MEASUREMENT / TECHNICAL REPORT

CENTRAL DATA CORPORATION

UNIVERSAL SERIAL BUS, SERIAL PORT SERVER

MODEL USB-2+

FCC ID: NBS131

RF Emission Measurements Performed For Determination of Compliance with the US Code of Federal Regulations Title 47, Chapter I, FCC Part 15 Subpart B As Required for Certification for Unintentional Radiators

Issue Date: April 20, 1998

This report concerns: Original grant

Equipment type: Personal Computer Peripheral; Universal Serial Bus, Serial Port Server
Transition Rules per 15.37 are not requested.

Report Prepared by: _____

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Height 1.0 in.

1.5 Test Facility

The open area test site used to collect the radiated data is located on 8625 Helmar Road in Newark, Illinois. The open field test site has a metal ground screen. Details of the site characteristics are on file with the FCC. Conducted emission measurements and preliminary radiated emission scans were performed in shielded enclosure "B" at Radiometrics' Romeoville, Illinois EMI test lab. These sites have been fully described in a report and accepted by the FCC in a letter dated October 1, 1996 (31040/SIT 1300F2).

Conducted emission measurements were performed using an Electrometrics Model FCC/VDE 50/2 Line Impedance Stabilization Network (LISN) as the pick-up device. This device is constructed in accordance with the circuit diagram provided in Figure 3 of ANSI document C63.4-1992.

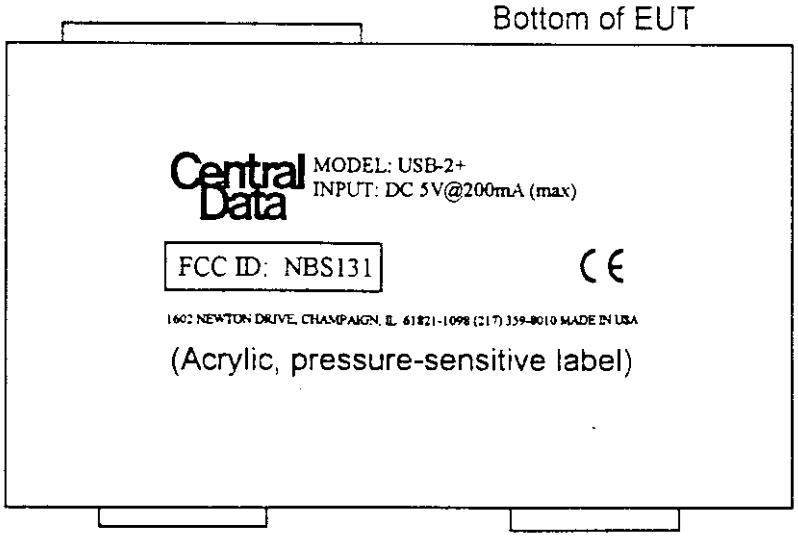
1.6 Test Equipment

Radiated emission measurements were performed with linearly polarized broadband antennas. The results obtained with these antennas can be correlated with results obtained with a tuned dipole antenna. When a radiated emission is detected approaching the specification limit, the measurement of the emission is repeated using a tuned dipole antenna with a Roberts Balun.

The emission measurements were performed with a spectrum analyzer measuring in quasi-peak mode. The bandwidths of the spectrum analyzers are adjusted to the correct bandwidths as specified by the FCC Rules. The bandwidth used from 450 kHz to 30 MHz is 9 or 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. In order to increase the sensitivity of the spectrum analyzer, a 20 dB preamplifier was used in the frequency range from 30 to 1000 MHz.

