# EMC

## TEST REPORT

REPORT NO. : F89080704
MODEL NO. : MX2120, 9005
DATE OF TEST : Aug. 9, 2000

PREPARED FOR: BEHAVIOR TECH COMPUTER CORP.

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PREPARED BY: ADVANCE DATA TECHNOLOGY CORPORATION

Accredited Laboratory

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# TABLE OF CONTENTS

# 1. CERTIFICATION

Issue Date: Aug. 10, 2000

| | | |
|---|---|---|
| Product | : | KEYBOARD |
| Trade Name | : | MEMOREX, BTC |
| Model No. | : | MX2120, 9005 |
| Applicant | : | BEHAVIOR TECH COMPUTER CORP. |
| Standard | : | FCC Part 15, Subpart B, Class B<br>CISPR 22:1993+A1: 1995+A2: 1996, Class B<br>ANSI C63.4-1992 |

We hereby certify that one sample of the designation has been tested in our facility on Aug. 9, 2000. The test record, data evaluation and Equipment Under Test (EUT) configurations represent herein are true and accurate representation of the measurements of the sample's EMC characteristics under the conditions herein specified.

The test results show that the EUT as described in this report is in compliance with the Class B limits of conducted and radiated emission of applicable standards.

TESTED BY : Kent Chen , DATE: 8/10/2000
( Kent Chen )

CHECKED BY : Yemmy Soong , DATE: 8/10/2000
( Yemmy Soong )

APPROVED BY : Mike Su , DATE: 8/10/2000
( Mike Su )

**ADVANCE DATA TECHNOLOGY CORPORATION**

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# 2. GENERAL INFORMATION

## 2.1 GENERAL DESCRIPTION OF EUT

| | | |
|---|---|---|
| Product | : | KEYBOARD |
| Model No. | : | MX2120, 9005 |
| Power Supply | : | DC 5V (from PC) |
| Data Cable | : | Non-shielded (1.5 m) |

Note: The EUT has two model names: MX2120 and 9005, which are identical to each other except their brand name only, as the following:

- Model: MX2120, brand: MEMOREX
- Model: 9005, brand: BTC

From the above models, model: MX2120 was selected as the representative for the test and its data is recorded in this report.

For more detailed features description, please refer to manufacturer's specification or User's Manual.

## 2.2 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories are used to form representative test configuration during the tests.

| No | Product | Brand | Model No. | FCC ID. | I/O Cable |
|---|---|---|---|---|---|
| 1. | PERSONAL COMPUTER | IBM | 2187-12W | FCC DoC Approved | Nonshielded Power (1.8m) |
| 2. | MONITOR | HP | D2846A | BEJCB910 | Shielded Signal (1.8m)<br>Nonshielded Power (1.8m) |
| 3. | PRINTER | HP | 2225C | BS46XU2225 | Shielded Signal (1.2m)<br>Nonshielded Power (1.8m) |
| 4. | MODEM | ACEEX | 1414 | IFAXDM1414 | Shielded Signal (1.2m)<br>Nonshielded Power (1.9m) |
| 5. | MOUSE | LOGTECH | M-S43 | DZL211106 | Shielded Signal (1.6m) |
| 6. | SPEAKER | J-S | J-008 | NA | Nonshielded Signal (1.1m) |

## 2.3 TEST METHODOLOGY AND CONFIGURATION

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 1992. Radiated testing was performed at an antenna to EUT distance of 10 m on an open area test site.

Please refer to the photos of test configuration in Item 5.

# 3. TEST INSTRUMENTS

## 3.1 TEST INSTRUMENTS (EMISSION)

**CONDUCTED EMISSION MEASUREMENT**

| Description & Manufacturer | Model No. | Serial No. | Calibrated Until |
|---|---|---|---|
| ROHDE & SCHWARZ Test Receiver | ESHS30 | 828109/007 | July 6, 2001 |
| ROHDE & SCHWARZ Artificial Mains Network | ESH3-Z5 | 839135/006 | July 9, 2001 |
| ROHDE & SCHWARZ 4-wire ISN | ENY41 | 835154/007 | Apr. 26, 2001 |
| EMCO-L.I.S.N. | 3825/2 | 9204-1964 | July 9, 2001 |
| Shielded Room | Site 2 | ADT-C02 | NA |

Note: 1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.

