify control by the RFM host computer. The host initializes a memory-mapped RFM allocation page and interrupts each VMIVME-9081 IIOC on the RFM link. Each IIOC uses its node number, read from the local RFM board, as an index into the RFM allocation page to locate its control window and buffer space. The host may then write commands for the IIOC to the appropriate control window and issue a command interrupt. The IIOC fields the locally generated interrupt, interprets the command and executes the requested action. After I/O configuration, the IIOC posts the locations and word counts of the configured I/O buffers in the control window. The host and IIOC then read and write I/O data to these shared RFM buffers.

Embedded Communications Protocol: The VMIVME-9081 IIOC communications protocol utilizes a simple memory-mapped control window and interrupt scheme to simplify control by the VMEbus host computer. The VMEbus host computer executes all IIOC commands, writing command codes and associated parameters to a global memory control window in the VMEbus extended supervisory data access area. This control window also provides IIOC status information for the host. After writing command information to the control window, the VMEbus host interrupts the VMIVME-9081 by performing an access to the IIOC mailbox interrupter, accessible from the VMEbus. The IIOC fields the locally generated interrupt, interrupts the command and performs the requested action. After I/O configuration, the IIOC posts the locations and sizes of the configured I/O buffers in the global control window. The VMEbus host can then use the I/O buffers for its data manipulation or request the IIOC perform data transfers to the host global memory.

Ethernet Communications Protocol: The VMIVME-9081 supports TCP/IP as a communications interface to a host computer. Stream sockets are used to ensure data integrity. The VMIVME-9081 initializes a server socket with a user-supplied TCP/IP address. The host computer connects to the IIOC using standard sockets calls. Commands and data are passed between the machines through the TCP sockets.

Command List Processing: The VMIVME-9081 IIOCs provide for command list processing to reduce or eliminate host command interaction during real time processing. These command lists are configured after the host has configured all I/O scan lists. Up to three command lists are supported by the host IIOC. These lists contain the scan commands, with associated data transfer addresses that would be utilized during a real time frame. Each command list may contain only one scan command for each of the twelve supported scan list types (that is, primary DO, secondary DO, primary AI, etc.). Each of the configured command lists may be executed with a single command each I/O frame or may be configured with an execution interval which allows the host to command autoscanning of each list at the execution interval provided with the command list configuration data. Command lists may not contain digital input scan commands when VMIVME-1110* digital input boards with the 5ms filter option are present in the IIOC.

VMIVME-9081 — IIOC Firmware:

- Diagnostic firmware
  - Processor
  - Local memory
  - Global memory
  - Local diagnostic control
  - Error reporting
  - Offline and real time fault detection and isolation
- Diagnostic control
  - Power up initialization
  - Host initiated (from customer-furnished host computer)
  - Local terminal control
- Failure reporting
  - Local terminal option
  - Host report
- Real time firmware
  - Floating-point to fixed-point conversion
  - Fixed-point to floating-point conversion
  - Bit-to-byte conversion
  - Byte-to-bit conversion
  - I/O data transfers
  - Real time fault detection
  - Synchro output step limiting
  - Analog output step limiting
  - Analog input smoothing

Note: For a detailed explanation of the performance, features and operation of the IIOC, refer to GE's IIOC family Instruction Manual (Document No. 500-009000-000).

VMIVME-9081/S — Includes:

1. VMIVME-9081 SBC, GE's firmware
2. Micro DB9 to Standard DB9 Adapter Cable

Optional (see respective Product Specification for additional information):

1. VMIVME-5550* Reflective Memory board
2. VMIVME-5565* Reflective Memory board
3. VMIVME-5576* Reflective Memory board
4. VMIVME-5588* Reflective Memory board
5. P2 backplane expansion

Physical/Environmental Specifications

SBC Type: VMIVME-7700 Intel Ultra Low Voltage Celeron SBC

CPU Clock Frequency: 650 MHz

Shared DRAM Capacity: 16 Mbyte

SRAM Capacity with Battery Backup: 128 Kbyte

RS232 Compatible Serial I/O Interface (Z85230 SCC): Two with Micro DB9 to Standard DB9 adapter cable

Dimensions: 6U (4HP) single slot Eurocard form factor
Height: 9.2 in. (233.4mm)
Depth: 6.3 in. (160mm)
Thickness: 0.8 in. (20.3mm)

Power Requirements:
+5VDC (±5 percent), 4.0A (typical), 5.4A maximum
+12VDC (±5 percent), Less than 1mA
-12VDC (±5 percent), Less than 1mA

Airflow: Forced air cooling required: 350 LFM minimum, measured at the top (outlet) of the unit

