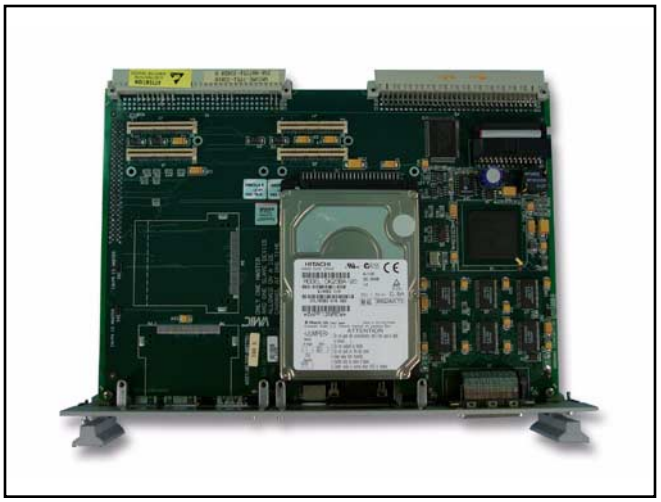
VMIVME-7751
Intel® Pentium® III Processor-Based VMEbus Single-Board Computer

- Pentium® III FC-PGA/PGA2 socket processor-based single-board computer (SBC) with 133 MHz system bus
- Special features for embedded applications include
  - — Up to 192 Mbyte bootable flash on secondary IDE (optional)
  - — Two 16-bit and two 32-bit programmable timers
  - — 32 Kbyte of nonvolatile SRAM
  - — Software-selectable watchdog timer with reset
  - — Remote Ethernet booting
  - — Up to three PMC mezzanine expansion sites (IEEE-P1386 common mezzanine card standard, 5 V)
  - — Optional on-board IDE hard disk drive
  - — VME64 modes supported: A32/A24/D32/D16/D08(EO)/MBLT64/BLT32
  - — VMEbus interrupt handler, interrupter, and system controller
  - — Includes real-time endian conversion hardware for little-endian and big-endian data interfacing (patent no. 6,032,212)
  - — Enhanced bus error handling
  - — Passive heat sink
- Standard features include
  - — Up to 1.26 GHz Pentium III processor with 256 Kbyte advanced transfer cache
  - — Up to 512 Mbyte PC-133 SDRAM using a single SODIMM
  - — Internal AGP SVGA controller with 4 Mbyte display cache
  - — 133 MHz system bus via Intel® 815E chipset
  - — Dual Ethernet controllers supporting 10BaseT and 100BaseTX interfaces
  - — On-board Ultra DMA/100 hard drive and floppy drive controllers (uses VMEbus P2 for connection to IDE/floppy)
  - — Optional PCI dual-channel Ultra160 SCSI
  - — Two high-performance 16550-compatible serial ports
  - — Enhanced parallel port with ECP/EPP modes supported
  - — PS/2-style keyboard and mouse ports on front panel
  - — Real-time clock and miniature speaker included
  - — Dual front panel universal serial bus (USB) connections
- Operating system support available
  - — Windows NT®
  - — Windows® 2000
  - — VxWorks
  - — Solaris x86
  - — QNX
  - — LynxOS
  - — Linux

MICROPROCESSOR — The VMIVME-7751 brings the Intel Pentium III processor to VMEbus, offering processor speeds up to 1.26 GHz. The Pentium III processor has 32-bit addressing and a 64-bit data bus. Its superscalar architecture allows three instructions to be executed per clock cycle. A dynamic branch prediction unit, separate instruction and data caches, and MMX™ technology also increase the processor's performance. The Pentium III processor also provides 256 Kbyte (1.26 GHz has 512 Kbyte) of advanced transfer cache (on-die, full speed level 2 cache) using dual independent bus architecture for high bandwidth and performance. This L2 cache operates at the same clock frequency as the processor, thus improving performance.

DRAM MEMORY — The VMIVME-7751 accepts one 144-pin SDRAM SODIMM for a maximum memory capacity of 512 Mbyte. The on-board DRAM is dual ported to the VMEbus.

