MEASUREMENT/TECHNICAL REPORT

APPLICANT: SPEC RESEARCH INC.

MODEL NO.: SP2000, SP3000

FCC ID: ~~OCJSP2000~~ NFS SP2000

This report concerns (check one) : **Original Grant** ✓
Class II Change _____

Equipment type: Mouse

Deferred grant requested per 47CFR 0.457(d)(1)(ii)?
Yes _____ No ✓ If yes, defer until: _____ (date)
We, the undersigned, agree to notify the Commission by (date) _____ / _____ / _____ of the intended date of announce ment of the product so that the grant can be issued on that date.

Transiyion Rules Request per 15.37? Yes _____ No ✓
If no, assumed Part 15, Subpart B for unintentional radiator the new 47 CFR (10-1-90 Edition) provision.

Report Prepared

by Testing House : **Neutron Engineering Inc.**

for Company :

Name SPEC RESEARCH INC.

Address 16725E, Gale Ave., City of Industry, CA91745, U.S.A.

Applicant Signature : Joseph Shih
Joseph Shih

CERTIFICATION

We hereby certify that:
The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (1992)/CISPR22(1996) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15 , Subpart B/CISPR22(1996).

Prepared by :	Sherry Kuo	Sherry kuo
Reviewed by :	Andy Chiu	Andy Chiu
Approved by :	George Yao	George Yao
Issued Date :	Jan. 14, 1999	
Report No. :	NEI-FCCB-98221	
Company Stamp :		NEUTRON ENGINEERING INC.

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Table of Contents

1. General Information
1-1 Product Description 4
1-2 Related Submittal(s)/Grant(s) 4
1-3 Tested System Details 5
1-4 Test Methodology 6
1-5 Test Facility 6

2. Product Labelling
Figure 2-1 FCC ID Lable 7
Figure 2-2 Location of Label on EUT 7

3. System Test Configuration
3-1 Justification 8
3-2 EUT Exercise Software 8
3-3 Special Accessories 9
3-4 Equipment Modifications 9
3-5 Configuration of Tested System 10
Figure 3-1 Configuration of Tested System 12

4. Block Diagram(s) 13

5. Conducted and Radiated Measurement Photos 14
Figure 5-1.Conducted Measurement Photos 14
Figure 5-2 Radiated Emission Data 15

6. Conducted Emission Datas 16

7. Radiated Emission Datas 17
7-1 Reaiated Emission Data 17
7-2 Field Strength Calculation 18
7-3 Correction Factor Table VS Frequency 19

8. Attachment
Photos of Tested EUT 20
User Manual 21

1-3. Tested System Details

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

Model No.	FCC ID	Equipment	Cable
SP2000	OCJSP2ØØØ (1)	Mouse	Shielded Data Cable
93V	ANO6282	PC	Shielded Power Cord
4500DC-E	GWGMULTI82	Monitor	Shielded Data Cable(2) Un-Shielded Power Cord
HP2225C+	DSI6XU2225	Printer	Shielded Parallel Data Cable Un-Shielded Power Cord
AT-1200CK	E2O5OV1200CK	Modem	Shielded Serial Data Cable Un-Shielded Power Cord
FDA-102A	F4Z4K3FDA-102A	Keyboard	Shielded Data Cable

Notes:

(1) EUT submitted for grant.
(2) Monitor's attached video cable without ferrite core.

1-4. Test Methodology

Both conducted and rediated testing were performed according to the procedures in ANSI C63.4 (1992)/CISPR 22(1996). Radiated testing was performed at an antenna to EUT distance 10 meters.

1-5. Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the address of No. 5, All 2, Lane 220, Kang Lo St., Nei Hwu, Taipei, Taiwan, R.O.C. of NEUTRON ENGINEERING INC. This site has been fully described in report dated Feb.4,1998 Submitted to your office, and accepted in a letter dated March 28, 1998 (31040/SIT-1300F2).

3. System Test Configuration

3-1. Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). The mouse was connected to support equipment-keyboard. Peripherals of PC, such as monitor, keyboard, modem and printer were contained in this system in order to comply with the ANSI C63.4/CISPR 22(1996) Rules requirement. The PC operated in the default 640x480/31.5KHz VGA Graphic mode. This operating condition was tested and used to collect the included data.