2.0 PRODUCT LABELING

Figure 2.1 Product Label and Placement



Location of FCC ID Label on EUT

1.3 Tested System Details

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) which have grants, are:

Model & Serial Number	FCC ID	Manufacturer & Description	Cable Descriptions
USB-2+ S/N: Prototype (EUT)	NBS131	Central Data Corp. USB Serial Port Server	2- RJ-45 to DB25 Serial Cables 2m, SH 1 USB Cable 2m, integral
M/N: LPMini Tower S/N: 8766183	DOC Label	Gateway 2000 Tower Computer	Power Cord 2m, US
M/N: 500-069CS S/N: 15025C042421	BEJCS592	Gateway 2000 VGA Monitor	Power Cord 2m, US Video Cable 1.8m, SH
P/N: 2196003-00-111 S/N: 50480939	D7J2196003-XX	Gateway 2000 Keyboard	1.5m, Integral
M/N: Intellimouse 1.1A S/N: 0791782	C3KKMP5	Serial Mouse P/S2	2m, Integral
M/N: Z15OL S/N: 510030137823	B6DZ15OL	Star Printer	Power Cord Integral Par. Cable w/ Metal Shells 2m, SH
M/N: Courier HST S/N:	CJE794FAST	USRobotics Printer	Power Cord Wall Transformer 2m, integral

1.4 Test Methodology

The test procedures used are in accordance with the ANSI document C63.4-1992, (July 17, 1992) "Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The specific procedures are described herein. Radiated testing was performed at an antenna to EUT distance of 3 meters.

3.0 SYSTEM TEST CONFIGURATION

3.1 Test System and Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). The EUT was externally connected to a personal computer via an integral USB cable. The following connections were made directly to the EUT:

A standard, shielded RJ-45 to RJ-45 cable with a DB 25 adapter was connected to a serial modem. The EUT side had a DB 9 adapter and was connected to the first serial port.

A standard, shielded RJ-45 to RJ-45 cable with a DB 9 adapter was connected to the second serial port of the EUT, while the other side was unterminated.

A standard, shielded DB 25 to printer cable was connected to the EUT with the printer connected to the other side of the cable.

The host computer system had a mouse connected to the mouse port via its integral data cable. A keyboard was connected to the system keyboard connector via its integral data cable.

3.2 EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was contained on the hard drive of the host computer. The program sequentially exercises each system component in turn. The following sequence was used: (1) 500 full lines of H's were printed on the computer monitor. The H's were also sent to the EUT which in turn sent the data to the serial and parallel devices. The cycle is repeated continuously. The software continuously fills the screens with capitol H's. No data was sent to the keyboard and mouse during the tests. This program ran until it was manually stopped at the end of each test.

3.3 Special Accessories

No special accessories were used during the tests in order to achieve compliance.