**RADIATED EMISSION MEASUREMENT**

| Description & Manufacturer | Model No. | Serial No. | Calibrated Until |
|---|---|---|---|
| HP Spectrum Analyzer | 8594A | 3144A00308 | Aug. 19, 2000 |
| HP Preamplifier | 8447D | 2944A08119 | Jan 11, 2001 |
| HP Preamplifier | 8347A | 3307A01088 | Aug. 30, 2000 |
| HP Preamplifier | 8449B | 3008A01201 | Dec. 14, 2000 |
| ROHDE & SCHWARZ TEST RECEIVER | ESVP | 893496/030 | July 10, 2001 |
| SCHWARZBECK Tunable Dipole Antenna | VHA 9103<br>UHA 9105 | E101051<br>E101055 | Nov. 23, 2000 |
| ROHDE & SCHWARZ TEST RECEIVER | ESMI | 839013/007<br>839379/002 | Aug. 30, 2000 |
| CHASE Bilog Antenna | CBL6112A | 2329 | Sept. 19, 2000 |
| EMCO Double Ridged Guide Antenna | 3115 | 9312-4192 | March 29, 2001 |
| EMCO Turn Table | 1060 | 1195 | NA |
| EMCO Tower | 1051 | 1163 | NA |
| Open Field Test Site | Site 2 | ADT-R02 | Sept. 10, 2000 |

Note: 1. The measurement uncertainty is less than +/- 3.0dB, which is calculated as per NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.

## 3.2 LIMITS OF CONDUCTED AND RADIATED EMISSION

### LIMIT OF RADIATED EMISSION OF CISPR 22

| FREQUENCY (MHz) | Class A (at 10m) * dBuV/m | Class B (at 10m) * dBuV/m |
|---|---|---|
| 30 - 230 | 40 | 30 |
| 230 - 1000 | 47 | 37 |

* Detector Function: Quasi-Peak

### LIMIT OF RADIATED EMISSION OF FCC PART 15, SUBPART B FOR FREQUENCY ABOVE 1000 MHz

| FREQUENCY (MHz) | Class A (dBuV/m) (at 3m) | | Class B (dBuV/m) (at 3m) | |
|---|---|---|---|---|
| | Peak | Average | Peak | Average |
| Above 1000 | 80.0 | 60.0 | 74.0 | 54.0 |

Note: (1) The lower limit shall apply at the transition frequencies.
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).
(3) All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### LIMIT OF CONDUCTED EMISSION OF CISPR 22

| FREQUENCY (MHz) | Class A (dBuV) | | Class B (dBuV) | |
|---|---|---|---|---|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.15 - 0.5 | 79 | 66 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 73 | 60 | 56 | 46 |
| 5.0 - 30.0 | 73 | 60 | 60 | 50 |

Note: (1) The lower limit shall apply at the transition frequencies.
(2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz
(3) All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

# 4. TEST RESULTS (EMISSION)

## 4.1 RADIO DISTURBANCE

| | | |
|---|---|---|
| Frequency Range | : | 0.15 - 30 MHz (Conducted Emission)<br>30 - 1000 MHz (Radiated Emission) |
| Input Voltage | : | 120 Vac, 60 Hz (from PC) |
| Temperature | : | 25 degree C |
| Humidity | : | 65 % |
| Atmospheric Pressure | : | 1000 mbar |

| TEST RESULT | Remarks |
|---|---|
| PASS | Minimum passing margin of conducted emission: -2.8 dB at 0.204 MHz<br>Minimum passing margin of radiated emission:-3.1 dB at 38.28 MHz |

## 4.2 EUT OPERATION CONDITION

1. Turn on the power of all equipment.
2. PC reads a test program to enable all functions.
3. PC reads and writes messages from FDD and HDD.
4. EUT sends “H” character to PC.
5. PC sends "H" messages to monitor and monitor displays "H" patterns on screen.
6. PC sends "H" messages to modem.
7. PC sends "H" messages to printer, and the printer prints them on paper.
8. PC sends audio messages to speaker.
9. Repeat steps 3-9.

