Bus-to-Bus Adapters

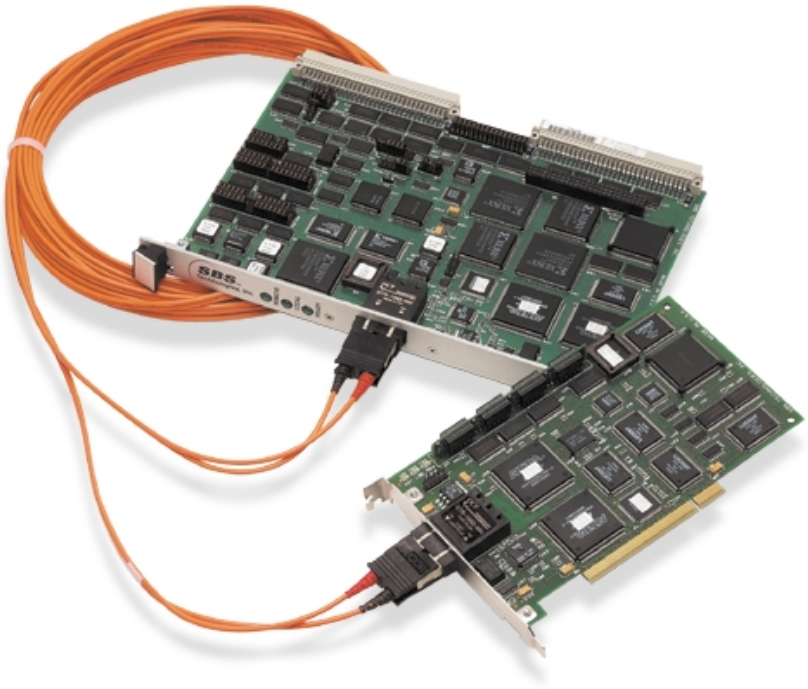
Directly connect 2 buses: PCI, VME, PC/AT

I/O & Communications

Features*

- Bi-directional bus mastership
- Memory and I/O mapping
- Streamlined no-protocol connectivity
- Controller Mode DMA (direct memory access): 35 MB/s
- Slave Mode DMA: 13 MB/s
- DMA modes support Dual Port RAM
- VMEbus System Controller Mode
- Byte and word swapping functions
- High-response hardware
- Bus isolation

* *Features supported depends on adapter model -- see Features Summary table*



SBS bus-to-bus adapters directly connect two buses. The virtual bus created allows the two systems to operate as one, enabling seamless operation, superior performance, and if the two buses are dissimilar, such as a PCI bus and a VMEbus, the combined benefits of two diverse systems.

The comprehensive suite of software drivers provided with PCI-VME bus adapters minimizes integration time. In most cases, applications can be up and running in a few days. Drivers for Solaris™, IRIX™, Windows® 9598, Windows® 2000/XP®, VxWorks®, Linux®, and HP-UX are available with these bus adapters.

For information about 8x0 series adapters, refer to the VME64 bus adapter data sheet.

Memory mapping

Transparent connectivity in which the address space of the destination bus appears as additional address space to the host bus is achieved via memory and I/O mapping. Mapping takes defined address ranges of unused memory on the host bus and transposes it to selected global memory address space and I/O on the destination bus. Once the mapping is created, there is no further software overhead; everything is handled by adapter and system hardware.

Bidirectional bus mastership in which address mapping is possible from both buses is provided by all bus adapters except the 406-1. Memory mapping hardware allows discontiguous remote addresses to be mapped to contiguous local addresses.

Memory mapping uses simple C language pointers to access remote resources and any memory or I/O space address can be memory mapped.

DMA controller

DMA allows large blocks of data to be moved between the two systems at high speed with little processor overhead. The DMA engine reads data from one bus and writes data to the other bus. When the transfer is complete, the adapter interrupts the processor.

Some SBS adapters support two DMA modes: Controller Mode DMA and Slave Mode DMA. Controller Mode DMA uses the adapter's DMA controller to enable high-speed transfers from one system's memory directly into the other system's memory. Data transfer in either direction can be initiated by the local or remote processor.

For PCI-VME adapters, the DMA controller allows data transfers between PCI memory and Dual Port RAM on the VME adapter card. To achieve the best performance, VME block mode is used. A pause mode that allows other VME masters more frequent access to the VME during DMA is also available.