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



Ordering Options

Feb. 11, 2002 800-007751-000 B		A	B	C	D	E	F
VMIVME-7751	–						

A = Processor
- 0 = Reserved
- 1 = Reserved
- 2 = Reserved
- 3 = 733 MHz Pentium III
- 4 = 866 MHz Pentium III
- 5 = Reserved
- 6 = 1 GHz Pentium III
- 7 = 1.26 GHz Pentium III with 512 Kbyte Cache

B = SDRAM Memory
- 0 = Reserved
- 1 = Reserved
- 2 = Reserved
- 3 = 64 Mbyte
- 4 = 128 Mbyte
- 5 = 256 Mbyte
- 6 = 512 Mbyte

C = CompactFlash
- 0 = No CompactFlash
- 1 = Reserved
- 2 = Reserved
- 3 = Reserved
- 4 = 64 Mbyte
- 5 = Reserved
- 6 = 128 Mbyte
- 7 = Reserved
- 8 = 192 Mbyte

D = SCSI Interface
- 0 = No SCSI
- 1 = Dual-Channel Ultra160 SCSI

E = IDE Hard Disk
- 0 = No On-Board Hard Disk
- 1 = 5 Gbyte, 1.8-inch Hard Disk Drive
- 2 = Reserved
- 3 = 20 Gbyte, 2.5-inch Hard Disk Drive[1]
- 4 = 30 Gbyte, 2.5-inch Hard Disk Drive[1]

Note

1. For options E = 3 or 4, the hard disk drive utilizes one of the PMC sites.

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

SUPER VGA CONTROLLER — High-resolution graphics and multimedia-quality video are supported on the VMIVME-7751 by the built-in 815E chipset AGP graphics adapter. The adapter is complemented by 4 Mbyte external synchronous DRAM cache with a high-bandwidth 64-bit data interface. Screen resolutions up to 1,600 x 1,200 x 256 colors (single view mode) are supported by the graphics adapter.

Table 1. Partial List of Display Modes Supported

Resolution	Bits Per Pixel (Frequency in Hz)		
	8-bit Indexed	16-bit	24-bit
320 x 200	70	70	70
320 x 240	70	70	70
352 x 480	70	70	70
352 x 576	70	70	70
400 x 300	70	70	70
512 x 384	70	70	70
640 x 400	70	70	70
640 x 480	60, 70, 72, 75, 85	60, 70, 72, 75, 85	60, 70, 72, 75, 85
720 x 480	75, 85	75, 85	75, 85
720 x 576	60, 75, 85	60, 75, 85	60, 75, 85
800 x 600	60, 70, 72, 75, 85	60, 70, 72, 75, 85	60, 70, 72, 75, 85
1,024 x 768	60, 70, 72, 75, 85	60, 70, 72, 75, 85	60, 70, 72, 75, 85
1,152 x 864	60, 70, 72, 75, 85	60, 70, 72, 75, 85	60, 70, 72, 75, 85
1,280 x 720	60, 75, 85	60, 75, 85	60, 75, 85
1,280 x 960	60, 75, 85	60, 75, 85	60, 75, 85
1,280 x 1,024	60, 70, 72, 75, 85	60, 70, 72, 75, 85	60, 70, 75, 85
1,600 x 900	60, 75, 85	60, 75, 85	
1,600 x 1,200	60, 70, 72, 75		

PCI DUAL-CHANNEL Ultra160 SCSI CONTROLLER — An on-board PCI Ultra160 SCSI controller is available as an option, which provides two independent differential channels. Both differential channels are capable of operating up to 160 Mbyte/s. High-speed connection is provided through two high-density connectors on the front panel. For applications requiring connection through the backplane, one channel is routed through the user-defined VMEbus and supports single-ended SCSI-2. The backplane connection is compatible with existing installations that use the VMIVME-7696, -7697, and -7697A CPUs and requires the VMIACC-0561 accessory.

Ethernet CONTROLLER — The VMIVME-7751 supports Ethernet LANs with two Intel Ethernet controllers (one 82559 and the other is internal to Intel's chipset ICH2). 10BaseT and 100BaseTX options are supported via two RJ45 connectors. For increased reliability and convenience, remote LAN booting through either adapter is supported.