## 4.3 TEST DATA OF CONDUCTED EMISSION

EUT: **KEYBOARD** MODEL: **MX2120**

6 dB Bandwidth: 10 kHz PHASE: LINE (L)

| Freq. [MHz] | Corr. Factor (dB) | Reading Value [dB (uV)] | | Emission Level [dB (uV)] | | Limit [dB (uV)] | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 0.204 | 0.2 | 53.8 | 50.4 | 54.0 | 50.6 | 63.4 | 53.4 | -9.4 | -2.8 |
| 0.412 | 0.2 | 44.9 | - | 45.1 | - | 57.6 | 47.6 | -12.5 | - |
| 0.517 | 0.2 | 40.3 | - | 40.5 | - | 56.0 | 46.0 | -15.5 | - |
| 0.927 | 0.2 | 37.4 | - | 37.6 | - | 56.0 | 46.0 | -18.4 | - |
| 13.804 | 0.8 | 29.1 | - | 29.9 | - | 60.0 | 50.0 | -30.1 | - |
| 22.248 | 1.2 | 26.5 | - | 27.7 | - | 60.0 | 50.0 | -32.3 | - |

Remarks:
1. "*": Undetectable
2. Q.P. and AV. are abbreviations of quasi-peak and average individually.
3. "-": The Quasi-peak emission level also meets average limit and measurement with the average detector is unnecessary.
4. The emission levels of other frequencies were very low against the limit.
5. Margin value = Emission level - Limit value
6. Emission Level = Correction Factor + Reading Value.

## TEST DATA OF CONDUCTED EMISSION

EUT: **KEYBOARD** MODEL: **MX2120**

6 dB Bandwidth: 10 kHz PHASE: NEUTRAL (N)

| Freq. [MHz] | Corr. Factor (dB) | Reading Value [dB (uV)] | | Emission Level [dB (uV)] | | Limit [dB (uV)] | | Margin (dB) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 0.204 | 0.2 | 50.7 | - | 50.9 | - | 63.4 | 53.4 | -12.5 | - |
| 0.412 | 0.2 | 47.3 | - | 47.5 | - | 57.6 | 47.6 | -10.1 | - |
| 0.517 | 0.2 | 42.2 | - | 42.4 | - | 56.0 | 46.0 | -13.6 | - |
| 0.927 | 0.2 | 36.8 | - | 37.0 | - | 56.0 | 46.0 | -19.0 | - |
| 13.804 | 0.7 | 28.7 | - | 29.4 | - | 60.0 | 50.0 | -30.6 | - |
| 22.248 | 1.1 | 29.8 | - | 30.9 | - | 60.0 | 50.0 | -29.1 | - |

Remarks:
1. "*": Undetectable
2. Q.P. and AV. are abbreviations of quasi-peak and average individually.
3. "-": The Quasi-peak emission level also meets average limit and measurement with the average detector is unnecessary.
4. The emission levels of other frequencies were very low against the limit.
5. Margin value = Emission level - Limit value
6. Emission Level = Correction Factor + Reading Value.

## 4.4 TEST DATA OF RADIATED EMISSION

EUT: **KEYBOARD** MODEL: **MX2120**

ANT. POLARITY: Horizontal

DETECTOR FUNCTION: Quasi-peak 6 dB BANDWIDTH: 120 kHz

FREQUENCY RANGE: 30-1000 MHz MEASURED DISTANCE: 10 M

| Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) |
|---|---|---|---|---|---|---|---|
| 38.15 | 13.9 | 11.9 | 25.8 | 30.0 | -4.2 | 400 | 314 |
| 48.15 | 8.7 | 13.2 | 21.9 | 30.0 | -8.1 | 400 | 140 |
| 86.63 | 8.8 | 13.3 | 22.1 | 30.0 | -7.9 | 400 | 297 |
| 168.02 | 10.8 | 7.7 | 18.5 | 30.0 | -11.5 | 400 | 131 |
| 184.22 | 10.7 | 4.5 | 15.2 | 30.0 | -14.8 | 400 | 239 |
| 199.83 | 11.1 | 13.3 | 24.4 | 30.0 | -5.6 | 400 | 114 |
| 214.37 | 11.9 | 4.6 | 16.5 | 30.0 | -13.5 | 400 | 167 |
| 244.05 | 13.5 | 12.0 | 25.5 | 37.0 | -11.5 | 308 | 271 |

REMARKS:
1. Emission level (dBuV/m) = Correction Factor (dB) + Reading value (dBuV).
2. Correction Factor (dB) = Ant. Factor (dB)+Cable loss (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level - Limit value

