



**BUGTRAP MODEL 8000 DYNAMIC RAM TESTER** 



**BUGTRAP** 

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# MODEL 8000 DYNAMIC RAM TESTER THEORY OF OPERATION

### SWITCH PANEL SELECTIONS

DEVICE: The device type must be selected, which "tells" the Model 8000 what size and configuration of DRAM is to be tested. For example, selecting "4164" (the most common part number for a 64K DRAM) sets up the DRAM tester for testing a 64K x 1 bit dynamic RAM, 4164 or equivalent. Making the device selection will also light a LED indicator at the bottom of the appropriate test socket to be used for the test.

ACCESS TIME: Next, the user must select the access time at which the DRAM will be tested. If the coding on the DRAM specifies a 150 nanosecond (ns) access time, the user would make the 150ns selection. The manufacturer specification for access time refers to the Row Address Strobe (RAS) time and is generally used as the DRAM's operating speed rating. A 150 nanosecond selection sets up the Model 8000 to test the DRAM for minimum performance levels guaranteed by DRAM manufacturers for a 150ns DRAM. A good DRAM must pass the testing at its rated speed or faster.

One of the access time selections on the Model 8000 is labeled "REFRESH". The refresh specification of a DRAM refers to the maximum length of time a memory location can retain its data correctly before it needs to be accessed again, allowing for continued retention of the data. Without "refreshing" the memory, data would be lost.

The Model 8000 does a long-cycle test of the DRAM when "REFRESH" is selected. The maximum amount of time allowed by manufacturer specifications is inserted between each row address accessed to confirm that data is retained for a guaranteed minimum amount of time at each memory location. On some DRAMs, this means that each row address must be ac-

MODE: The only selection left to be made is for the mode of testing, "NORMAL" or "CONTINUOUS". In the normal mode, five complete test cycles are performed on the DRAM. Each test cycle consists of moving six different data patterns through all address locations of the DRAM, writing first and then reading. After all address locations (cells) have been written into, and read from, with all six data patterns five times each, the test will automatically stop. It may seem like this much testing would take a long time, but the entire test sequence on a 64K DRAM, for example, would take less than one second.

2

2

2

In the continuous mode, the testing would not automatically stop. It would continue as long as the DRAM kept performing correctly or until the user terminated the test. This continuous mode selection is especially helpful when an intermittent or thermal related failure of the DRAM is suspected. This mode can also be used to "burn-in" a DRAM before inserting it into your equipment. In either mode, normal or continuous, the test will automatically stop as soon as any DRAM failure occurs.

### **DRAM INITIALIZATION**

When the "START TEST" switch is pushed, the DRAM being tested will be initialized. This consists of first powering up the DRAM with the proper voltages, in the proper order. After powerup, at least one millisecond is allowed before DRAM operation and RAS is held at a logic high (+5VDC) for at least 100 microseconds. The logic buffers to the test sockets are then turned on and a minimum of eight RAS cycles are executed before valid testing begins.

### **ADDRESSING**

Each memory cell is accessed sequentially starting at the lowest order address location, address 0000..., and ending at the highest order location, address 1111..., and starting all over again at the lowest address location. An address location is determined by a combination of a row address and a separate column address, creating a type of matrix to select the proper memory cell, or cells.

These address locations are first written into with the appropriate data bit, a logic one or logic zero, depending on the data pattern in progress. After all locations have been written into, they are all read from while the Model 8000 verifies that the data being read is correct. After all locations have been read, the Model 8000 steps to a different data pattern and performs the cycle all over again, until all six data patterns have been used.

### **DATA PATTERNS**

As mentioned, there are six different data patterns. One pattern consists of writing all logic "ones" to all address locations sequentially. Another has all logic "zeroes" written into the DRAM. The checkerboard pattern writes a logic "one" to one address location then a logic "zero" to the next, a logic "one" to the next, etc. The next pattern consists of inverting the checkerboard so that every location that received a "one" now gets a "zero" and vice-versa. Finally, two pseudorandom data patterns are generated.

