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DATA SHEET

MODEL 608

Adapter with DMA connects a GIO64 Bus Indigo system to a VMEbus system

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Bit 3's Model 608 is an easy-to-use, cost effective way to share memory and special purpose boards between a Silicon Graphics GIO64 bus Indigo2 computer and a VMEbus system. The Model 608 Adaptor provides high-speed data transfers between systems, and requires minimal software support.

Model 608 interconnects the GIO64 bus and VMEbus systems at the physical layer. Working at the lowest level, the bus, the Adaptor allows the two systems to share memory; memory appears to and is treated by each system as if it were its own. In addition, a card only available on one bus may be directly controlled by a device on the other bus. For example, an Array Processor board in a VMEbus chassis can be directly controlled by the GIO64 processor.

The Model 608 Adaptor allows each bus to operate independently. The timing of the GIO64 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 608 supports bi-directional random access bus mastering from either system and also supports 16- / 32-bit data transfers using a built-in DMA Controller. The DMA Controller is a high-speed data mover engine that moves data between GIO64 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 GIO64 memory at data transfer rates in excess of 12M Bytes/sec. Actual performance rates are dependent on the capabilities of the specific GIO64 system and the speed of the VMEbus memory.

Other Bit 3 Adaptors, supporting a wide variety of buses, can be used with Model 608 Adaptors to connect multiple computers and systems in star, daisy-chain or modified star/daisy-chain configurations.

COMMUNICATIONS BETWEEN GIO64 BUS & VMEbus

Model 608 supports two methods of intersystem communications: Memory Mapping and Direct Memory Access (DMA).

Memory Mapping controls random access (PIO transfers) to VMEbus RAM, dual-port memory, and VMEbus I/O, and provides an easy-to-use, flexible interface with low overhead. When the GIO64 bus is the transmitting system, it can access up to 4G bytes of memory in the VMEbus system through a window in GIO64 bus address space. Conversely, if the VMEbus is the transmitting system, it can access all GIO64 bus memory from a window in VMEbus address space.

Seven Window Mapping Registers are available to steer accesses in 256K segments from GIO64 address space to VMEbus address space. Likewise, there are 16 Page Mapping Registers available for accesses in 4K segments from VMEbus address space to GIO64 address space.

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

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

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DMA, the other method of communication, is the automatic transfer of data from one memory address to another. The Model 608 Adaptor supports two DMA techniques: DMA Controller Mode and Slave Mode DMA.

DMA Controller Mode uses the Adaptor's DMA Controller to enable high-speed data transfers from one system's memory directly into the other system's memory. Data transfer in either direction can be initiated by the GIO64 bus or VMEbus processor. Each DMA cycle supports transfer lengths up to 64K bytes. The DMA Controller also allows data transfers between GIO64 bus 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 GIO64 bus.

INTERRUPT AND ERROR HANDLING

The Adaptor supports interrupts from four sources:

- Pending VMEbus interrupts IRQ1 - IRQ7.
- Programmed interrupts to the GIO64 bus (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 four interrupts can be sent from the VMEbus system to the GIO64 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 GIO64 bus interrupt signal is used. Therefore, an 8-bit status register and an interrupt control register are available for the GIO64 bus interrupt handling routine to use to determine the VMEbus interrupt source.

Two types of programmed interrupts, PT and PR Interrupts, can be generated from the GIO64 Adaptor card and sent to the VMEbus.

SYSTEM CONTROLLER MODE CAPABILITY

In addition to VMEbus control and bus master capabilities, the Model 608 Adaptor can provide the system controller functions. If the VMEbus system is used primarily as an expansion chassis for the GIO64 system, System Controller Mode eliminates the need to purchase an additional VMEbus system controller.

When configured as the system controller the Model 608 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 GIO64 to VMEbus, except Adaptor I/O registers, are through Window Mapping Registers. Each of the seven Mapping Registers controls access to 256K bytes of VMEbus address space.

Sixteen Page Mapping Registers are available to access the GIO64 bus for VMEbus initiated or DMA transfers. Each Page Mapping Register controls access to 4K bytes of GIO64 address space.

TECHNICAL HIGHLIGHTS

- GIO64 Adaptor card installs and operates in a GIO64 slot.
- Random access reads and writes from the GIO64 system to the VMEbus.
- Random access reads and writes from the GIO64 bus to Dual Port RAM.
- Random access reads and writes from the VMEbus to the GIO64 bus.
- Flexible mapping of GIO64 bus address space to VMEbus memory and I/O address space.
- Accesses from the GIO64 bus to the VMEbus are A32, A24, or A16; data accesses are 1 byte, 2 bytes, and 4 bytes.
- Accesses from the VMEbus to GIO64 bus are A32 or A24; data accesses are D32, D16, D8, or D32 Block Mode transfer.
- DMA Controller Mode and Slave Mode DMA.

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- 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.
- Seven Window Mapping Registers control accesses from GIO64 to VMEbus.
- Sixteen Page Mapping Registers control access from the VMEbus to GIO64.
- Add up to 8M bytes of shared memory via optional Dual Port RAM cards.
- Interrupts can be passed from the VMEbus system to the GIO64 system.
- Parity checking on address, control and data lines on the GIO64 Adaptor card and on the interface between Adaptor cards.
- Power requirements -

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The VMEbus Adaptor card draws 2.6A at 5V.

The GIO64 Adaptor card draws 1.0A at 5V.
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- Environment -

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Temperature:            0 to 60 degrees C operating;

                        -40 to 85 degrees C storage.

Humidity:               0% to 90% non-condensing.
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- 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.
- 6U to 9U Holders are available as an option.
- Recognized under the component program of Underwriter Laboratories, Inc.
- VMEbus Adaptor card meets IEEE 1014C specifications.

REQUIRED COMPONENTS

- One GIO64 Adaptor card.
- One 6U VMEbus Adaptor card.
- A round EMI-shielded copper-conductor cable to connect the Adaptor cards (purchased separately from Bit 3).
- An IRIX device driver for the GIO64 system (optional Model 963 Support Software includes a device driver).

Each Model 608 package contains: one GIO64 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
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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

Two Fiber Card	Model 400-5
Four Fiber Card	Model 400-6
Two Fiber Module	Model 400-50
Four Fiber Module	Model 400-60

(Fiber-Optic Cards are for the VMEbus system only; Modules may be used with either the GIO64 or VMEbus system. Two Fiber-Optic Interfaces are required. For more information, request the Fiber-Optic Interface data sheet.)

- Support Software

Model 963 provides IRIX compatible software support, including: a device driver, installation scripts and example programs that demonstrate use of the device driver and Model 608 Adaptor.

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