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Electromagnetic Compatibility (EMC) and Electrical Safety Test Report for Network Telecommunications Equipment

For

American Microsystems, AMERICAN MICROSYSTEMS' M6000

FCC PART 15, SUB-PART B, CLASS B and FCC part 15.249

Prepared For: American Microsystems

Prepared By: National Technical Systems
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This is to certify that the following report is true and correct to the best of my knowledge.

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EMI Operations Manager
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1.0 GENERAL INFORMATION

1.1 Product Description

The Model 6000 RF Barcode Reader (M6000) provides the user with the means of converting an undecoded laser, CCD, or wand into a wireless device. By allowing many types of input devices, this system provides users the ability to customize according their needs and is an affordable alternative to purchasing an integrated RF system. The M6000 has a superior range, up to 150 feet, providing users with an RF link to an IBM compatible PC.The RF host is used as a companion to the M6000, receiving the RF data and converting it into useable IBM compatible PC keyboard data. For an AT or PS/2 PC keyboard interface, the Model 6200 RF Host (M6200) is used. For a USB keyboard interface, the Model 6300 USB RF Host (M6300) is used. The M6000 can be custom configured using the M6000/M6200/M6300 Setup Menu Sheet to allow multiple independent users, as well as, other standard options that allow the equipment to be tailor-fitted for your individual data collection application. The M6000's simple but rugged construction allows for extended reliable operation. Once configured, simply connect a scanning device, push the ON button, and you are ready to scan. Every valid scan is confirmed with an audible beep. The M6000 automatically turns off power after a few minutes, so batteries are not wasted or accidentally discharged. Reliability, ease of use, and affordability make the M6000 system an excellent choice for wireless barcode data collection.

Hardware Detail:

Description	**Manufacture**	**Model Number**	**Serial Number**	**FCC I/D**
RF Barcode Reader	American Microsystems LTD	M6000	NTS1-revI	Not available
Bar code reader Pen	Hewlett Packard	HBCS-T305	3422S	B94cdrz
Personal Computer	Gateway 2000	NTS	NTS-Sample test	N/A

1.2 Instrument Calibration

All test instrumentation requiring calibration will be calibrated in accordance with ANSI Standard NCSL Z540-1. There will be a current calibration sticker attached to the item and traceability documentation will be provided at the customer's request.

1.2.1 Accuracy of Measurement

The expected accuracy of measurement shall be:

Frequency Accuracy: ± 2%
Amplitude Accuracy: ± 2 dB
Distance: ± 5%
Amplitude, Measurement System (includes measurement receivers, transducers, cables, etc): ± 3 dB
Time (waveforms): ± 5%

1.3 Ambient Tests

In the event that an out-of-tolerance interference condition arises, ambient measurements shall be made in the frequency range where out-of-tolerance condition is present. Ambient measurements shall be made with power applied to all equipment, with the exception of the system under test. This level shall be at least 6 dB below the specification limits of FCC Part 15.

1.4 Failure Reporting

In the event of a test item failure or a test anomaly, the following procedure will be followed:

1. The testing will be stopped.
2. The American Microsystems Program Manager or his designate will immediately be notified.
3. A Notice of Deviation (NOD) will be prepared.
4. The test item will be retained in the setup or in storage, as applicable, pending disposition from American Microsystems.
5. Testing will be resumed only on instructions (written, if practicable) of American Microsystems to the project engineer or test engineer.

1.5 Threshold of Susceptibility

When susceptibility indications are noted in test sample operation, the threshold level shall be determined where the susceptible condition is no longer present. The threshold level shall be determined as follows:

1. When a susceptibility condition is detected, reduce the signal level until the test sample recovers.
2. Gradually increase the signal level until the susceptibility condition reoccurs. The resulting level is the threshold of susceptibility, and that level shall be recorded.

1.6 Test Program Deviation

Unless otherwise directed by the responsible test witness, the tests described in the table summary page of this document may be performed in any sequence.

In the event that test plan deviations are required during the normal qualification test program, they shall be made only upon approval of the cognizant representative and that approval shall be noted in the test log with a complete description and justification for such deviations.

1.7 Inspection

All tests described herein may have been witnessed by the authorized representative(s) of American Microsystems. All testing will be performed by qualified test engineers/personnel.

1.8 Disposition of Test Items

The test sample was returned to American Microsystems upon completion of the test program.