### **RAS & CAS TIMING**

Two major timing signals required for DRAM operation are the Row Address Strobe ( $\overline{RAS}$ ) and the Column Address Strobe ( $\overline{CAS}$ ). These two signals are responsible for locking in the necessary row address and column address locations. Both are needed to determine which memory cell is being used. In addition, the length of time  $\overline{RAS}$  is at a logic low corresponds to the access time. If a DRAM is rated at 150ns, valid data must be available at the DRAM's output within the 150ns  $\overline{RAS}$  signal, if in the read cycle. The Model 8000 verifies that the DRAM operation is correct within these strict timing parameters.

### **ERROR GENERATION**

During testing, the Model 8000 verifies that all the DRAM inputs are operating correctly, that is, that none are either open or shorted. This includes the data input, RAS, CAS, R/W (read/write), and all address inputs.

Correct data output is also verified and is verified within the strict access time performance parameters already discussed. Multiple data patterns are used during testing to insure that all internal cells of the DRAM are operating correctly. This insures that no cells are stuck "high", stuck "low", or shorted to adjacent cells.

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After the DRAM has gone through its initialization procedure and valid testing has begun, the "FAIL" indicator LED on the Model 8000 will light at the first occurrence of any DRAM failure. Testing will then automatically stop as further testing is pointless.

The "PASS" indicator LED will not light, however, until an entire "NORMAL" mode test sequence has been executed, whether in the normal or the continuous test mode. In the continuous mode, this "PASS" indicator will remain lit until a DRAM failure, if any, is encountered. If a DRAM failure is detected, the "PASS" LED will turn off, the "FAIL" LED will light and testing will automatically stop.

### MODEL 8000 DYNAMIC RAM TESTER OPERATING INSTRUCTIONS

- 1. Turn on the power switch and check that the voltage indicator LEDs (+5VDC, +12VDC, -5VDC) are lit. Proceed if lit.
- Select the type of DRAM device to be tested. If the part number on the DRAM looks unfamiliar, check for it in the cross reference chart.
- 3. Select the proper access time at which the DRAM is to be tested. There is no industry standard for the access time coding on the DRAM, so please check for the speed rating of the DRAM in the cross reference chart. It is not uncommon for a DRAM to pass at one speed faster than it is rated.

If "REFRESH" is selected, the test will take considerably longer than if any of the other access times are selected. The test cycle time is much slower to insure each address location retains its data for the guaranteed minimum amount of time necessary before being accessed.

4. Select either the "NORMAL" or "CONTINUOUS" test mode. In the normal mode, a single test sequence will be executed on the DRAM. This test sequence involves running six different data patterns, five times each, through all address locations of the DRAM.

In the continuous mode, testing of the DRAM doesn't stop unless a DRAM failure occurs or the user stops the test.

To stop the test while in the continuous mode, simply touch the "NORMAL" switch and watch for the "TEST IN PROGRESS" LED to turn off.

5. Now place the DRAM into the appropriate Z.I.F. (Zero-Insertion-Force) test socket. An LED was lit just below the appropriate socket when you selected the type of DRAM to be tested. Make sure that pin #1 of the DRAM is placed at the upper left corner of the test socket, closest to the locking handle. Now, push down the locking handle to lock the DRAM in place and assure good electrical contact. Be sure to only have one DRAM in the bank of test sockets at any one time.

