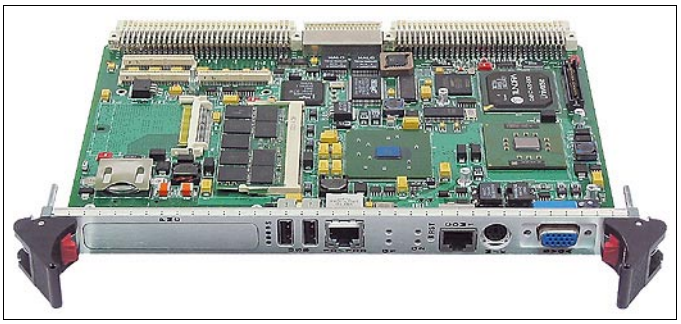
Embedded Systems

VMIVME-7807

Intel® Pentium® M-Based VME Single Board Computer

- ***Available with either the 1.1 GHz, 1.6 GHz or 1.8 GHz Pentium® M processor***
- ***Up to 2 Mbyte of advanced L2 cache***
- ***Up to 1.5 Gbyte DDR SDRAM***
- ***Up to 1 Gbyte bootable CompactFlash on secondary IDE (see ordering options)***
- ***Internal SVGA and DVI controller***
- ***Serial ATA support through P2 rear I/O***
- ***400 MHz system bus via Intel® 855GME chipset***
- ***Ethernet controller supporting 10BaseT and 100BaseTX through the front panel***
- ***Gigabit Ethernet controller supporting 10BaseT, 100BaseTX and 1000BaseT interface with optional Vita 31.1 support***
- ***Four asynchronous 16550 compatible serial ports***
- ***Four Universal Serial Bus (USB) Rev. 2.0 connections, two on the front panel and two rear I/O***
- ***PMC expansion site (PCI-X, 66 MHz)***
- ***32 Kbyte of nonvolatile SRAM***
- ***Operating system support for Windows® XP, Windows 2000, VxWorks®, QNX® , LynxOS® and Linux®***



Functional Characteristics

Microprocessor: The VMIVME-7807 is based on the Pentium M processor family. The enhanced 1.1 GHz and the 1.6 GHz Pentium M processors have 1 Mbyte of L2 cache, while the 1.8 GHz Pentium M processor has 2 Mbyte of L2 cache. The Pentium M processor family offers thermal characteristics that are well suited for embedded systems operating over a wide range of temperatures.

DRAM Memory: The VMIVME-7807 supports DDR SDRAM with the optional ECC support for a maximum memory capacity of 1.5 Gbyte. The SDRAM is dual ported to the VMEbus.

BIOS: System and video BIOS are provided in reprogrammable flash memory.

Ethernet Controller: The VMIVME-7807 provides a connection for 10/100 Mbyte LAN using the Intel 82551ER Ethernet controller. One standard RJ45 connector is provided on the front panel with network status indicators. The second Ethernet interface is the dual Gigabit Ethernet (Intel 82546EB) with one routed to the front panel and the other to the backplane using the P2 connector. Both Gigabit Ethernets

Ordering Options

August 4, 2004 800-007807-000 B		A	B	C	D	E	F
VMIVME-7807	–						

A = Processor
- 1 = Reserved
- 2 = 1.1 GHz Pentium M
- 3 = 1.6 GHz Pentium M
- 4 = 1.8 GHz Pentium M

B = System DDR SDRAM
- 0 = Reserved
- 1 = 512 Mbyte
- 2 = 1 Gbyte
- 3 = 1.5 Gbyte

C = CompactFlash
- 0 = No CompactFlash
- 1 = 128 Mbyte
- 2 = 256 Mbyte
- 3 = 512 Mbyte
- 4 = 1 Gbyte

D = Connector P0
- 0 = No P0
- 1 = P0 Installed (with Gigabit Ethernet and VITA 31.1 support)

E = ECC Support
- 0 = No ECC
- 1 = With ECC

F = Special Sales Order
- 0 = VME standard
- 1 = 1101.10 front panel

VMEbus Rear Transition Utility Boards

VMIACC-0586 and VMIACC-0590

The VMIACC-0586 and VMIACC-0590 install in the rear transition area of the VMEbus backplane. The VMIACC-0586 and VMIACC-0590 are sold separately.

Note

All VME single board computer products come standard with a VME specification compliant front panel.

For Ordering Information, Call:
1-800-322-3616 or 1-256-880-0444 • FAX (256) 882-0859
Email: info.embeddedsystems@gefanuc.com
Web Address: www.gefanuc.com/embedded

can be routed through an optional P0 connector supporting VITA 31.1 available via the VMEbus backplane.