1.9 Test Facility

Measurements for this report were taken at National Technical Systems, EMC Test Facility, 1701 East Plano Parkway Suit 150, Plano Texas, USA. At the time of testing, the EMC facility had the following accreditations, registrations, etc.:

- Compliance with the requirements of ISO/IEC Guide 25: 1990 (E).
- Compliance with the requirements of ISO 9000: 1997 (E).
- Compliance with the requirements NVLAP, VCCI, BSMI.
- Compliance with the radiated and AC line conducted test site criteria in ANSI C63.4-1992 as required by the Federal Communications Commission (FCC).

The EMC chamber has been qualified as one having performance characteristics suitable for testing to the requirements of IEC 1000-4-3;95, and the Open Area Test Site (OATS) has been qualified as one having performance characteristics suitable for testing as per CISPR, Part 16, and ANSI C63.4-1992.

2.0 GENERAL TEST METHODOLOGY

2.1 Emissions

Required emissions testing is performed in accordance with the respective measurement procedures listed on page 1. Specifics such as test locations will be listed in the appropriate data sections of this report.

Radiated measurements are made at an open area test site (OATS) with an antenna to AMERICAN MICROSYSTEMS' M6000 distance of 3m or 10m, as appropriate. The actual test distance will be listed in the respective test data sections. The applicable frequency spectrum is searched with a calibrated antenna system for RF emissions approaching the appropriate limits. "Maximization" of each suspect frequency is accomplished by a combination of a 360° azimuth search and varying the antenna to ground plane height from 1m to 4m, in both the vertical and horizontal polarizations. Final data was collected in the worst case configurations of the AMERICAN MICROSYSTEMS' M6000 with the highest emission levels. The six highest emission readings and the corresponding frequencies are listed in Appendix A. If necessary, radiated emissions over 1 GHz are maximized after first "aiming" the horn antennas using the "bore sight" method.

Other emissions tests will be performed in accordance with the appropriate measurement procedures listed in this report.

2.1.1 Radiated Emissions Field Strength Calculations

FS = RA + AF + CF - AG where: FS = field strength CF = cable attenuation factor
RA = receiver amplitude AG = amplifier gain

The receiver used for radiated emissions measurements performed the field strength calculations automatically. The program has resident AF and CF figures for individual antennas and cables.

2.2 Order of Testing

Testing normally proceeds from the least volatile to the most. As an example for "global" requirements the sequence typically would begin with conducted emissions, then radiated prescans in the semi-anechoic chamber, then OATS radiated emissions measurements. The actual order may vary due to tests conducted, scheduling and facility availability.

2.3 Special Test Justification

None

3.0 TEST CONFIGURATION

3.1 Selection of AMERICAN MICROSYSTEMS' M6000 Configuration and Modes of Operation

As per measurement procedures, **the worst-case test configuration and mode of operation was used for all testing**. Unless otherwise noted elsewhere in this report, this selection will apply to all testing. The selection process was based on previous investigative testing of the AMERICAN MICROSYSTEMS' M6000 system.
Worst case operating mode is described as "Operate." Other modes used will be listed in the respective data measurement sections when appropriate. Operating modes considered were all those available to the operator, including Standby.

3.2 Equipment Modifications

None

4.0 TEST INSTRUMENTATION

Instrument	Mfr.	Model	NTS Control No.	Cal Due
RADIATED EMISSIONS				
HP Spectrum Analyzer	HP	8566B	E100P	7/25/01
Quasi Peak Detector	HP	85650A	E1004P	7/25/01
Antenna	EST	3115	E3115P	11/07/01
HP Pre-Amp	HP	1040	E1008P	8/29/01
HP -Pream	HP	8449B	E1009F	02/25/01
Biconilog Antenna	ETS	94455-SP	SN: 0003-1500	3/14/01

5.0 EMISSIONS

The test procedures of Paragraph 2.1 were followed for these measurements. Conducted measurements were made in shielded enclosures. Radiated final measurements were made at the OATS facility described in Paragraph 2.0. All readings are quasi-peak unless otherwise stated and are listed in order of ascending delta. The original test data is contained in Master Job Folder A 0579, located at the National Technical Systems EMC Facility. Mode of operation is that listed under Paragraph 3.1, unless otherwise stated.