3-2. EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use. The software, contained on a 3-1/2 inch disk, was inserted into driver A and is auto-starting on power-up. Once loaded, the program sequentially exercises each system component in turn. The sequence used is:

1. Read (write) from (to) mass storage device (Disk).
2. Send "H" pattern to video port device (Monitor).
3. Send " H " pattern to parallel port device (Printer).
4. Send " H " pattern to COM port device (Modem).
5. Repeated from 1 to 4 continuously.

As the Keyboard and mouse are strictly input devices, no data is transmitted to (from) them during test. They are, however, continuously scanned for data input activity.

3-3. Special Accessories

Not available for this EUT intended for grant.

3-4. Equipment Modifications

Not available for this EUT intended for grant.

Applicant Signature : Joseph Shih **Date :** Jan. 14, 1999

Type/Printed Name : Joseph Shih **Position :** President

3.5 Configuration of Tested System

The configuration of tested system is described as the block diagram shown in next page Figure 3.1 and details information of I/O cable an dpower cord connection are tablized as Table A and B. The monitor is powered from a floor mounted receptale (referred to as the wall outlet in the previous described)was tested.

TABLE A - Test Equipment

Item	Equipment	Mfr.	Model/Type No.	I/O Port	FCC ID	Remark
E-1	PC	IBM	93V		ANO6282	
E-2	Monitor	TECO	RE995B	VGA Port	E80TE995	
E-3	Mouse	SPEC	SP2000	PS/2 Port	OCJSP2ØØØ	EUT
E-4	Printer	HP	HP2225C+	Centronic Port	DSI6XU2225	
E-5	Modem	Datatronics	AT-1200CK	Com Port	E2O5OV1200CK	
E-6	Keyboard	Forward	FDA-102A	PS/2 Port	F4Z4K3FDA-102A	

Remark:

(1) Unless otherwise denoted as EUT in 「Remark」 colum , device(s) used in tested system is a support equipment.

(2) Unless otherwise marked as ※ in 「Remark」 colum, Neutron consigns the supporting equipment(s) to the tested system.

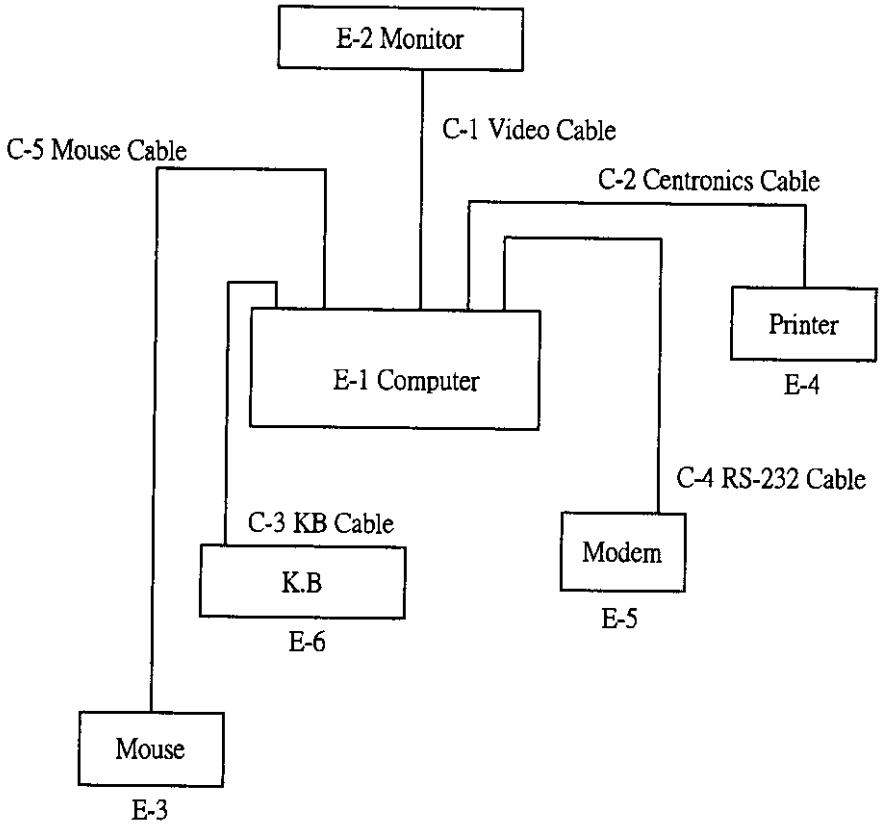
Table B. - Informations Cable Information

