FCC CFR47 PART 15 DIGITAL DEVICE

TEST REPORT

FOR

KEYBOARD

MODEL: KEY800

FCC ID: NH3KEY800

REPORT NUMBER: 99C0572-1

ISSUE DATE: SEPTEMBER 28, 1999

Prepared for
YUEHUA ELECTRON CO., LTD. OF ZHUHAI
30 BLDG., CHUIZHU INDUSTRIAL DISTRICT
ZHUHAI, GUANGDONG
P. R. CHINA

Prepared by
COMPLIANCE ENGINEERING SERVICES, INC.
d.b.a.
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LAB CODE:200065-0

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1. VERIFICATION OF COMPLIANCE

NVLAP® LAB CODE:200065-0

COMPANY NAME: YUEHUA ELECTRON CO., LTD. OF ZHUHAI
30 BLDG., CHUIZHU INDUSTRIAL DISTRICT
ZHUHAI, GUANGDONG
P. R. CHINA

CONTACT PERSON: HANXIONG JIANG / ENG. MANAGER

TELEPHONE NO: 756-8610-916

MODEL NO/NAME: KEY800

SERIAL NO: N/A

DATE TESTED: SEPTEMBER 28, 1999

TYPE OF EQUIPMENT:	INFORMATION TECHNOLOGY EQUIPMENT (ITE)
MEASUREMENT DISTANCE:	(X) 3 METER ( ) 10 METER
TECHNICAL LIMIT:	CLASS B
FCC RULES:	PART 15
MEASUREMENT PROCEDURE	ANSI C63.4:92
EQUIPMENT AUTHORIZATION PROCEDURE	CERTIFICATION
MODIFICATIONS MADE ON EUT	☐ YES ☒ NO
DEVIATIONS FROM MEASUREMENT PROCEDURE	☐ YES (refer to section 21 for comments) ☒ NO
RADIATED EMISSION TEST RESULT	-1.66 dB @ 37.4 MHz/VERTICAL
CONDUCTED EMISSION TEST RESULT	-6.07 dB @ 8.37 MHz/L1

The above equipment was tested by Compliance Certification Services for compliance with the requirements set forth in the FCC CFR 47, PART 15. The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved By

MIKE C.I. KUO / VICE PRESIDENT
COMPLIANCE CERTIFICATION SERVICES

2. PRODUCT DESCRIPTION

CHASSIS TYPE	PLASTIC
NUMBER OF PCB LAYERS	1
NO. OF EXTERNAL I/O CONNECTORS	1

3. TESTED SYSTEM DETAILS

The Model names for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

External Peripheral Devices

Device Type	Manufacturer	Model Number	Serial No.	FCC ID / DoC
MONITOR	PACKARD BELL	1712SL	MEMN52000551	ACJ93312120
MOUSE	NEC	INTELLIMOUSE 1.1A	00024853	C3KKMP5
MODEM	SMARTEAM	103/212A	A038329	EF56A5103/212A
PRINTER	HP	2225C	2930S52630	DSI6XU2225
COMPUTER	HP	VECTRA XM 5/100	FR3950381	B94VECTRAXM5

4. TEST FACILITY

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5. ACCREDITATION AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code:200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT(1300F2))

6. MEASUREMENT INSTRUMENTATION

Radiated emissions were measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, ridged waveguide, liner horn. EMI receivers were used for line conducted readings, spectrum analyzers with pre-selectors and quasi-peak detectors were used to perform radiated measurements. Receiving equipment (i.e., receiver, analyzer, quasi-peak adapter, pre-selector) and LISNs conform to CISPR specification for "Radio Interference Measuring Apparatus and Measurement Methods," Publication 16.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

7. MEASURING INSTRUMENT CALIBRATION

The measuring equipment which was utilized in performing the tests documented herein has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment which is traceable to recognized national standards.

8. UNITS OF MEASUREMENT

Measurements of radiated interference are reported in terms of dB(uV/m) at a specified distance. The indicated readings on the spectrum analyzer were converted to dB(uV/m) by use of appropriate conversion factors. Measurements of conducted interference are reported in terms of dB(uV).

The field strength is calculated by adding the Antenna Factor and Cable Factors, then 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 52.5 dBuV is obtained. The Antenna Factor of 7.4dB/m and a Cable Factor of 1.1dB is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dBuV/m. The 32 dBuV/m value was mathematically converted to its corresponding level in uV/m.

