RapidIO

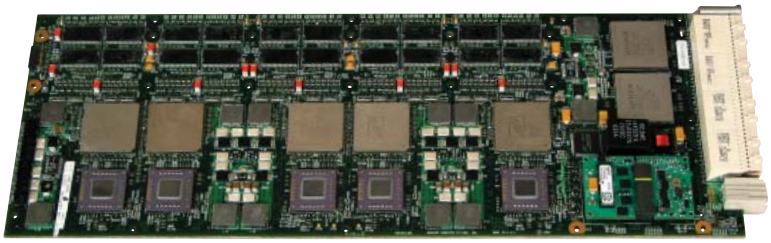
DATASHEET

MERCURY COMPUTER SYSTEMS™

PowerStream 7000 Processor Module

High Processing Density for Mobile Platforms

- Drastically reduced latency
- Increased processing throughput
- Patented air-cooling system with ManagedAir™ technology



The PowerStream® 7000 processor module from Mercury Computer Systems is based on Freescale™ MPC7447A PowerPC® processors with AltiVec™ technology and the RapidIO® communications fabric, offering a performance density of 40 GFLOPS per 4U slot. Fitting more processing power into tight spaces enables full signal and image processing closer to the sensor in mobile platforms.

Each of the five compute nodes (CN) on the processor module includes an MPC7447A processor, 1 GB DDR SDRAM, and 8 MB flash EEPROM, all connected to the RapidIO switch fabric by a Mercury RapidIO CN ASIC. The MPC7447A includes a 32 KB instruction and 32 KB data L1 cache, and an on-chip 512 KB L2 cache. The double data-rate SDRAM enables overlapping memory access requests from the local processor and remote accesses over the RapidIO switch fabric. The 8-MB flash EEPROM on each node is used for built-in test.

Memory Controller and Switch Fabric Interface Integration

The RapidIO CN ASIC acts as both a memory controller and a network interface to the RapidIO switch fabric interconnect. The CN ASIC includes an enhanced DMA controller, a high-performance memory system with error checking and correcting, metering logic, and a RapidIO interface. By integrating memory control and the network interface, Mercury's CN ASIC provides functionality and performance not achievable from separate components. The CN ASIC also contains architectural advancements that enhance concurrency between arithmetic and I/O operations.

Lower Latency, Increased Processing Throughput

The true power of the PowerStream 7000 system is realized when applying many processors to a single algorithm step, working as a finely coordinated team. The processors, enhanced DMA controllers, and RapidIO switch fabric combine to drastically reduce the latency while increasing the processing throughput.

Serviceability Features

During power-on self-test (POST), diagnostics run out of the flash on each module. The results of these diagnostics are available out-of-band before the modules are joined together to form a multicomputer. This testing from the inside out provides excellent fault isolation. Slot keying ensures proper replacement of boards during service.

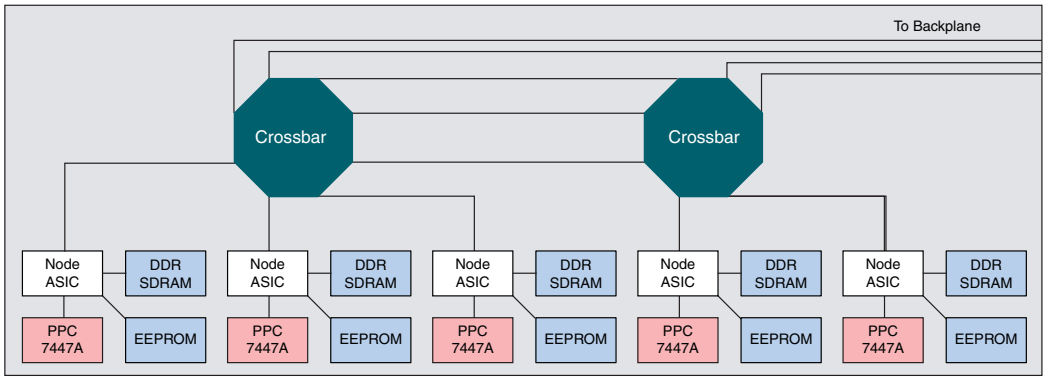


***Figure 1**. PowerStream 7000 Processor Module functional block diagram*

Patented Air-Cooling System with ManagedAir Technology

The PowerStream 7000 system utilizes patented ManagedAir™ cooling technologies to provide sufficient cooling to satisfy extreme performance density requirements. ManagedAir technology is a system-level approach to meeting the challenges posed by the escalating power consumption of today's processors and infrastructure chips, especially in military environments.

