THE RAMMASTER COMPACT

HIGH SPEED MEMORY TESTER

OPERATORS MANUAL

A.B.I. Electronics Ltd, Mason Way, Platts Common Industrial Park,
Barnsley, South Yorkshire, S74 9TG, ENGLAND.

Tel: (0226) 350145 Fax: (0226) 350483 Tlx: 547938 EXPERT G

RamMaster Compact Operators Manual (RM/1.06) - Contents

Introduction

Thank you for purchasing the ABI RamMaster Compact High Speed Memory Tester.

The basic function of the RamMaster Compact is to perform a full speed functional test on DRAMs, SRAMs, SIMMs and SIPs using a variety of test algorithms to ensure reliable and rapid results. The test is performed by reconfigurable HARDWARE, allowing most memories to be tested at their theoretical full speed. Any malfunctioning memory cell results in a FAIL indication, and in the case of SIMM and SIP modules the faulty bit(s) is/are identified on the integral LCD display so that the module can be repaired. Additional facilities are also provided, amongst them test loops that can be used for goods inwards inspection or detecting intermittent faults. The supply voltage to the IC under test can be varied by ±5% during the test to simulate actual circuit conditions. Since the RamMaster Compact contains an extensive memory IC library, it is not necessary to programme the unit other than to select the IC part type. The unit is equipped with sockets covering the majority of Dual in Line (DIL), SIMM and SIP packages, and a range of adaptors are available for SOJ and ZIP packages and also for 72 pin PS/2 type SIMM modules. The RamMaster is capable of being upgraded and is designed to test the components of tomorrow.

DC input

The RamMaster Compact is powered by four AA batteries or by use of the battery eliminator input at the front of the case. Nickel–Cadmium batteries have a terminal voltage which is too low and they should not be used. To insert the batteries, turn the unit upside down and remove the battery cover at the front underside of the case by removing the two cross head screws holding it in place. The batteries must be inserted in the correct orientation, as indicated within the battery compartment. Incorrect insertion of batteries may cause damage to the unit. Replace the battery cover and insert the screws. If the battery voltage falls below 5.1 volts, a low battery warning symbol will be displayed at the bottom right hand corner of the display in normal operating mode. A low battery warning may also be displayed during a result display. Test results may be inconsistent under these conditions, and in particular the high voltage (5.25V) test will not be possible. If this happens change the batteries or use the battery eliminator supplied.

battery eliminator

An external battery eliminator is supplied for prolonged use of the RamMaster Compact. Many SIMM modules consume a large amount of current during the test, and battery life can be conserved by using the eliminator. There is no need to remove the batteries prior to inserting the battery eliminator. However, please note that during prolonged periods of non–use batteries are prone to leakage and should be removed. Do not use any battery eliminator other than the one supplied with the unit. This is preset to the correct rating of 6.75V 1A regulated.

switching on

To switch the unit on simply press the 'ON' key. To preserve battery life, the unit powers itself off after approximately four minutes of non–use, although this facility can be disabled if required using the CONFIG facility. When the unit is switched on it first of all performs a self diagnosis test. Therefore, before switching on, check that the test sockets are empty to prevent interference with the diagnostics. If the unit passes the self test the display will be as follows:–

```
Typ>SIM30 AUTO

Mode:Single At:150nS
FIELD  CONFIG  CHANGE
  ^       ^       ^
 F 1     F 2     F 3
```

When this initial display is obtained the RamMaster Compact is ready for use. If, however, the message SELF TEST FAIL:– is displayed along with a fault message, this indicates that a self test diagnostic fault has been detected. Pressing the CONTINUE key (F1) will display all the faults diagnosed before reverting to the opening menu as above, but of course operation of the unit will then be suspect. Before contacting your distributor, check that the test sockets are completely empty and the batteries are in good condition.

using the menus

The RamMaster Compact uses a menu driven interface to control all aspects of its operation. The three soft function keys, F1, F2 and F3 next to the display are used to set up the unit prior to carrying out a test. The exact function of these three soft keys varies according to the operation in progress, and is indicated on the bottom of the display. After power on, the function of these keys is as follows:–

F1 = FIELD = move the flashing arrow cursor to the field to be changed.
F2 = CONFIG = select CONFIG mode
F3 = CHANGE = change the contents of the selected field.