SBS Support Software automatically engages the DMA engine for all reads or writes that are long enough to benefit from a DMA transfer.

VME Slave Mode DMA

Slave Mode DMA is the process by which a VME device uses the adapter to transfer a block of data directly into the host's memory. Slave Mode DMA transfers use the adapter's FIFOs to boost throughput to 13 MB/s. Like Controller Mode DMA, Slave Mode DMA uses very little host processing power during the transfer; the VME device actually performs the transfer and the adapter performs all host page manipulation. A programmed or VME device interrupt can be used to alert the host process when the Slave Mode DMA transfer is complete.

Because most operating systems use a memory manager, the user's buffer may be scattered across physical memory. The adapter hardware allows contiguous VME data to be transferred into the discontiguous host buffer. This feature is essential for Slave Mode DMA.

Interrupts across the cable

Interrupts can be passed directly between two buses. For VME adapters, all seven VME interrupts can be monitored and acknowledged from the host system. Consequently, the host system can be asynchronously notified when a VME card requires servicing and the need to poll is eliminated.

Adapters support at least one programmed interrupt that can be used to communicate between host and remote processes. Adapter hardware status is monitored by an error interrupt that eliminates the need to poll the adapter for errors.

Physical layer interface

SBS bus adapters utilize a streamlined, simple no-protocol connection in which the local bus and remote bus actually become one bus.

VME system controller

In addition to VME control and bus master capabilities, the adapter can provide slot 1 system controller functions. In most cases, configuring the adapter to perform system controller functions and installing it in slot 1, eliminates the need for an additional VME system controller. The adapter also allows the host to reset the VME bus so that a system failure can be remotely reset.

In system controller mode, the adapter provides the VME system clock and system reset, and the bus error global timeout. The adapter card also provides four-level priority, four-level round-robin, or single-level bus arbitration.

High response hardware

SBS bus adapters incorporate very low latency and robust response architecture via a proprietary pipelined interface. Adapter hardware, not software, handles multiple variations of byte and word swapping so that little endian (PCI) and big endian (VME) data transfers appear transparent.

Bus isolation

The bus adapters allow each bus to operate 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 so that bus bandwidth is not affected during non transfers periods.

Dual Port RAM option - VME only

Up to 8M bytes of optional shared memory can be added to most adapters. Dual Port RAM access does not require access to the other bus; consequently, providing system security and limiting bandwidth use to only the accessing bus. Memory mapping and both DMA modes support Dual Port RAM. Arbitration is handled by the card itself.

Operating systems supported

Operating System	*Model* **dataBLIZZARD***	**616**	**618-3**	**620-3**
AIX		924		
HP-UX		934	934	934
Solaris	946	946	946	946
IRIX	965		965	965
Windows 95/98		973	973	973
Windows 2000/XP	983	983	983	983
VxWorks	993	993	993	993
Linux	1003	1003	1003	1003

** See the dataBLIZZARD data sheet for more information.*

Software drivers

Software drivers are included with SBS PCI adapters. The software provides all the tools required to access and control SBS adapters. Software components include:

- A device driver for the OS
- Example programs demonstrating:
  - How to map remote bus and Dual Port RAM into an application's memory space
  - Read and write functions
  - Requirements for sending, receiving, and processing interrupts, including those generated on the remote bus
  - How applications use the device driver to process programmed and error interrupts
- Tools for device driver installation
- Documentation

PCI Platform	Operating Systems Supported
Pentium PC	Windows 95/98, Windows 2000/XP, VxWorks, Linux
Sun Workstations	Solaris
SGI Workstations	IRIX
HP Workstation	HP-UX
IBM Workstation	AIX

Visit www.sbs.com for the latest software driver revisions or to download software.

Logical devices:
Multiple adapters can be installed in a single host system. The device driver separates each physical adapter unit into several windows that are each treated as a logical device with a separate device name. One logical device is allocated to each of the following windows:

- Dual Port RAM address space
- I/O space on the remote bus
- Remote bus 24-bit memory located in the range 0x00000000 to 0x00FFFFFF (VME only)
- Remote bus memory located in the range 0x00000000 to 0xFFFFFFFF
- Local system memory accessed from the remote system (not available on all systems)

DMA functions:
The device driver, for Controller Mode DMA, automatically engages the adapter's DMA engine for all reads and writes that will benefit from a DMA transfer. Slave Mode DMA transfers must be serialized through the driver.