REMOTE Ethernet BOOTING — The VMIVME-7751 utilizes Lanworks Technologies, Inc.'s BootWare® BIOS. BootWare provides the ability to remotely boot the VMIVME-7751, and provides the following features:

- NetWare (802.1, 802.3, or Eth II), TCP/IP (DHCP or BOOTP), 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 LAN1, LAN2 network, or local booting

SERIAL PORTS — Two 16550-compatible serial ports are featured on the VMIVME-7751 front panel. The serial channel has a 16-byte FIFO to support baud rates up to 1.5 Mbaud. Requires two micro-DB-9 to standard DB-9 adapters, VMIC P/N 360-010050-001.

ENHANCED PARALLEL PORT — The VMIVME-7751 provides a Centronics-compatible, fully bidirectional parallel port meeting all IEEE-1284 standards (Compatibility, Nibble, EPP, and ECP). The parallel port contains a 16-byte FIFO to allow data rates up to 2 Mbyte/s in ECP mode. For VMIVME-7751 configurations with on-board Ultra160 SCSI option, the parallel port connector is mounted on a PMC bezel, and is installed at the factory in one of the PMC sites. This consumes one of the three PMC sites available on the assembly. If a 2.5-inch IDE hard drive (option E = 3 or 4) is installed, the parallel port connector is installed at the PMC site which was lost to the hard drive. This keeps two PMC sites available for expansion devices. This parallel port bezel may be removed in the field for applications requiring more PMC sites and no parallel port. For VMIVME-7751 configurations without the on-board Ultra160 SCSI option, the parallel port connector is mounted on the front panel and does not occupy any of the available PMC expansion sites.

KEYBOARD AND MOUSE PORTS — The VMIVME-7751 has a combined PS/2 keyboard and mouse connector. A **Y**-adapter cable is included.

FLASH MEMORY — The VMIVME-7751 provides up to 192 Mbyte of IDE CompactFlash memory accessible through the secondary IDE port. The VMIVME-7751 BIOS includes an option to allow the board to boot from the Flash memory.

TIMERS — The VMIVME-7751 provides the user with two 16-bit timers and two 32-bit timers (in addition to system timers). These timers are mapped in I/O space, and are completely software programmable.

WATCHDOG TIMER — The VMIVME-7751 provides a software-programmable watchdog timer. The watchdog timer is enabled under software control. Once the watchdog

timer is enabled, on-board software must access the timer within the specified timer period, or a timeout will occur. A user jumper allows the timeout to cause a reset. Independent of the jumper, software can enable the watchdog timeout to cause a nonmaskable interrupt (NMI) or a VMEbus SYSFAIL.

NONVOLATILE SRAM — The VMIVME-7751 provides 32 Kbyte of nonvolatile SRAM. The contents of the SRAM are preserved when +5 V power is interrupted or removed from the unit.

PMC EXPANSION SITE — The VMIVME-7751 provides three, 5 V PCI mezzanine card (PMC) expansion sites conforming to IEEE P1386 common mezzanine card specification. One expansion site is located on the base board, and two are located on the expansion board.

Contact VMIC for more information concerning PMC modules and compatibility.

ON-BOARD IDE DISK DRIVE — On-board location for either 2.5-inch or 1.8-inch IDE hard disk drive is available as an option. The 2.5-inch hard disk consumes one PMC site, thereby limiting the SBC to two PMC sites. However, the 1.8-inch IDE disk drive physical envelope is such that it does not consume a PMC site, and all sites are available for user application.

UNIVERSAL SERIAL BUS (USB) — The VMIVME-7751 provides a front panel dual connection hub host controllers for the USB. Supported USB features include: isochronous data transfers, asynchronous messaging, self-identification and configuration of peripherals, and dynamic (hot) attachment.

VMEbus INTERFACE — The VMIVME-7751 VMEbus interface is based on the Universe IIB high-performance PCI-to-VME interface from Newbridge/Tundra.

SYSTEM CONTROLLER — The on-board 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 (BCAP)

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 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-7751 VMEbus-issued interrupts)

All error processing VMEbus-related interrupts can be mapped to PCI INTA# or SERR#. Note: PCI SERR# initiates a 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 use little-endian format. To accommodate other VMEbus modules that transfer data in big-endian format such

as the 680x0 processor family, the VMIVME-7751 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.

