MEASUREMENT/TECHNICAL REPORT

APPLICANT: FORWARD ELECTRONICS CO., LTD.

MODEL NO.: FDA-105M

FCC ID: F4ZFDA-11∅1

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

Equipment type: Keyboard

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 : FORWARD ELECTRONICS CO., LTD.

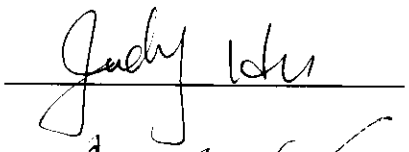
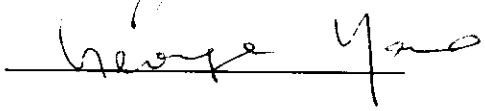
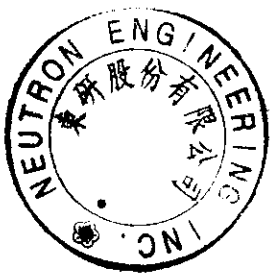
Address : 393, Chung Cheng, Road, lst Section, Sanhsia Chen, Taipei Hsien, Taiwan.

Applicant Signature : C. K. Chen

C. K. Chen / Engineer

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)/CISPR 22 (1996) and the energy emitted by the sample EUT tested as described in this report is in compliance with CLASS B conducted and radiated emission limits of FCC Rules Part 15 , Subpart B/CISPR 22 (1996).

Prepared by :	Judy Hu	
Reviewed by :	Andy Chiu	
Approved by :	George Yao	
Issued Date :	Sep. 02, 1998	
Report No. :	NEI-FCCB-98153	
Company Stamp :		

NEUTRON ENGINEERING INC.
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Table of Contents

1. GENERAL INFORMATION

1-1. Product Description

The FORWARD ELECTRONICS CO., LTD. Model: FDA-105M (referred to as the EUT in this report) is an PS/2 Port standard compatible keyboard designed for Microsoft Win95 system with 3 additional Win95 function keys.

The summairized features of EUT are described as follow:

Oscillator Frequency : 1.843 MHz
Power Consumption : 1000 mW, 200mA at 5 Vdc supply, in average.

A more detailed and/or technical description of EUT is attached in **User's Manual**.

1-2. Related Submittal(s) / Grant (s)

1-2-1. Models Covered

Models covering in this test report is :

FORWARD / FDA-105M

1-2-2. Models Difference

N/A

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
4500DC-E	GWGMULTI82	Monitor	Shielded Data Cable (2) Non-shielded Power Cord
PRESARIO7222	EJH3326	PC	Un-Shielded Power Cable
HP2225C+	DSI6XU2225	Printer	Shielded Parallel Data Cable Un-Shielded Power Cord
AT-1200CK	E2O5OV1200CK	Modem	Shielded Parallel Data Cable Un-Shielded Power Cord
FDA-105M	F4ZFDA-11∅1	Keyboard	Shielded Data Cable
SERIES.2-7S	DZL6QBS2	Mouse	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 Keyboard was connected to support equipment-personal computer. Peripherals of PC, such as monitor, print and modem were contained in this system in order to comply with the ANSI C63.4 /CISPR 22 Rulse requirement. The PC operated in the default 640x480/31.5 KHz VGA Graphic mode. This operated 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 serial port device (Modem).
5. Repeated from 2 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

No any other special accessory used for complince testing.

3-4. Equipment Modifications

Not available fo rthis EUT intended for grant.

Applicant Signature : C. K. Chen **Date :** Sep. 03, 1998

Type/Printed Name : C. K. Chen **Position :** Engineer

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	Monitor	Optiquest	4500DC-E	VGA Port	GWGMULTI82	
E-2	PC	COMPAQ	PRESARIO7222		EJH3326	
E-3	Mouse	Logitech	SERIES.2-7S	PS/2 Port	DZL6QBS2	
E-4	Printer	HP	HP2225C+	Printer Port	DSI6XU2225	
E-5	Modem	Datatronics	AT-1200CK	COM Port	E2O5OV1200CK	
E-6	Keyboard	Forward	FDA-105M	PS/2 Port`	F4ZFDA-11∅1	EUT

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.