Interrupts:
The device driver includes an interrupt handler for status error, programmed, DMA, and remote bus interrupts. Interrupt processing is controlled by interface commands that register to receive notification of an interrupt, and that allow user written remote bus interrupt handlers to be incorporated.

Interrupt call backs:
Applications can register functions that are called when error, programmed, or remote bus interrupts occur.

Atomic instruction emulation:
Atomic Test & Set (TAS) and Atomic Compare & Swap (CAS) are emulated on the bus adapters. TAS provides an indivisible or interlocked test and set operation on either the remote bus or remote Dual Port RAM. CAS provides an indivisible or interlocked transaction on the remote bus or to remote Dual Port RAM. Both functions are useful for accessing a semaphore on the remote bus or remote Dual Port RAM, and for coordinating communication between the two systems.

Control & configuration:
Device control and configuration commands are supported. They are used to customize the device driver for your specific environment.

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Features summaries

For information about dataBLIZZARD, refer to the dataBLIZZARD data sheet.

For 8x0 VME64 adapter features, see the VME64 data sheet

Feature	414 VME-VME	412-1 VME-VME	406-1 PC/AT-VME
Bidirectional bus mastership	Yes	Yes	No
Memory mapping	Yes	Yes	Yes
Controller Mode DMA	Yes	No	No
Slave Mode DMA	No	No	No
Byte and word swapping	No	No	Yes
System Controller Mode	Yes	Yes	Yes
Cable interface	Fiber to 500M	Copper to 25 ft	Copper to 25 ft
Interrupts across cable	IRQ1-7 & 2 programmable	IRQ1-7 & 2 programmable	Yes
Latency across cable	1.8 usec	2.2 usec	2.2 usec
Latency VME to Dual Port RAM	.4 usec	.42 usec	.4 usec
DMA transfer rates	35 MB/s	--	--
DMA block size	4 to 16M bytes	--	--
Dual Port RAM option	128K and 8M	128K and 8M	128K
Addressing	A32, A24, A16	A32, A24, A16	A32, A24, A16
Data widths	D32, D16, D8	D32, D16, D8	D32, D16, D8
Data widths for DMA transfers	D32, D16	--	--
Loopback diagnostics	No	No	No
Optional 9U holder	Yes	Yes	Yes
Software drivers included	No	No	No

Feature	620-3 PCI-VME	618-3 PCI-VME	616 PCI-VME
Bidirectional bus mastership	Yes	Yes	Yes
Memory mapping	Yes	Yes	Yes
Controller Mode DMA	Yes	Yes	No
Slave Mode DMA	Yes	Yes	No
Byte and word swapping	Yes	Yes	Yes
System Controller Mode	Yes	Yes	Yes
Cable interface	Fiber to 500M	Fiber to 500M	Copper to 25 ft
Interrupts across cable	IRQ1-7 & 2 programmable	IRQ1-7 & 2 programmable	IRQ1-7 & 2 programmable
Latency across cable	2 usec	2 usec	2.2 usec
Latency to Dual Port RAM from VME	.4 usec	.4 usec	.5 usec
DMA transfer rates - controller	35 MB/s	35 MB/s	--
DMA transfer rates - slave	13 MB/s	13 MB/s	--
DMA block size - controller & slave	2 to 16M bytes	2 to 16M bytes	--
Dual Port RAM option (on VME card)	128K and 8M	128K and 8M	128K and 8M
Addressing from PCI to VME	A32, A24, A16	A32, A24, A16	A32, A24, A16
Addressing from VME to PCI	A32	A32	A32
Data widths from PCI to VME	D32, D16, D8	D32, D16, D8	D32, D16, D8
Data widths from VME to PCI	D32, D16, D8	D32, D6, D8	D32, D16, D8
Data widths for DMA transfers	D32, D16	D32, D16	--
Loopback diagnostics for PIO transfers	No	Yes	No
Model with VME card in 9U holder	Optional 9U holder	618-9U	Optional 9U holder
Software drivers included	Yes	Yes	Yes

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