MEASUREMENT/TECHNICAL REPORT

Central Data Corporation Model USB-8H

FCC ID: NBS132

APPLICATION FOR CERTIFICATION

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

Radiometrics Midwest Corporation Test Document RP-3846A
Issue Date: August 25, 1998
This report concerns: Original grant
Equipment type: Computer Peripheral (Universal Serial Bus)
Transition Rules per 15.37 are not requested.

Tests Performed For	*Test Facility*
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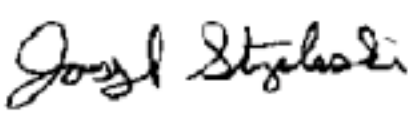
Test Report Written By	*Test Report Approved By*
 Charles Grimes EMC Engineer	 Joseph Strzelecki Senior EMC Engineer NARTE EMC-000877-NE

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1.0 General Information

1.1 Product Description

The Model USB-8H (referred to as the EUT in this report) is a Serial Port Server. The EUT is manufactured by Central Data Corporation.

The EUT is a freestanding communication device with power supplied by its own power supply 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 two 16C554 Four Port Communications Controllers (run on a 7.3728 crystal.) The 16C554s drive the eight RS232 comm ports and handles all data encoding and transfer handshaking. The maximum data rate possible by any port is 230k bps. The I/O circuitry consists of appropriate drivers and receivers and TVS protection devices.

Incoming data (from peripheral equipment hooked to the four ports) moves in the opposite direction as described in the above paragraph. The Case is nonconductive plastic.

1.2 Related Submittals

Central Data Corporation is not submitting any other submittals related to the EUT.

1.3 Tested System Details

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

Model Number Serial Number	FCC ID	Manufacturer & Description	Cable Descriptions
M/N: USB-8H (EUT) S/N:	NBS132	Central Data Serial Port Server	Two USB (1.5m, SH) two Serial (1.8m, SH)
M/N SA051A5F-11	N/A	Central Data Power supply for USB-8H	DC Cord: (1.5m, US) AC cord: (2m, US)
M/N: WY-55ES S/N: 0X415100033	N/A	Wyse Terminal 1	Power (1.8m, US) Serial (1.8m, SH)
M/N: WY-55E5 S/N: 0X416800578	N/A	Wyse Terminal 2	Power(1.8m, US) Serial (1.8m, SH)
M/N: LPMini-tower S/N: 0008766183	DOC	Gateway 2000 Desktop Computer	Power (1.8m, US) See peripherals for cables
M/N: 2196003-XX-XXX S/N: 50480939	D7J2196003-XX	Gateway 2000 Key Board	1.5m Integral
M/N: NX-1001 S/N: 510010542390	B6DZ150L	Star Printer	Power(1.8m, US) Metal Shell Prn. (1.8m, SH)
M/N: 500-069CS S/N: 15025C042421	BEJCS592	Gateway 2000 VGA Monitor	Video (1.8m, I) Power(2.2m, US)
M/N: 97599 S/N: 01634257	C3KKMPS	Gateway 2000 Mouse	Serial (2m, US)

Note: SH = Shielded; US = Unshielded; m = Cable Length in Meters,

1.5 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. The antenna was raised and lowered from 1 to 4 meters.

1.6 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 a 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.

1.7 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. Below 1 GHz, 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 radiated emission measurements were performed with a spectrum analyzer. 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 10 kHz and the bandwidth from 30 MHz to 1000 MHz is 100 or 120 kHz. Above 1 GHz a 1 MHz bandwidth is used. In order to increase the sensitivity of the spectrum analyzer, a preamplifier was used. The preamplifiers used had sufficient dynamic range that ensured that an overload condition was not present during the tests.

2.0 System Test Configuration

2.1 Test System and Justification

Wiring was consistent with manufacturer's recommendations. The EUT was connected to the USB port of the host computer using the upstream cable supplied with EUT. A printer was also connected to the parallel port of the host computer. Attached to the EUT was a VGA 14" monitor using its standard data cable. A mouse was connected to the serial port (COM1) via its integral data cable. A keyboard was attached to the system keyboard connector.

The EUT had its standard external power supply connected to it. Power was supplied at 115 VAC, 60 Hz single-phase to its external power supply.

Two terminals were connected to the EUT during the tests via serial cables. Two unterminated USB cables were also connected to the EUT. Various port configurations were checked to find the worst case configuration. Adding additional Serial devices did not change the worst case readings by more than 2 dB. This was first checked during preliminary radiated emission scans in a shielded enclosure and verified again at the OATS when, emission were approaching the limit.

Wiring was consistent with manufacturer's recommendations. The system was configured for testing in a typical fashion (as a customer would normally use it).

2.2 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 as well as each of the two WYSE video terminals. The H's were sent to the EUT which in turn sent the data to the WYSE terminals. 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.