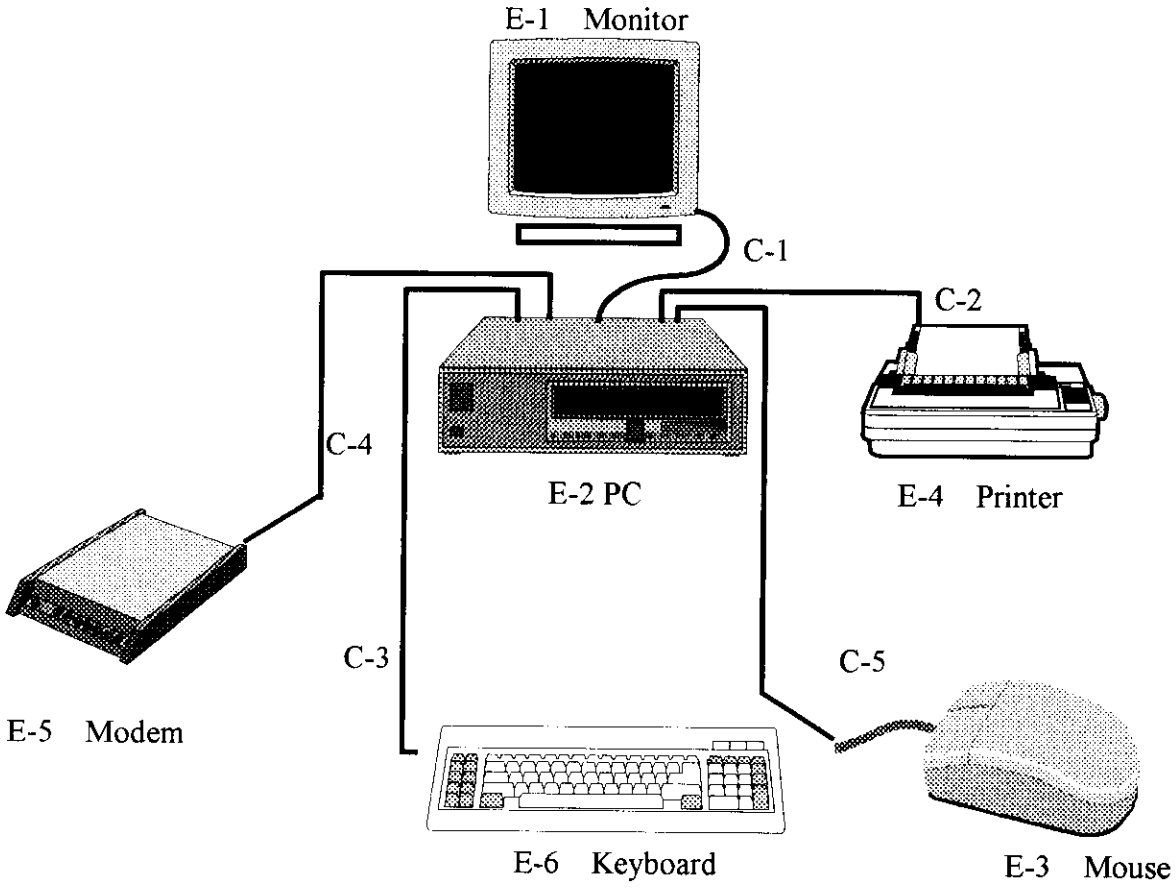
Table B. - Informations Cable Information

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

Note:

