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MODEL 413-1

VMEbus - VMEbus Adapter with DMA

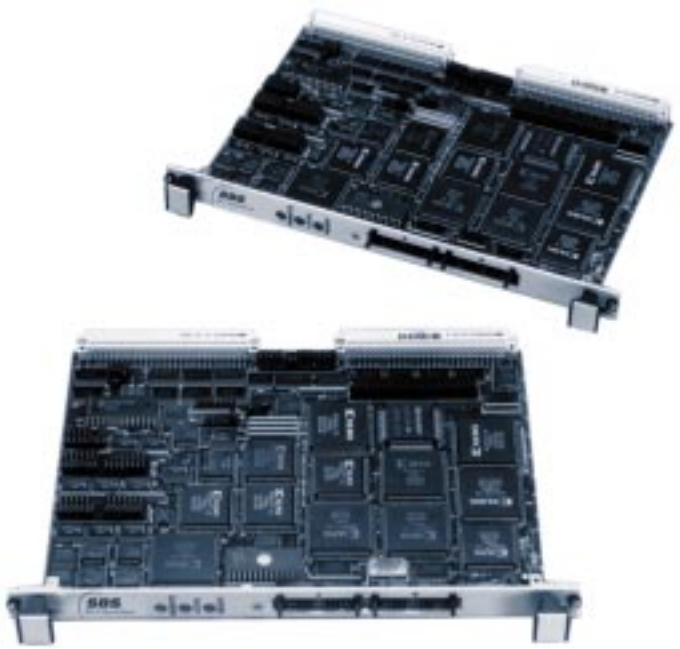
SBS's Model 413-1 is an easy-to-use, cost effective way to share memory and special purpose boards between two VMEbus systems. Model 413-1 provides high-speed data transfers between two VMEbus systems, and requires minimal software support.

The Model 413-1 adapter expands your computing environment by combining the power, memory and card capacity of two systems. Interconnected by the adapter, each system can:

- Directly address the other's resources as though they were local.
- Pass blocks of data, I/O commands, and interrupts to the other system.
- Execute random access reads and writes to the remote VMEbus.

Plus, the Model 413-1 can function as a coprocessor or as the only bus controller in the remote VMEbus chassis.

With the adapter, 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 adapter cards is maintained by parity checks on address, control and data lines.



Adapter With DMA For VMEbus To VMEbus Connection

Model 413-1 supports bidirectional 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 the VMEbus system memories at sustained data transfer rates 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 adapter directly into VMEbus memory at data transfer rates in excess of 12M Bytes/sec. Actual performance rates are dependent on the capabilities of the specific VMEbus systems and speed of the VMEbus memories.

Other SBS adapters, supporting a wide variety of buses, can be used with Model 413-1 adapters to connect multiple computers and systems in star daisy-chain or modified star/daisy-chain configurations.

Communications Between Systems

Model 413-1 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. Memory Mapping 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.

Two Memory Mapping techniques are supported: Direct Mode (with address biasing) and Page Mode. Either technique can be used to control access to remote bus memory and dual port memory. Access to remote bus I/O is not affected by 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 jumper settings on the adapter cards.

In Page Mode, a window in the transmitting bus address space is coupled with a 16-bit programmable register. 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.

Memory Mapping also controls access to dual-port memory. Dual Port RAM, an optional card installed on either adapter 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 adapter arbitrates accesses.

Dual Port RAM cards now available from SBS include: 128K and 8M byte cards.

DMA, the other method of communication, is the automatic transfer of data from one memory address to another. The Model 413-1supports two DMA techniques: DMA Controller Mode and Slave Mode DMA.

DMA Controller Mode uses the adapter'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 either system's processor. Each DMA cycle supports transfer lengths from 4 bytes to 16M bytes. The DMA controller also allows data transfers between VMEbus system memory and Dual Port RAM on the remote adapter card.

To initiate a DMA Controller Mode 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 (A16, A24 or A32), the address modifier, and Block or Non-Block transfer mode.

In Slave Mode DMA, the adapter 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 adapter directly into the other VMEbus.

Interrupt & Error Handling

Any of the seven VMEbus interrupts may be passed to the remote system for handling by that system’s processor. Programmed interrupts may be

passed in either direction by writing to an I/O register on an adapter card.

There are four sources of interrupts from the adapter:

- Interrupts from the remote VMEbus backplane. Interrupt lines IRQ1 - IRQ7 may be passed from the remote VMEbus.
- Programmed interrupts from the remote card.
- An interface error interrupt that is activated when a timeout, parity error or bus error condition is detected on an adapter card.
- A DMA Done interrupt that is activated when the DMA Done 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.

VMEbus System Controller Capability

In addition to VMEbus control and bus master capabilities, the adapter can function as the VMEbus system controller. In System Controller Mode, the adapter card provides bus arbitration, the VMEbus system clock and system reset, and the BERR global timeout. If the remote VMEbus system is to be used primarily as an expansion chassis for VMEbus cards, this feature saves the expense of an additional VMEbus system controller.

The adapter 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.

Technical Highlights

- Random access reads and writes from system to system.
- Random access reads and writes from the VMEbus systems to Dual Port RAM.
- Flexible mapping of address space between the systems' memories and I/O address spaces.
- 32-, 16-, or 8-bit data transfers; A16, A32 or A24 addressing.
- Jumper settings map destination VMEbus windows into local VMEbus address space.
- 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. Burst rates at 35M Bytes/sec.
- Page Mode allows access to 4G bytes of memory through page size from 64K to 1M byte.
- Add up to 8M bytes of shared memory via optional Dual Port RAM cards.
- Interrupts can be exchanged between systems.
- Parity checking on address control and data lines and on the interface between adapter cards.
- Provides VMEbus system controller functionality with four level arbitration.
- Power requirements: The VMEbus adapter cards draw 2.6A at 5V.
- Environment -

  Temperature: 0° to 60° C operating; -40° to 85° 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.
- 6U to 9U Holders are available as an option.
- VMEbus adapter cards meet IEEE 1014C specifications.
- Recognized under the component program of Underwriter Laboratories, Inc.

Model 413-1 Adapter

Required Components

- Two 6U VMEbus adapter cards.
- A round EMI-shielded copper-conductor cable to connect adapter cards (purchased separately from SBS so that you can specify the appropriate length and type for your installation).

Each Model 413-1 package contains: two VMEbus adapter cards and a manual.

Dual Port RAM

128K byte Model 400-202

8M byte Model 400-206

Cable *(one required)*

8' Round EMI-Shielded	Model 400-101
25' Round EMI-Shielded	Model 400-102
Bulkhead connector configurations	Contact SBS for configurations

Fiber-Optic Interfaces

Modules: Two Fiber Module Model 400-50; Four Fiber Module Model 400-60.

(Two Fiber-Optic Interfaces are required.)

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