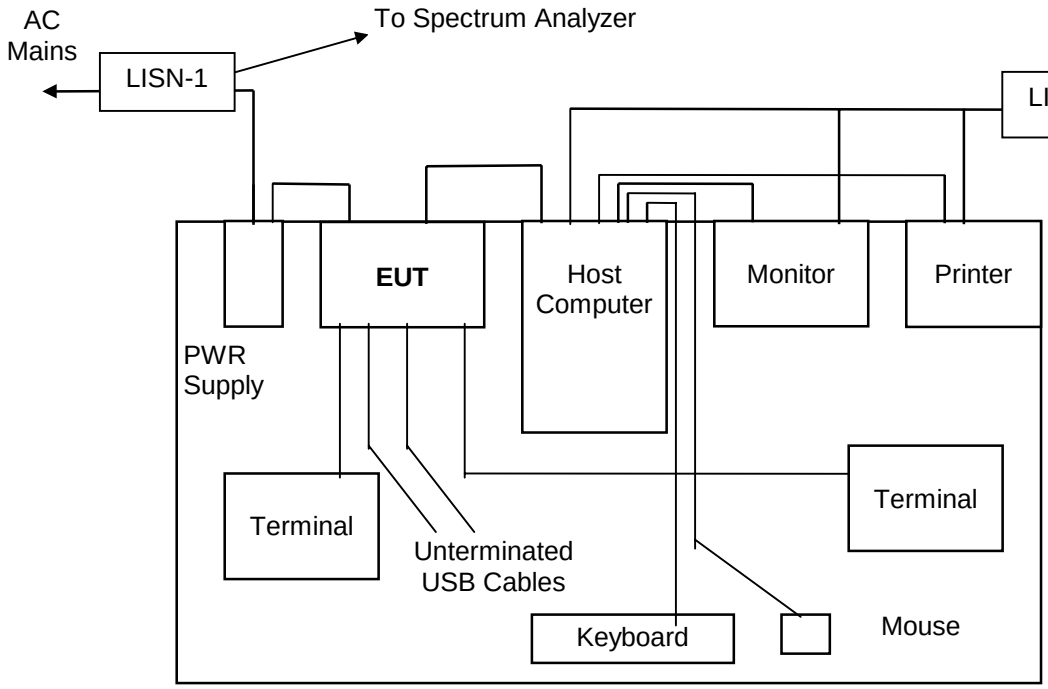
2.3 Special Accessories

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

2.4 Equipment Modifications

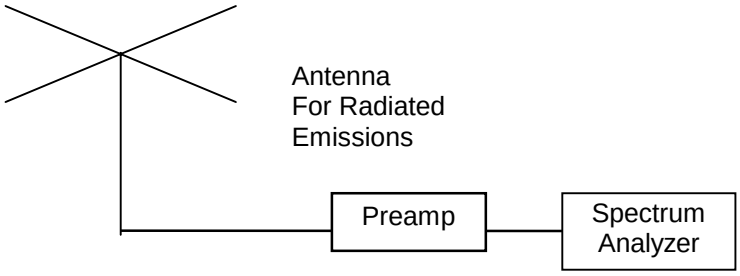
No modifications were made to the EUT at Radiometrics' test facility in order to comply with the standards listed in this report.

Figure 2.1 Configuration of Tested System



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

AC power to terminals are routed through LISN-2.
These cords are not shown in the drawing



Radiated Emissions:
- LISN's not used
- AC outlet with low-pass filter at the base of the turntable
- No vertical conductive wall
- Antenna height varied from 1 to 4 meters
- Distance from antenna to tested system is 3 meters

Notes:
- Not to Scale

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

3.0 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 EUT power cord, after testing all modes of operation.

Model : USB-8H
Test Date : July 29, 1998

Line Tested	Freq. MHz	Reading dBuV	Loss dB	of Signal dBuV	Limit dBuV	Margin under Limit dB
AC Hot	0.71	40.6	0.1	40.7	48.0	7.3
AC Hot	0.94	43.9	0.1	44.0	48.0	4.0
AC Hot	1.18	44.5	0.1	44.6	48.0	3.4
AC Hot	2.82	41.5	0.2	41.7	48.0	6.3
AC Hot	8.68	36.3	0.3	36.6	48.0	11.4
Neutral	0.47	44.1	0.1	44.2	48.0	3.8
Neutral	0.71	42.3	0.1	42.4	48.0	5.6
Neutral	0.95	44.6	0.1	44.7	48.0	3.3
Neutral	1.18	44.3	0.1	44.4	48.0	3.6
Neutral	2.60	39.3	0.2	39.6	48.0	8.4
Neutral	8.72	39.5	0.3	39.8	48.0	8.2

* All reading are quasi-peak with a 9 kHz bandwidth and no video filter.

