



**ATOMIC**  
ADVANCED TESTING OF MEMORY ICs

It is important that you register ATOMIC if you require technical support or wish to be notified of updates and upgrades. Online registration is the preferred way to register. It immediately places your information into our user base and saves you the inconvenience of filling out, stamping, and mailing in the registration.

## **ATOMIC Registration**

To register online go to:  
<http://www.micromat.com>

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# About ATOMIC

ATOMIC (Advanced Testing Of Memory ICs) is an advanced memory testing utility for the Apple Macintosh. It utilizes industry standard testing algorithms, along with a few others to detect a variety of memory faults. More importantly, ATOMIC reclaims memory from other applications before beginning testing, providing maximum memory for testing.

Random Access Memory (RAM) is one of the most important components in your computer. Because almost every operation done on a computer passes through RAM, its accuracy is critical to the proper operation of your computer. It is also one of the components most susceptible to damage and failure. This is because RAM upgrades are common, hence RAM is handled more than most other components. RAM is extremely susceptible to damage from static electricity due to handling. Also, like any

chip, RAM is susceptible to overheating and thermal fluctuations.

Most other failures on your computer are more obvious than a RAM failure. For example, if your hard drive begins to malfunction, you will probably start to see read and write errors appear via dialogs displaying messages like, "Could not write file because of a disk error." However, RAM errors are much less obvious since software uses different areas of RAM at different times. RAM problems usually manifest as unexplained and inconsistent crashes. There is no clear error message indicating a RAM failure.

RAM is very susceptible to damage. Static, heat and even normal air moisture can damage the RAM used to store your Mac's workspace. It is possible that damaged RAM will prevent your Mac from booting. However, the most common symptom of

bad RAM is much more subtle. Usually, the symptom will be an inexplicable system freeze that is difficult to reproduce consistently. Conventional troubleshooting techniques won't isolate the problem. In fact, standard techniques will prove to be more frustrating since the problem appears only intermittently, leading you to believe you've solved it only to discover later that the problem still exists and manifests somewhere else.

Unlike physically damaged storage areas on your hard drive that can be remapped by software so that they are no longer used, faulty RAM bits cannot be mapped out of use. While a technician with adequate equipment and replacement components can repair a RAM module, the cost to do this would greatly outweigh the cost to replace the entire module.

Using ATOMIC to test your RAM regularly can help identify problems before they result in data corruption, providing the opportunity to replace faulty

modules. Because it includes an iterate function that will test for an indeterminate amount of time it can identify errors that will only appear with extended, intensive use. And, because it includes a wider variety of tests, it can potentially identify edge-case errors which don't normally occur.

# Getting Started

## System Requirements

- A Macintosh capable of running OS X 10.9 or later
- 4 GB RAM or higher recommended.

(Specifications subject to change without notice.)

## Installation

ATOMIC is a self-contained application which does not require a traditional installer application. To install, simply drag the application icon to the Applications folder. Running the ATOMIC application will install a couple of extra files:

```
/Library/PrivilegedHelperTools/com.micromat.  
popHelper
```

```
/Library/LaunchDaemons/com.micromat.  
popHelper.plist
```

```
~/Library/Application Support/ATOMIC
```

```
~/Library/Preferences/com.micromat.ATOMIC.  
plist
```

An uninstall application is included to remove the extra files created by running ATOMIC. To uninstall, simply double-click the uninstall application icon.

# Using ATOMIC

## The ATOMIC Interface

ATOMIC runs from an installation on your hard drive. To launch the program, double-click the ATOMIC icon. After the program has launched, you will see the main ATOMIC window.



The window is divided into three panes with a start and stop button at the bottom. The upper pane is the status view. This is a visual summary of the current state of the application. The two panes beneath the status view display information about the installed RAM on the left, and an area containing the test selection, options, and progress of current tests on the right.

# Configuration

The configuration pane consists of the lower right-hand section of the ATOM interface. There are two circular gauges which will count the number of passed and failed



test results while testing. The two linear gauges track the current test progress and overall progress for all selected tests, respectively. The Test Options column provides a choice of which tests will be run.

Beneath the test options are two additional options: Stop on Fault, and Iterate. Stop on Fault will suspend further tests as soon as the first fault is found. Iterate will continue running the selected tests in a loop until stopped by the user, regardless of the number of faults found. If both Stop on Fault and Iterate are selected, tests will run continuously until the first fault is detected. Iterate can be useful for stress testing memory.

# Memory Module View

The memory module view displays the installed RAM ,



along with available slots. The DIMM addresses are listed to the left of the modules, and the text to the right describes the installed module.

## Running Tests

Simply click the Start button to begin the selected tests. ATOMIC will first allocate memory, retrieving as much memory as possible from idle applications. It will then run the selected tests through allocated RAM. The amount of processor usage will be displayed in the CPU field.