If CHANGE key (F3) is pressed the selected memory type changes from SIM30 to SIM72, and at the same time the F3 key is re–labelled UP and the F2 key is labelled DOWN. Pressing UP (F3) again will select DRAM, DOWN (F2) will select SIM72 again and so on. Each of the other parameters shown on the display are selected in this way, using the FIELD key (F1) to first choose the parameter to be changed, then CHANGE/UP (F3) and DOWN (F2) to alter the contents of the selected field.

selecting the memory to test

The memory device to be tested can be chosen by menu selection of the memory type, organisation, manufacturer and device part number or by using the auto–detect feature.

Auto–detect is the default setting upon switch on. In order to test a memory device or module first select the memory type using the CHANGE (F3) key. Once this has been done simply press the Test key and the memory organisation will automatically be determined and the device tested. The organisation of the device inserted will be shown in the top left corner of the display whilst the test is in progress. If a SIMM module with major faults is tested, the erroneous bits will be displayed and the test halted before the selected test algorithm has been executed. When testing a discrete device (i.e. SRAMs or DRAMs) the RamMaster will display the message 'No memory, faulty or unknown device'. In this case the memory may have a number of faults or may have an organisation unknown to the tester. Check that correct memory type has been selected and the device correctly inserted if this occurs.

The menu method is provided to allow selection of memories when either a combination of the type, manufacturer and organisation or the full manufacturer's part number are know. To use this device selection method move the cursor to the organisation field using the FIELD key and press CHANGE. This allows each valid organisation for the memory type chosen to be stepped through. Once AUTO mode has been left the display will appear as follows:

```
Typ>SIM30 ALL
Man:ALL    MB85240
Mode:Single At:150nS
FIELD CONFIG CHANGE
  ^      ^      ^

 F 1    F 2    F 3
```

With the memory type, organisation and manufacturer set to ALL, the cursor could be moved to the part number parameter on the display and each part number stepped through (using CHANGE – F3) until the one required is displayed. However, since there are hundreds of ICs and modules in the library, this would take a very long time! As part numbers are scrolled, the display shows the position in the list of parts and the total number of parts available.

By preselecting the type of memory to be tested the organisation and the manufacturer, the range of allowable type numbers can be limited, in many cases right down to an individual IC. For example if the memory under test is known to be a DRAM, use FIELD and CHANGE to select DRAM for the memory type. This immediately cuts down the range of allowable part numbers. If the memory manufacturer is Hitachi, use FIELD and CHANGE again to select HIT for the manufacturer (Man:). This will then cut down the number of part numbers even more. Furthermore, if the organisation of the IC is known to be 1M by 1, use FIELD and CHANGE again to choose this organisation. It can now be seen by moving the cursor to the part number, that there are only a very small number of part numbers matching these criteria, one of which will be the IC you are about to test.

The first parameter is the memory type (Typ:), which allows selection of the type of memory to be tested. The options available are:–

ALL – Allow selection of all types of memory.
SRAM – Select only static RAM memories.
DRAM – Select only dynamic RAM memories.
SIM30 – Select only 30 pin SIMM modules.
SIM72 – Select only 72 pin SIMM modules (requires external adaptor).
DRAMZ – Select only ZIP packaged DRAMs (requires external adaptor).
DRAMJ – Select only SOJ packaged DRAMs (requires external adaptor).
PS2 – Select only PS2 type 72 pin SIMMs (requires external adaptor).

The next parameter is the memory organisation. This parameter selects the depth (number of memory locations) and the width (number of bits) of the memory to be tested. The available options, in addition to ALL, are shown below:–

16k by 1	16k by 4	2k by 8	256k by 9	256k by 32	256k by 36
64k by 1	64k by 4	8k by 8	512k by 9	512k by 32	512k by 36
256k by 1	256k by 4	32k by 8	1M by 9	1M by 32	1M by 36
1M by 1	1M by 4	128k by 8	2M by 9	2M by 32	2M by 36
4M by 1	4M by 4	256k by 8	4M by 9	4M by 32	4M by 36
		512k by 8	16M by 9	8M by 32	8M by 36
		1M by 8			
		4M by 8			
		16M by 8			

The next parameter is the memory manufacturer (Man:). The options available are:–

ALL: All manufacturers
AMD: Advance Micro Devices
FUJ: Fujitsu
GOL: Goldstar
HIT: Hitachi
HYU: Hyundai
INT: Intel
MIC: Micron
MIT: Mitsubishi
MOT: Motorola
NEC: NEC
OKI: OKI
SAM: Samsung
SIE: Siemens
TEX: Texas Instruments
TOS: Toshiba

selecting the test mode

Once memory to be tested has been selected there are two further parameters that can be selected prior to the test. The first of these is the Mode, which is selectable using FIELD and CHANGE from the following options:-

Single – execute a single test on the chosen memory IC or module.
Loop – execute a test repeatedly, regardless of the result.
P Loop – execute a test repeatedly, provided the result was PASS.
F Loop – execute a test repeatedly, provided the result was FAIL.
Access – repeat the test with gradually increasing access time until the test passes.
S Test – execute the diagnostic self test.

