Chapter 1: Adaptor Functions

1.0 Executive Overview

The Bit 3 Model 607 Adaptor is an easy-to-use, cost-effective way to share memory and special purpose cards between a GIO bus computer and a VMEbus system. The Model 607 Adaptor provides high-speed data transfers between the two systems, and requires minimal software support.

Model 607 interconnects the GIO 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 another bus. For example, an Array Processor board in a VMEbus chassis can be directly controlled by the GIO processor.

The GIO Adaptor card installs and operates in either a GIO32 or GIO32bis slot.

The Adaptor supports bi-directional random access bus mastering from either system and also supports 16- / 32-bit data transfers using a built-in DMA Controller. This controller enables the Adaptor to transfer data from one system's memory to the other system's memory at sustained data transfer rates of up to 26 Megabytes per second (M Bytes/sec). It also allows a VMEbus DMA device to DMA through the Adaptor directly into GIO memory at data transfer rates in excess of 12M Bytes/sec.

Model 607 supports two methods of inter-system 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. A GIO bus master can access memory in the VMEbus system through a window in GIO address space. Conversely, a VMEbus bus master can access GIO system memory from a window in VMEbus address space.

Seven Mapping Registers are available to steer accesses in 256K segments from GIO address space to VMEbus address space. Likewise, there are 16 Mapping Registers available for accesses from VMEbus address space to GIO address space. Each Mapping Register can be independently set to point to any address on the bus.

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.

Bit 3's Dual Port RAM is a printed circuit card that plugs into the VMEbus Adaptor card as a daughter card. The following memory sizes are currently available: 32K, 128K, 1M, 2M, 4M, and 8M bytes.

Optional Dual Port RAM provides shared memory space that is accessible 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.

DMA, the other method of communication, is the automatic transfer of data from one memory address to another. Model 607 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 GIO or VMEbus processor. Each DMA cycle supports transfer lengths from 4 bytes to 64K bytes. The DMA Controller also allows data transfers between GIO bus memory and Dual Port RAM on the VMEbus Adaptor card.

To initiate a DMA Controller transfer, a processor sets the transmitting and receiving system's target addresses, and a word count. Bits in the command registers specify parameters, such as word width, destination address space (A32, A24 or A16), the address modifier, and Block or Non-Block transfer mode. Interrupts must be prevented from being passed between the buses during the DMA transfer. Also, random access (PIO) across the I/O cable must not occur during a DMA Controller transfer.

In Slave Mode DMA, the Adaptor card appears as a slave memory card. A Slave Mode DMA transfer is performed when a VMEbus DMA device transfers data through the Adaptor directly into the GIO bus.

Model 607 Adaptor does not link the timing of the two buses so that activity on one bus slows down the other. Instead, the Adaptor permits each bus to operate *independently*. The buses are 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 Model 607 Adaptor consists of two cards: a GIO bus card and a 6U size VMEbus card. The two cards are connected by a round EMI-shielded copper-conductor cable purchased separately from Bit 3.

Cable is available in standard 8- or 25-foot lengths and custom lengths. Fiber-Optic Interface Cards and Modules are also available from Bit 3.

A 6U to 9U Holder for the VMEbus Adaptor card is available as an option from Bit 3.

Optional Support Software is also available from Bit 3. Model 963 Support Software provides an IRIX™ GIO bus device driver and extensive example programs that demonstrate the use of the Model 607 Adaptor.

1.1 Card Specifications

Bus Communication Specifics:
Each Adaptor card may function as a transmitter device at one end of the Adaptor cable and as a receiver at the other. Communication may be specified as one way in either direction or as two-way. A dual-port memory option, Dual Port RAM, provides a convenient way for VMEbus masters to pass data to and from the GIO bus.

Accesses from the GIO bus to the VMEbus are A32, A24, or A16; data accesses are 1 byte, 2 bytes, or 4 bytes wide.

Accesses from the VMEbus to GIO bus are A32 or A24; data accesses are D32, D16, D8, or D32 Block Mode transfer.