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DATA SHEET

MODEL 436

Adaptor with DMA connects a Q22-bus system and A32 VMEbus system

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Bit 3's Model 436 Adaptor connects a Q22-bus system to an A32 VMEbus system for fast, cost-effective sharing of memory and special purpose boards. The Model 436 Adaptor provides high-speed data transfers between the Q22-bus and the VMEbus, and requires minimal software support.

Model 436 supports DEC Q22-bus computers including MicroVAX II, PDP/LSI, and stand-alone Q22-bus card cages. On the other side, the Adaptor supports virtually all A32 VMEbus systems.

The Model 436 Adaptor gives you the best of both worlds by uniting the power of a VMEbus system with the DEC Q22-bus environment so that:

- Both systems can directly address resources at the remote end of the cable as though they were local.
- Random access reads and writes can be executed between the Q22-bus and the VMEbus.
- Blocks of data, I/O commands, and interrupts can be passed between systems.

Plus, either system can function as a coprocessor or as the only bus master processor in the other 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 the Adaptor cards is maintained by parity checks on address, control, and data lines.

The Adaptor supports 16-bit reads and writes to the destination system; resulting host and destination addresses can be established by the user in 32-bit VMEbus address space and 22-bit Q22-bus address space.

Model 436 also supports block mode Direct Memory Access (DMA) data transfers initiated by the Q22-bus system.

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Other Bit 3 Adaptors, supporting a wide variety of buses, can be used with Model 436 Adaptors to connect multiple computers and systems in star, daisy-chain or modified star/daisy-chain configurations.

COMMUNICATION BETWEEN SYSTEMS

Model 436 supports two methods of inter-system 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's memory at speeds to 20M 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 Q22-bus system can access up to 4G bytes of memory in the VMEbus system through a window in the VMEbus address space. Up to 4M bytes of Q22-bus memory can be accessed by the VMEbus system.

Memory Mapping permits high-speed random access 16-bit writes from the VMEbus to an address in 22-bit Q22-bus address space. Sixteen-bit writes from the Q22-bus to the VMEbus are sent to a user-established destination address in 32-bit VMEbus address space. Writes to either system are performed at speeds comparable to reads and writes to local memory. Programmable I/O registers, loaded at system boot, establish the resulting host and destination address ranges in address space.

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 RAM. 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.

In Page Mode, a small window in the transmitting bus address space is coupled with a programmable register. The address within the window provides the lower 16 address bits. The I/O register provides the upper six bits of a 22-bit Q22-bus address or the upper 16 bits of a 32-bit VMEbus destination address. Thus, the Q22-bus system can scan 4G bytes of memory in the VMEbus system by paging through the remote system's address space; the VMEbus can access 4M bytes of Q22-bus memory using 64K byte - 1M byte pages.

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

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Dual Port RAM cards now available from Bit 3 for Model 436, include: 32K, 128K, 1M, and 2M byte cards. Grant continuity cards are available for Q22-bus installations.

The Model 436 Adaptor also supports communication via a built-in DMA controller on the Q22-bus Adaptor card. The DMA controller enables high-speed data transfer from one system's memory directly into the other's memory. Data transfer are initiated by the Q22--bus system's processor. Each DMA cycle supports transfer lengths to 16M bytes.

The built-in DMA controller also allows memory-to-memory transfers between system memory and Dual Port RAM at the other end of the cable.

INTERRUPT AND ERROR HANDLING

Model 436 supports interrupts from the following sources:

- Any one of four Q22-bus interrupts (BIRQ4 - BIRQ7) can be passed by the Adaptor to the VMEbus system if the Q22-bus has no processor present.
- Any or all of the seven VMEbus backpanel interrupts (IRQ1 - IRQ7) can be passed from the VMEbus chassis to the Q22-bus chassis.
- Programmed interrupts from the remote Adaptor card can be passed in either direction.
- An Interface Error Interrupt that 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 forcing the "DMA Done" bit to zero or by starting another DMA operation.

An Adaptor control register provides Q22-bus acknowledgment of VMEbus interrupts and vector passing.

SYSTEM CONTROLLER CAPABILITY

In addition to control and bus master capabilities, the Model 436 Adaptor can function in either system as the system processor. If one system is to be used primarily as an expansion chassis for the other system's slave cards, this feature saves the expense of an additional processor.

When configured as the VMEbus system processor, the VMEbus Adaptor card provides level 3 bus arbitration, the VMEbus system clock (SYSCLK) and system reset, and the BERR global timeout.

If the Q22-bus Adaptor card is configured as the Q22-bus processor, the Model 436 Adaptor drives the bus arbitration and interrupt acknowledge signals.

TECHNICAL HIGHLIGHTS

- Random access reads and writes from the Q22-bus system to VMEbus devices.
- Random access reads and writes from VMEbus masters to the Q22-bus.

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- Flexible mapping of Q22-bus address space to and from VMEbus memory and I/O address space.
- Sixteen-bit data transfers to 32-bit VMEbus and 22-bit Q22-bus address space.
- Page Mode allows the VMEbus system to access up to 4M bytes of memory in the Q22-bus system through a page size from 64K - 1M byte. The Q22-bus system can access up to 4G bytes of memory in the VMEbus system by paging in 64K byte increments.
- Add up to 2M bytes of shared memory via optional Dual Port RAM cards.
- Support for byte and word swapping in hardware.
- Interrupts can be exchanged between the Q22-bus and VMEbus.
- Parity checking on address, control and data lines on the interface between Adaptor cards.
- Power requirements -

```
The Q22-bus Adaptor card draws 5A at 5V.
The VMEbus Adaptor card draws 4.5A at 5V.
```

- Environment -

```
Temperature:           0 to 60 degrees C operating;
-40 to 85 degrees C storage.
Humidity:              0% to 90% (non-condensing).
```

- 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.
- Meets IEEE 1014C VMEbus specifications.
- Recognized under the component program of Underwriter Laboratories, Inc.

REQUIRED COMPONENTS

- One 6U VMEbus Adaptor card (included in Model 436 package).
- One Q22-bus Adaptor card (included in Model 436 package).
- A round EMI-shielded cable to connect the Adaptor cards (purchased separately from Bit 3).
- A device driver for the Q22-bus system (optional Bit 3 Model 901 & Model 902 Support Software for VMS versions 4.0 and 5.0 include VMS device drivers).

Each Model 436 package contains: one VMEbus Adaptor card, one Q22-bus 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

```
32K byte            Model 400-201
128K byte            Model 400-202
1M byte            Model 400-203
```

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```
2M byte            Model 400-204
```

- Cable (one required)

```
8' Round EMI-Shielded            Model 400-101
25' Round EMI-Shielded            Model 400-102
```

Bulkhead connector configurations (contact Bit 3 for configurations)

- Fiber-Optic Interfaces

```
Two Fiber Card            Model 400-5
Two Fiber Module            Model 400-50
```

(Fiber-Optic Cards are for the VMEbus system only; Modules may be used with either the Q22-bus or VMEbus. Two Fiber-Optic Interfaces are required. For more information, request the Model 400 Fiber-Optic Interface data sheet.)

- Support Software

Models 901 and 902 provide all the tools required to access and control Bit 3 Adaptors for VMS versions 4.0 and 5.0 Q22-bus systems; Model 901 Support Software is on RX50 diskettes; Model 902 Support Software is on TK50 tape.

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