

# MCFT

MEMORY COMPATIBILITY & FUNCTIONALITY TESTER



PCI HARDWARE CARD FOR  
PERFORMING COMPREHENSIVE  
MEMORY MODULE TESTING ON  
COMPUTER MOTHERBOARDS

**USERS GUIDE**

**CMTL**<sup>®</sup>  
Computer Memory Test Labs

[WWW.CMTLABS.COM](http://WWW.CMTLABS.COM)

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CMTL was established in 1997 with the goal of creating an industry standard for memory module and motherboard compatibility testing. In order to pass these stringent standards, memory modules must maintain the highest manufacturing procedures and pass an exacting battery of tests. Most of this testing is performed with equipment, software and procedures developed by CMTL for each desktop, server and workstation manufacturer. Modules are extensively cross platform “CMTL Advanced” tested with the MCFT Card for compatibility and functionality.

Testing on motherboards from multiple manufacturers with different processor and chipset manufacturers provides maximum assurance that the module is reliable and not a border line design. Not using memory modules that have been tested extensively for compatibility and functionality is a common reason why a lot of systems do not perform reliably or have the fastest through put. Problems can be caused by issues with the module design, component selection, SPD programming, structural integrity, manufacturing and quality control processes.

Based on extensive experience (over 7000 motherboard compatibility tests). CMTL has formulated a memory module and motherboard certification program that identifies which modules and motherboards have been extensively tested for cross platform compatibility and reliable operation. It doesn't matter if you are buying desktop memory for a single system or a white box builder buying server board, you should always make sure the memory and motherboard is CMTL Tested and Certified.

## Table Of Contents

Introduction .....	5
The MCFT Advantage.....	2
Upgrades .....	8
Installing the Board .....	12
<i>Bypassing the MCFT Card</i> .....	15
<i>Normal Mode</i> .....	16
<i>Memory Map</i> .....	18
<i>SPD</i> .....	19
<i>MCFT Level 1:</i> .....	21
<i>MCFT Level 2:</i> .....	21
<i>MCFT Level 3:</i> .....	22
<i>MCFT Level 4:</i> .....	22
<i>Custom:</i> .....	22
<i>Specify Testing Criteria</i> .....	22
<i>Address Range</i> .....	23
<i>Test Loops</i> .....	24
<i>Test to be Executed (Custom Level Only)</i> ....	25
<i>Run Tests</i> .....	26
<i>ECC / Parity support</i> .....	27
<i>Stopping and Restart Testing</i> .....	29
<i>Burn-In</i> .....	29
<i>Printing Test Results</i> .....	30
<i>FAQ's about Test Results</i> .....	31
<i>Exit</i> .....	32
Test Descriptions .....	33
WARRANTY .....	40

## **Introduction**

Headquartered in Huntington Beach, California and founded in 1997, CMTL has extensive experience in memory module and motherboard compatibility testing.

CMTL's **MCFT (Memory Compatibility & Functionality Test)**, is a memory testing PCI card designed for the rigorous testing needs of personal computer manufacturers, memory manufacturers, PC design engineers, and computer service professionals.. MCFT is one of the fastest, most robust, and most accurate memory diagnostic and verification tools available on the market today. CMTL supports all SIMMs, DIMMs, RIMMs, (SDRAM, DDR, DDR2, RDRAM, RAMBUS, SRAM, ECC, Parity and Non Parity) and others.

In developing MCFT, CMTL worked closely with Ultra-X (the creators of R.S.T. Ram Stress Test) and other high end, industry leading microprocessor and memory manufacturers to design new algorithms and testing patterns that are specifically oriented towards testing the latest chip technology and towards supporting future technologies. As a result, MCFT's capabilities were greatly exceed. MCFT can currently test up to 64 gigabytes and is designed to handle 4096 gigabytes for future processors.

## **The MCFT Advantage**

Memory is one of the most notoriously difficult system functions to troubleshoot, exercise, and test. PC's are not only being equipped with increasingly large amounts of RAM but they're often complex system hardware and software configurations can make it even more difficult to determine if a problem is truly a RAM failure, or if it is caused by hardware or software conflicts, or by a combination of both. MCFT's capabilities far exceed those of stand-alone testers in meeting both of these challenges. Unlike stand-alone testers, MCFT has the capacity to test today's larger amounts of RAM. MCFT can also test RAM more comprehensively than stand-alone testers, which can only test memory one module at a time from outside the system. MCFT works inside the system to test for all of the factors that are potential causes of memory failure, such as problems caused by the system chipset or noise, or problematic interactions between modules.

MCFT is also unique in its ability to exercise the complete range of a computer's RAM, verifying that the memory module will work with the latest chipsets, the latest speeds, and with all access methods. While stand-alone systems run at a slower speed, MCFT can run at the maximum speed of the latest PCs. MCFT also has the capability to test memory with the broadest range of algorithms, including newer, more sophisticated algorithms that can find problems in the latest modules. In addition, since some problems can be caused when the operating system is accessing memory, MCFT tests for this kind of problem by replicating different operating systems' access methods. All of these factors make MCFT one of the best, easiest, and fastest ways to test system RAM and it's also the

reason why MCFT successfully resolves RAM problems in many environments where standalone testers fail.

### **Small but Robust Program Size**

In addition, MCFT is a small but potent memory testing package that loads itself into the least amount of RAM possible. MCFT occupies far less RAM than many other memory testing products which boast similar functionality.

### **Testing Flexibility**

MCFT, in the Normal mode, allows you to select the number of testing loops desired, the memory address range to be tested, and other testing criteria.

### **Who Should Use MCFT?**

MCFT was designed for manufacturers of computer systems and memory modules, system designers, and computer service professionals.