FS = 52.5 + 7.4 + 1.1 - 29 = 32 dBuV/m

Level in uV/m = Common Antilogarithm [(32 dBuV/m)/20] = 39.8 uV/m

9. ANTENNAS

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 3 meters from the leading edge of the turn table.

10. CLASSIFICATION OF DIGITAL DEVICE

Class A includes digital devices that are marketed for use in commercial, industrial or business environments, excluding devices which are marketed for use by the general public or are intended to be used in the home.

Class B includes digital devices that are marketed for use in residential environments, notwithstanding use in commercial, business and industrial environments.

Note: The responsible party may also qualify a device intended to be marketed in a commercial, business or industrial environment as Class B device, and in fact is encouraged to do so provided the device complies with the technical specifications for a Class B digital device. In the event that a particular type of device has been found to repeatedly cause harmful interference to radio communications, the Commission may classify such a digital device as a Class B digital device, regardless of its intended use.

11. RADIATED EMISSION LIMITS

FCC PART 15 CLASS A

MEASURING DISTANCE OF 10 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	90	39.1
88-216	150	43.5
216-960	210	46.4
Above 960	300	49.5

FCC PART 15 CLASS B

MEASURING DISTANCE OF 3 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

FCC RADIATED EMISSION ALTERNATIVE METHOD
(CISPR 22/EN55022)

Limits for radiated disturbance of Class A ITE at measuring distance of 10 m

Frequency range MHz	Quasi-peak limits dB(uV/m)
30 to 230	**40**
230 to 1000	**47**

NOTES
1. The lower limit shall apply at the transition frequency.
2. Additional provisions may be required for cases where interference occurs.

Limits for radiated disturbance of Class B ITE at measuring distance of 10 m

Frequency range MHz	Quasi-peak limits dB(uV/m)
30 to 230	**30**
230 to 1000	**37**

NOTES
1. The lower limit shall apply at the transition frequency.
2. Additional provisions may be required for cases where interference occurs.

12. CONDUCTED EMISSION LIMITS

FCC CLASS A

FREQUENCY RANGE	FIELD STRENGTH (Microvolts)	FIELD STRENGTH (dBuV)/QP
450kHz-1.705MHz	1000	60
1.705mhz - 30mhz	3000	69.54

FCC CLASS B

FREQUENCY RANGE	FIELD STRENGTH (Microvolts)	FIELD STRENGTH (dBuV)/QP
450kHz-30MHz	250	48

FCC CONDUCTED EMISSION ALTERNATIVE METHOD (CISPR 22/EN55022)

Limits for conducted disturbance at the mains ports of Class A ITE

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	**Average**
0.15 to 0.50	**79**	**66**
0.5 to 30	**73**	**60**
Note- The lower limit shall apply at the transition frequency.		

Limits of Conducted disturbance at the mains ports of Class B ITE

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	**Average**
0.15 to 0.50	**66 to 56**	**56 to 46**
0.50 to 5	**56**	**46**
5 to 30	**60**	**50**
Note 1.The lower limit shall apply at the transition frequencies 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

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13. CONDUCTED EMISSION TEST PROCEDURE

The EUT is located so that the distance between the boundary of the EUT and the closest surface to the LISN is 0.8m.

EUT test configuration is according to Section 7 of ANSI C63.4/1992.

Conducted disturbance shall be measured between the phase lead and the ground, and between the neutral lead and the ground. The frequency 0.450 - 30 MHz (or 0.150 - 30 MHz in case of CISPR 22/EN55022 method) shall be investigated.

Set the EMI receiver to PEAK detector setting and sweep continuously over the frequency range to be investigated. Set resolution bandwidth to 9kHz minimum. Connect EMI receiver input cable to LINE 1 RF measurement connection on the LISN. Connect a 50ohm terminator to the unused RF connection on the LISN. For each mode of EUT operation, maximize emissions readings by manipulating cable and wire positions. Record the configuration for each EUT power cord which produces emissions closest to the limit. Repeat the same procedure for LINE 2 of each EUT power cord.

14. RADIATED EMISSION TEST PROCEDURE

The EUT and all other support equipment are placed on a wooden table 80 cm above the ground screen. Antenna to EUT distance is either 3 meters or 10 meters (Class B or Class A). During the test, the table is rotated 360 degrees to maximize emissions and the antenna is positioned from 1 to 4 meters above the ground screen to further maximize emissions. The antenna is polarized in both vertical and horizontal positions.

EUT test configuration is according to Section 8 of ANSI C63.4/1992.