Note that the self test option includes various set up routines that are used in manufacture. These are inhibited by a special code and are not user-accessible.

selecting the test speed

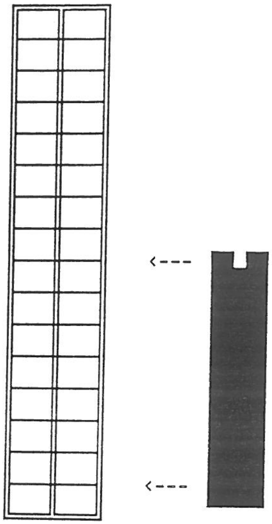
The access speed of the memory under test may be selected in the ACCESS TIME field (At:). The access time appropriate for the component under test can be set with a resolution of 25nS. If the exact speed is not available, select the next higher speed. Note that selecting a speed which is faster than the component under test may well result in a FAIL result. If the access speed is not known set the test mode (Mode:) to Access before carrying out the test. The RamMaster will then automatically find the fastest speed at which the component under test will pass. When using auto-detect mode for PS2 modules the speed is determined from the presence detect code of the module and cannot be set manually.

inserting the IC or module

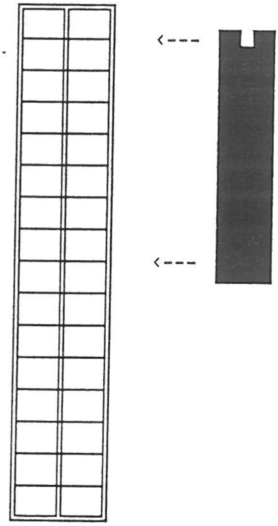
After selecting the options described above, you are ready to insert the memory IC or module and carry out a test. Memories come in a wide variety of packages and the RamMaster is equipped with sockets covering the most common, with adaptors available to cover the remaining package types.

Dual in Line (DIL) ICs are inserted in the black 32 pin ZIF socket on the right of the unit, with pin 1 of the IC towards the display. If the IC has less than 32 pins insert it at the front of the socket as shown in the diagram below:-

<u>CORRECT</u>



<u>INCORRECT</u>



Industry standard 30 pin SIMM modules are inserted into the black 30 pin single in line socket on the unit. Insert the SIMM with the ICs facing to the left. Pin 1 of the SIMM socket is nearest the display. Industry standard 30 pin SIP modules are inserted into the green 30 pin single in line ZIF socket on the unit. Insert the SIP with the ICs facing to the left. Pin 1 of the SIP socket is nearest the display.

Other types of packages and modules are supported by fitting one of a range of adaptors which are equipped with the necessary sockets. For full details please contact our product support department.

testing the IC or module

The test is performed by pressing the TEST key. The test will then commence and the display will change as follows, using a Siemens 1M by 9 bit SIMM as an example:-

```
HYM91000S
50% ?????????
                QuickMarch
         CANCEL
  ^          ^          ^
F 1        F 2        F 3
```

The part number of the component under test is displayed at the top left and the progress of the test is displayed as a percentage. The question marks represent the 9 bit positions, with bit 0 (least significant bit) on the right. The algorithm (in this case QuickMarch) is displayed below the bit pattern, and finally the F2 key is labelled as CANCEL during the test. In order to abandon the test in progress the CANCEL key (F2) should be pressed and the test will stop.

After the test has completed the display will be as follows:-

```
HYM91000S
100% √√√√√√√√√  PASS
                QuickMarch
            END
  ^          ^          ^
F 1        F 2        F 3
```

The tick (√) symbol shows that each bit position fully passed the test, and therefore the entire module passed as indicated to the right of the bit pattern. If one of the LOOP modes has been selected, the loop number will be shown at the top right of the display. In the case of a faulty component, the result will of course be FAIL and the bit pattern will contain a combination of the following symbols:-

√ = this bit was fully tested and found to be good.
? = this bit was not fully tested (because the test was not completed) and its status is undefined.
1 = this bit was found to be incorrectly high during the test.
0 = this bit was found to be incorrectly low during the test.
x = this bit was found to be incorrect in both logic states during the test.