Temperature:
Operating: 0° to +70° C
Storage: -40° to +80° C

Altitude:
Operating: 0 – 10,000 ft (3,000m)
Storage: 0 – 40,000 ft (12,000m)

Humidity:
Operating: relative humidity 5% to 95%, noncondensing
Storage: relative humidity 5% to 95%, noncondensing

No. of Slots used: 1

VMEbus Interface:

DTB Master:	BLT32/BLT64, A32/D32, A24/D32, A16/D32
DTB Slave:	BLT32/BLT64, A32/D32, A24/D32, A16/D32
Requester:	Programmable, BR(3 to 0), ROR, RWD, BCAP
Interrupt Handler:	IH(1 to 7) D8(O)
Interrupter:	Programmable, IRQ7* to IRQ1*
Arbiter:	SGL, PRI, RRS
BTO:	Programmable (4 to 1,024µs)
Compliance:	ANSI/VITA 1-1994
RESET Switches:	Yes

Trademarks

I/O Board Support

The following GE's I/O boards are supported by the VMIVME-9081:

	Model No.
• Digital I/O boards	
— 64-bit high-voltage digital input	VMIVME-1110
— 64-bit high-voltage and/or differential digital input	VMIVME-1111[1]
— 128-bit high-voltage digital input board	VMIVME-1128
— 128-bit high-voltage filtered digital input	VMIVME-1129
— 64-bit optically isolated digital input	VMIVME-1150
— 64-bit high-voltage digital output	VMIVME-2120
— 128-bit voltage source digital output	VMIVME-2127
— 128-bit high-voltage digital output board	VMIVME-2128
— 64-bit high-current source digital output	VMIVME-2130
— 64-bit high-current sink/source digital output	VMIVME-2131
— 64-channel relay board	VMIVME-2210
— 32-channel relay board	VMIVME-2232
— 64-bit TTL digital I/O	VMIVME-2510B
— 128-bit TTL digital I/O	VMIVME-2528 [2]
— 32-bit high-voltage digital output and 32-bit high-voltage digital input	VMIVME-2532A[1]
— 32-bit differential digital output	VMIVME-2533
— 32-bit high-voltage digital input and/or output with P2 I/O and Built-in-Test	VMIVME-2534
• Analog I/O boards	
— 64-channel, scanning, 12-bit analog-to-digital converter board	VMIVME-3113A
— 32-channel, 12-bit analog output board	VMIVME-4132
— 16-channel, 12-bit analog I/O board (AIO) with Built-in-Test on-board	VMIVME-4512
— 16-channel, 12-bit analog I/O board (AIO) with Built-in-Test and P2 I/O	VMIVME-4514A
• Synchro/resolver boards	
— Dual channel digital-to-synchro/resolver	VMIVME-4900
— Dual channel digital-to-synchro/resolver with 5.0VA option	VMIVME-4905
— Quad channel synchro/resolver-to-digital converter	VMIVME-4911
• Generic boards	
— Quad serial port board	VMIVME-6015[3]

[1] The use of a 5ms delay on the VMIVME-1110 digital input (DI) board or the VMIVME-2532A digital input/output (DIO) board requires a delay of 10ms before DI scanning in the event the I/O service interrupt occurs during DI real time testing. This delay is necessary to preclude erroneous real time data because of filter capacitor discharge/charge time. By placing the transfer DI and scan DI commands at the beginning of the frame, the 10ms may be absorbed by the processing of the other I/O types. GE offers the VMIVME-1111 that allows the use of 5ms filters without any real time input service delay.
[2] The VMIVME-2528 board is supported as an output board only. Inputs are not supported.
[3] 19.2 Kbaud maximum.