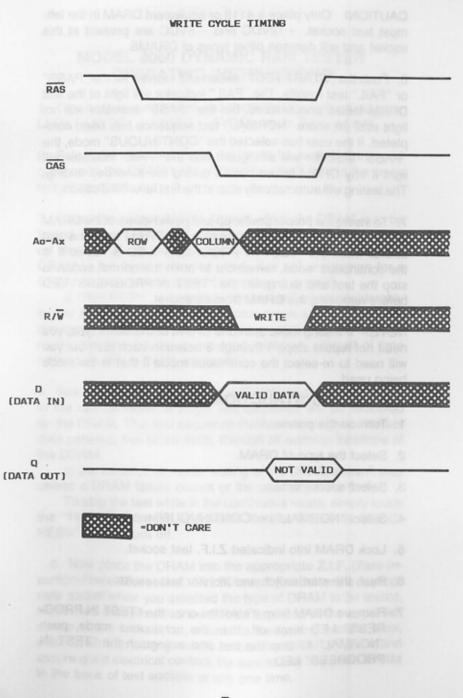
5

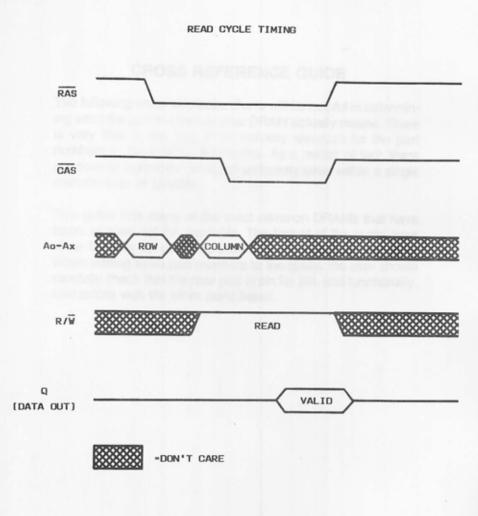
- 6. Push the "START TEST" switch and monitor for the "PASS" or "FAIL" test results. The "FAIL" indicator will light at the first DRAM failure encountered, but the "PASS" indicator will not light until an entire "NORMAL" test sequence has been completed. If the user has selected the "CONTINUOUS" mode, the "PASS" indicator will extinguish and the "FAIL" indicator will light if any DRAM failure occurs during the extended testing. The testing will automatically stop at the first failure indication.
- 7. To insure the proper power-up and power-down of the DRAM being tested, only insert or remove the DRAM from the test socket when the "TEST IN PROGRESS" LED is not lit. If in the continuous mode, remember to push the normal switch to stop the test and extinguish the "TEST IN PROGRESS" LED before removing the DRAM from its socket.

NOTE: If testing more than one DRAM of the same type, you need not repeat steps 1 through 3 between each test, but you will need to re-select the continuous mode if that is the mode being used.

### INSTRUCTION SUMMARY

- 1. Turn on the power.
- 2. Select the type of DRAM.
- 3. Select access time.
- 4. Select "NORMAL" or "CONTINUOUS" mode.
- 5. Lock DRAM into indicated Z.I.F. test socket.
- 6. Push the start switch and monitor test results.
- Remove DRAM from it's socket once the "TEST IN PROG-RESS" LED turns off. If in the continuous mode, push "NORMAL" to stop the test and extinguish the "TEST IN PROGRESS" LED.





### **CROSS REFERENCE GUIDE**

The following cross reference charts will be helpful in determining what the part number on your DRAM actually means. There is very little in the way of an industry standard for the part numbers or the access time codes. As a matter of fact, there are several instances of lack of uniformity even within a single manufacturer of DRAMs.

This guide lists many of the most common DRAMs that have been, or soon will be, available. The format of the guide does allow for it to be easily updated and expanded by the user. When adding more part numbers to the guide, the user should carefully check that the new part is pin for pin, and functionally, compatible with the other parts listed.

