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## SKY HARDWARE

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- [9U VME](#)
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## SKYbolt II 6U VME Multiprocessor Accelerators

The SKYbolt II 6U VME motherboard is the foundation of SKY's VME solution, adding intelligent support for system services and high-performance data transfers to the carrier board for SKY's daughtercards containing compute processors, I/O interfaces, and global memory. A separate System Processor resident on the motherboard handles system overhead functions that would otherwise burden the compute processors. The [SKYchannel](#) packet bus transfers data at 320 MB/sec to continually keep the high performance processors operating at peak efficiency. Compatible with SKY's [MPC 7400](#) and [604e PowerPC](#)-based compute daughtercards, the SKYbolt II motherboard ensures that the compute processors are well fed and protected from distractions so that they can do their main job of executing your numerically-intensive application.



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### SKYbolt II 6U Features

#### Scalable Processing

- Scalable VME systems of up to 256 boards are connected by the same SKYchannel packet-switched protocol interconnect
- Multiple GFLOPS of processing in each slot
- Transfer data at 320 MB/sec on every SKYchannel connection
- SKYchannel's 16 terabyte linear address space provides easy, direct access to all processors, memory, and devices in large system configurations

#### Heterogeneous Computing

- Heterogeneous processor support for MPC7400 and 604e PowerPC multi-processor daughtercards
- Intelligent system I/O processor on the

motherboard reduces context switching for RISC processor daughtercards and reduces OS requirements for DSPs

### **Maximum Flexibility**

- Optimize configurations with compute processors, memory and I/O
- Simultaneously perform I/O and processing
- Modular daughtercards facilitate easy processor, memory, and I/O upgrades

### **COTS You Can Use**

- All hardware interfaces are open standards: VME, SKYchannel, and FPDP
- Processor independent architecture enables future upgrades and software reuse
- Rugged versions available for demanding environments
- Three year warranty demonstrates SKY's commitment to quality

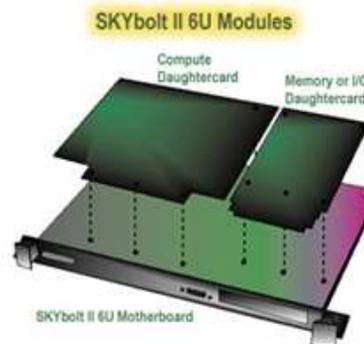
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## **SKYbolt II Architecture**

SKYbolt II is part of a modular set of building blocks that can be configured uniquely to create the optimum solution for your design and deployment needs. At

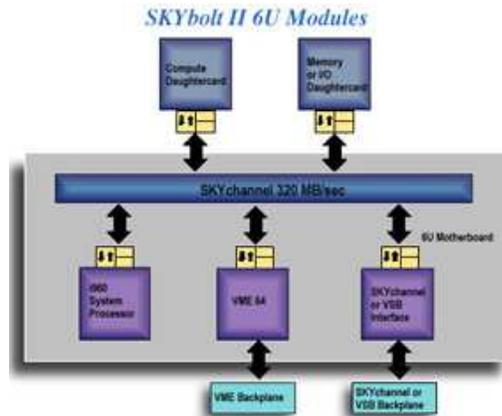
SKY Computers each program is evaluated for its specific requirements to architect the ideal balance of processing performance, memory capacity, and I/O bandwidth. SKY's proposal, derived from a mutual understanding of the objectives, includes the required off-the-shelf SKY building blocks, suggestions for partner-supplied components, and recommendations for new technologies to be developed by or with SKY. The result of this partnership achieves maximum advantage in time-to-market, performance, and cost. Only SKY has the expertise, the flexibility and the resources to provide the complete solution.

The 6U SKYbolt II motherboard provides all the resources required to obtain optimal performance from SKY's family of processor, memory, and I/O daughtercards. Data is transferred throughout the SKYbolt II motherboard over the SKYchannel Packet Bus, capable of moving information at 320 MB/sec. That data moves transparently through the SKYchannel P2 interface to other boards in a



SKYchannel system, whether they are in the same chassis or a different chassis. System control is handled by the System Processor, which performs I/O and operating system tasks that would otherwise burden the compute processors. A full VME 64 interface provides communication to the host and other for off-board communication. The SKYchannel P2 interface can be replaced by a VSB interface for off-board communication to VSB capable devices.