In the case of multi-IC modules the module can be repaired by replacing the appropriate IC with a known good one before repeating the test, provided the necessary reworking equipment is used. Note that there are two reasons why the test may not be completed and a question mark (?) may be displayed in one or more bit positions. The first is that the CANCEL (F2) key may have been pressed to abandon the test, but more likely at this stage is that the unit is configured to stop the test upon detection of the first faulty bit. This is controlled by the CONFIG function, which is described in the next section. If a test is abandoned by pressing the CANCEL key, the result could either be FAIL if faulty bits have already been discovered, or UNDEF (undefined) if the test passed up to the point where it was abandoned.

After the test has finished it can be repeated by pressing the TEST key, or the main menu can be returned to by pressing the END key.

Note: Testing high current ICs in any of the loop modes will drain the batteries quickly, and it is recommended that the battery eliminator is used for repeated tests.

using the 72 pin (PS2) SIMM adaptor

In order to test 72 pin SIMMs, a separately available adaptor must be used. This is inserted into both the 32 pin ZIF socket on the unit and also the 32 pin SIP socket. It contains a 72 pin SIMM socket into which the module under test is inserted, with pin 1 towards the display. If the industry standard part number and organisation for the module to be tested is known, select SIM72 and the organisation or use auto-detect in the usual way. Pressing the TEST key will then execute the test as described earlier and the result will be displayed. The result display is slightly different, as in the following typical example:-

```
MB85236
100% √√√√√√√√√   PASS
Bank 4      QuickMarch
INFO     END     BANK#
 ^        ^        ^
 F 1      F 2      F 3
```

72 pin SIMM modules are organised and tested in banks of 8 or 9 bits each, and the result for each bank can be viewed by pressing the BANK# (F3) key. These type of modules also provide a 4 bit PRESENCE DETECT code, which can be viewed if required by pressing the INFO (F1) key.

PS2 can be selected to test 36 bit wide modules using the auto-detect feature to determine the device type. Note that auto-detection for this memory type uses only the presence detect code to identify the module under test.

using the ZIP adaptor

This adaptor contains 16, 20, 24 and 28 ZIP sockets and is inserted into the 32 pin ZIF socket on the RamMaster – the orientation is shown on the adaptor PCB. The component under test should be inserted into the appropriate ZIP socket with pin 1 towards the display. The test can then be carried out by selecting DRAMZ for the memory type, and the test result is displayed in the usual way.

using the SOJ adaptor

This adaptor contains two SOJ test sockets to cover the majority of SOJ package requirements. Socket SOJ1 is for narrow–bodied (300 mil – 0.3") packages with up to 26 pins, while SOJ2 is for wide–bodied (350 mil – 0.35") packages. The adaptor is inserted into the 32 pin ZIF socket and the test is carried out by selecting DRAMJ for the memory type.

using config mode

In the main menu, it can be seen that the F2 key is defined as CONFIG. Pressing the CONFIG key allows various operating parameters to be set up. The parameters that can be changed are the test algorithm, test supply voltage (VCC), auto power off function and error count. Changes are made in the usual way using the FIELD and CHANGE keys.

test algorithm

The default test algorithm used after switch on is QuickMarch, which is a shortened version of the industry standard March6N algorithm recommended by many memory IC manufacturers as the best compromise between test integrity and test time. However there are alternative selections available to allow trade off, to a certain extent, the test time against test integrity. The options available are:–

QuickMarch (default). The entire memory is filled with an alternating low/high data pattern, then read back and checked. This is then repeated with the opposite pattern. In this way every individual memory cell is tested in both logical states, but interaction between cells and address decoding faults may not be detected. This algorithm is suitable for finding most IC failures.

March6N. For a single bit memory this algorithm executes as follows:–

1) The entire memory is filled with logical 0's
2) Location 0 is read and compared with 0.
3) Location 0 is then written with a logical 1.
4) Location 1 is read and compared with 0.
5) Location 1 is then written with a logical 1.