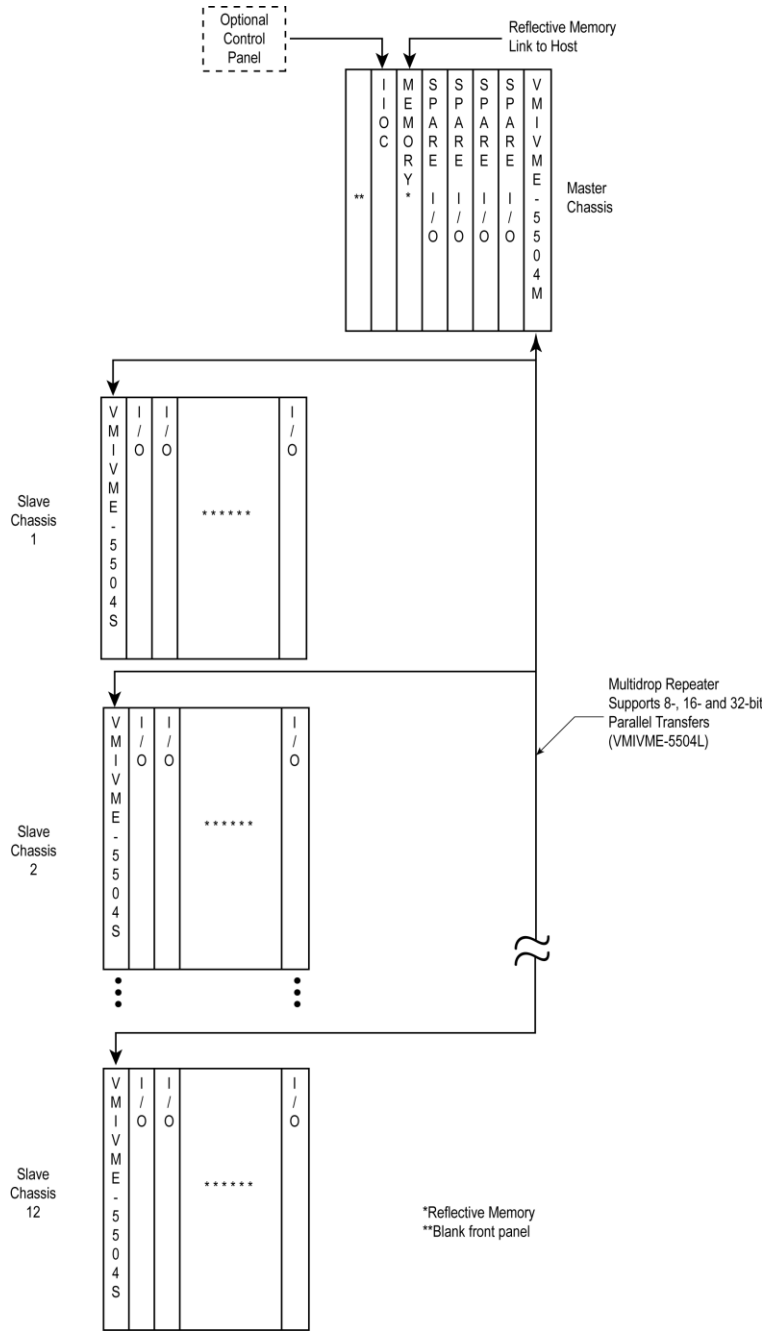

Figure 1. Intelligent I/O Controller Subsystem Block Diagram Using Reflective Memory Host Interface and Multidrop Repeater Link

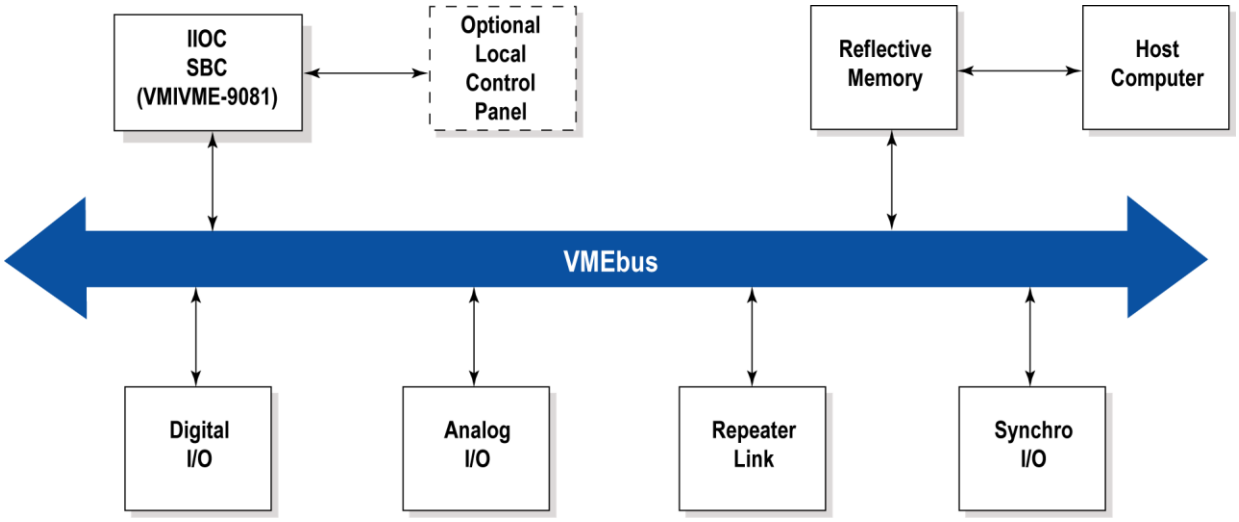

Figure 2. Bus Structure Block Diagram

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Additional Resources

For more information, please visit the GE Intelligent Platforms Embedded Systems web site at:

www.ge-ip.com