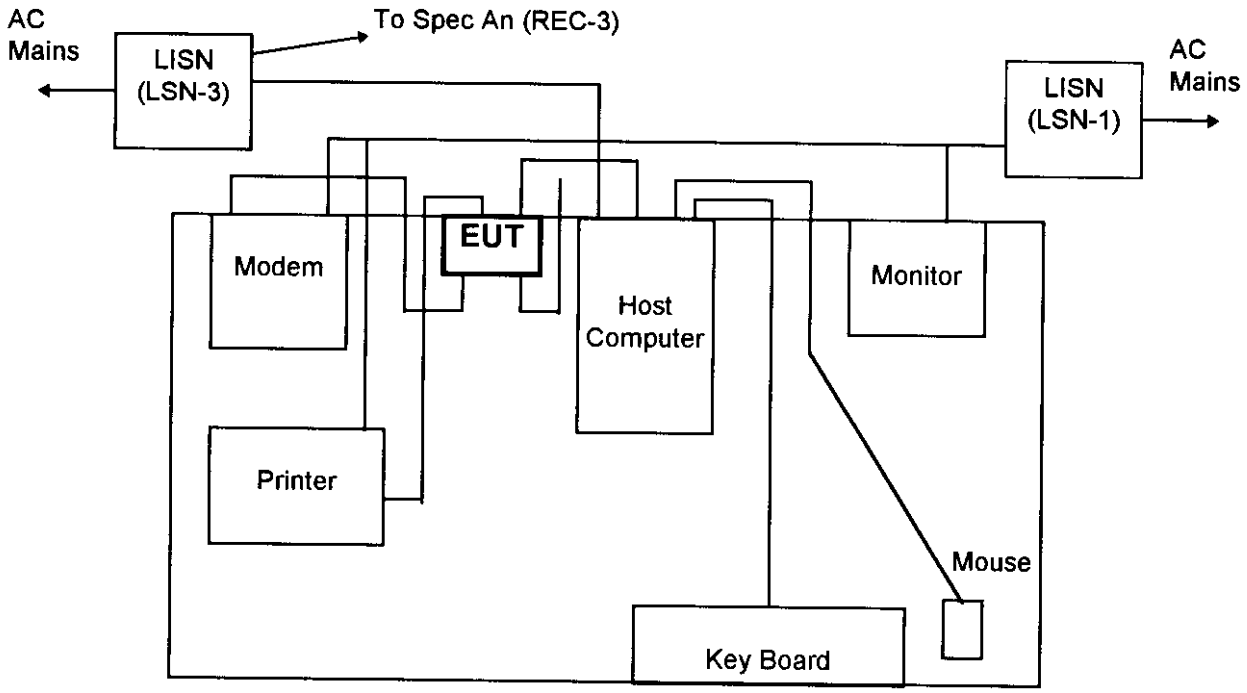
3.4 Equipment Modifications

No modifications to the EUT were made by Radiometrics Midwest Corp. prior to or during the testing in order to achieve compliance with Class B limits.

Figure 3.1 Configuration of Tested System

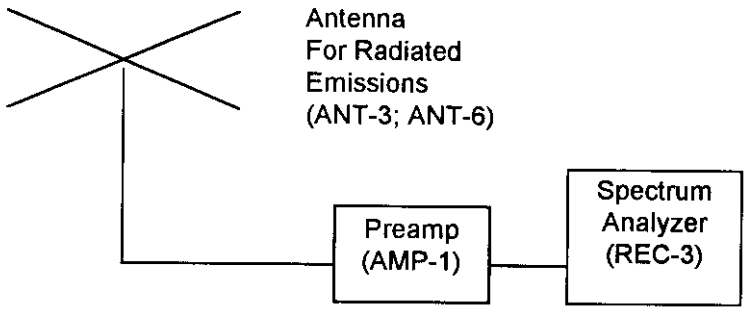
Conducted Emissions:
- LISN's at least 80 cm from EUT chassis
- Vertical conductive plane 40 cm from rear of table top
- EUT power cord bundled
- Test platform is not rotated

Radiated Emissions:
- LISN's not used
- AC outlet with low-pass filter at the base of the turntable
- No vertical conductive wall



Notes:
- Not to Scale
- Antenna height varied 1-4 mtrs
- Distance from antenna to tested system is 3 meters
- LISN=Line Impedance Stablization Network
- Devices 10cm away from each
- other

Rotating Platform:
1x1.5m surface above GND plane



1.0 GENERAL INFORMATION

1.1 Product Description

The USB Serial Port Server model USB-2+, referred to as EUT (Equipment Under Test) is a freestanding communication device with power supplied by the host machine and data passed back and forth with the host machine via the standard USB cable. The Intel 80930A USB microprocessor (runs on a 12 MHz crystal) handles all USB data transfer timing and passes the outbound data to the 16C552 three port communications controller (runs on a 7.3728 MHz crystal). The 16C553 drives two serial ports with a maximum rate of 230K baud. And it also drives a parallel port with a maximum data rate of 1 Mbytes. The I/O circuitry consists of appropriate drivers and receivers with TVS protection. In coming data moves in the opposite direction as described above.

The case of the EUT is all plastic with no shielding.

The physical characteristics of the EUT are:

Height	1.0 in.
Width	2.4 in.
Depth	4.0 in.
Weight	0.37 lbs

1.2 Related Submittals/Grants

Central Data Corporation is not submitting another device for FCC authorization simultaneously.

6.0 CONDUCTED EMISSION DATA

The initial step in collecting conducted data is a spectrum analyzer peak scan and the plotting of the measurement range. Significant peaks are then marked as shown on the following table, and these signals are then measured with the quasi-peak detector. The following represents the worst case emissions from the host computer (with EUT installed) power cord, after testing all modes of operation.