The application runs on the processors resident on the compute



daughtercard. Each compute daughtercard uses a specific processor architecture to maximize performance for a specific application. Examples of compute daughtercards include the Merlin with 4 MPC7400 processors and Excalibur with 4 604e PowerPC processors. Processor daughtercards can be mixed in the same system or on the same board to achieve the highest performance for the application. Up to 256 boards of heterogeneous processors can be configured into a single system. Memory or front-panel I/O expansion daughtercards may be added without removing any of the compute processors.

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## System Processor

The SKYbolt II architecture utilizes a System Processor (SP) to off-load system-level functions from the compute processors. The core of the SP is an Intel i960CA superscalar processor. SKY adds 256 KB SRAM used as zero-wait-state RAM and 512KB Flash RAM for non-volatile storage of configurable boot code. This configuration not only allows the compute daughtercards to be more effective at executing the numerically intensive tasks but also provides more systems-level functionality.

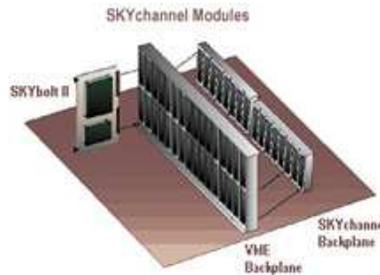
### System Processor Features

- Provides the bulk of the operating system services, freeing the compute processors to run more efficiently with a small kernel
- Quickly fields all interrupts, and informs a

- compute processor only when there is a task specifically for that processor
- Effectively schedules the SKYmpx Real-time Executive
- Controls interface synchronization, polling, and setup on a separate bus, freeing SKYchannel from performance draining single-word transfers
- Executes a programmable list of I/O operations as directed by a compute processor, while that processor continues computation

### **SKYchannel 320 MB/sec True Packet Bus**

At the heart of the SKYbolt II motherboard is the 64-bit [SKYchannel](#) Packet Bus. The packet switched technology used by SKYchannel



represents an architectural leap that more than doubles the performance of older circuit switched technology. Reduced transfer latency and reduced blocking have been realized through the use of high-speed bi-directional FIFOs combined with local node DMA engines and Packet Controllers at every SKYchannel interface. All transfers to these FIFOs are zero-wait-state writes from source to destination, providing a constant and sustained data transfer rate of 320 MB/sec. The asynchronous nature of these transfers provides the foundation for performance upgrades. As new technology emerges, it is implemented on daughtercards without the need for a new motherboard.

SKYchannel is the on-board communication path connecting the VME64 interface, the optional VSB interface, the SKYburst parallel I/O, the System Processor, and the compute daughtercards. SKYchannel can also replace the VSB interface and provide communication between SKYbolt II boards. The 320 MB/sec bandwidth provides for multiple, simultaneous operations without overloading the bus. Combined with the SKYchannel's processor-independent architecture, the high bandwidth provides an easy migration path to future processor and I/O technologies. Because SKYchannel is a packet bus, the bus is not held by any one device. Several transactions may interleave communication without slowing any transfer, thereby allowing full utilization of the bus. Processing and communication are optimized and balanced.

**TOP**

Increased functionality and ease of use are also provided by SKYchannel's 44-bit address field. The large address field provides a 16 terabyte linear address space that can be used by any device interface to directly access any address in the system with simple loads and stores. Such global addressing simplifies programming and enables data to be transferred easily between processors.