Serial ATA: The VMIVME-7807 provides a serial ATA interface via the VMEbus backplane connector.

Super VGA Controller: High-resolution graphics and multimedia-quality video are supported on the VMIVME-7807 using the 855GME chipset internal graphics controller. Screen resolutions up to 1,600 x 1,200 true colors (single view mode) are supported by the graphics adapter. The super VGA controller is accessible through the front panel.

Digital Visual Interface (DVI): The VMIVME-7807 has a digital visual interface that provides a high speed digital connection for visual data types that are display technology independent. DVI is a display interface developed in response to the proliferation of digital flat-panel displays. The DVI interface is available through the rear I/O.

Remote Ethernet Booting: The VMIVME-7807 utilizes the Argon Manage Boot BIOS that provides the ability to remotely boot the VMIVME-7807 using PXE, NetWare, TCP/IP or RPL network protocols.

Remote Ethernet Features:

- PXE, NetWare, TCP/IP, RPL network protocol support
- Unparalleled boot sector virus protection
- Detailed boot configuration screens
- Comprehensive diagnostics
- Optional disabling of local boots
- Dual-boot option lets users select network or local booting

Serial Ports: Four 16550-compatible serial ports are featured on the VMIVME-7807. COM1 is available through the front panel using an RJ45 connector. COM2, COM3 (TTL) and COM4 (TTL) are routed to the rear P2 I/O connector.

Keyboard and Mouse Ports: The VMIVME-7807 has a combined PS/2 keyboard and mouse connector. A Y-adapter cable is included.

Flash Memory: The VMIVME-7807 provides up to 1 Gbyte CompactFlash memory accessible through the secondary IDE port. The VMIVME-7807 BIOS includes an option to allow the board to boot from the Flash memory.

Timers: The VMIVME-7807 provides the user with two 16-bit timers and two 32-bit timers (in addition to system timers). These timers are mapped in memory space, and are completely software programmable.

Watchdog Timer: The VMIVME-7807 provides a software-programmable watchdog timer. The watchdog timer is enabled under software control. Once the watchdog timer is enabled, software must access the timer within the specified timer period or a timeout will occur. A user configurable switch allows the timeout to cause a reset. Independent of the switch, software can enable the watchdog timer to cause a nonmaskable interrupt (NMI) or a VMEbus SYSFAIL.

Nonvolatile SRAM: The VMIVME-7807 provides 32 Kbyte of nonvolatile SRAM. The contents of the SRAM are preserved when power is interrupted or removed from the unit.

PMC Expansion Site: The VMIVME-7807 has one IEEE 1386.1 PCI mezzanine card (PMC) expansion site. This expansion capability allows the addition of peripherals offered for PMC applications. The PMC site is PCI-X, 66 MHz.

GE Fanuc's PMC237CM1/V Expander Card: The PMC237CM1/V expander card is a 6U form factor board that adds three PMC slots or two PMC slots and one PCMCIA/CardBus socket.

NOTE: The VMIVME-7807 will throttle back the PCI-X 66 MHz/64-bit bus when using legacy 33MHz, 32-bit PMC cards.

Universal Serial Bus (USB): The VMIVME-7807 provides four USB 2.0 connections. Two of the USB ports are available on the front panel, while the other two are routed to the rear I/O. High speed USB 2.0 allows data transfers of up to 480 Mbyte/s. This rate is 40 times faster than USB 1.0. USB 2.0 is backward compatible with USB 1.0.

IDE Interface: The IDE interface on the VMIVME-7807 supports ATA-33, ATA-66 and ATA-100 drives and automatically determines the proper operating mode based on the type of drive used. In order to properly function in the ATA-100 mode, a special 80-conductor cable must be used instead of the standard 40-conductor cable. This cable is typically available from the ATA-100 drive manufacturer.

Thermal Management: The VMIVME-7807 utilizes a passive heat sink that relies on forced air cooling within the equipment rack at the specified flow rate. Please refer to the environmental specifications for more information.

VMEbus Interface: The VMIVME-7807 VMEbus interface is based on the Universe II high performance PCI-to-VMEbus interface from Newbridge/Tundra.

