DATA SHEET

MODEL 487-1

Adaptor with DMA connects and EISA Bus computer to a VMEbus system

Bit 3's Model 487-1 Adaptor with DMA is a fast, easy-to-use and cost effective way to share memory and special purpose boards between an EISA-based computer and a VMEbus system. The Adaptor provides high-speed data transfers between systems, and requires minimal software support.

The Adaptor gives you the best of both worlds by uniting the power of a VMEbus system with the EISA environment so that:

- Both systems can directly address resources at the remote end of the cable as though they were local.
- Blocks of data, I/O commands, and interrupts can be passed between systems.

Plus, the EISA-based system can function as either a coprocessor or as the only bus master processor in a VMEbus chassis.

With the Bit 3 Adaptor, each bus operates independently. The timing of the two buses is linked only when a memory or I/O reference is made to an address on one system that translates to a reference on the other. The integrity of the interface between Adaptor cards is maintained by parity checks on address, control, and data lines.

Model 487-1 supports A32/D32 random access cycles from either system and includes a built-in DMA controller. The DMA controller is a high-speed data mover engine that moves data between EISA system memory and the VMEbus at sustained data rates of up to 26M bytes per second (M Bytes/sec). It also allows a VMEbus DMA device (such as a disk controller) to DMA through the Adaptor directly into EISA memory at data transfer rates in excess of 12M Bytes/sec. Actual performance rates are dependent on the capabilities of the specific EISA system and the speed of the VMEbus memory.

Other Bit 3 Adaptors, supporting a wide variety of buses, can be used with EISA - VMEbus Adaptors to connect multiple computers and systems in star, daisy-chain or modified star/daisy-chain configurations.

COMMUNICATION BETWEEN SYSTEMS

Model 487-1 supports two methods of intersystem communication: Memory Mapping and DMA Controller. Memory Mapping controls random access to remote bus RAM, dual-port memory, and remote bus I/O. The built-in DMA controller moves large blocks of data directly from one system's memory into the other system's memory at speeds up to 26M Bytes/sec.

Memory Mapping provides an easy-to-use, flexible interface with low overhead that permits two processors to communicate via random access memory reads and writes. The transmitting system can access up to 4G bytes of memory in the receiving system through a window in the transmitting system's bus address space.

Memory Mapping permits high-speed random access 32-bit reads and writes to either the VMEbus or EISA bus at speeds comparable to reads and writes to local memory. EISA configuration I/O registers (loaded at system boot) and VMEbus jumpers establish the resulting host and destination address ranges in address space. Also, a portion of memory space can be mapped in the opposite direction allowing either system to become a bus master on the other system's bus.

Memory Mapping also controls access to dual-port memory. Dual Port RAM is an optional card installed on either the EISA or VMEbus Adaptor card. Dual Port RAM provides a memory buffer; saves the cost of additional memory cards; and requires no additional VMEbus or EISA card slots.

Optional Dual Port RAM provides shared memory space accessible by random access reads and writes from either system. Dual Port RAM access uses only the bandwidth of the accessing bus. Consequently, data can be exchanged with minimal impact on the performance of the other system's bus. Both systems can access Dual Port RAM simultaneously; the Adaptor arbitrates accesses.

Dual Port RAM cards now available from Bit 3, include: 32K, 128K, 1M, 2M, 4M and 8M byte cards.

Memory Mapping is also used to control access to remote bus I/O.

Two Memory Mapping techniques are supported: Direct Mode (with address biasing) and Page Mode. Either technique may be used to control access to remote bus memory and dual-port memory. Access to remote bus I/O is not affected by the mapping mode.

Direct Mode has a one-to-one relationship between address windows. Data are transferred through one window directly into an equal size window on the other bus. Window size is configured via EISA Adaptor card configuration registers and VMEbus Adaptor card jumper settings.

In Page Mode, a 64K - 1M byte window in the transmitting bus address space is coupled with a 16-bit programmable register. Window size is selected by software. The address within the window provides the lower 16 - 20 address bits. The I/O register provides the upper 16 - 12 bits of the 32-bit receiving bus address. Thus, the transmitting system can scan 4G bytes of memory in the receiving system by paging through the receiving system's address space.

DMA, the other method of communication, is the automatic transfer of data from one memory address to another. Model 487-1 supports two DMA techniques: DMA Controller Mode and Slave Mode DMA.

DMA Controller Mode uses the EISA System's DMA Controller to enable high-speed memory-to-memory data transfers without processor intervention. The EISA Adaptor card transfers data in Burst DMA Transfer Mode at rates up to 33M Bytes/sec between the on-card FIFO and the EISA bus. This allows a sustained data transfer rate up to 26M Bytes/sec between the EISA and VMEbus Adaptor cards. VMEbus DMA participants must be 32-bit devices. Each DMA cycle supports transfer lengths from 4 bytes to 16M bytes. The DMA Controller also allows transfers between the optional Dual Port RAM and system memory.

In Slave Mode DMA, the Adaptor card appears as a slave memory card. This type of DMA transfer is performed when a VMEbus DMA device transfers data through the Adaptor directly into the EISA bus. Each Slave Mode DMA cycle supports transfer lengths from 4 bytes - 64K bytes. Slave Mode DMA transfers are also allowed between Dual Port RAM and EISA system memory.