Implemented at all levels from the component through the chassis, ManagedAir cooling maximizes the effectiveness of unconditioned moving air, allowing the system to support higher-performance processors and their associated circuitry without conduction cooling, liquid cooling, or other exotic cooling techniques. The result is a simpler, lighter system that is easier to deploy and maintain. For example, ManagedAir technology encloses each printed circuit board assembly with a cover that is tailored to the profile, placement, and airflow requirements of the board's components. The cover's topography manages the airflow for that board by directing air through the heat sinks, increasing their cooling capacity.

At the slot level, ManagedAir technology manages the airflow to get an even distribution from front to back and across all the slots. The covers for each board regulate the airflow and stay with the board as it is moved or replaced.

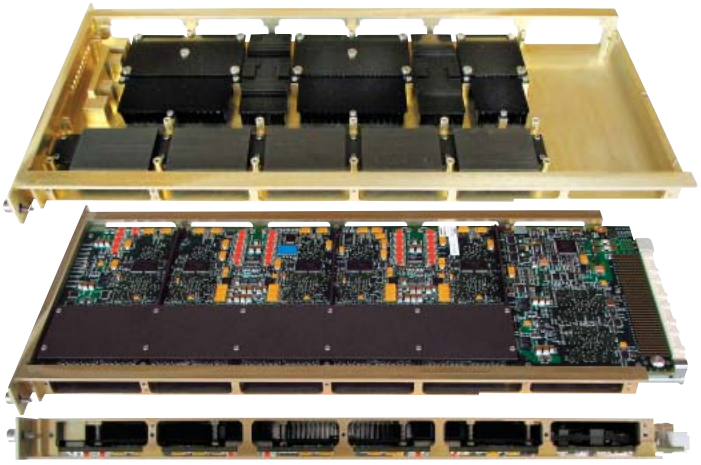


***Figure 2**. Example of ManagedAir board cover and mounted board*

Specifications

Module

5 compute nodes, each with:

Processor	1.0 GHz MPC7447A PowerPC microprocessor
Processor bus	MPX bus at 154 MHz
Memory	1 GB DDR SDRAM
Memory speed	308 MHz DDR
Flash	8 MB EEPROM
Switch fabric	Dedicated RapidIO interface
Protocol	8-bit parallel RapidIO (ISO/IEC DIS 18372)
Bandwidth	622 MB/s peak per link in each direction, 5.0 GB/s peak to the backplane

Electrical/Mechanical

Input voltages	48.0 VDC ±5%, main power 5.0 VDC ±5%, management power

Input voltages measured at the backplane pins inclusive of all ripple.
Mercury strongly recommends that system-level power designs use a ±2% margin to avoid any potential issues with respect to the system-level operating characteristics and operating environment.

Power	110W typical max
Dimensions	M155 format
Slot spacing	1.015 in

Environmental - Level 1 Rugged

Minimum airflow/slot	28 CFM per stacked pair
Temperature*	
Operating	-25°C to +35°C (stacked pair, sea level)
Storage	-55°C to +85°C
Rate of change	5°C/min
Humidity	5% to 95% non-condensing
Vibration	
Random	0.04g²/Hz, 20 Hz to 2000 Hz
Shock	Test axes x and z: 50g, 11 ms, half-sine; test axis y: 30g, 11 ms, half-sine
Altitude*	
Operating	0 to 30,000 ft
Storage	0 to 50,000 ft

*As altitude increases, air density decreases and, therefore, the cooling effect of a particular number of CFM decreases. Different limits can be achieved by trading among altitude, temperature, performance, and airflow. Contact Mercury for more information.

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