System Controller: The VMEbus system controller capabilities allow the board to operate as a slot 1 controller, or it may be disabled when another board is acting as the system controller. The system controller may be programmed to provide the following modes of arbitration:

Round Robin (RRS)
Single Level (SGL)
Priority (PRI)

The system controller provides a SYSCLK driver, IACK* daisy-chain driver, and a VMEbus access timeout timer. The system controller also provides an arbitration timeout if BBSY* is not seen within a specified period after a BGOUT* signal is issued. This period is programmable for 16 or 256 µs.

VMEbus Requester: The microprocessor can request and gain control of the bus using any of the VMEbus request lines (BR3* to BR0*) under software control. The requester can be programmed to operate in any of the following modes:

Release-On-Request (ROR)
Release-When-Done (RWD)
VMEbus Capture and Hold (VCAP)

Mailboxes: The VMEbus interface provides four 32-bit mailboxes, which are accessible from both the microprocessor and the VMEbus providing interprocessor communication. The mailboxes have the ability to interrupt the microprocessor when accessed by the VMEbus.

Interrupt Handler: The interrupt handler monitors, and can be programmed to respond to any or all VMEbus IRQ* lines. All normal process VMEbus-related interrupts can be mapped to PCI INTA# or SERR# interrupts. These include:

Mailbox interrupts
VMEbus interrupts
VMEbus interrupter IACK cycle (acknowledgment of VMIVME-7807 VMEbus-issued interrupts)

All error processing VMEbus-related interrupts can be mapped to PCI INTA# or SERR#. Note: PCI SERR# initiates an SBC NMI. These include:

ACFAIL* interrupt
BERR* interrupt
SYSFAIL* interrupt

The interrupt handler has a corresponding STATUS/ID register for each IRQ* interrupt. Once the handler receives an IRQ*, it requests the VMEbus and, once granted, it performs an IACK cycle for that level. Once the IACK cycle is complete and the STATUS/ID is stored in the corresponding ID register, an appropriate interrupt status bit is set in an internal status register and a PCI interrupt is generated. The PCI interrupt can be mapped to PCI INTA# or SERR#.

Interrupter: Interrupts can be issued under software control on any or all of the seven VMEbus interrupt lines (IRQ7* to IRQ1*). A common ID register is associated with all interrupt lines. During the interrupt acknowledge cycle, the interrupter issues the ID to the interrupt handler.

The interrupter can be programmed to generate a PCI INTA# or SERR# interrupt when a VMEbus interrupt handler acknowledges a software-generated VMEbus interrupt.

Byte Swapping: The Intel 80x86 family of processors uses little-endian format. To accommodate other VMEbus modules that transfer data in big-endian format (such as the 680x0 processor family), the VMIVME-7807 incorporates byte-swapping hardware. This provides independent byte swapping for both the master and slave interfaces. Both master and slave interface byte swapping are under software control.

The VMIVME-7807 supports high throughput DMA transfers of bytes, words and longwords in both master and slave configurations.

If endian conversion is not needed, we offer a special “bypass” mode that can be used to further enhance throughput. (Not available for byte transfers.)

Master Interface: MA32:MBLT32:MBLT64
(A32:A24:A16:D32:D16:D8 (EO):BLT32)

The VMEbus master interface provides nine separate memory windows into VMEbus resources. Each window has separate configuration registers for mapping PCI transfers to the VMEbus (that is, PCI base address, window size, VMEbus base address, VMEbus access type, VMEbus address/data size, etc.). The maximum/minimum window sizes for the nine windows are as follows:

Window	Minimum Size	Maximum Size
0, 4	4 Kbyte	4 Gbyte
1 to 3, 5 to 7	64 Kbyte	4 Gbyte
Special Cycle	64 Mbyte	64 Mbyte

Slave Interface: Memory Access
SAD032:SD32:SBLT32:SBLT64
(A32:A24:A16:D32:D16:D8 (EO): BLT32)

The VMEbus slave interface provides eight separate memory windows into PCI resources. Each window has separate configuration registers for mapping VMEbus transfers to the PCI bus (that is, VMEbus base address, window size, PCI base address, VMEbus access type, VMEbus address/data size, etc.). The maximum/minimum window sizes for the eight windows are as follows:

Window	Minimum Size	Maximum Size
0, 4	4 Kbyte	4 Gbyte
1 to 3, 5 to 7	64 Kbyte	4 Gbyte

In addition, each window can be programmed to operate in coupled or decoupled mode. In decoupled mode, the window utilizes a write-posting FIFO and/or a read prefetching FIFO for increased system performance. In coupled mode, the FIFOs are bypassed and VMEbus transactions are directly coupled to the PCI bus (that is, transfers on VMEbus are not completed until they are completed on the PCI bus).