#### Manufacturers of Computer systems

- Manufacturers of high end computer systems and servers who need to test the complete range of a system's memory before it is shipped will benefit from using MCFT. MCFT is the only product that is equipped to test the larger amounts of RAM in these newer high end systems.
- MCFT is also important a tool in an assembly line environment because it enables technicians to test and to test memory as it functions in a specific system.

## Manufacturers of Memory Modules

- Manufacturers of Memory Modules can depend on MCFT to do everything possible to exercise the memory module before it is shipped, and to verify that their memory modules will work with the latest chipsets, the latest speeds, and with all access methods.

## System Designers

- MCFT was also developed to aid system designers who need to exercise the complete range of the system's RAM, and who need a dependable and comprehensive tool to check compatibility issues and problems that arise in the process of designing a new computer.

## Service Professionals

- MCFT is an invaluable tool to computer service professionals. Its ability to test RAM comprehensively from inside a system and to exercise the complete range of even the newer, high end modules, will enable a diagnostic professional to determine definitively whether a problem is rooted in hardware or software.

This highly integrated product provides the following capabilities:

- Tests base, extended, and All memory in any system using x86 compatible architecture.
- PCI card with on-board self-loading program eliminates operating system and hard drive dependencies.
- Provides full manufacturing-level diagnostics using the latest memory testing techniques, yet occupies a minimum amount of RAM.
- Runs completely in protected mode for exceptional testing speed and exclusive memory access.
- Includes over 26 industry standard and proprietary memory tests that can be run on all accessible RAM.
- Capable of testing entire CPU memory range. Up to 4096 Gigabytes on future processors. 64G limit for Pentium 4.
- Memory address range to be tested can be specific in 1 Gigabyte, 10 Mb, 1 Mb, and 1 Kb increments.
- Allows the user to specify the number of times all selected tests are to be executed (from 1 to testing loops per session).
- Provides an unattended Burn-In mode for lengthy troubleshooting sessions and new RAM installation verification testing.
- Permits customized testing sessions to be defined; any test can be included or excluded from testing as desired.

**Following is a partial list of MCFT's features:**

### MCFT - PCI Card

Support Memory capacity  
Base Memory to 64G –  
(4096 G for future Processors)

#### Test Patterns

- Sequence 1 (Test 1 & 2)
- Sequence 2 (Test 3 & 4)
- Sequence 3 (Test 5)
- Sequence 4 (Test 6, 7 & 8)
- Sequence 5 (Test 9 & 10)
- Sequence 6 (Test 11)
- Sequence 7 (Test 12)
- Sequence 8 (Test 13 & 14)
- Sequence 9 (Test 15, 16, 17 & 18)
- Sequence 10 (Test 19)
- Sequence 11 (Test 20)
- Sequence 12 (Test 21)
- Sequence 13 (Test 22)
- Sequence 14 (Test 23)
- Sequence 15 (Test 24)
- Sequence 16 (Test 25 & 26)

### **Other Functions**

- ECC Support with Parity and Non Parity Function
- SDRAM PC 66 to PC 150 support
- RDRAM (RAM Bus Support) 400 ~ 1066 (-32P included)
- DDR – 1600 ~ 3200 Support
- DDR2 – (all current speeds)
- SMI Information of Memory Devices N/A
- SPD (Serial Presence Detect) Data of DIMM Modules – Including Speed and configuration. N/A
- Dedicated Testing based on Bus Width
- Automatic Start-up procedure
- All Memory Mode Support – One function to test all system memory devices.
- Fully Up-gradable

The standard commercial temperature range of the MCFT card is 0C to +70C.

Below is an example of MCFT running:

```
CMTL Memory Compatibility & Functionality Test (MCFT) Base & Extended Memory

From 7 M 93 K
To 384 M
RAM Bus 128 bits
Cache On
Loop 1 of 5

Errors 0
Status 04:29:17

MCFT Level 4
Currently running Sequence
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16

Running: Test7 128

Address 1sb Random Access Memory msb
7-64 .....
64-128 .....
128-192 0123456789ABCDEF0123456789ABCDEF 0123456789ABCDEF0123456789ABCDEF
192-256 .....
256-320 .....
320-384 .....
```

ESC - Stop (may not be immediate)

## Upgrades

MCFT is fully upgradeable and uses the latest Flash technology. As memory systems change, you can be assured, that MCFT will be upgraded to support the latest technologies and to use the most aggressive parameters to exercise system memory.

## Technical Support

CMTL is committed to helping you successfully use MCFT to test memory. If you have a question about or problem with MCFT, please contact CMTL Technical Support at the following email:

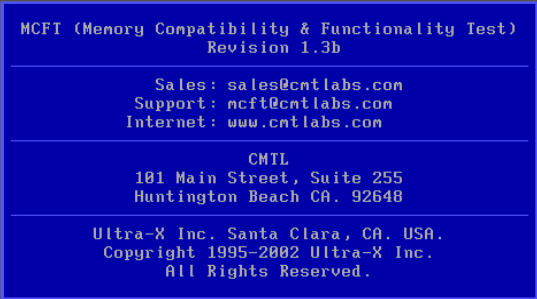
E-mail: [mcft@cmtlabs.com](mailto:mcft@cmtlabs.com)

As an additional service to our customers, we provide access to on-going research and development. In this regard, if you are aware of an instance where MCFT did not accurately test a memory module or did not identify the reason for a memory module's failure, you can send that module to CMTL for in-depth examination. Any upgrades developed by the research will be forwarded to you at no cost.

## System Requirements

A system to be tested with MCFT must meet the following requirements:

- ◆ IBM-compatible PC equipped with a Pentium or higher processor with a free PCI bus slot, and a functioning monitor.
- ◆ The system must be capable of completing to POST (Power On Self Test) sequence – the self-test routine which is controlled by the BIOS that precedes the loading of the operating system.
- ◆ Minimal functioning RAM to load the program.