Changing the frequency of the transmitter did not affect the emissions listed above.
Judgment: Passed by 3.8 dB

Test Personnel: Charles Grimes
EMC Engineer

4.0 Radiated Emissions Data

The following table lists the highest measured emission frequencies, and measured levels and the Class B limit. A sample calculation is given in paragraph 4.1. The analyzer readings are quasi-peak with a 120 kHz bandwidth and no video filter.

Model : USB-8H
Test Date : July 29, 1998
Notes : Pol = Antenna Polarization; V = Vertical; H = Horizontal
BC = Biconical; LP = Log Periodic; DP = Dipole; P = Peak; Q = QP
Corr. Factors = cable loss - preamp gain

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
35.1	35.9	11.7	V/BC	-18.0	29.6	40.0	10.4
48.0	41.0	12.7	V/BC	-17.4	36.3	40.0	3.7
57.1	32.2	11.3	V/BC	-16.0	27.5	40.0	12.5
65.1	32.3	8.5	V/BC	-14.4	26.4	40.0	13.6
75.3	35.7	7.4	V/BC	-15.4	27.6	40.0	12.4
112.3	31.2	13.8	V/BC	-16.5	28.5	43.5	15.0
130.3	32.7	13.2	V/BC	-16.4	29.6	43.5	13.9
131.9	31.4	13.2	V/BC	-16.4	28.2	43.5	15.3
156.0	31.6	15.1	V/BC	-16.1	30.6	43.5	12.9
162.6	32.9	15.9	V/BC	-16.2	32.6	43.5	10.9
163.3	35.1	15.9	V/BC	-16.2	34.8	43.5	8.7
168.0	39.3	16.4	V/BC	-16.1	39.6	43.5	3.9
170.8	30.8	16.6	V/BC	-16.0	31.4	43.5	12.1
204.1	33.2	12.9	V/LP	-15.9	30.2	43.5	13.3
210.0	30.7	12.3	V/LP	-15.8	27.1	43.5	16.4
264.1	33.3	13.7	V/LP	-15.7	31.3	46.0	14.7
287.8	30.3	14.5	V/LP	-15.6	29.2	46.0	16.8
290.3	29.6	14.4	V/LP	-15.6	28.5	46.0	17.5
344.2	31.1	16.0	V/LP	-15.3	31.7	46.0	14.3

4.0 Radiated Emissions Data (Continued)

Model : USB-8H
Test Date : July 29, 1998
Notes : Pol = Antenna Polarization; V = Vertical; H = Horizontal
BC = Biconical; LP = Log Periodic; DP = Dipole; P = Peak; Q = QP
Corr. Factors = cable loss - preamp gain

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
45.8	26.3	12.7	H/BC	-17.5	21.5	40.0	18.5
72.1	43.8	5.8	H/DP	-14.9	34.7	40.0	5.3
72.8	42.2	7.0	H/BC	-15.0	34.2	40.0	5.8
111.2	29.5	13.9	H/BC	-16.5	26.9	43.5	16.6
114.5	35.8	13.8	H/BC	-16.5	33.0	43.5	10.5
115.7	35.3	13.7	H/BC	-16.5	32.4	43.5	11.1
127.9	34.8	13.3	H/BC	-16.4	31.7	43.5	11.8
130.3	30.6	13.2	H/BC	-16.4	27.4	43.5	16.1
147.5	30.8	14.0	H/BC	-16.3	28.5	43.5	15.0
151.6	30.6	14.5	H/BC	-16.2	28.8	43.5	14.7
156.3	35.7	15.1	H/BC	-16.1	34.7	43.5	8.8
168.1	30.4	16.4	H/BC	-16.1	30.7	43.5	12.8
193.3	33.0	17.9	H/BC	-15.8	35.1	43.5	8.4
196.7	31.7	17.9	H/BC	-15.8	33.8	43.5	9.7
197.7	34.1	18.0	H/BC	-15.8	36.3	43.5	7.2
209.1	33.0	12.4	H/LP	-15.8	29.6	43.5	13.9
208.5	34.4	12.4	H/LP	-15.8	30.9	43.5	12.6
264.1	32.6	13.7	H/LP	-15.7	30.7	46.0	15.3
282.9	30.9	14.6	H/LP	-15.6	29.8	46.0	16.2
287.7	31.5	14.5	H/LP	-15.6	30.4	46.0	15.6
368.8	31.0	15.3	H/LP	-15.3	31.0	46.0	15.0
383.7	29.8	15.1	H/LP	-15.3	29.6	46.0	16.4
444.8	30.7	17.0	H/LP	-15.1	32.6	46.0	13.4

Judgment: Passed by 3.7 dB
No Emissions were detected from 450 to 2000 MHz within 15 dB of the limits.
Test Personnel: Charles Grimes
EMC Engineer

4.1 Field Strength Calculation

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