DRAM SIZE: 16k (+12,+5,-5VDC only) COMMON DESIGNATION: 4116

MANUFACTURER

ACCESS TIME

	100ns	120ns	150ns	200ns	250ns	300ns
AMD			AM9016F	AM9016E	AM9016D	AM9016C
AT & T				2221	Trans.	<u> </u>
FAIRCHILD			F16K=2	F16K-3	F16K=4	8
				F4116-3	F4116-4	20
UJITSU			MB8116H	MB8116E	MB8116N	
HITACHI			HM4716A-2	HM4716-3	HM4716-4	- 10
HYUNDAI				1111111	28 6 3 8 8	0
INMOS				0 4 8 9 4 8 8	485568	-8
INTEL			P2117-2	P2117-3	P2117-4	
ITT			ITT4116-2	ITT4116-3	ITT4116-4	

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MITSUBISHI			M5K4116P-2	M5K4116P=3		
MOSTEK			MK4116=2	MK4116-3/-83/-93	MK4116-4/-84/-94	
MOTOROLA	Market Market	9636-0-1-1 9636-0-1	MCM4116B-15	MCM4116B-20	MCM4116B-25	MCM4116B-30
NATIONAL		MM5 2 9 0 = 1	MM5290-2	MM5290=3	MM5 2 9 0 = 4	
NEC	90111-1	uPD416-5	uPD416=3	uPD416-2	uPD416-1	uPD416
OKI	HR0 / 19V-2	10000100-0		MSM3716-3		
PANASONIC	M88117,8118-10	MB01/7,1118-13				
SAMSUNG						
SGS			M4116			
SIEMENS			HYB4116-P2	HYB4116-3/-P3	HYB4116-4	
SIGNETICS	19000	15848	2690-2	2690-3	2690-4	1.00
T.I.			TMS4118-15	TMS4116-20	TMS4116-25	
TOSHIBA			TMM4 1 6 = 2	TMM4 1 6 = 3	TMM4 1 6 = 4	
TRISTAR			CHANDA DESTRUMPTIONS	3.110		

DRAM SIZE: 16k (+5 only) COMMON DESIGNATION: 2118

MANUFACTURER ACCESS TIME 100ns 120ns 150ns 200ns 250ns 300ns AMD AT & T FAIRCHILD FUJITSU MB8117,8118-10 MB8117,8118-12 HITACHI HM8418A-3 HM8416A-4 HYUNDAI INMOS INTEL 2118-4 2118-7 ITT MICRONTECH MITSUBISHI MOSTEK MK4516-10 MK4518-12 MK4518-15 MKB4516-81 MKB4516-80 MOTOROLA MCM4517-10 MCM4517-12 MCM4517-15 MCM4517-20 MCM6665C-12 MCM6665C-15 NATIONAL NEC uPD2118-3 OKI PANASONIC SAMSUNG SGS SIEMENS SIGNETICS T.I. TOSHIBA

DRAM SIZE: 64k

COMMON DESIGNATION: 4164

MANUFACTURER

ACCESS TIME

	100ns	120ns	150ns	200ns	250ns	300ns
MITTER LICE				200113	230115	30008
AMD	AM9064-10	AM9064-12	AM9064-15			
CIENENS						
AT & T						
FAIRCHILD		F64K-12	FRAV. 15			
		104K-12	F64K-15	F84K-20		
UJITSU	MDDDDD OF OOL 10			F4164-20		
	MB8264,65,66A-10	MB8264,65,66A-12	MB8264,65,66A-15	MB8264,65-20		
HITACHI	roll 1 1 6 6 m 3	HM4864-1	HM4864-2	HM4864=3		
-		HM4864A,65A-12	HM4864A,65A-15	HM5864A, 65A-20		
HYUNDAI						
den .	0.03118-5					
INMOS	IMS2600-10	IMS2600-12	IMS2600-15			
DENT TOMET			1102000 10			
INTEL		MENNEYRC-1X	2164A-15	2164A-20		
on inverse						
ITT			H20017-15	MORRETZ-20		
edaturis:	1004010-10					
MICRONTECH		MT4284-12			18091010-00	19(0)(0)(0)(0)
		1111204-12	MT4284-15	MT4254=20		