Monitor the frequency range of interest at a fixed antenna height and EUT azimuth. Frequency span should be small enough to easily differentiate between broadcast stations and intermittent ambients. Rotate EUT 360 degrees to maximize emissions received from EUT. If emission increases by more than 1 dB, or if another emission appears that is greater by 1 dB, return to azimuth where maximum occurred and perform additional cable manipulation to further maximize received emission.

Move antenna up and down to further maximize suspected highest amplitude signal. If emission increased by 1 dB or more, or if another emission appears that is greater by 1dB or more, return to antenna height where maximum signal was observed and manipulate cables to produce highest emissions, noting frequency and amplitude.

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15. AMBIENT CONDITIONS

The ambient conditions at the time of final tests were as follows:

	Radiated Emission	Conducted Emission
Temperature	**30** ^{o}C	**32**^{o}C
Humidity	**50%**	**50%**

16. SYSTEM TEST CONFIGURATION

The equipment under test was configured and operated in a manner which tended to maximize its emission characteristics in a typical application. Power and signal distribution, ground, interconnecting cabling and physical placement of equipment simulated the typical application and usage insofar as practicable.

SOFTWARE USED DURING THE TESTS	
Operating System	WINDOWS 98
File Name	NOTE PAD
Program Sequence	Keyboard typing H's continuously to PC.

17. EQUIPMENT MODIFICATIONS

To achieve compliance to CLASS B levels, the following change(s) were made during compliance testing:

NOT APPLICABLE

18. EUT SETUP PHOTOS

Radiated Emission Setup Photos (Worst Emission Position)

Conducted Emission Setup Photos (Worst Emission Position)

19. TEST EQUIPMENT LIST

Equipment	Manufacturer	Model No.	Serial No.	Site	Cal Date	Due Date
Receiver	H.P.	8546A	3520A00259	A	04/1999	04/2000
RF Filter Section	H.P.	85460A	3448A00232	A	04/1999	04/2000
Antenna	Chase	CBL6112	2049	A/F	03/1999	03/2000
Antenna	EMCO	3110	8908-1079	A/F	03/1999	03/2000
Antenna	EMCO	3146	NSN=X100	A/F	03/1999	03/2000
Pre-Amp	H.P.(P1)	8447D	2944A06833	A	10/1998	10/1999
Pre-Amp	H.P.(P2)	8447D	2944A06265	F	09/1999	09/2000
Spectrum Analyzer	H.P.	8566B	3014A06685	F	07/1999	07/2000
Spectrum Display	H.P.	85662A	3026A19146	F	07/1999	07/2000
Quasi-peak Detector	H.P.	85650A	3145A01654	F	07/1999	07/2000
Spectrum Analyzer	H.P.	8568A	2314A02604	B	02/1999	02/2000
Spectrum Display	H.P.	85662A	2314A04793	B	02/1999	02/2000
Quasi-peak Detector	H.P.	85650A	2521A01038	B	02/1999	02/2000
Pre-Amp	H.P.(P8)	8447D	2944A06589	B	08/1999	08/2000
Antenna	Eaton	94455-1	1197	B	08/1999	08/2000
Antenna	Emco	3146	2120	B	08/1999	08/2000
Spectrum Analyzer	H.P.	8568B	2732A03661	C	11/1998	11/1999
Spectrum Display	H.P.	85662A	2811A015728	C	11/1998	11/1999
Quasi-peak Detector	H.P.	85650A	2811A01335	C	11/1998	11/1999
Pre-Amp	H.P.(P5)	8447D	2944A06550	C	08/1999	08/2000
Antenna	Eaton	94455-1	1214	C	08/1999	08/2000
Antenna	EMCO	3146	9107-3163	C	08/1999	08/2000
LISN	Fischer	LISN2	00710	Cond	01/1999	01/2000
LISN	Fischer	CISPR adapter	00711	Cond	01/1999	01/2000
EMI Receiver	Rohde Schwarz	ESHS20	827129/006	Cond	03/1999	03/2000
LISN	Fischer	FCCLISN 50/250-25-2	114	Cond	08/1999	08/2000

20. TEST RESULT SUMMARY

Preliminary Radiated Emission Tests were performed at the 3 meter open area test site. CCS test procedure no:CCSUE2001B and the procedure listed in ANSI C63.4 /1992 section 8.3.1.1. were used. The following preliminary tests were conducted to determine the worst mode of operation and configuration.

Preliminary Radiated Emission Test			
Frequency Range Investigated		30 MHz TO 1000 MHz	
Mode of operation	Date	Data Report No.	Worst Mode
Typing H's	**9/28/99**	**990928F1**	☒

Final Radiated Emission Test was conducted by operating the worst mode as indicated above.