Enhanced Bus Error Handling: Enhancements over the Universe chip's bus error handling features are provided. A latch and register are provided to allow the SBC to read the VMEbus address that caused the bus error in all modes. The Universe chip's support is limited to decoupled mode. Support for bus cycle timeout and assertion of bus error is provided. The board may be configured to assert bus error upon timeout regardless of its status as system controller. The Universe chip asserts bus error only if it is system controller. In addition, this board may be configured to assert an interrupt upon bus cycle timeout.

Operating System and Software Support

The VMIVME-7807 provides embedded features beyond PC/AT functionality. These features are supported by GE Fanuc software products aimed at developers who are incorporating GE Fanuc's SBCs, I/O boards, and workstations into systems.

VMISFT-9420 VMEbus Access™ for Windows XP/Windows 2000: The VMEbus Access product is specifically designed for accessing the advanced VMEbus Access architecture of the VMIVME-7807. Running on Windows XP/Windows 2000, VMEbus Access is both sophisticated and easy to use.

The function library, VMEbus toolset and open architecture VMEbus Access offers make it one of the most powerful products on the market today. It provides compatibility with both existing GE Fanuc VMEbus PC platforms and with future GE Fanuc VMEbus PC platforms.

The VMEbus Access development package gives you everything you need to develop applications for your VMEbus operations. This package includes the VMEmanager™ function library and four utilities that enable you to easily configure a VMEbus, dynamically monitor VMEbus activities, manage VMEbus data, and use DDE-client applications. VMEbus Access provides powerful tools for developing, debugging and monitoring VMEbus applications and increasing VMEbus performance. The flexible design of VMEbus Access enables you to incorporate it as a stand-alone solution, or use it to open your VMEbus operations to the IOWorks product suite. VMEbus Access manipulates the hardware behind the scenes. With VMEbus Access, you can develop applications in or use existing applications developed in most programming environments. For example, VMEbus Access enables your VMEbus to recognize applications developed in these popular programming environments:

- IOWorks Manager™
- LabVIEW
- Citect
- Wonderware InTouch
- Visual IOWorks®
- Visual Basic®
- Visual C++®

VxWorks OS Support — VMISFT-7418 Board Support Package: The VMISFT-7418 is Wind River Systems, Inc.'s board support package (BSP) for GE Fanuc's series of VMEbus Pentium processor-based computers, which is required to run the VxWorks OS. With the SBC, VxWorks, the BSP, and other VMEbus equipment from GE Fanuc, implementations can be created for a wide variety of applications including real time factory automation, simulation, instrumentation and control, and process control and monitoring.

The BSP is linked with VxWorks OS, thus allowing software applications created with Wind River Systems, Inc.'s development system to load and run on the particular GE Fanuc SBC hardware being used. Serial ports, parallel ports, keyboard, text mode video and Ethernet transceivers are all supported, as well as floppy and IDE hard disk drives that can be connected to the SBCs. The BSP provides Flash boot, NVRAM and timer support. The BSP allows VxWorks applications to have access to the VMEbus. When hardware includes single cycle and block transfers using DMA devices, they are supported by the BSP, as well as interprocessor communications with mailbox registers. VMEbus interrupt handling and error handling are supported. Since the VMEbus environment often contains a mixture of devices from various manufacturers, the byte-swapping feature is provided to allow big-endian and little-endian devices to share data correctly.

QNX OS Support — VMISFT-7435 Board Support Package: The VMISFT-7435 BSP provides QNX support and includes a VMEbus manager, user API, and configuration files needed to run the QNX BSP on GE Fanuc's VMIVME-7xxx SBC products. This BSP provides customizable VMEbus access. Using the QNX OS on the VMIVME-7xxx SBCs provides a computing platform suitable for real time applications. QNX provides the applications programmer with a real time extensible POSIX OS.

GE Fanuc's VMISFT-7435 is designed to tailor QNX's x86 OS to the VMIVME-7xxx platform. This combination provides a self-hosted development environment which runs entirely on the VMIVME-7xxx SBC boards without requiring any external host systems.

LynxOS x86 Support — VMISFT-7419 Board Support Package: The VMISFT-7419 BSP includes all of the device drivers and configuration tables needed to install the LynxOS x86 development system (available separately from Lynx Real-Time Systems, Inc.) onto GE Fanuc's VMIVME-7807.

Using LynxOS on GE Fanuc's SBCs provides a computing platform suitable for hard real time applications. LynxOS provides the applications programmer with a stable development environment based on industry-wide standards such as POSIX and Motif.