Line Tested	Freq. MHz	Measured* Strength of Signal dBuV	Limit dBuV	Margin Under Limit dB
Hot	0.4725	29.33	48.0	18.67
Hot	7.199	25.98	48.0	22.02
Hot	16.22	27.76	48.0	20.24
Neutral	0.4517	34.15	48.0	13.85
Neutral	3.106	21.11	48.0	26.89
Neutral	24.32	30.21	48.0	17.79

* All reading are quasi-peak with a 9 kHz bandwidth and no video filter. The cable losses are accounted for in these reading.

Judgment: Passed by 17.79 dB.

Test Personnel: _____ Date: 4/20/98

Jeffrey E. Tomes
Senior EMC Technician

7.0 RADIATED EMISSIONS DATA

The tables on the following page list the highest radiated emission frequencies, measured levels, antenna factors, correction factor (includes cable and preamp corrections), the corrected reading, the Class B limit, and margin under the FCC Class B limit. A sample calculation is given in paragraph 7.2.1.

Manufacturer : Central Data Corp.
Model : USB-2+
Serial Number : None
Specification : FCC Part 15; Subpart B; Class B
Test Date : 04-10-1998
Test Distance : 3 Meters

Notes : Pol = Antenna Polarization; V = Vertical; H = Horizontal
BC = Biconical; LP = Log-Periodic; DP = Dipole
Corr. Factors = cable loss - preamp gain - distance factor.

Freq. MHz	Meter Reading dBuV	Antenna Factor dB	Antenna Pol/ Type	Corr. Factors dB	Field Strength of Signal dBuV/m	Limit Field Strength dBuV/m	Margin Under Limit dB
99.1	43.7	8.5	V/DP	-16.5	35.7	43.5	7.8
230.3	35.8	11.1	V/LP	-15.7	31.2	46.0	14.8
231.4	32.4	11.2	V/LP	-15.7	27.9	46.0	18.1
466.6	24.5	16.8	V/LP	-15.1	26.3	46.0	19.7
399.9	34.2	15.4	V/LP	-15.2	34.4	46.0	11.6
68.7	36.9	7.0	H/BC	-14.4	29.6	40.0	10.4
113.9	35.4	13.8	H/BC	-16.6	32.7	43.5	10.8
222.9	42.2	11.0	H/LP	-15.8	37.4	46.0	8.6
210.4	39.5	12.2	H/LP	-15.8	35.8	43.5	7.7
227.9	42.3	10.9	H/LP	-15.7	37.5	46.0	8.5
230.1	41.8	11.1	H/LP	-15.7	37.2	46.0	8.8
233.0	42.6	11.3	H/LP	-15.7	38.2	46.0	7.8
237.9	41.3	11.5	H/LP	-15.6	37.2	46.0	8.8
270.5	37.5	14.3	H/LP	-15.7	36.1	46.0	9.9
275.5	37.0	14.7	H/LP	-15.7	36.0	46.0	10.0

* All reading are quasi-peak with a 120 kHz bandwidth and no video filter. The cable loss is accounted for in this reading.

Judgment: Passed by 7.7 dB.

Test Personnel: _____ Date: 4/20/98

Jeffrey E. Tomes
Senior EMC Technician

7.1 Field Strength Calculation

7.1.1 The field strength is calculated by adding the Antenna Factor and Cable Loss, and by subtracting the Amplifier Gain from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

Where: FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier Gain

Assume a receiver reading of 49.5 dBuV is obtained. The Antenna Factor of 8.1 and a Cable Factor of 1.7 is added. The Amplifier Gain of 23.3 dB is subtracted, giving a field strength of 36 dBuV/m. The 36 dBuV/m can be mathematically converted to its corresponding level in uV/m.

FS = 49.5 + 8.1 + 1.7 - 23.3 = 36.0 dBuV/m

Level in uV/m = Common Antilogarithm [(36 dBuV/m)/20] = 63.1 uV/m

8.0 PHOTOS OF TESTED EUT

The following photos are attached:

Figure 8.1 EUT, Front & Top

Figure 8.2 EUT, Bottom & Rear

Figure 8.3 EUT Case, Inside

Figure 8.4 EUT, Foil Side

Figure 8.5 EUT, Component Side