# TEST DATA OF RADIATED EMISSION

EUT: **KEYBOARD** MODEL: **MX2120**

ANT. POLARITY: Vertical

DETECTOR FUNCTION: Quasi-peak 6 dB BANDWIDTH: 120 kHz

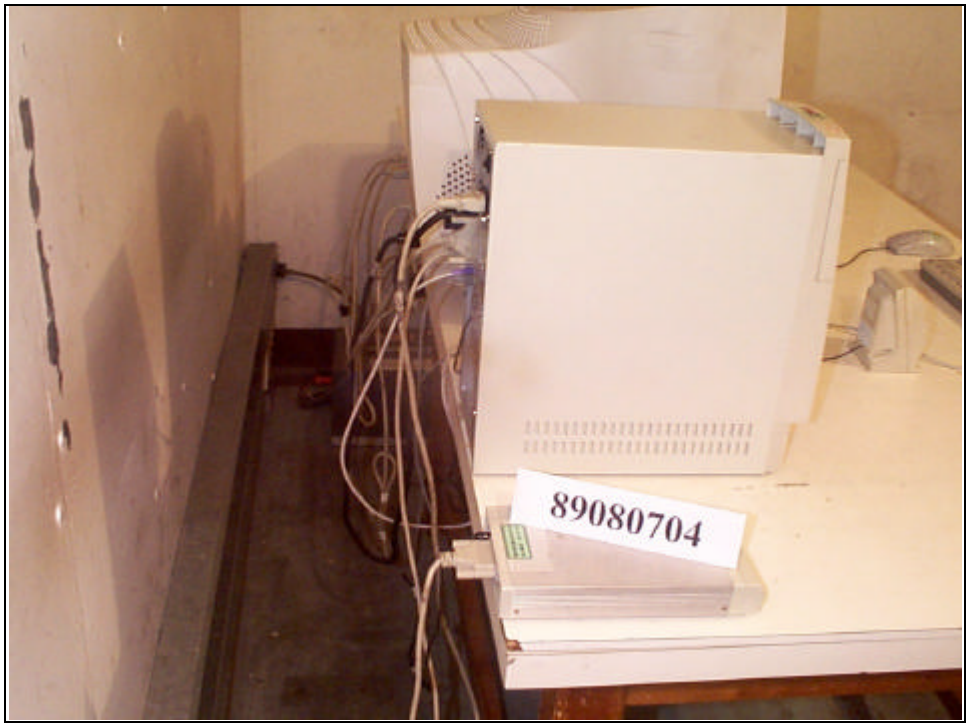
FREQUENCY RANGE: 30-1000 MHz MEASURED DISTANCE: 10 M

| Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) |
|---|---|---|---|---|---|---|---|
| 38.28 | 13.9 | 13.0 | 26.9 | 30.0 | -3.1 | 100 | 296 |
| 40.38 | 12.7 | 8.4 | 21.1 | 30.0 | -8.9 | 100 | 153 |
| 59.96 | 6.5 | 18.9 | 25.4 | 30.0 | -4.6 | 100 | 297 |
| 168.02 | 10.8 | 8.0 | 18.8 | 30.0 | -11.2 | 100 | 270 |
| 184.23 | 10.7 | 4.8 | 15.5 | 30.0 | -14.5 | 100 | 104 |
| 199.78 | 11.1 | 13.6 | 24.7 | 30.0 | -5.3 | 100 | 253 |
| 210.64 | 11.7 | 5.7 | 17.4 | 30.0 | -12.6 | 100 | 136 |
| 216.03 | 12.0 | 9.5 | 21.5 | 30.0 | -8.5 | 100 | 278 |
| 226.49 | 12.6 | 5.8 | 18.4 | 30.0 | -11.6 | 100 | 106 |

REMARKS:
1. Emission level (dBuV/m) = Correction Factor (dB) + Reading value (dBuV).
2. Correction Factor (dB) = Ant. Factor (dB)+Cable loss (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level - Limit value

## 5. PHOTOGRAPHS OF THE TEST CONFIGURATION WITH MINIMUM MARGIN

**CONDUCTED EMISSION TEST**

## RADIATED EMISSION TEST

# 6. APPENDIX - INFORMATION OF THE TESTING LABORATORY

## Information of the testing laboratory

We, ADT Corp., are founded in 1988, to provide our best service in EMC and Safety consultation. Our laboratory is accredited by the following approval agencies according to ISO/IEC Guide 25 or EN 45001:

| | |
|---|---|
| ● USA | FCC, UL, NVLAP |
| ● Germany | TUV Rheinland |
| | TUV Product Service |
| ● Japan | VCCI |
| ● New Zealand | RFS |
| ● Norway | NEMKO, DNV |
| ● U.K. | INCHCAPE |
| ● R.O.C. | BSMI |

Enclosed please find some certificates of our laboratory obtained from approval agencies. If you have any comments, please feel free to contact us with the following:

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