A screenshot of the MCFT software splash screen. The text is white on a blue background. It includes the product name and revision, contact information for sales, support, and internet, the company name and address, and copyright information.

MCFT (Memory Compatibility & Functionality Test)  
Revision 1.3b

Sales: [sales@cntlabs.com](mailto:sales@cntlabs.com)  
Support: [ncft@cntlabs.com](mailto:ncft@cntlabs.com)  
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## Memory Testing Tips

The following provides information on features you can control which may help MCFT work better for you, and tips you may want to try if you encounter odd or unusual problems or results while testing a system's memory:

Some system BIOSes include advanced configuration options which can control functions such as memory timing, data bus timing, the addresses for shadowing video and system ROMs, and so forth. Configuring the BIOS with its default or optimum settings may help avoid problems which can result from having certain advanced BIOS functions enabled.

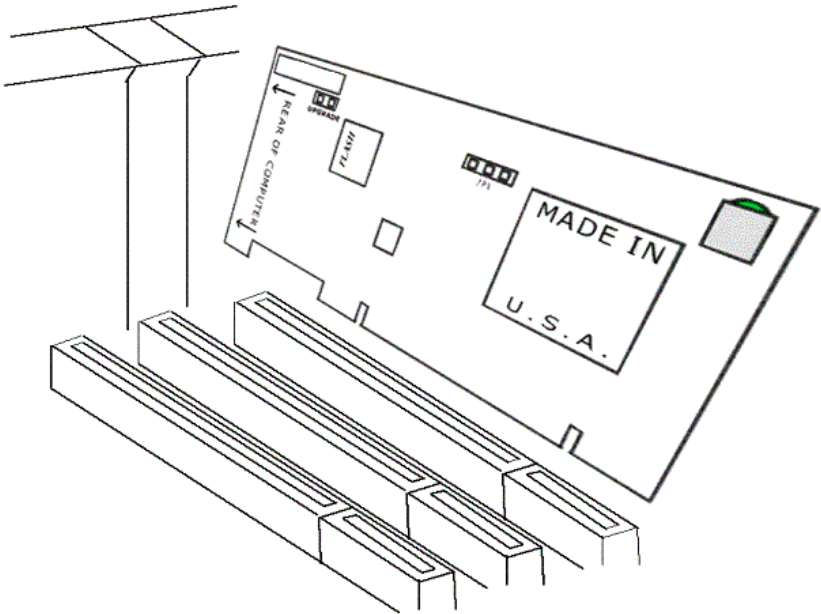
If the BIOS has any Power Management functions and they are enabled, disable them. On most systems, MCFT will automatically disable Power management.

Memory failures can sometimes be attributable to cache coherency (timing) problems. To check for this: disable the cache in the BIOS Setup, run the MCFT card and note the test results. Then, re-enable the cache and run the MCFT card again to retest the memory and compare the test results with what occurred when the cache was disabled.

Memory testing can also be affected depending on whether or not the system BIOS is "shadowed." To determine if this factor impacts memory testing in a given system, try running MCFT with the BIOS shadow on and then off to see if different results are obtained.

## Installing the Board

1. Turn the computer **OFF**, and disconnect *all* cables from the rear of the computer. Remove the computer case by following the instructions provided in the computer user's manual.
2. Pick any available PCI bus slot in which to install the board.
3. To properly orient MCFT for installation, hold the upper left and right corners of the board *with the component side of the board facing you*.
  - Notice the arrows and the wording, "**REAR OF COMPUTER,**" which appears on the left edge of the board. This labeling indicates that MCFT must be installed with the left side of the board (as you face the component side) **nearest the BACK of the computer**.
4. Carefully insert MCFT into the PCI bus slot so that the arrows point to the rear of the computer.



### Tech Tip

MCFT should be inserted into the PCI bus gently with a straight downward motion. Do not rock the board back and forth or exert great pressure to seat the board in the PCI slot (as you might when installing an option board in an ISA bus). The PCI bus is much less tolerant of rough handling than the ISA bus.

### Tech Tip

Also, you should always check the PCI bus for damaged leads etc. and before installing and after removing the MCFT board. This will help prevent

problems which may damage MCFT or cause MCFT to malfunction or not work at all. If you suspect that a PCI bus is damaged, choose another PCI slot in which to install MCFT.

### **Caution - Warning!**

Before powering up the system, make sure that MCFT is installed correctly. (i.e., with the labeling **“REAR OF COMPUTER,”** nearest the **BACK of the computer.**) If the **“REAR OF COMPUTER”** label is nearest the front of the computer, MCFT is **installed backward** and applying power to the system with the board installed that way could **destroy the board and cause system damage!** **Make sure the card is plugged in properly before power is applied.**

5. Reattach the power cable, and any other cables for peripheral equipment as you wish.
6. Once MCFT is installed, turn on the computer.
7. System BIOS will start and POST will do the standard tests and begin the boot cycle. On most BIOSes, the system will display system components and boot MCFT. This should be just before a system normally boots to HD or Floppy. If MCFT does not take over the system, change your first boot device to Network or option boot roms. This may be required in some systems. If the system still fails to boot to the MCFT card, please contact Customer Support for further options.