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

Flgure 3.1 Configuration of Tested System

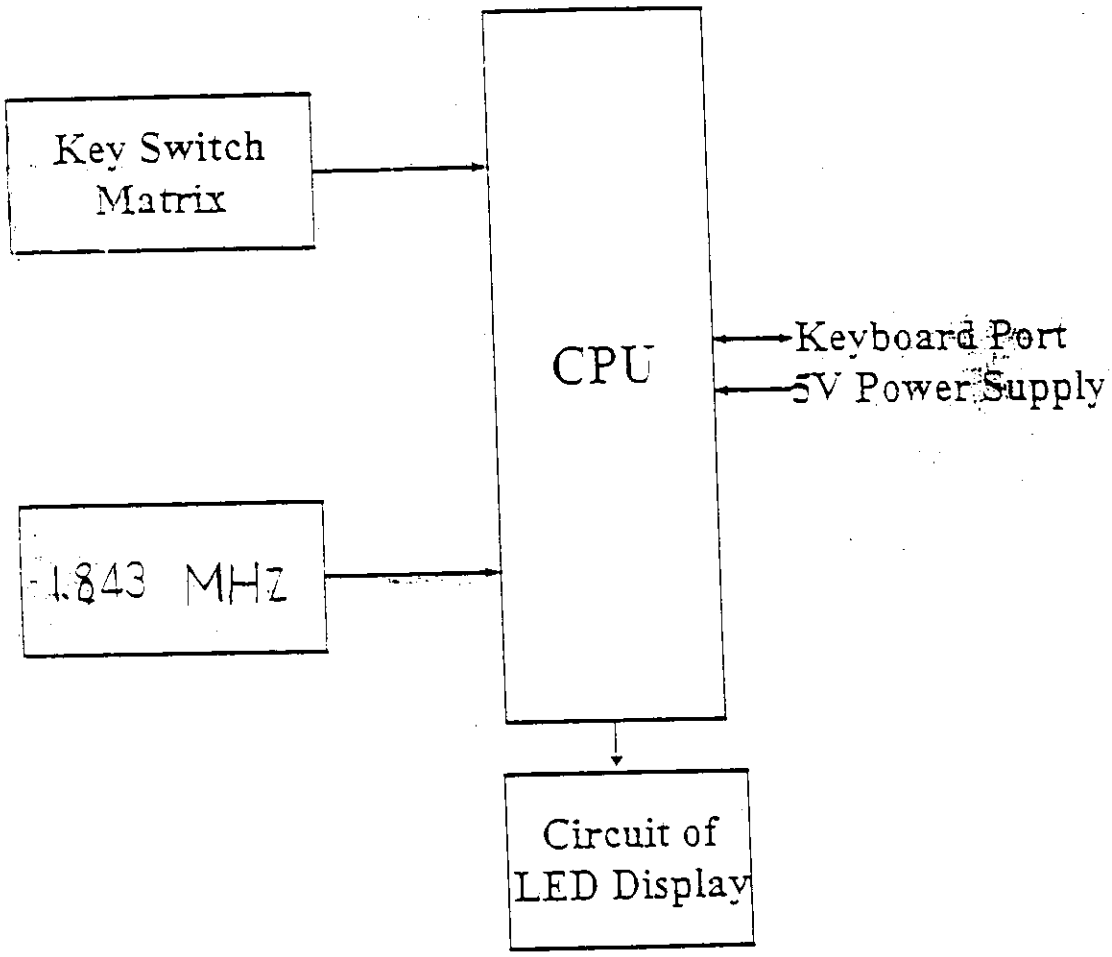


4. Block Diagram(s)

Figure 4.1 Block diagram of system, Page 13.A

Keyboard Diagram

MODEL:FDA-105M



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 **-4.01** **dB** in mode of **Line** terminal **15.72** **MHz**

Freq.	Terminal	Measured(dBuV)		Limits(dBuV)		Safe	Margins
(MHz)	L/N	QP-Mode	AV-Mode	QP-Mode	AV-Mode	(dBuV)	Note
0.20	L	43.73	*	63.65	53.65	-19.92	(QP)
0.23	L	41.77	*	62.49	52.49	-20.72	(QP)
0.36	L	31.43	*	58.71	48.71	-27.28	(QP)
14.83	L	52.35	15.82	60.00	50.00	-7.65	(QP)
15.72	L	55.99	14.26	60.00	50.00	-4.01	(QP)
0.17	N	48.86	*	65.16	55.16	-16.30	(QP)
0.23	N	45.49	*	62.60	52.60	-17.11	(QP)
0.37	N	40.00	*	58.61	48.61	-18.61	(QP)
1.37	N	30.60	*	56.00	46.00	-25.40	(QP)
15.72	N	54.25	15.29	60.00	50.00	-5.75	(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.： Date: Sep. 01, 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 **-5.03 dB** in polarity of **Vertical 131.5 MHz**

Freq. (MHz)	Polar. H/V	Reading(RA) (dBuV)	Corr.Factor. (dB)	Corrected FS (dB)	Limits (QP) (dBuV/m)	Margins (dBuV/m)	Note (QP)
47.90	V	12.40	12.07	24.47	30.00	- 5.53	
69.10	H	15.40	7.83	23.23	30.00	- 6.77	
127.60	V	11.80	13.17	24.97	30.00	- 5.03	
131.50	V	11.60	12.87	24.47	30.00	- 5.53	
142.00	H	11.90	12.32	24.22	30.00	- 5.78	
159.40	H	10.20	14.30	24.50	30.00	- 5.50	
214.40	H	9.10	11.94	21.04	30.00	- 8.96	
215.20	V	11.10	11.91	23.01	30.00	- 6.99	
224.80	V	11.60	11.61	23.21	30.00	- 6.79	
253.60	H	13.90	13.92	27.82	37.00	- 9.18	
464.00	V	10.80	19.93	30.73	37.00	- 6.27	
464.00	H	10.30	19.93	30.23	37.00	- 6.77	

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.： Date: Aug. 31, 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 + CL - AG

Where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor (1)

CL = Cable Attenuation Factor (1)

AG = Amplifier Gain (1) (2)

Remark :

(1) The Correction Factor = AF + CL - 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 dB and a Cable Factor of 1.1 dB Then:

1. The Correction Factor will be caculated by

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

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 (dBμV/m).

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:

Photo # 1.	Front View
Photo # 2.	Rear View
Photo # 3.	Unit Partially Disassembled
Photo # 4.	Unit Partially Disassembled
Photo # 5.	Unit Partially Disassembled
Photo # 6.	Unit Partially Disassembled
Photo # 7.	Unit Partially Disassembled
Photo # 8.	Unit Partially Disassembled
Photo # 9.	Unit Partially Disassembled