NOTE: Testing memory is especially resource intensive, and may cause your computer to respond slowly during testing. Before starting testing, a reminder will display in

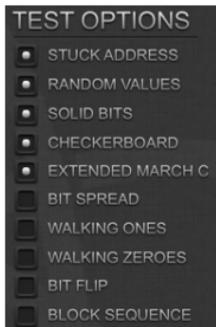
the status field that discourages using the computer until testing has completed or been stopped.

Testing will stop automatically when the selected tests have been completed, and the overall result will be displayed by the circular gauges. Testing may also be stopped at any time by clicking the Stop button.

NOTE: The Stop button must be used to stop testing if the Iterate option is selected.

# Test Descriptions

ATOMIC includes ten different tests.



- Stuck Address—On the first pass, this test writes the address of each memory cell to that cell itself. On the second pass, the address is read and verified to ensure address space uniqueness.
- Random Values—This test first writes a series of random numbers into memory. Then, on the

second pass, the initial pattern is verified. Testing with random values can help locate intermittent problems. This test is also helpful in checking for neighborhood pattern sensitivity. Over multiple runs, it can help identify temperature sensitivity.

- Solid Bits—This test writes a solid bit pattern into memory, for example all 1s. The initial pattern is checked and then complemented - switched to all 0s - and checked again. This checks that all addresses are both readable and writable, and is useful for detecting stuck-at faults.
- Checkerboard—This test makes four passes. The first writes a pattern (different for each run). The second pass reads/verifies the pattern and writes the inverse of the original pattern. The third round travels downward back through memory as it reads/verifies the inverse and then writes the original pattern. Finally, the fourth round verifies the original pattern. This checks for adjacent bit sensitivity - a situation in which addresses other than the one being modified are affected. It also verifies the efficacy of memory refresh.

- **Extended March C**—This test uses a complex algorithm consisting of six passes through memory. It moves upwards through memory during the first three passes, writing and reading/verifying either 1s or 0s. The next two passes move downward, reading/writing 1s and 0s again (alternatively). The final pass may travel either direction, verifying that the last write was successful. This test detects address faults, coupling faults, stuck-at faults, stuck-open faults, and transition faults.
- **Bit Spread**—This test moves a 101 pattern across a 64-bit field of 0s. The 0, a discharged state, between the 1s, a charged state, can cause charged states to occur in adjacent cells if RAM is faulty. The test detects changes in adjacent cells by looking for 1s where 0s are expected.
- **Walking Ones**—Starting with the bit pattern 00000001, each memory cell is written and read to verify the pattern. The 1 is moved over by one address and then the test is repeated for each

position. This test ensures that each bit can maintain a value opposite of its neighboring bits, known as an intra-word coupling fault. It can also find stuck address faults.

- **Walking Zeroes**—This test represents the inverse of Walking Ones. A pattern of 11111110 is the starting pattern, and the 0 is moved through memory. This test is also useful for detecting intra-word coupling faults and stuck address faults.
- **Bit Flip**—This test combines the Walking Ones and Zeroes tests by using an alternating 10101010 pattern. Each bit (either a 1 or a 0) is changed to its complement as the test moves through memory, testing to ensure that the pattern isn't broken. This test is also useful for detecting intra-word coupling faults and stuck address faults.
- **Block Sequence**—This test is similar to the Walking Ones and Zeroes tests. It moves an exhaustive

series of patterns through a field of either ones or zeroes. (Two 1s through 0s, four 0s through 1s, etc.) In addition to locating intra-word coupling faults, it is also useful for detecting if RAM is susceptible to neighborhood pattern sensitivity.

# Contacting Technical Support

Micromat provides technical support to its customers by telephone or over the internet. For a current listing of telephone numbers and other contact information, please visit our website at [www.micromat.com](http://www.micromat.com). Technical support is available Monday through Friday (excluding public holidays), from 9:00 AM to 5:00 PM Pacific time.

- Email: [help@micromat.com](mailto:help@micromat.com)
- Phone: (707) 566-3860

If you wish to contact technical support by telephone you will need to have your ATOMIC serial number and version number ready. Our automated phone attendant will require you to enter this information before connecting you to a technician. Please be near your computer when you phone,

since our technicians will need to ask you questions about your system, and will attempt to guide you through solving any problems.

Please have the following information ready for the support technician, and be sure to include it in any email you send to Micromat.

- A brief description of your problem.
- Version number of your ATOMIC software.
- Type of Macintosh and configuration, including Processor and RAM installed. (Example: MacBook Pro 3 GHz Intel i7, 4 GB RAM, 2 TB internal hard drive.)
- Version of Mac OS X installed.

# About Micromat Inc.

Micromat Incorporated has been developing Macintosh diagnostic utilities since 1989. As the first company to offer diagnostic products for Macintosh, Micromat has pioneered many new technologies for helping Macintosh users bring their computers back to life and to keep them running their absolute best.