### ***Bypassing the MCFT Card***

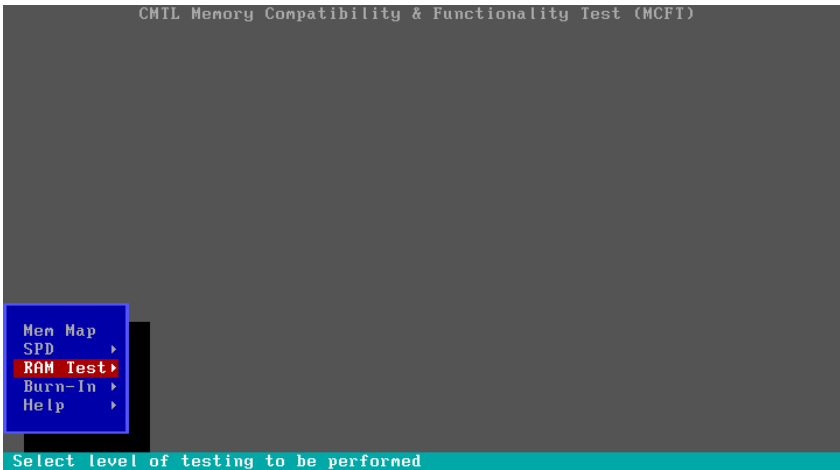
MCFT incorporates a special function to bypass and continue with the standard boot process. This function can be useful if you are using the MCFT card in a thermal test chamber and want to bypass the card and go into the system normal boot process without removing the card from the system.

To bypass MCFT, hold down the Ctrl key on power up and release it after the BIOS scans for MCFT. This may take a few tries to get to know the system's BIOS. The CTRL Key must be pressed only after the BIOS starts initialization. Release the Ctrl key after the hard drive detection is done and system scans for plug in cards.

## Using the MCFT Card

### **Normal Mode**

When MCFT is started in the Normal mode, a startup screen is displayed showing Serial number, User Data, and MCFT version number. This start-up screen will change to the main menu as shown below.



From the Main Menu, you can select from the following:

- 1) Memory Map : This function provides a listing of system memory usage blocks.
- 2) SPD : This function displays the contents of the Serial Presence Detect chip on memory modules. System BIOS use this information for configuration.
- 3) RAM Test : This menu gives you access to testing system RAM.

- 4) Burn-In : This menu gives you control functions to design a auto start script for MCFT.
- 5) Help : This menu option gives you access to keyboard functions, test descriptions, and CMTL Support. Under Support, you can identify the MCFT registration and version number.



From the menu shown above, you can select MCFT Level 1 through 4 and Custom.

Use the **up and down arrow** keys to highlight the desired function and press **Enter** to select the item. Some menus will give a sub-menu. Use the arrow keys and select the desired operation.

## Memory Map

CHIL Memory Compatibility & Functionality Test (MCFT) System Memory Map

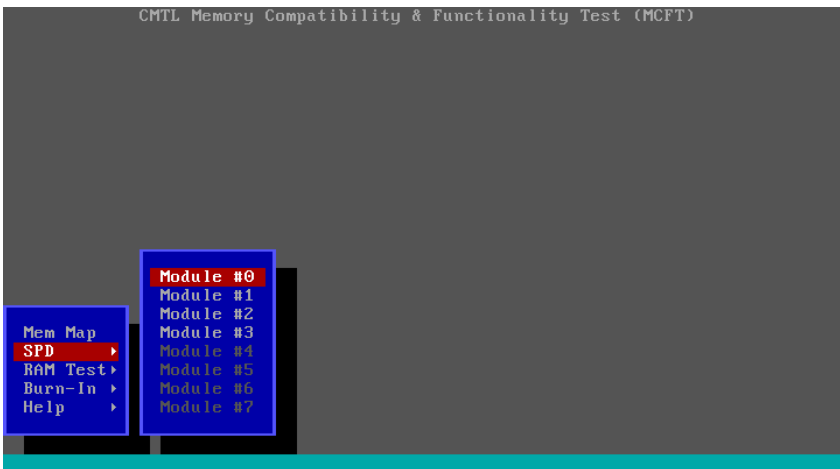
Type	From	To
Available	0 K (00000000)	639 K (0009FC00)
Reserved	639 K (0009FC00)	640 K (000A0000)
Available	1 M (00100000)	191 M 938 K (0BFEA800)
Reserved	191 M 938 K (0BFEA800)	192 M (0C000000)
Reserved	4078 M 640 K (FEEA0000)	3 G 1007 M (FEF00000)
Reserved	4091 M 512 K (FFB80000)	4 G (100000000)

ANY KEY - Exit

## SPD

This function displays information gathered from Serial Presence Detect ROM on DIMM & RIMM modules. This test requires your system to support the read function of SPD rom. Most newer BIOS support this function, but if MCFT is not able to access it, then the test will not show the first screen for SPD. Pressing Enter on the test menu will just exit back to menu. You can view this information to determine if the BIOS or O/S is gathering wrong information and therefore creating wrong information for memory usage.

This test will show the manufacturer of module, the speed rating, date of manufacture and many other items that can be used to determine the quality of the module.



1. Selecting this function from the Configuration menu displays SPD information gathered directly from DIMM modules.
2. Use the UP and Down arrow keys or PgUp and PgDn keys to scroll through the list.
3. Press Esc when you're ready to exit.

```

CMTL Memory Compatibility & Functionality Test (MCFT) SPD Information
Addr Description Value
28 Module Size (MB) 64
2D SPD Revision 1.0
01 SPD Chip Size 256
02 Memory Type RDRAM
44 Module Type RIMM
03 Row Address Bits 9
04 Column Address Bits 6
45 Bank Address Bits 5
46 Split Bank Org Yes
47 Doubled Bank Yes
48 Refresh Bank Bits 5
49 Refresh Time (ms) 32
4A Protocol Version 1
4B DQS Time (clock) 1.5
4C Self Refresh No
4D S2BIECO Yes
4E Support S3 Powerdown Yes
2E Checksum Valid
2F Manufacturer Code CE 00 00 00 00 00 00 00
    
```