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MITSUBISHI		M5K4164-12	M5K4164-15	M5K4184-20	
MOSTEK	MK45H64-10	MK45H64-12/-81	MK4564-15/-82/-92	MK4564-20/-83	MK4584-25/-84
MOTOROLA		MCM6665B-12	MCM6665A-15/B-15	MCM6685A-20/B-20	
NATIONAL		NMC4164-12	NMC4164-15	NMC4164-20	
NEC	uPD4164-2	uPD4164-12	uPD4164-15/-3	uPD4164-0/-20	uPD4164-1
OKI		MSM3764-12	MSM3764-15	MSM3764-20	
PANASONIC			MN4164-15	MN4164-20	
SAMSUNG					
sgs					
SIEMENS			HYB4164-2	HYB4164-3	
SIGNETICS	18848	1 1000	14800		
T.I.		TMS4164-12	TMS4164-15	TMS4164-20	TMS4184-25
TOSHIBA		TMM4 1 6 4 - 2	TMM4164-3	TMM4164-4	
TRISTAR		KM4164A-12	KM4184A-15	KM4164A-20	

DRAM SIZE: 128K (PIGGYBACK) COMMON DESIGNATION: 41128

MANU		

твт	00ns	120ns				
твт	00115	120115	150ns	200ns	250ns	300ns
ТВТ			Tours	20005	25005	300118
de fil						
de la companya de la		GODEN-15 -	RESTRICT	HARRIES-S		
AIRCHILD						
AIRCHILD						
LITTOLI						
JJITSU						
ITACHI				HM48128P=2		
				111101201 2		
YUNDAI						
PACELLES.	-5	60e104-15	PhDE108-104-9	(B)(00/10/10/100	0501101-1	
NMOS .						
WILDHIN		indelse-18	Michigal I.	10034104-30		
NTEL						
TT		CH10535-12	Partition Investigation	10mm 10 ct - 50 (9-3)		
COLEX MINDE						
ICRONTECH		NAME OF TAXABLE	- 10 - 10 - 10 - 10 - 10 - 10 - 10 - 10	THE REPLY OF THE	10C4244-257-44	
MITSUBISHI		mierzze, 252-11	Mineralas, 227-18	MLH4231,257-21		
NTOKOHLEON		NL1528-12	ACT 1250-15	HL1370-37		
MOSTEK			MK4128-15	MK4128-20	MK4128-25	
MOTOROLA			APPLICATION OF THE PERSON OF T	MOMES 1201 20		
MOTOROLA				MCM66128L20		
NATIONAL						
198408						
NEC		uP391286, 207-15	18 18 18 18 18 18 18 18 18 18 18 18 18 1	water and a factor		
BANNOVI						
OKI						
HILMORIE		WEST 256 2087-12	MR CS 24 (2006-12	19171012511191234		
PANASONIC						
	81583-10	ER 1958, 252-12	MB01330,353-15	1001250,357-20		
SAMSLING						
SAMSUNG						
PAIRCHILD						
SGS						
SGS						
SGS						
SGS SIEMENS BIGNETICS	1000	1,200A	12.000	Silone	12018	3000 W
SGS	7.000 0.000 25.71-16	12008	TMS41128-15	TMS41128-20	(2018	Section #
SIEMENS BIGNETICS	7 (7 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1 (1	1300W	TMS41128-15	TMS41128-20	13648	3000 H

DRAM SIZE: 256k

COMMON DESIGNATION: 41256

MANUFACTURER

ACCESS TIME

	100ns	120ns	150ns	200ns	250ns	300ns
BIOMETTON					200113	300118
AMD						
SIEVEND						
AT & T						
FAIRCHILD						
EHWEIWAG						
FUJITSU	MB81256,257-10	MD010F0 OFF 10				
001100	MD01230,237-10	MB81256,257-12	MB81256,257-15	MB81256,257-20		
HITACHI						
		HM50256,257-12	HM50256,257-15	HM50256,257-20		
I BA II III						
HYUNDAI						
NEO						
INMOS						
NATIONAL						
INTEL						
MOTOROLA						
ITT						
HOSTEK						
MICRONTECH		MT1256-12			M63(126-35	
MITEUBIEHL		1117200-12	MT1256-15	MT1256-20		

