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SEP OCT FEB
30
1995 1996 1997
Close
Help
3 captures
30 Oct 96 - 11 Jul 97

BIT 3 COMPUTER CORPORATION

DATA SHEET

MODEL 617

Adaptor with DMA Connects a PCI System to a VMEbus System

Bit 3's Model 617 is an easy-to-use, cost effective way to share memory and special purpose boards between a PCI Local Bus computer and a VMEbus system. The Model 617 Adaptor provides high-speed data transfers between systems, and requires minimal software support.

Linked by the Model 617 Adaptor, these two powerful computing environments become even more powerful and versatile. From the VMEbus side of the Adaptor, you can take full advantage of PCI system resources for VMEbus applications. And, because the Adaptor card is treated as any other processor on the VMEbus, the PCI system acting through the Adaptor can function as either a coprocessor or as the only bus master processor on the VMEbus. Consequently, the PCI system can directly control and monitor a wide variety of VMEbus cards and high-performance processors, as well as exchange interrupts with the VMEbus.

The Model 617 Adaptor allows each bus to operate independently. The timing of the PCI bus and VMEbus 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 617 supports bi-directional random access bus mastering from either system and also supports 16- and 32-bit data transfers using a built-in DMA Controller. The DMA Controller is a high-speed data mover engine that moves data between PCI system memory and the VMEbus at sustained data transfer rates up to 26 Megabytes per second (M Bytes/sec). It also allows a VMEbus DMA device (such as a disk controller) to DMA through the Adaptor directly into PCI memory at data transfer rates in excess of 10M Bytes/sec.

Other Bit 3 Adaptors, supporting a wide variety of buses, can be used with Model 617 Adaptors to connect multiple computers and systems in star, daisy-chain or modified star/daisy-chain configurations.

COMMUNICATIONS BETWEEN PCI BUS & VMEbus

Model 617 supports two methods of intersystem communications: Memory Mapping and Direct Memory Access (DMA).

Memory Mapping controls random access (PIO transfers) to remote bus RAM, dual-port memory, and remote bus I/O, and provides an easy-to-use, flexible interface with low overhead. A PCI bus master can access memory in the VMEbus system through a window in PCI address space. Conversely, a VMEbus bus master can access PCI memory from a window in VMEbus address space.

Memory mapping registers (Mapping RAM Registers) are used to steer accesses in 4K byte segments from PCI address space to VMEbus address space. The contents of the 8,192 PCI to VMEbus Mapping RAM Registers identify the VMEbus address, the address modifier code, and the option of byte or word swapping.

Likewise, 4,096 32-bit Mapping RAM Registers are available to map accesses from VMEbus bus masters onto the PCI bus. In addition, there are 4,096 32-bit DMA to PCI bus Mapping RAM Registers.

Memory Mapping also controls access to dual-port memory. Dual Port RAM, an optional card installed on the VMEbus Adaptor card, 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.

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

DMA, the other method of communication, is the automatic transfer of data from one memory address to another. The Model 617

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Go
SEP OCT FEB
Close
3 captures
30 Oct 96 - 11 Jul 97
30
1995 1996 1997
Help

the other system's memory. Data transfer in either direction can be initiated by the PCI or VMEbus processor. Each DMA cycle supports transfer lengths up to 16M bytes. The DMA Controller also allows data transfers between PCI memory and Dual Port RAM on the VMEbus Adaptor card.

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 (such as a disk controller) transfers data through the Adaptor directly into the PCI system.

INTERRUPT AND ERROR HANDLING

The Adaptor supports interrupts from four sources:

- Pending VMEbus interrupts IRQ1 - IRQ7.
- Programmed interrupts to the PCI system (PT interrupts).
- Interface error interrupts activated when a timeout, parity error, or bus error condition is detected on an Adaptor card.
- The DMA Done Interrupt that is activated when the Done Interrupt enable bit is set and a DMA operation ended. The interrupt remains active until cleared by clearing the DMA Done bit or by starting another DMA operation.

Up to seven interrupts can also be sent from the VMEbus system to the PCI bus. These interrupts are selected from eight possible sources: IRQ1 - IRQ7 and the PT interrupt.

Although there are several potential VMEbus interrupt sources, only one PCI interrupt signal is used. Therefore, an 8-bit status register and an interrupt control register are available for the PCI interrupt handling routine to use to determine the VMEbus interrupt source.