ESC - Exit, ↑↓ PgUp PgDn - Move

```

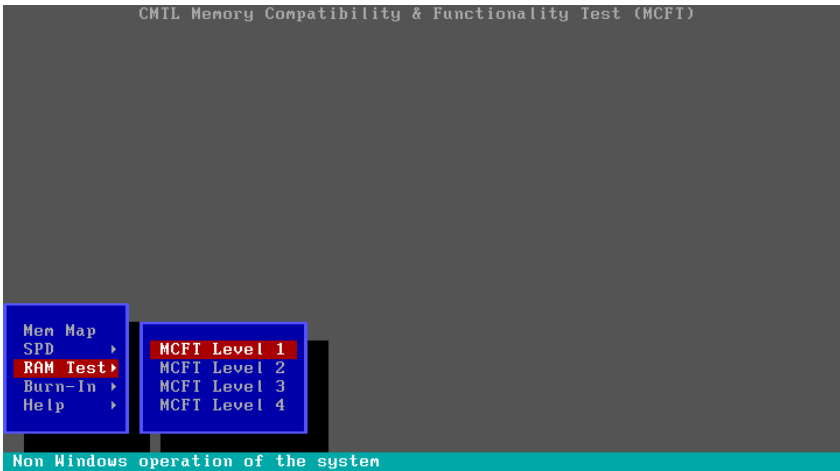
CMTL Memory Compatibility & Functionality Test (MCFT) SPD Information
Addr Description Value
47 Doubled Bank Yes
48 Refresh Bank Bits 5
49 Refresh Time (ms) 32
4A Protocol Version 1
4B DQS Time (clock) 1.5
4C Self Refresh No
4D S2BIECO Yes
4E Support S3 Powerdown Yes
2E Checksum Valid
2F Manufacturer Code CE 00 00 00 00 00 00 00
30 Manufacturing Location 1
31 Part Number MR16R 0824AM1-CX8
32 Revision 4131
33 Manufacture Date 2 week of 2001
34 Serial Number 0029B621
4F Devices on Module 4
06 Module Data Width 16
50 Enabled Devices 1 2 3 4
    
```

ESC - Exit, ↑↓ PgUp PgDn - Move

Above are sample screens showing SPD window on SDRAM and RDRAM modules. Up to 8 modules are supported.

## Memory Test

---



### MCFT Level 1 / Level 2 / Level 3 / Level 4

Select the level of RAM testing you want by using the **up/down arrow** keys to highlight **MCFT Level 1**, **MCFT Level 2**, **MCFT Level 3** or **MCFT Level 4**, and then press the **Enter** key.

#### **MCFT Level 1:**

This level emulates application programs that are running DOS and a limited Windows OS, Single user. Older systems, may still be used in imbedded process control applications.

#### **MCFT Level 2:**

This level emulates standard use of a Windows OS and application programs. Single user. Home and light business applications. Spreadsheet, e-mail, documents, etc.

***MCFT Level 3:***

This Level emulates rigorous use of Windows based programs. Single user. Demanding programs: publishing, 3-D imaging, gaming, video editing, etc.

***MCFT Level 4:***

Emulates multi-user OS's such as Windows NT Enterprise Server, Linux, Unix. Multi-user. Server/workstations. Extremely demanding programs and high end gaming. Maximum memory stress.

***Custom:***

This function allows users to select individual sequences for advanced troubleshooting of specific failures.

(Some newer systems do not support standard Refresh rates and may cause this test to hang. Please consult with Tech Support to identify any refresh test issues.)

There are 16 testing sequences and 26 unique algorithms that are used during testing, including proprietary algorithms developed exclusively by CMTL. Some of the tests use unique methods developed by CMTL to test RAM with the maximum amount of data traffic. Some rely on stressing the bus with data throughput to achieve a full load. In any case, MCFT does everything possible to stress a system's memory to create a failure that would occur in standard or stressful use environments.

Extra efforts were made to ensure the accuracy and reliability of the tests. Simply put, you throw everything at the system RAM with MCFT and verify that the system can handle the data movement and that data integrity is always maintained.

***Specify Testing Criteria***



```
CMIL Memory Compatibility & Functionality Test (MCFT) Base & Extended Memory

From      155 K
To        191 M 938 K
RAM Bus   128 bits
Cache     0n
Refresh   15 uSec
Loops     5

ENTER - Save, ESC - Exit, TAB ↑↓ - Move, ← → - PgUp PgDn DICIT - Change
```

To move from option to option, use the **left/right arrow** keys.

### **Address Range**

The **From** and **To** options allow you to select the RAM address range to be tested. The default range is all base or extended RAM. The **From** option specifies the address of the first byte where testing will begin; the **To** option specifies the address of the first byte where testing will stop. At either option:

Use the **plus and minus** keys to increase/decrease the address in one kilobyte (1 Kb) increments.

Use the **up and down arrow** keys to increase/decrease the address in one megabyte (1Mb) increments.

Use the **PgUp and PgDn** keys to increase/decrease the address in 10 megabyte (10 Mb) increments.