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-7751 provides embedded features beyond PC/AT functionality. These features are supported by VMIC software products aimed at developers who are incorporating VMIC SBCs, I/O boards, and workstations into systems. Windows NT/Windows 2000 and VxWorks are the most common operating systems supported by VMIC software products.

Windows NT/Windows 2000 — The IOWorks® software family is a set of software components that can work together or separately to provide a total development environment for any application in a Windows NT/ Windows 2000 OS.

VMISFT-9420 VMEbus Access™ for Windows NT/Windows 2000 — The VMEbus Access product is specifically designed for accessing the advanced VMEbus Access architecture of the VMIVME-7751. Running on Windows NT/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 existing VMIC VMEbus PC platforms and compatibility with future VMEbus PC platforms VMIC creates.

The VMEbus Access development package gives you everything you need to develop applications for your VME 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 a Wind River Systems, Inc.'s certified board support package (BSP) for VMIC'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 VMIC, 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 VMIC 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 computer boards. 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-7417 BOARD SUPPORT PACKAGE — The VMISFT-7417 BSP provides QNX support and includes a VMEbus manager, user API, and configuration files needed to run the QNX BSP on VMIC'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.

VMIC's VMISFT-7417 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.

Solaris OS SUPPORT

VMISFT-7416 BOARD SUPPORT PACKAGE — The VMISFT-7416 BSP includes everything necessary to allow installation of the Solaris Intel edition OS (available separately from Sun Microsystems, Inc.) onto VMIVME-7751 SBC. This BSP includes a nexus driver for VMEbus access. It allows military and telecommunications and other applications to take advantage of Sun Microsystems, Inc.'s Solaris OS on a VMEbus-based Intel SBC. This BSP and the Solaris OS provides POSIX-compliant real-time characteristics.

LynxOS x86 OS 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 VMIC's VMIVME-7751.

Using the LynxOS on the VMIC 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 VMIC's extensive line of VME I/O boards, and is available for Windows NT/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 VMIC 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 VMIC board; the WriteAnalog function controls the output from any VMIC analog output board; or the GetScanMode function retrieves the scan mode for any VMIC analog board.

SPECIFICATIONS

6U Eurocard format, two slots

Height	9.2 in. (233.4 mm)
Depth	6.3 in. (160 mm)
Thickness	1.6 in. (20.3 mm)

Power Requirements:
+5 VDC (±5 percent), 6.0 A (typical), 7 A maximum

+12 VDC (±5 percent), 105 mA (typical), 200 mA maximum

-12 VDC (±5 percent), 50 mA (typical), 75 mA maximum

Note: The currents at +12 and -12 VDC are specified with the serial connectors open.

Operating Temperature: 0 to 50 ˚C (Forced air cooling required, 350 LFM minimum, measured at the heat sink outlet)

Relative Humidity: 10 to 90 percent, 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:
5 V signaling, types 1 and 2
32-bit PCI bus, 33 MHz maximum

MTBF: 82,534 hours (Bellcore)

COMPATIBLE PRODUCTS

The VMIVME-7751 can be used with a number of VMIC PMC bus and VMEbus products.

Floppy/Hard Disk: VMIC produces floppy/hard drive modules to support the built-in IDE and floppy controller ports.

The VMIVME-7452 provides up to 18.0 Gbyte of hard disk storage and a 3.5-inch 1.44 Mbyte floppy drive. The unit fits into a standard VMEbus 6U single-slot form factor. The VMIACC-0562 converts P2 IDE/Floppy signals to 40- and 34-pin headers for use at the rear of the VMEbus backplane.

PMC Capability: VMIC supports PMC via the on-board PMC expansion sites. These expansion sites allows the VMIVME-7751 to take advantage of the many commercially available PMC boards available from third-party sources.

CD-ROM Support: Since much of today's advanced software is delivered on CD-ROM, the VMIVME-7455 provides CD-ROM capability within a single 6U VME slot.

VMEbus: The VMIVME-7751 enables access to VMIC's wealth of VMEbus products. If you have real-world control, monitoring and real-time networking requirements, VMIC 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.