5.1 Radiated Emissions

5.1.1 Radiated Emissions Test Setup

Top View of Equipment Under Test

Back of AMERICAN MICROSYSTEMS' M6000

5.1.2 Radiated Measurement Data

Date of measurement: 11/11/00. Test Personnel: Scott Oates, EMC Technician
Radiated Emissions (CFR 47 FCC Subpart B Class B prorate to 10m distance from antenna)

Emission Freq. (MHZ)	Ant. Pol	Emission Level (dBuV)	Site Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Azi.	Hgt.	Margin
40.076	H	24.9	-6.8	18.1	29.5	0	3	-11.4
40.12	V	27.2	-8.7	18.5	29.5	0	1	-11
109	V	24.2	-8	16.2	33	0	1	-16.8
109.702	H	29.9	-8.6	21.3	33	0	3	-11.7
300	V	26.7	-6.1	20.6	35.5	0	1	-14.9
300.503	H	23.8	-6.3	17.5	35.5	0	3	-18
500	V	23.8	-1	22.8	35.5	0	1	-12.7
500.008	H	23.5	-1.4	22.1	35.5	0	3	-13.4
999.99	H	23.5	3.6	27.1	43.5	0	3	-16.4
999.99	V	23.5	4.5	28	43.5	0	1	-15.5

5.13 Radiated Measurement CFR 47 FCC part 15.249 Subpart C

Mode of Operation during emissions test: The diagnostic mode of the M6000 was set to continuously transmit random data. Note that this mode represents the worst case where data transmissions can last for periods greater than 100mS. This diagnostic mode was added specifically to simplify FCC Subpart C compliance testing.

This transmission method employs Manchester data encoding with an On/Off Keying (OOK) modulation method at the frequency 916.5 MHz. Due to the nature of this method, the duty cycle of the transmission waveform is by definition 50%, corresponding to a peak correction factor of -6 dB. The frequency tolerance of the transmitter is +- 200 KHz. The nominal power output of the transmitter is 0.25 mW.

Test Result for FCC 15.249

a) The field strength was measured at 3 meters distance between Equipment under test and measurement antenna.

b) Radiated outside specific frequency band were met FCC part 15 subpart B class B and Spurious frequency per FCC part 15 subpart C requirement.

c) Radiated emission was scan from 30 Mhz to 9.2Ghz.

Test requirement Field Strength of Emissions from Intentional Radiator

EUT name: American Microsystems M6000.
Reference to FCC part 15 subpart C, 15.249.
The fundamental frequency tuned at 916.58.

Duty Cycle: 50 % (due to modulation method per manufacture information)

The table lists the fundamental and harmonic emissions frequencies. The site correction factor includes: cable loss, antenna factor, and pre-amplifier. All measurements were taken with 1 MHz RBW and 1 MHz VBW. All readings are peak with the specific bandwidth. The duty-cycle correction factor is not required, as all peak measurements are below the FCC limits.

Ferq (Mhz)	Vert/hori	SA Reading (DBuV)	Correction Factor (dB)	Field Strength DbuV/m	Field Strength uV/m	FCC Limit 3m (uV/m)
916.522	V	52	22.9	74.9	5,559.04	50,000.00
916.522	H	50.6	22.9	73.5	4,731.51	50,000.00
1833.17	V	46.3	-6	40.3	103.51	500
1833.17	H	44.7	-6	38.7	86.10	500
2749	V	39.5	-3.2	36.3	65.31	500
2749	H	35.2	-3.2	32	39.81	500
3666	V	33.5	-1.1	32.4	41.69	500
3666	H	32.3	-1.1	31.2	36.31	500
4582	V	No signal	N/A	N/A	N/A	500
4582	H	No signal	N/A	N/A	N/A	500
5499	V	No signal	N/A	N/A	N/A	500
5499	H	No signal	N/A	N/A	N/A	500
6416	V	No signal	N/A	N/A	N/A	500
6416	H	No signal	N/A	N/A	N/A	500
7332	V	No signal	N/A	N/A	N/A	500
7332	H	No signal	N/A	N/A	N/A	500
8249	V	No signal	N/A	N/A	N/A	500
8249	H	No signal	N/A	N/A	N/A	500
9165	V	No signal	N/A	N/A	N/A	500
9165	H	No signal	N/A	N/A	N/A	500

Note that: The Equipment under test was power by 9VDC battery.