### ***SKYchannel Features***

- 64-bit Packet Bus transfers data at 320 MB/sec
- Split Transaction design uses FIFOs and DMA capability at each interface to maximize throughput and minimize blocking on the bus
- Global addressing simplifies programming by addressing any memory from any interface
- Modular interface makes heterogeneous processing easy and ensures a future migration path

### ***SKYchannel Backplane***

- Connects 8 boards and 2 expansion ports
- 5 independent SKYchannel buses at 320 MB/sec for a total of 1600 MB/sec
- Attaches to the VME P2 backplane
- Connect multiple SKYchannel backplanes using a SKYchannel Extender – within or between chassis

Multiple SKYbolt II boards can be connected using a SKYchannel Backplane. Utilizing the non-blocking SKYcrossbar, each SKYchannel Crossbar Backplane has 10 ports with 5 independent SKYchannels for a total of 1600 MB/s communications bandwidth. The standard SKYchannel Backplane connects 8 VME boards plus two optional ports for connecting to other SKYchannel Backplanes.

SKYchannel connections extend easily to boards in other chassis. Because SKYchannel is a packet-switched architecture connected by decoupling FIFOs, SKYchannel overcomes the end-to-end communications limitation of outdated circuit-switched architecture. A cable connecting two SKYchannel Crossbar Backplanes can send data at the full 320 MB/sec within a chassis or between chassis.

SKY Computers is committed to using open standards, and this includes the SKYchannel Packet Bus. SKYchannel is an ANSI standard (ANSI/VITA 10-1995).

## ***VME 64 Interface***

The SKYbolt II includes a fully featured VME 64 Master/Slave interface. Data transfers using multiplexed block mode transfers (MBLT) provide high performance communication with other VME boards. The fully programmable master/slave interface supports Read-Modify-Write (RMW) cycles, three programmable release methods, requester on all levels, interrupter on all levels, and VME Retry. A special communication buffer RAM enhances performance of VMEbus RWM cycles. Programs have the flexibility of accessing the VME interface directly or handing off the communication task to the System I/O processor.

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## ***VSX Interface***

The SKYbolt II is available with a native VSX interface. The built-in DMA controller can initiate master VSX block mode transfers at speeds approaching the theoretical maximum. Other VSX features include slot 1 serial arbitration, polled interrupt capability in both master and slave modes, variable block sizes for master transfers, and adaptive block sizes for slave transfers.

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## ***Technical Support and Warranty Programs***

SKY's commitment to quality begins with the industry's longest standard hardware warranty. All SKYbolt II family hardware products have a standard three year warranty. Throughout your development and deployment, SKY's experienced technical support engineers follow up with the support you need when you need it.

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## ***SKYbolt II 6U Specifications***

### **System Processor**

Processor: Intel i960 CA, 25 MHz  
External Memory: 256 KB SRAM, 512 KB Flash RAM

### **SKYchannel Interface**

Specification: ANSI/VITA 10-1995  
Location: Motherboard system bus and P2 backplane interface  
Data Size: 64 bits data per word. Up to 256 data words per packet  
Throughput: 320 MB/sec  
Addressing: 44-bit addressing, 16 Terabyte address space

Connectivity: 256 Boards per system

### **VME64 Interface**

Specification: VITA Rev. C.1 (VME32), IEEE  
1014-1987 Rev.

C.3, VITA Rev. D (VME64)

Interface Capabilities: A16 and A24 (master only),

A32, D8, D16,

D32 (single), D16, D32(BLT), D64 (MBLT), RMW and

VME

Retry

### **VSB Interface**

Specification: ANSI/IEEE Std. 1096-1988

Transfers: Master/Slave/Block mode D16 or D32

Features: Slot 1 Arbitration, Built in DMA controller,

ROR Serial

Requester

### **Configuration Options**

P2 Interface: SKYchannel Backplane or VSB or none

### **Environmental Requirements**

Temperature: 0 to 40 C, operating, -25 to 85 C,  
non-operating

Humidity (non-condensing): 90%, operating 95%,  
non-operating

Air Flow: at least 300 LF/min

Altitude: 30,000 feet above sea level

### **Electrical Requirements**

DC Voltage: 5.0 Volts 5%

Power Consumption: 18 Watts, peak @ 5V

### **Physical**

Dimensions: 6.3 x 9.2 inches

Slot-to-slot Spacing: 0.80 inches

Net Weight: 0.91 pounds

Specifications are subject to change.



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