I/O Support — VMISFT-9450 IOWorks Board Drivers: This driver supports GE Fanuc's extensive line of VMEbus I/O boards, and is available for Windows XP/Windows 2000 and VxWorks. IOWorks board drivers take advantage of all the key benefits and features of each supported I/O board and new I/O boards are constantly being added.

IOWorks board drivers contain both a C++ class library and a C function library that provide a common interface to GE Fanuc I/O products for reading, writing and configuring. You do not need to know the details of how an individual board is programmed. For instance, you can use the SetAttributes function on any supported GE Fanuc board; the WriteAnalog function controls the output from any GE Fanuc analog output board; or the GetScanMode function retrieves the scan mode for any GE Fanuc analog board.

Linux OS Support — VMISFT-7433 Board Support Package The VMISFT-7433 BSP for Linux provides device drivers for easy access to GE Fanuc's unique watchdog timers, non-volatile RAM (NVRAM) and additional hardware timers. The BSP also provides simple and powerful tools to access the VMEbus for select SBCs. With the VMISFT-7433 BSP for Linux you'll spend less time and money getting your VMEbus and functioning to their fullest potential. GE Fanuc's BSP for Linux is FREE, with the full source code for all drivers, libraries and example code provided under the BSD license.

- VMISFT-7433 is available for free download from http://www.geindustrial.com/cwc/gefanuc/embedded/products/hw_sbc_linux.html and is open-source software, provided by GE Fanuc under the BSD license (http://www.opensource.org/licenses/bsd-license.php).

Physical/Environmental Specifications

Dimensions: 6U single slot Eurocard form factor

Height	9.2 in. (233.4 mm)
Depth	6.3 in. (160 mm)
Thickness	0.8 in. (20.3 mm)

Power Requirements:
+5 VDC (±5 percent), <TBD> A (typical), <TBD> A maximum

Power Requirements for the 1.1 GHz option:
+5 VDC (±5 percent), <TBD> A (typical), <TBD> A maximum

Operating Temperature: 0 to 50 °C (Air flow requirement as measured at outlet side of heatsink is to be greater than 450 LFM)

Operating Temperature for the 1.1 GHz option: 0 to 60 °C

Storage Temperature: -25 to 80 °C

Relative Humidity: 10% to 90%, noncondensing

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 1,024 µs)
Compliance:	Rev. C.1

PMC Expansion Site Connector:

3.3 V signaling

64-bit PCI-X bus, 66 MHz maximum

MTBF: TBD

Compatible Products

The VMIVME-7807 can be used with a number of GE Fanuc PMC and VMEbus products.

VMEbus IDE CD-RW/Hard Disk: GE Fanuc produces an IDE CD-RW/hard drive module to support the built-in EIDE controller ports. The VMIVME-7459 provides hard disk storage or CompactFlash. The unit fits into a standard VMEbus 6U single slot form factor. See product Specification for available hard drive and CompactFlash sizes.

PMC Capability: GE Fanuc supports PMC via the PMC expansion site. This expansion site allows the VMIVME-7807 to take advantage of the many PMC boards commercially available from third-party sources.

GE Fanuc's PMC237CM1/V Expander Card: The PMC237CM1/V expander card is a 6U form factor board that adds three PMC slots or two PMC slots and one PCMCIA/CardBus socket.