You can also enter the memory size in text format as: Highlight the segment and enter the change:

18G 280m 26k for 18 gigabytes, 280 megabytes and 26 kilobytes. As shown below:

```

CMIL Memory Compatibility & Functionality Test (MCFT) Base & Extended Memory

From 155 K
To 191 M 938 K
RAM Bus 128 bits
Cache 0n
Refresh 15 uSec
Loops 5

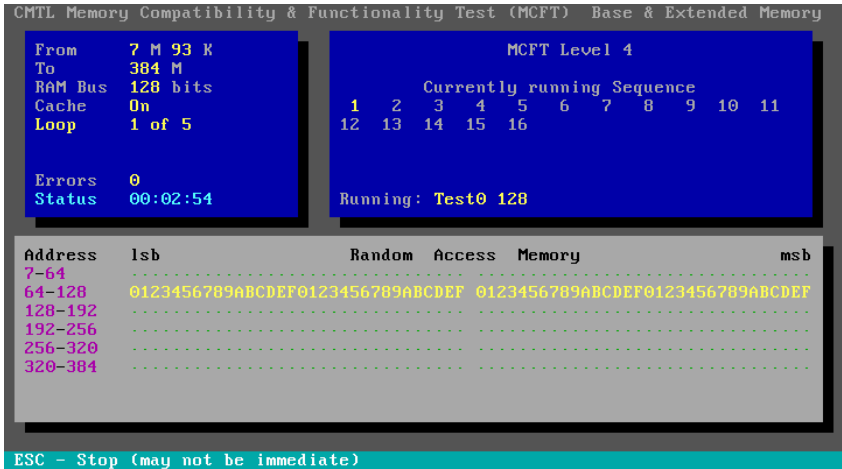
ENTER - Run, ESC - Exit, TAB ↑↓ - Move, ← → - PgUp PgDn, DIGIT - Change
  
```

### Test Loops

The **Loops** option allows you to execute the desired MCFT Level you select from 1 to 9,999 times, giving you the flexibility to perform short or long testing sessions depending on what you want to accomplish (e.g. troubleshooting / isolate failures, verify proper operation, etc.). The default is that all selected tests are executed once.

The standard loop count is set to 5. This is done to loop all the tests in all access modes. The first loop will access RAM in maximum data width. The bottom left corner of their sequences box identifies the sequence, test algorithm, and also access mode. For example; In Sequence 2, it can show Test 3 or Test 4 with an extension of 128. This indicates the test pattern is running in 128 bit mode. The next loop will step one level down. The sequence is set from 128, 64, 32, 16 and 8 bit mode.

For proper testing, we recommend running a full cycle of 4 loops to test logic conversion and CPU access in various modes.



Use the **up and down arrow** keys to increase/decrease the number of testing cycles by one loop at a time.

Use the **PgUp and PgDn** keys to increase/decrease the number of testing cycles by 10 loops at a time.

**Test to be Executed (Custom Level Only)**

Each of the MCFT tests can be included or excluded from testing. By default, all tests are included, except the User and LEAK tests.

To move from test to test, use the **left/right arrow** keys. At any test, press the **space bar** to toggle the test on and off. The color of a test's name indicates whether or not the test will be run. When a test is displayed in **white**, it is included in testing; when displayed in **orange**, it is excluded from testing.

## Run Tests

Once you've selected the MCFT test level, set the address range and specified the number of test loops, then press the **Enter** key to start testing.

Some of MCFT's tests execute very quickly while others can take awhile (for example, Sequence 8 tests takes awhile, and can tend to be lengthy).

However, you will probably notice that MCFT in general runs pretty fast. This is not because the program isn't doing its job, but rather that the program works completely in the protected mode (like Windows). When MCFT runs, it has *exclusive control* over all of the visible memory which *significantly* increases the speed with which it can test memory.

During testing, MCFT's testing screen provides the following information:

**Loops** shows that the number test loop is in progress (e.g. 1 = first loop in progress, 2 = second loop in progress, etc.). The second part shows the number of requested loops before completion.

**Passed** shows how many test loops have been completed without a failure.

**Failed** shows how many test loops have been completed where a failure occurred.

**Status** shows the amount of time that has elapsed. You can also use this indicator for system Hang up. During some tests, no screen activity is shown. In cases where no activity is seen, check the Status and re-check after 15 minutes. If no change has taken place, reset the system and start testing in smaller increments.

A test's **color** indicates the following: **yellow** is the test currently being run; **green** indicates that the test was completed successfully with no failures; and **red** indicates that a failure was encountered during the test.

The screen below shows a failure in system RAM on the first 64 meg module and on the most significant bit side with bits 4-7 failing. Schematics for the module can pin-point the exact failing chip on the module.

```

CMTL Memory Compatibility & Functionality Test (MCFT) Base & Extended Memory

From 25 M 93 K
To 386 M
RAM Bus 128 bits
Cache On
Loop 1 of 5

Errors 2
Status 00:09:52

MCFT Level 4
Currently running Sequence
 1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16

Running: Test1 128

Address lsb Random Access Memory msb
25-64 .....
64-128 .....
128-192 .....
192-256 ..... 4567
256-320 .....
320-384 0123456789ABCDEF0123456789ABCDEF 0123456789ABCDEF0123456789ABCDEF
384-386 .....

ESC - Stop (may not be immediate)
    
```

**ECC / Parity support**

MCFT will support ECC only if:

- ✓ ECC is enabled

- ✓ ECC memory is used
- ✓ Known chipset is present

ECC failure will show up as EEEEEEEEEEEEEEE or CCCCCCCCCC on full range. Parity will show up as a PFFFFFFFFF. The exact bit may not be identified on ECC multiple bit failure.

CCCCC but not EEEEE. 'C' is corrected. This means error detected but was corrected. The exact bit that was corrected cannot be identified.. If bit was not corrected, MCFT will display it on the screen if the exact address is known, if not it will mark the range with an EEEEE....