This process is repeated until the entire memory is full of logical 1's, then the algorithm continues as follows:–

6) The highest location is read and compared with 1.
7) The highest location is then written with a logical 0.
8) The next lowest location is read and compared with 1.
9) The next lowest location is then written with a logical 0.

This process is repeated until the entire memory is full of logical 0's, then the algorithm continues as follows:–

10) The highest location is read and compared with 0.
11) The next lowest location is read and compared with 0.

This is repeated until the entire memory has been checked.

For an n bit wide memory, this entire process is repeated for each bit in turn whilst the other bits are set to and compared with zero. This ensures that shorts or interaction between data bits will be detected.

March6Nx2. For a single bit wide memory this is in effect identical to the March6N described above. For n bit wide memories the March6N algorithm described above is carried out, then repeated with the logically opposite data pattern. This gives improved test integrity for pattern sensitive faults and data interaction between bits.

Refresh. The memory is filled with an alternating high/low pattern, then all refresh activity is suspended for the maximum time allowed by the component specifications. The component is then checked for the correct pattern. This test is the fastest but each cell is only tested in a single logical state. This test is not necessary for Static RAMs but can be used if desired.

V–Bounce. The March6N test described above is carried out but this time the supply voltage to the component under test is varied by ±5% every 100mS during the test. For this test to work correctly the batteries must be in good condition or the battery eliminator should be used.

Exhaustive. This test is a combination of the March6Nx2, QuickMarch, Refresh and Voltage Bounce tests. It is the most severe test but takes longer to execute – for this reason it is most suitable when running an extended test in PASS LOOP mode, for example.

summary of test algorithms

The following table summarises the various algorithms and gives the test times for a 1M by 9 bit SIMM as an aid to selection:-

ALGORITHM	TEST INTEGRITY	TEST TIME	
March6N	Very Good	Medium	30s
March6Nx2	Excellent	Long	60s
Refresh	Reasonable	Shortest	2s
V-Bounce	Very Good	Medium	30s
QuickMarch	Good	Short	4s
Exhaustive	Comprehensive	Longest	96s

test Vcc voltage

The supply voltage to the component under test can be set to 5V (Norm), 5V + 5% or 5V - 5% to check that the component will function over a range of supply voltages. The default on power up is 5V. Note that in order to carry out the 5V + 5% test the batteries must be in good condition or the battery eliminator should be used.

auto power off

In normal use the unit will switch itself off after four minutes of non-use to conserve power. This can in some circumstances be inconvenient. For example if a test is left running in PASS LOOP mode the system will remain powered up while the test is running, but if a failure occurs the test will stop and subsequently switch off after four minutes. This would result in the exact outcome of the test being lost. For this reason the auto power off function can be disabled if required. Note that if this function is disabled it is recommended that the battery eliminator be used to avoid draining the batteries.

error count

On power up the error count parameter is set to 100, which means that the test will stop if over one hundred errors have detected. This gives a fast test throughput when testing a mixed batch of good and bad ICs but the error count can be set to 1 for optimum throughput, or 1000 or unlimited to allow the test to continue until the specified number of errors have been detected. When testing and repairing SIMMs the error count may require setting to unlimited to ensure that the entire test executes and all faulty ICs in the module are detected.

self test mode

This feature allows the integrity of the unit to be tested, including the pin drivers and receivers, power supplies and other internal hardware. The test executes automatically at switch on, but a self test can be performed at any time by selecting Self Test (S Test) mode using the FIELD and CHANGE keys from the main menu and pressing TEST. The F1 function key can then be used to carry out the self test function, or alternatively the F3 key can be used to return to the main menu. The MDA function is for factory use only and cannot be used in the field.

If a fault is discovered a diagnostic message will be displayed which will help our engineers to locate and rectify the fault. This message should be noted and quoted in any correspondence relating to a unit fault. Contact your distributor in the event of a self test fail, but first of all ensure that the sockets were empty when the diagnostics were run. Note that a self test failure will occur if the battery voltage is too low, so always try replacing the batteries or using the eliminator before deciding that the unit is faulty.

specification

Batteries:	4 X 1.5V AA size (not Ni-Cd)
DC input:	6.75V, 1A max, Regulated.
Power consumption:	Power off 10uA Standby 35mA
Test thresholds:	Logic High 2.2V Min Logic Low 0.8V Max
Dimensions:	250mm x 120mm x 55mm approx
Library ICs:	Static RAMS, Dynamic Rams, SIMMs, SIPs