Item	I/O Cable	Device Connected	Shielded	Ferrite Core	Detachable/Permanently	Length	Note
C-1	VGA Cable	PC-Monitor	Yes	No	Permanently attached on Monitor	150cm	
C-2	Centronics Cable	PC-Printer	Yes	No	Part of Printer, Detachable	200cm	
C-3	Keyboard Cable	PC-Keyboard	Yes	No	Permanently attached on Keyboard	200cm	
C-4	RS-232C Cable	PC-Modem	Yes	No	Part of Modem, Detachable	180cm	
C-5	Mouse Cable	PC-Mouse	Yes	No	Permanently attached on Mouse	180cm	※

Note:

(1) Unless otherwise marked as ※ in 「Remark」 colum, Neutron consigns the supporting equipment(s) to the tested system.

Figure 3.1 Configuration of Tested System



4. Block Diagram(s)

Figure 4.1 Block diagram of system, Page 13.A

6. Conducted Emission Datas

6.1 The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

Judgement: Passed by **-12.78** **dB** in mode of **Neutral** terminal **0.51 MHz**

Freq.	Terminal	Measured(dBuV)		Limits(dBuV)		Safe Margins	
(MHz)	L/N	QP-Mode	AV-Mode	QP-Mode	AV-Mode	(dBuV)	Note
0.28	Line	46.01	*	60.76	50.76	-14.75	(QP)
0.36	Line	43.29	*	58.71	48.71	-15.42	(QP)
0.63	Line	41.72	*	56.00	46.00	-14.28	(QP)
0.76	Line	42.48	*	56.00	46.00	-13.52	(QP)
6.06	Line	42.28	*	60.00	50.00	-17.72	(QP)
0.28	Neutral	45.49	*	60.85	50.85	-15.36	(QP)
0.51	Neutral	43.22	*	56.00	46.00	-12.78	(QP)
0.63	Neutral	41.91	*	56.00	46.00	-14.09	(QP)
0.76	Neutral	43.19	*	56.00	46.00	-12.81	(QP)
6.09	Neutral	43.63	*	60.00	50.00	-16.37	(QP)

Remark :

(1) Reading inwhich marked as QP means measurements by using are Quasi-Peak Mode with Detector BW=9KHz ; SPA setting in RBW=100KHz,VBW =100KHz, Swp. Time = 0.3 sec./MHz ◦ Reading inwhich marked as AV means measurements by using are Average Mode with instrument setting in RBW=1MHz,VBW=10Hz, Swp. Time =0.3 sec./MHz ◦

(2) All readings are QP Mode value unless otherwise stated AVG in colum of 『Note』. If the QP Mode Measured value compliance with the QP Limits and lower than AVG Limits, the EUT shall be deemd to meet both QP & AVG Limits and then only QP Mode was measured, but AVG Mode didn't perform ◦ In this case, a " * " marked in AVG Mode colum of Interference Voltage Measured ◦

(3) Measuring frequency range from 150KHz to 30MHz ◦

Review : Test Personnel. : Riley Hsu Date: Dec. 7, 1998

7. Radiated Emission Datas

7.1 The following data lists the significant emission frequencise, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, as well as the limit. Explanation of the Correction Factor is given in paragraph 7.2.

Judgement: Passed by **-3.35 dB** in polarity of **Horizontal 31.40 MHz**

Freq. (MHz)	Ant. H/V	Reading(RA) (dBuV)	Corr.Factor(CF) (dB)	Measured(FS) (dBuV/m)	Limits(QP) (dBuV/m)	Safe Margins (dBuV/m)	Note
31.40	H	31.82	- 5.17	26.65	30.00	- 3.35	
70.10	H	30.15	- 8.20	21.95	30.00	- 8.05	
70.30	V	32.69	- 8.24	24.45	30.00	- 5.55	
131.70	V	28.41	- 2.77	25.64	30.00	- 4.36	
151.70	V	27.25	- 2.61	24.64	30.00	- 5.36	
157.80	H	24.93	- 1.75	23.18	30.00	- 6.82	
226.40	V	25.89	- 3.72	22.17	30.00	- 7.83	
228.80	H	23.17	- 3.56	19.61	30.00	- 10.39	
298.40	H	29.13	1.36	30.49	37.00	- 6.51	
332.35	H	31.49	1.56	33.05	37.00	- 3.95	
365.60	V	24.98	1.99	26.97	37.00	- 10.03	
461.60	V	25.54	5.12	30.66	37.00	- 6.34	

