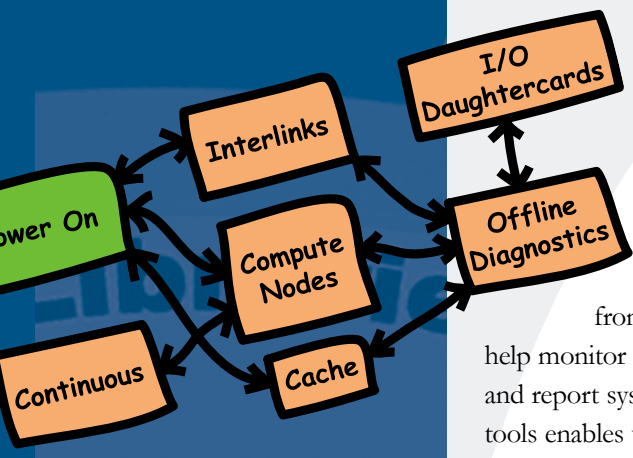
RACE++ SERIES

Computer Systems, Inc.
MERCURY

Hardware Diagnostic Software Tools



Confidence for Mission-Critical Systems

Fast Testing on Boot-up

Continuous, Non-invasive, Runtime System Monitoring

Extensive Offline Diagnostics

RACE++® Series hardware diagnostic software tools from Mercury Computer Systems help monitor system operation, and detect and report system problems. This set of tools enables users to obtain timely detection and notification of potential problems related to system components such as processors, cache, memory, I/O devices, RACE++ interfaces, and RACE++ and RACE Series™ crossbar switches.

Users can set up diagnostics to run at system startup, and monitoring software to run continuously during operation. Offline diagnostics are also available to allow operators or supervisory applications to test and evaluate each system element, verify system health, and simplify fault correction.

Power-On Testing

The Power-on Built In Test (PBIT) utility verifies system hardware before application software is loaded and run. Optimized for speed, the PBIT host program runs on the host single-board computer (SBC) and loads a small test program into each Mercury compute environment (CE) in the system. This software then runs a suite of tests on its target CE and returns a pass or fail indication that can be accessed by the user's application running on the host SBC.

Tests exercise the local CE, local and remote RACEway links, and processor cache. Each PowerPC® microprocessor is tested by performing a known FFT calculation. Memory may be tested through a quick check of each signal and address line, or a comprehensive check of each location in the CE's memory.

The PBIT software can isolate faults either to a single CE or to a set of boards, depending on the failure mode. RACEway interlink hardware errors can also be reported. All of these error messages are written to a parseable log file that the user application can examine to determine system health. The outcome of this examination can indicate whether to continue booting the system or signal the need for corrective action. The PBIT utility also provides a callable C language interface, accessible from the user interface or a script, that returns a prescribed value if testing runs successfully, or an error code if a fault was detected.

Continuous Testing

The Continuous Built-in Test (CBIT) utility runs under user-specified parameters to verify the ongoing health of each CE during system operation. Should a CE fail, hardware detection circuitry identifies the failure, and a counter maintained by the MC/OS™ multicomputer operating environment stops. When CBIT detects that this counter has stopped, it notifies the supervisory application program through a shared memory buffer. Since this information is maintained in the CE's local memory, these checks do not consume resources on the target processor.

In addition to monitoring CE status, the CBIT utility can also check for evidence that a correctable ECC error has occurred.

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If so, then a per-CE counter will be incremented for inspection by the supervisory application program. Frequent corrections occurring on a particular node may indicate a persistent error and signal the need for testing and repair.

Multiple CBIT processes can run in a single Mercury multicomputer system, allowing flexibility for testing elements in separate chassis or logical partitions of the system. CBIT is non-intrusive, retrieving information normally stored in the ASIC. Only one of the two reads is targeted at the ASIC. The other comes from memory and is maintained by MC/OS as a normal part of its operation and does not task the processor or take away from application program cycles. Users specify the host or CBIT CE and the frequency and scope of CBIT checks. This allows a balance of status checks and bandwidth allocation.

The CBIT utility rapidly stores status, counters, and error information in local shared memory buffers (SMBs) for later retrieval by the supervisory application. CBIT must be integrated into the user's application.

Offline Diagnostic Testing

The DMC utility is a comprehensive offline test and diagnosis tool for Mercury hardware. It includes a host component with a menu-based user interface that launches and supervises an executive program, and processes test results into diagnostic messages. It also includes a board-side executive that runs on one or more CEs, and controls the CE as it participates in the tests.

The DMC utility supports all possible configurations and combinations of Mercury hardware, and delivers the most extensive test coverage of all Mercury diagnostic utilities. DMC tests include:

- **Each CE including cache and memory**
- **RACE++ crossbar point-to-point communication**
- **VMEbus communications**
- **Bulk memory transfers**
- **I/O daughtercard functionality**

The DMC utility can be used interactively by an operator at the console, or called from a supervisory program in the application. It exercises one or more operational aspects of a functional block, and automatically selects only the phases and tests that apply to the system configuration. Results are written to a parseable log file for review by the supervisory application, and can be used to identify faults at the field-replaceable unit (FRU) level.

The DMC utility provides a callable C language interface that will return a prescribed value if testing runs successfully, or an error code if a fault was detected.

Product Packaging

The DMC utility is bundled with Mercury's PK1 software distribution at no additional charge. The Built-in Test (BIT) products, consisting of PBIT and CBIT, are licensed together as a separate layered product called BIT.

Diagnostic System Requirements

Compute Elements (CEs)
PowerPC® processor families in RACE 1.0 and RACE++ systems
Multicomputer operating environment
MC/OS 5.0 or greater
Development Hosts
Solaris™, Windows NT® or Windows® 2000
Runtime Hosts
Solaris, Windows NT, VxWorks®, or Windows 2000

For more information, go to www.mc.com

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