The I/O Solution for Your I/O Problem: VMIC's 16 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, VMIC 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 shown in Figure 1.

TRADEMARKS

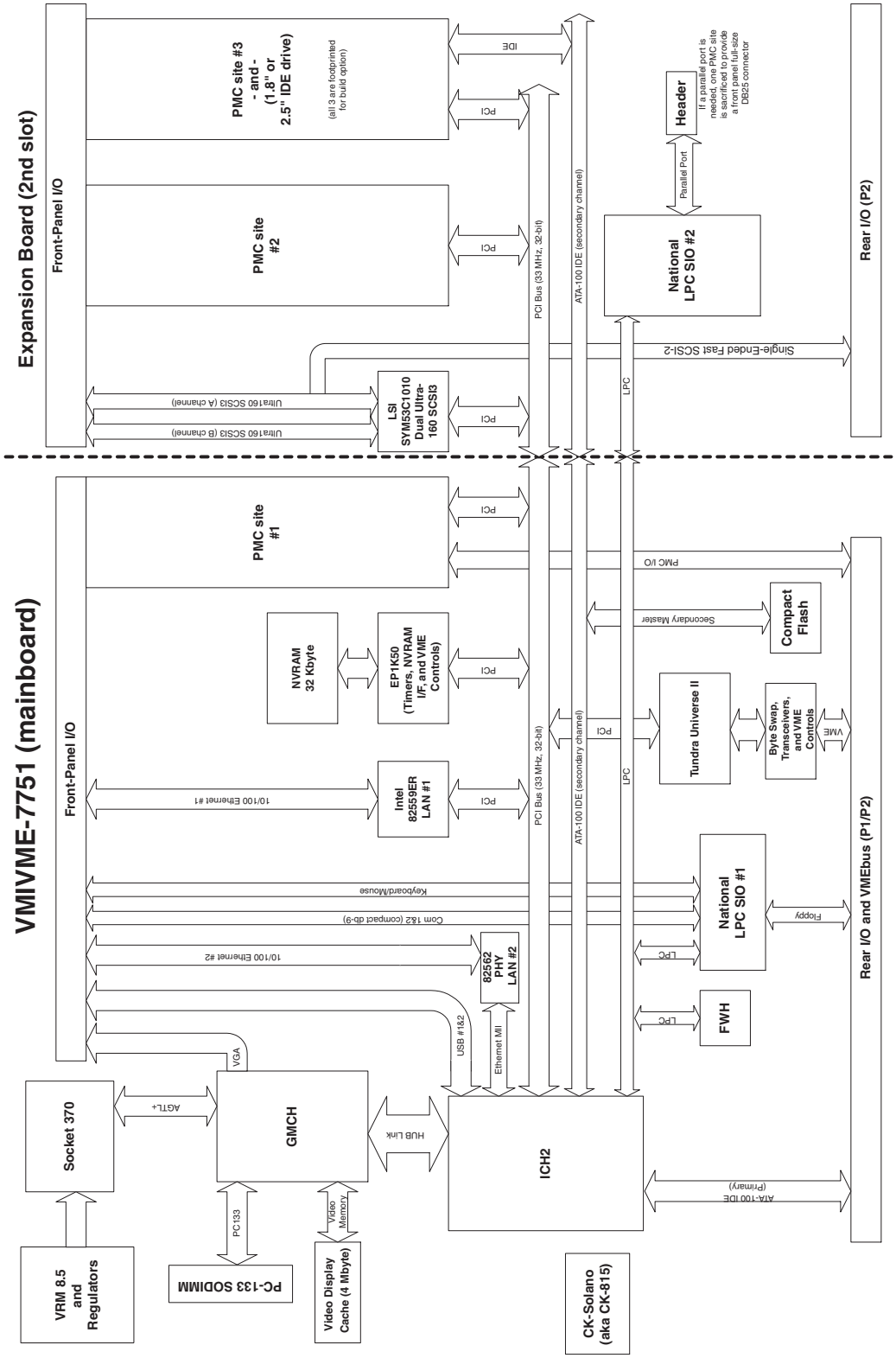


Figure 1. VMIVME-7751 Main Board (Single-Slot)