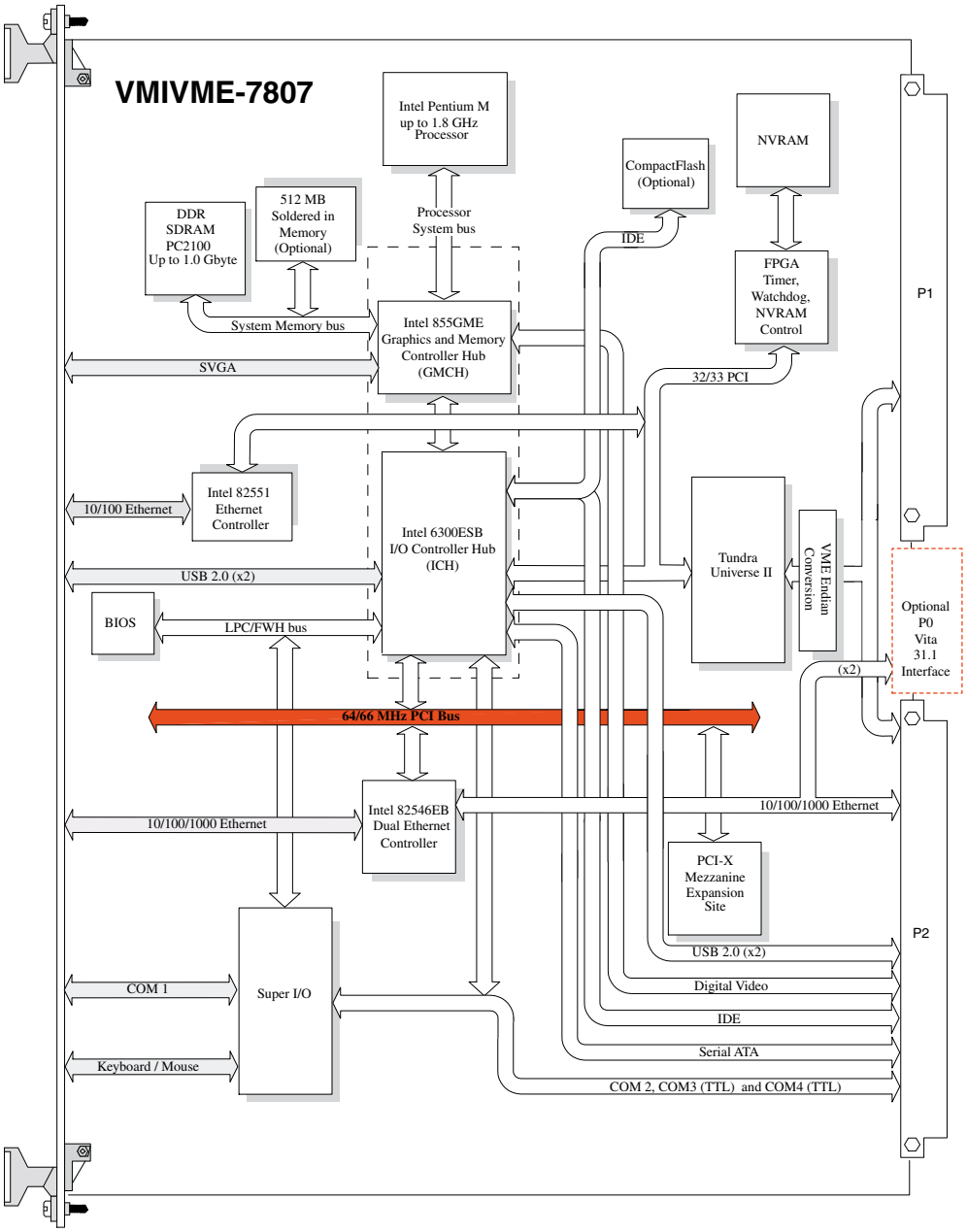
NOTE: The VMIVME-7807 will throttle back the PCI-X 66 MHz/64-bit bus when using legacy (33MHz, 32-bit PMC cards).

VMEbus: The VMIVME-7807 enables access to GE Fanuc's wealth of VMEbus products. If you have real world control, monitoring and real time networking requirements, GE Fanuc has a solution for you. Today's system requirements demand state of the art solutions. Our advanced I/O features such as built-in-test, self-test, isolation, digital autocalibration, and intelligent on-board DSP processing give our customers those solutions.

P2 I/O: The VMIACC-0586 and VMIACC-0590 provide standard connector access for I/O routed out the VMEbus P2 connector.

The I/O Solution for Your I/O Problem: GE Fanuc's 18 years of experience in supplying high performance deterministic controllers for multiple markets has led to the development of IOWorks software with features, benefits and capabilities to solve just about any I/O problem. From PLC alternatives to data servers that support the seamless interconnection of dissimilar systems, GE Fanuc has the solution for simple to complex high speed deterministic requirements. IOWorks PC platforms, target, OS and I/O independency provide the flexibility for solutions.

Trademarks



NOTE: When the P0 option is chosen, the Ethernet **is not** routed to the front panel or the P2 connector.

Figure 1. VMIVME-7807 Functional Block Diagram

Embedded Systems

GE Fanuc Embedded Systems Information Centers

USA and the Americas:

Huntsville, AL	***1 800 322-3616***
	1 (256) 880-0444
Ventura, CA	***1 (805) 650-2111***
Greenville, SC	***1 (864) 627-8800***

Europe, Middle East and Africa:

Edinburgh, UK	***44 (131) 561-3520***
Paris, France	***33 (1) 4324 6007***

Additional Resources

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

www.gefanuc.com/embedded