The following screen shows a failure in the Cache RAM test. Cache failure may not be translated into physical space or a chip. Cache by definition is not addressable as physical memory. The failure in this case indicates a cache ram failure. More detailed schematics may be needed to identify the exact component in the cache array.

```

CMTL Memory Compatibility & Functionality Test (MCFT) Base & Extended Memory

From 25 M 93 K
To 386 M
RAM Bus 128 bits
Cache On
Loop 1 of 5

Errors 2
Status 00:09:52

MCFT Level 4
Currently running Sequence
1 2 3 4 5 6 7 8 9 10 11
12 13 14 15 16

Running: Test1 120

Address lsb Random Access Memory msb
25-64 .....
64-128 .....
128-192 .....
192-256 812345 .....
256-320 .....
320-384 0123456789ABCDEF0123456789ABCDEF 0123456789ABCDEF0123456789ABCDEF
384-386 .....

ESC - Stop (may not be immediate)

```

Press **Esc** to STOP the test at any time. Some tests may not exit immediately. Once the test has stopped an option to Print or show Errors will be given. Press **P** for printing the results or **E** for the list of errors.

### ***Stopping and Restart Testing***

To stop and restart testing:

You may stop testing at any time by pressing the **Esc** key. MCFT completes the current portion of the test being executed before stopping. – Depending on the test currently being executed, it may take awhile for testing to stop.

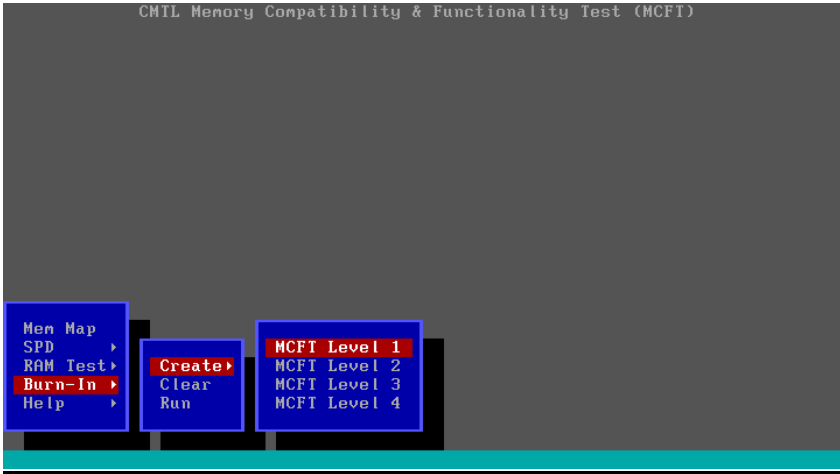
After stopping MCFT, you may restart testing at any time by pressing the **Enter** key.

### ***Burn-In***

The Customize functions allow you to run MCFT tests automatically to accommodate more lengthy testing sessions where you want to burn in or test new or repaired components or full systems.

Burn-in testing can also be used to isolate random or intermittent failures which may only surface during extended testing sessions.

- 1) To use the Burn-In Mode, Select Burn-In from the main menu.
- 2) Select Create. As Shown below.



3) Select Memory function you want to use for Burn-in. IE: Select MCFT Level 4.

Now choose the memory address, loops etc to create your script. After making your selection, Press Enter. This will save a script on the MCFT card.

Reboot the computer, MCFT will initialize and show the startup screen with the auto script function. If no keys are pressed, MCFT will execute the script you have saved.

**Clear:** Use this function to clear the script in MCFT.

**Run:** Use this function to execute the script you have created without doing a complete re-start of the system.

### ***Printing Test Results***

When testing is paused or is completed, you can print a report of test results by pressing the **P** key. The report shows the status and results of all tests, from the start of testing to the time when

the report is printed. The report also provides areas for writing in system identification and configuration information, and testing notes. A sample report appears on the next page.

**FAQ's about Test Results**

How is the error log interpreted? What do the various location address mean? (e.g., 80D000000)? Does this address indicate not only the failed DIMM but also the failed chip on the DIMM?

This is true only if memory address routing mechanism is known.

Two error address fields:

a) Range XXXXXXXXXXXX-YYYYYYYYYYYY

b) At YYYYYYYYYYYY

this is the exact address of byte/word/dword/qword/oword where error appears.

For example, if we have error 'At 00000100001 got 0400, expect 0000'.

This means second byte of word, started at address 100001 failed. Absolute byte address will be 100002.

If we have a single 64-bits SDRAM with 8 chips installed.

Result can be interpreted with following address routing:

Byte at address 00 -> chip0 address 00

Byte at address 01 -> chip1 address 00

Byte at address 02 -> chip2 address 00

Byte at address 03 -> chip3 address 00

Byte at address 04 -> chip4 address 00

Byte at address 05 -> chip5 address 00

Byte at address 06 -> chip6 address 00  
Byte at address 07 -> chip7 address 00  
Byte at address 08 -> chip0 address 01  
Byte at address 09 -> chip1 address 01  
Byte at address 0A -> chip2 address 01  
Byte at address 0B -> chip3 address 01  
Byte at address 0C -> chip4 address 01  
Byte at address 0D -> chip5 address 01  
Byte at address 0E -> chip6 address 01  
Byte at address 0F -> chip7 address 01  
....  
Byte at address 100000 -> chip0 address 20000  
Byte at address 100001 -> chip1 address 20000  
Byte at address 100002 -> chip2 address 20000  
Byte at address 100003 -> chip3 address 20000  
Byte at address 100004 -> chip4 address 20000  
Byte at address 100005 -> chip5 address 20000  
Byte at address 100006 -> chip6 address 20000  
Byte at address 100007 -> chip7 address 20000

Conclusion: Third chip (chip2) failed.

***Exit***

To exit MCFT, power down the system and remove the card.