Remark :

(1) Reading inwhich marked as QP or Peak means measurements by using are Quasi-Peak Mode or Peak Mode with Detector BW=120KHz ; SPA setting in RBW=1MHz, VBW =1MHz, Swp. Time = 0.3 sec./MHz ◦

(2) All readings are Peak unless otherwise stated QP in colum of 『Note』. Peak denotes that the Peak reading compliance with the QP Limits and then QP Mode measurement didn't perform ◦

(3) Measuring frequency range from 30MHz to 1000MHz ◦

(4) If the peak scan value lower limit more than 20dB, then this signal data does not show in table ◦

Review : Test Personnel. : Riker 1/5/99 Date: Dec. 7, 1998

7-2. Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain (if any) 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 (1)

CF = Cable Attenuation Factor (1)

AG = Amplifier Gain (1) (2)

Remark :

(1) The Correction Factor = AF + CF - AG, as shown in the data tables' Correction Factor column.

(2) AG is not available for Neutron's Open Site Facility

Example of Calculation:

Assume a Receiver Reading of 23.7 dBuV is obtained with an Antenna Factor of 7.2 dBuV and a Cable Factor of 1.1 dBuV. Then:

1. The Correction Factor will be caculated by

Correction Factor = AF + CF - AG = 7.2 + 1.1 - 0 = 8.3 (dBuV)

as shown in the data tables' Correction Factor column.

2. The Field Strength will be calculated by

FS = RA + Correction Factor = 23.7 + 8.3 = 32 (dBuV).

FS is the value shown in the data tables' Corrected Reading column and RA is the value shown in the data tables' Receiver Reading column.The 32 dBuV/m value was mathematically converted to its corresponding level in uV/m as:

$$\mathbf{Log^{-1}\ [(32.0dBuV/m)/20\ ]\ =\ 39.8\ (uV/m)}$$

7-3. Correction Factor VS Frequency

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30.00	11.10	0.20
35.00	10.80	0.00
40.00	11.20	0.40
45.00	11.50	0.40
50.00	11.30	0.90
55.00	10.50	0.00
60.00	9.90	0.00
65.00	8.70	0.20
70.00	7.60	0.00
75.00	6.40	0.50
80.00	6.10	0.10
85.00	7.00	0.80
90.00	8.00	0.30
95.00	10.00	0.40
100.00	11.20	0.60
110.00	12.60	0.60
120.00	13.00	0.60
130.00	12.50	0.50
140.00	12.00	0.20
150.00	12.00	1.00
160.00	13.20	1.20
170.00	14.80	1.60
180.00	16.30	1.90
190.00	17.00	1.90
200.00	17.30	1.40
225.00	10.50	1.10
250.00	11.70	2.00
275.00	12.80	2.40
300.00	14.50	2.40
325.00	14.00	1.90
350.00	14.20	2.40
375.00	14.60	2.90
400.00	15.10	2.70
450.00	16.20	3.20
500.00	17.60	3.70
550.00	17.80	3.90
600.00	18.40	4.30
650.00	19.50	4.00
700.00	20.80	4.10
750.00	20.50	5.30
800.00	21.10	5.90
850.00	22.40	5.80
900.00	23.50	5.50
950.00	24.00	6.30
1000.00	24.80	5.20

8. Photos of Tested EUT:

1. Photo # 1. SP2000 Front View
2. Photo # 2. SP2000 Rear View
3. Photo # 3. SP2000 Unit Partially Disassembled
4. Photo # 4. SP2000 Unit Partially Disassembled
5. Photo # 5. SP2000 Unit Partially Disassembled
6. Photo # 6. SP2000 Unit Partially Disassembled
7. Photo # 7. SP3000 Front View
8. Photo # 8. SP3000 Rear View
9. Photo # 9. SP3000 Unit Partially Disassembled
10. Photo # 10. SP3000 Unit Partially Disassembled
11. Photo # 11. SP3000 Unit Partially Disassembled
12. Photo # 12. SP3000 Unit Partially Disassembled