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MITSUBISHI		M5M4256,257-12	M5M4258,257-15	M5M4258,257-20	
MOSTEK		MK4556-12	MK4556-15	MK4556-20	
MOTOROLA	MCM6256-10	MCM6256-12	MCM6256-15	MCM6256-20	
NATIONAL					
NEC		uPD41256,257-12	uPD41256,257-15	uPD41258,257-20	
OKI	MSM41256-10	MSM41256-12	MSM41256-15		
HYTACHI		MSM37256-12	MSM37256-15	MSM37256-20	
PANASONIC			M0011000-19		
SAMSUNG					
SGS					
M D I					
SIEMENS					
SIGNETICS					
	16808				
т. і.	TMS4256,257-10	TMS4256,257-12	TMS4258,257-15	TMS4258,257-20	
TOSHIBA	TORRESTED DE LA	TMM41256-12	TMM41256-15	TMM41256-20	
TRISTAR		. 029	BINE:   Namedil		

DRAM SIZE: 1 Megabit

COMMON DESIGNATION: 411000

MANUFACTURER						
			ACCESS TIME			
	00ns	120ns	150ns	200ns	250	200
POLYBROA				200118	250ns	300ns
4D						
' 6 Т	-		M411024-15			
98			M411024-15			
IRCHILD						
JITSU	237-10. 0	10 10 11	MB811000-15			
TARUM						
TACHI		BMA1255-17 BMS7866-12-14	MENGALD PROPERTY.	e massanak		
'UNDAI			W2Wp1399-12			
		E1-105,0051FO	WPD41256,297-15	MID#1286,217-20		
IMOS						
ITEL					,	
STOROLA HCHOTES-	10 kg	MB256-12	NON6256-15			
T						
CRONTECH		0.224-12	MT1250-15	HK4558+20		
ROSTONI						
222222	5555		22222	0000000	000000	99999
222222	0000	00000	00000	000000	333333	
мітѕивізні	0000		33333			55555
мітѕивізні	0000	00000	00000			
MITSUBISHI MOSTEK	0000	00000	00000			
MITSUBISHI MOSTEK MOTOROLA	0000	00000	00000			
MITSUBISHI MOSTEK MOTOROLA	0000	00000	00000			
MITSUBISHI MOSTEK MOTOROLA NATIONAL	0000	00000	00000			
MITSUBISHI MOSTEK MOTOROLA NATIONAL	0000	00000	33333			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC		00000	33333			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC			D411000D,01D			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC  OKI  PANASONIC			D411000D,01D			
MITSUBISHI MOSTEK MOTOROLA NATIONAL NEC OKI PANASONIC			D411000D,01D			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC  OKI  PANASONIC  SAMSUNG			D411000D,01D			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC  OKI  PANASONIC  SAMSUNG			D411000D,01D			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC  OKI  PANASONIC  SAMSUNG			D411000D,01D			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC  OKI  PANASONIC  SAMSUNG  GGS			D411000D,01D			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC  OKI  PANASONIC  SAMSUNG  GGS  SIEMENS  IGNETICS			D411000D,01D			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC  OKI  PANASONIC  SAMSUNG  GGS  SIEMENS  LIGNETICS			D411000D,01D			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC  OKI  PANASONIC  SAMSUNG  GGS  BIEMENS  LIGNETICS			D411000D,01D			