Two interrupt sources, PT and PR interrupts, can be generated from the PCI Adaptor card and sent to the VMEbus.

SYSTEM CONTROLLER MODE CAPABILITY

In addition to VMEbus control and bus master capabilities, the Model 617 Adaptor can provide the system controller functions. If the VMEbus system is used primarily as an expansion chassis for the PCI system, System Controller Mode eliminates the need to purchase an additional VMEbus system controller.

When configured as the system controller the Model 617 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.

MAPPING REGISTERS

All accesses from PCI to VMEbus, except Adaptor I/O registers, are through Mapping RAM. Each of the 8,192 Mapping RAM Registers controls access to 4K bytes of VMEbus address space. If all 8,192 Mapping RAM Registers point to different 4K byte VMEbus addresses, a total of 32M bytes of PCI address space can be mapped to the VMEbus.

Likewise, 4,096 Mapping RAM Registers are available for mapping random accesses and Slave Mode DMA accesses originating on the VMEbus into PCI address space. The remaining upper 4,096 Mapping RAM Registers provide the DMA Controller Mode address control for either PCI or VMEbus initiated DMA transfers.

Because the PCI environment provides demand-paged virtual memory, a contiguous buffer is not guaranteed to reside in contiguous pages when it is present in physical memory. Mapping RAM Registers on the PCI Adaptor card provide a mechanism that allows discontiguous PCI physical pages to be accessed from a contiguous VMEbus address window, or to appear contiguous for DMA operations. A third set of Mapping RAM Registers controls the remote address and other attributes of part of the PCI's window into the VMEbus system. The 32M byte PCI window into VMEbus address space is divided into 4K byte segments, each controlled by its own Mapping RAM Register; therefore, the address gaps between devices do not need to be mapped.

TECHNICAL HIGHLIGHTS

- Random access reads and writes from the PCI system to the VMEbus.
- Random access reads and writes from the PCI bus to Dual Port RAM.
- Random access reads and writes from the VMEbus to the PCI bus.
- Flexible mapping of PCI bus address space to VMEbus memory and I/O address space.
- Accesses from the PCI bus to the VMEbus are A32, A24, or A16; data accesses are 32-, 16-, or 8-bit.
- Accesses from the VMEbus to PCI bus are A32; data accesses are 32-, 16-, or 8-bit.

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30 Oct 96 - 11 Jul 97
Go
SEP OCT FEB
30
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- DMA Controller Mode and Slave Mode DMA.
- DMA modes support Dual Port RAM.
- DMA data transfers from chassis to chassis at sustained rates up to 26M Bytes/sec.
- Provides Byte Swapping and Word Swapping functions.
- VMEbus Adaptor card can function in System Controller Mode.
- Add up to 8M bytes of shared memory via optional Dual Port RAM cards.
- Interrupts can be passed from the VMEbus system to the PCI system.
- Parity checking on address, control and data lines on the PCI Adaptor card and on the interface between Adaptor cards.
- Power requirements -

The VMEbus Adaptor card draws 3.5A at 5V.

The PCI Adaptor card draws 1.5A 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- and 25-foot lengths.
- Fiber-Optic Interfaces are available as an option.
- 6U to 9U Holders are available as an option.
- VMEbus Adaptor card meets IEEE 1014C specifications.

REQUIRED COMPONENTS

- One short form factor PCI Adaptor card.
- One 6U VMEbus Adaptor card.
- A round EMI-shielded copper-conductor cable to connect the Adaptor cards (purchased separately from Bit 3).

Each Model 617 package contains: one PCI 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 and type for your installation.

OPTIONS

- Dual Port RAM

```
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
```

- Cable (one required)

```
8' Round EMI-Shielded                  Model 400-107
25' Round EMI-Shielded                  Model 400-108
```

Bulkhead connector configurations (contact Bit 3 for configurations)

- Fiber-Optic Interfaces

```
Two Fiber Card                  Model 400-5
Four Fiber Card                  Model 400-6
Two Fiber Module                  Model 400-50
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Go
SEP OCT FEB
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3 captures
30 Oct 96 - 11 Jul 97
30
1995 1996 1997
Help

- Support Software

Support Software for the PCI Local Bus will be available soon.

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