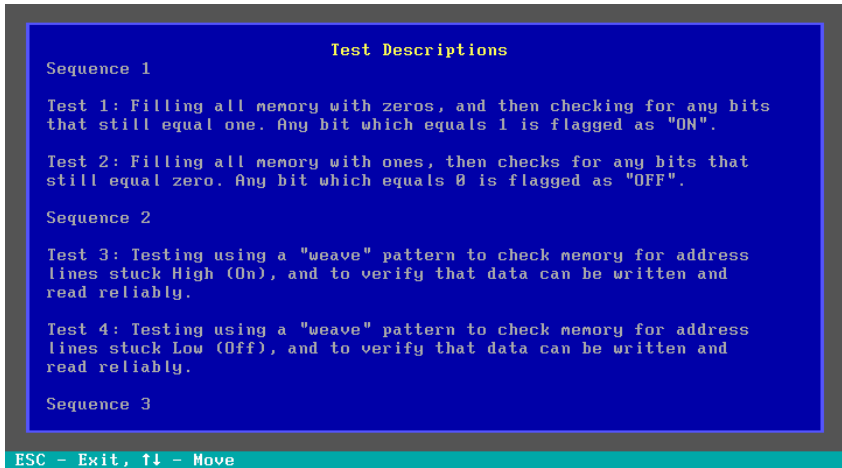
---

## Test Descriptions

Due to the proprietary nature of some tests, details may not be provided. A Star \* next to the test name indicates a proprietary pattern developed by CMTL and its partners.

All tests check for supported ECC and Parity functions. All tests also cycle various access modes.

This Information can also be found under the Help menu on the MCFT card.



### **Sequence 1**

Test 1: Filling all memory with zeros, then checks for any bits that still equal one. Any bit which equals 1 is flagged as “ON”.

Test 2: Filling all memory with ones, then checks for any bits that still equal zero. Any bit which equals 0 is flagged as “OFF”.

### **Sequence 2**

Test 3: Testing using a “weave” pattern to check memory for address lines stuck High (On), and to verify that data can be written and read reliably.

Test 4: Testing using a “weave” pattern to check memory for address lines stuck Low (Off), and to verify that data can be written and read reliably.

### **Sequence 3**

Test 5: Filling memory with zeros and then alternating by jumping from the beginning and end of RAM to the middle block of memory.

### **Sequence 4 \***

Test 6: Performing a checkerboard combination sequence test that incorporates walking and auto base sequencing routines.

Test 7: Performing an inverted checkerboard combination sequence test that incorporates walking and auto base sequencing routines.

Test 8: Performing a combination of the checkerboard and inverted checkerboard sequence test that incorporates three bits walking and auto base sequencing routines.

## **Sequence 5**

Test 9: Checking each byte's parity bit using a checker board pattern.

Test 10: Checking each byte's parity bit using an inverted checker board pattern.

## **Sequence 6**

Test 11: Copying the system BIOS code into RAM until the memory is filled and then reading all RAM to verify that the BIOS data was written correctly.

## **Sequence 7**

Test 12: Performing test to verify and isolate failures in the data lines between the system bus and RAM.

## **Sequence 8**

Test 13: Filling each word of RAM with a unique data pattern and then checking each word's value to ensure that it is the same as the value written.

Test 14: Filling each word of RAM with a unique address pattern and then checking each word's value to ensure that it is the same as the value written.

## **Sequence 9**

Test 15: Performing walking bit patterns; a bit is written and the next is skipped and then one is written again, etc.

Test 16: Performing inverted walking bit patterns; a bit is written and the next is skipped and then one is written again, etc.

Test 17: Performing walking bit patterns left; a bit is written and the next is skipped and then one is written again, etc.

Test 18: Performing inverted walking bit patterns left; a bit is written and the next is skipped and then one is written again, etc.

### **Sequence 10**

Test 19: Attempting to detect single coupling failures and multiple failures of any combination of bits stuck at zero or one.

### **Sequence 11** \*

Test 20: Reading each bit for a preloaded expected value, then writing the opposite value and reading the value a second time.

### **Sequence 12**

Test 21: Filling and writing all memory with zeros and then, in ascending order, verifying that zero is present in every bit. Then filling and writing all memory with ones. Another pass inverts all of the patterns and performs a complete data integrity check.

### **Sequence 13** \*

Test 22: Testing for cross contamination of cell data.

### **Sequence 14** \*

Test 23: Testing for cross contamination of cell data.

### **Sequence 15**

Test 24: Testing memory transfer which determines if data can be moved from one location in RAM to another without causing changes to the data.

**Sequence 16** \*

Test 25: Testing a combination of unique access methodology and standard pattern testing.

Test 26: Testing a combination of custom walking and standard pattern testing.

Below is a sample printout of the MCFT report.

MCFT (Memory Compatibility & Functionality Test)v1.3

ID #: \_\_\_\_\_  
Note 1: \_\_\_\_\_  
Note 2: \_\_\_\_\_  
Note 3: \_\_\_\_\_  
Note 4: \_\_\_\_\_

Memory Size : 16G  
Memory Test From : 150M  
Memory Test To : 160M  
Memory Test Loops: 1  
Passed Loops : 4  
Failed Loops : 1  
Error Count : 35

Sequence1 Passed  
Sequence2 Passed  
Sequence3 Passed  
Sequence4 Passed  
Sequence5 Skipped  
Sequence6 Passed  
Sequence7 Passed  
Sequence8 Skipped  
Sequence9 Passed  
Sequence10 Passed  
Sequence11 Passed  
Sequence12 Passed  
Sequence13 Passed  
Sequence14 Passed  
Sequence15 Skipped  
Sequence16 Skipped  
Diagnosis: PASSED

Date: 03/01/2002 Time: 09:28:34

Tested By: \_\_\_\_\_



## **WARRANTY**

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2. Prior to the return of any product under the terms of this warranty, the original purchaser must contact CMTL for an RMA number. All units must be returned to the point of purchase. Goods returned during the warranty period with a proof of purchase and a written notice of a defect that is confirmed by CMTL will be replaced or restored to proper operating condition and returned to the sender without any charge. In any event, CMTL's liability shall not exceed the original purchase price of this product.

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