DRAM SIZE: 16k x 4 bit COMMON DESIGNATION: 4416

MANUFACTUR	ER		ACCESS TIME			
	100ns	120ns	150ns	200ns	250ns	300ns
AMD						
AMD						
AT & T						
AIRCHILD						
owania						
UJITSU	MB81416-10	MB81416-12	MB81416-15			
ITACHI		HM48416A-12	HM48416A-15	HM48416A-20		
YUNDAI						
			DATTERDO, UTD			
NMOS						
INTEL						
INIEL						
TT						
WEIGHTE						
2222	22222	000000	000000	00000000	000000	200000
MITSUBISHI		M5M4416-12	M5M4416-15	Pd. #018-50		
MOSTEK						
MOTOROLA						
NATIONAL						
NEC						
OKI		HM20464, 483-12	1003101,435-13	2005030V, <08-70		
PANASONIC			mina			
SAMSUNG						
968						

SIGNETICS

SIEMENS

T.I.

TMS4416-12 TMS4416-15 TMS4416-20 TMS4416-25

TOSHIBA

DRAM SIZE: 64k x 4 bit COMMON DESIGNATION: 4464

		ACCESS TIME			
100ns	120ns	150ns	200ns	250ns	300ns
AMD					
AT & T					
FAIRCHILD					
UJITSU		MB81464			
ITACHI	HM50464,465-12	HM40464,465-15	HM50464,465-20		
YUNDAI					
INMOS					
INTEL					
TT					
MICRONTECH	MT4064-12	MT4064-15	MT4064-20		
2222222	0000000	333333	000000		00000
мітѕивізні	,,,,,,,,	333333	300000	0000000	00000
MITSUBISHI	M5M4464P-12	M5M4464P-15	300000		00000
000000000	,,,,,,,,	333333	000000		00000
MITSUBISHI	,,,,,,,,	333333			00000
MITSUBISHI  MOSTEK	,,,,,,,,	333333			00000
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL	,,,,,,,,	333333	uPD41254-20		00000
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC	,,,,,,,,	M5M4464P-15			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL	,,,,,,,,	M5M4464P-15			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC	,,,,,,,,	M5M4464P-15			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC  OKI  PANASONIC	,,,,,,,,	M5M4464P-15			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC  OKI  PANASONIC  SAMSUNG	,,,,,,,,	M5M4464P-15			
MITSUBISHI  MOSTEK  MOTOROLA  NATIONAL  NEC  OKI  PANASONIC  SAMSUNG  SGS	,,,,,,,,	M5M4464P-15			