INTERRUPT AND ERROR HANDLING

The Adaptor supports interrupts from four sources:

- VMEbus interrupts (IRQ1 - IRQ7) can be passed by the Adaptor to the EISA-based system.
- Programmed interrupts can be passed in either direction.
- The Interface Error Interrupt can be activated when a timeout, parity error or bus error condition is detected on an Adaptor card.
- The DMA Done Interrupt is activated when the "Done Interrupt" enable bit is set and a DMA operation has ended. The interrupt remains active until cleared by clearing the "DMA Done" bit or by starting another DMA operation.

An Adaptor card control register provides EISA acknowledgment of VMEbus interrupts and vector passing.

VMEbus SYSTEM CONTROLLER CAPABILITY

In addition to VMEbus control and bus master capabilities, the Adaptor can function as the VMEbus system controller. If the VMEbus system is to be used primarily as an expansion chassis, this feature saves the expense of an additional VMEbus system controller.

When configured as the system controller the Model 487-1 Adaptor provides the VMEbus system clock and system reset, and the Bus Error (BERR) global timeout. The VMEbus Adaptor card may be configured to be a Single-Level (SGL) bus arbiter or a four-level bus arbiter in Priority (PRI) or Round-Robin (RRS) Mode.

OTHER FEATURES

- Handshake Mode allows the EISA processor to communicate with very slow VMEbus devices. When the Handshake Mode bit is set, software polls to complete the transfer.
- Byte swap and word swap controls the order of data passing through the Adaptor.

TECHNICAL HIGHLIGHTS

- Random access reads and writes from the EISA-based system to VMEbus devices.
- Random access reads and writes from VMEbus masters to the EISA-based system.
- Flexible mapping of EISA address space to and from VMEbus memory and I/O address space.
- Direct Mode window sizes up to 256M bytes.
- Page Mode allows access to 4G bytes of memory through page sizes from 64K to 1M byte.
- A32, A24, or A16 Addressing, and D32, D16, and D8 Data Transfer mode support.
- Supports two DMA techniques: DMA Controller Mode and Slave Mode DMA.

- DMA data transfers from chassis to chassis at sustained data transfer rates up to 26M bytes/sec.
- Supports Data Streaming on the EISA-based system to maximize throughput in DMA mode.
- Burst DMA Transfer Mode rates up to 33M Bytes/sec.
- Slave Mode DMA data transfer rates up to 12M Bytes/sec.
- Add up to 8M bytes of shared memory via optional Dual Port RAM cards.
- DMA modes support Dual Port RAM.
- Interrupts can be exchanged between the VMEbus and the EISA bus.
- Parity checking on address, control and data lines on the EISA Adaptor card and on the interface between Adaptor cards.
- Support for byte and word swapping in hardware.
- Round EMI-shielded copper conductor cable to 25 feet. Cable is available in standard 8-foot and 25-foot lengths.
- Fiber-Optic Interfaces are available as an option.
- Power requirements: the VMEbus Adaptor card draws 2.6A at 5V; the EISA Adaptor card draws 2.0A at 5V.
- Operating Temperature: 0 - 60 degrees C.

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Storage Temperature:  -40 - 85 degrees C.

Humidity:             0% - 90% non-condensing.
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- VMEbus Adaptor card meets IEEE 1014 revision C specifications.
- Recognized under the component program of Underwriter Laboratories, Inc.
- Supports all features of the earlier Model 487 EISA Adaptor card.

REQUIRED COMPONENTS

- One 32-bit EISA Adaptor card (included in the Model 487-1 package).
- One 6U VMEbus Adaptor card (included in the Model 487-1 package).
- A round EMI-shielded copper-conductor cable to connect the Adaptor cards (purchased separately from Bit 3).
- A device driver for the EISA-based system (optional Bit 3 Model 933 Support Software for HP-UX is available; includes a loadable device driver).

Each Model 487-1 package contains one EISA Adaptor card, one VMEbus Adaptor card and a manual. A cable is required but is ordered separately so that you can specify the appropriate length for your installation.

OPTIONS

- Dual Port RAM

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32K byte                Model 400-201

128K byte                Model 400-202

1M byte                Model 400-203

2M byte                Model 400-204

4M byte                Model 400-205

8M byte                Model 400-206
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- Cable (one required)

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8' Round EMI-Shielded               Model 400-107

25' Round EMI-Shielded               Model 400-108
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Bulkhead connector configurations (contact Bit 3 for configurations)

- Fiber-Optic Interfaces

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Two Fiber Card                Model 400-5

Four Fiber Card                Model 400-6

Two Fiber Module                Model 400-50

Four Fiber Module                Model 400-60
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(Fiber-Optic Cards are for the VMEbus system only; Modules may be used with either the EISA or VMEbus system. Two Fiber-Optic Interfaces are required. For more information, request the Model 400 Fiber-Optic Interface data sheet.)

- Support Software Model 933

HP-UX version 8.05 compatible; provides software support tools for logical devices, UNIX standard read/write interface, interrupts, memory mapped interface and atomic instruction emulation.

TRADEMARK DISCLAIMER

Specifications subject to change without notice.

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