TMM41464P-15

TOSHIBA

DRAM SIZE: 256k x 4 bit COMMON DESIGNATION: 44256

MANL		

ACCESS TIME

	100ns	120ns	150ns	200ns	250ns	300ns
MD						
твт			M441024-15			
AIRCHILD						
JJITSU			MALCON TO SERVICE STREET			
TACHI		900101,165-12	000000000000000000000000000000000000000	(CARCO 7/4-10		
YUNDAI						
NMOS .			uPDX1254+15	(460k) 264-20		
NTEL						
тт						
ICRONTECH		CS(14-12				
MITSUBISHI	ING TEMPERATU			(receils)		
MOSTEK	ing and speed rela- lary retention (RE)	FRESH)		3 100 13 115		
MOTOROLA	n and shorted inpu	uts				
NATIONAL	DETECTION					
NEC				DIMENSIONS: 8.68 M. x 2.79	In. X 17.08 in. 70.87 mm x 439.83	1 (0.01)
		extended (esting of	DBW	DIMENSIONS:	n x 17 08 in 10.87 mm x 435.85	( mar)
				Input frequency	190 YAC 16 260 VA 7 - 47 HZ 15 450 HZ	( autr)
OKI PANASONIC	five times each	with all data notice		Input frequency	7 - 47 Hz to 450 Hz	C OC OC
OKI PANASONIC SAMSUNG	ned Checkerboard udoranacm ned pseudorandon nel: Tests DRAMa five times each	n with all data some		Input voitage - input frequency	190 YAC 16 260 VA 7 - 47 HZ 15 450 HZ	ST seconds
OKI PANASONIC SAMSUNG	opic zeroes operational ned Checkerboard oderendom ned pseudorandom nel: Tasts DRAMs five times each	n with all data some		POWER: Input vorage - Input frequency	95 VAC to 130 VA 190 VAC to 260 VA 7 - 47 Hz to 450 Hz	C 94
OKI PANASONIC SAMSUNG	ned Checkerhoerd  yourshacm  ried pseudorandon  nel: Tasta DRAMa  five times each	n with all data new		POWER: Input voitege - Riput frequency	95 VAC to 130 VA 190 VAC to 280 VA 1-47 M2 to 450 M2	21 seconds
PANASONIC SAMSUNG SGS SIEMENS	ogic zeroes ogic zeroes ownbored ned Checkerboerd odorendorn net Tests DBAMs five times each	n all data some		1 Meg	12.0 seconds 0.8 seconds 0.8 seconds 85 VAC to 130 VA 190 VAC to 280 VA 190 VAC to 280 VA 190 VAC to 450 Hz	2.75 minutes 81 seconds
PANASONIC  SAMSUNG  SGS  SIEMENS  SIGNETICS	TTERNS: TTERNS: Type ones Ogic zeroes Inchouse I	200ns, 250ns, 300		1 Meg	1. 6.2 seconds 1. 5 seconds 2. 0 seconds 12.0 seconds .0.8 seconds .0.8 seconds .0.9 vAC to 130 VA 190 VAC to 260 VA 191 VAC to 260 VA	21 seconds 2.75 minutes 21 seconds
PANASONIC  SAMSUNG  SGS  SIEMENS  SIGNETICS	TERNS: TERNS: TOTAL MONEY (ACTIONS) TOTAL MO	NS: 200ns, 250ns, 300	lins	18K 128K 128K 1 Meg 1 Me	1. 6.2 seconds 1. 5 seconds 2. 0 seconds 12.0 seconds .0.8 seconds .0.8 seconds .0.9 vAC to 130 VA 190 VAC to 260 VA 191 VAC to 260 VA	S accords 21 seconds 2.75 minutes 21 seconds

### SPECIFICATIONS \*

### DRAM TYPES:

16K(+5, +12, -5VDC), 16K(+5VDC), 128K(piggyback), 256K, 1 Megabit, 16K x 4, 64K x 4, 256K x 4

### ACCESS TIME SELECTIONS:

100ns, 120ns, 150ns, 200ns, 250ns, 300ns REFRESH (long cycle)

### DATA PATTERNS:

All logic ones
All logic zeroes
Checkerboard

Inverted Checkerboard

Pseudorandom
Inverted pseudorandom

### MODES:

Normal: Tests DRAMs with all data patterns, five times each.

Continuous: Allows for extended testing of DRAM.

### ERROR DETECTION:

Single bit data errors
Open and shorted inputs
Timing and speed related errors
Memory retention (REFRESH)

### OPERATING TEMPERATURE:

+32° to +100°F

### TEST TIMES:

Test times will vary depending on the size of DRAM being tested and the access time at which it is being tested. Typical test times with "150ns" or "REFRESH" selected are:

				50ns	REFRESH
16K			. 0.2 s	econds	5 seconds
64K					21 seconds
128K .			. 1.5 s	econds	21 seconds
256K .					42 seconds
1 Meg .					2.75 minutes
16K x 4			. 0.2 s	econds	5 seconds
64K x 4					21 seconds
256K x 4					42 seconds

### POWER:

Input voltage - 95 VAC to 130 VAC or 190 VAC to 260 VAC Input frequency - 47 Hz to 450 Hz

### DIMENSIONS:

8.68 in. x 2.79 in. x 17.08 in. (220.47 mm. x 70.87 mm. x 433.83 mm.)

### WEIGHT:

3 lbs., 12 oz. (1.7 kg.)

\* Subject to change without notice.