OATS No: F / 3 METER	Data Report No. 990928F1	Date 9/28/99	Tested By: PETE KREBILL

Six Highest Radiated Emission Readings							
Frequency Range Investigated				30 MHz TO 1000 MHz			
Freq (MHz)	Meter Reading (dBuV)	C.F. (dB/m)	Corrected Reading (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Reading Type (P/Q/A)	Polar (H/V)
33.02	**50.6**	**-16.74**	**33.86**	**40.0**	**-6.14**	**Q**	**H**
33.02	**54.2**	**-17.48**	**36.72**	**40.0**	**-3.28**	**Q**	**V**
37.4	**56.5**	**-18.16**	**38.34**	**40.0**	**-1.66**	**Q**	**V**
41.8	**51.5**	**-18.45**	**33.05**	**40.0**	**-6.95**	**P**	**H**
79.27	**50.3**	**-19.80**	**30.5**	**40.0**	**-9.50**	**P**	**H**
83.66	**51.1**	**-19.66**	**31.44**	**40.0**	**-8.56**	**P**	**H**

C.F.(Correction Factor)=Antenna Factor+Cable Loss-Amplifier Gain
Corrected Reading = Metering Reading + C.F.
Margin=Corrected Reading - Limits
P=Peak Reading H=Horizontal Polarization/Antenna
Q=Quasi-peak V=Vertical Polarization/Antenna
A=Average Reading

Comments: N/A

Preliminary Conducted Emission Tests were performed according to CCS test procedure no:CCSUE2002B and ANSI C63.4/1992 section 7.2.3. The following preliminary tests were conducted to determine the worst mode of operation.

Preliminary Conducted Emission Test			
Frequency Range Investigated		450 kHz TO 30 MHz	
Mode of operation	Date	Data Report/Plot No.	Worst Mode
Typing H's	**9/28/99**	**99C0572**	☒

Final Conducted Emission Test was conducted by operating the worst mode as indicated above.

Conducted Room	Plot No. 99C0572		Date 9/28/99		Tested By: PETE KREBILL	
Six Highest Conducted Emission Readings						
Frequency Range Investigated			450 kHz TO 30 MHz			
Freq (MHz)	Meter Reading (dBuV)	C.F. (dB)	Corrected Reading (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Reading Type (P/Q/A)	Line (L1/L2)
8.37	**41.93**	**0**	**41.93**	**48.0**	**-6.07**	**Q**	**L1**
8.30	**41.43**	**0**	**41.43**	**48.0**	**-6.57**	**Q**	**L1**
8.44	**41.11**	**0**	**41.11**	**48.0**	**-6.89**	**Q**	**L1**
8.37	**39.91**	**0**	**39.91**	**48.0**	**-8.09**	**Q**	**L2**
26.34	**40.35**	**0**	**40.35**	**48.0**	**-7.65**	**Q**	**L2**
28.65	**40.31**	**0**	**40.31**	**48.0**	**-7.69**	**Q**	**L2**

C.F.(Correction Factor)=Insertion Loss + Cable Loss
Corrected Reading = Metering Reading + C.F.
Margin=Corrected Reading - Limits
P=Peak Reading L1=Hot
Q=Quasi-peak L2=Neutral
A=Average Reading

Comments: N/A

APPENDICES

EXTERNAL I/O CABLE CONSTRUCTION DESCRIPTION

CONFIGURATION BLOCK DIAGRAM

CONDUCTED EMISSION PLOT

RADIATED EMISSION DATA

EUT PHOTOGRAPHS

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External I/O Cable Construction Description

CABLE NO: 1	
I/O Port: PS/2 KB	Number of I/O ports of this type: 1
Number of Conductors: 6	**Connector Type: PS/2**
Capture Type: Snap-In	**Type of Cable used: Unshielded**
Cable Connector Type: Molded	**Cable Length: 1.5 m**
Bundled During Tests: No	**Data Traffic Generated: Yes**
Remark: N/A	

CABLE NO: 2	
I/O Port: PS/2 Mouse	Number of I/O ports of this type: 1
Number of Conductors: 6	**Connector Type: PS/2**
Capture Type: Snap-In	**Type of Cable used: Unshielded**
Cable Connector Type: Molded	**Cable Length: 2 m**
Bundled During Tests: No	**Data Traffic Generated: Yes**
Remark: N/A	

CABLE NO: 3	
I/O Port: RS232	Number of I/O ports of this type: 1
Number of Conductors: 9	**Connector Type: DB9**
Capture Type: Screw-In	**Type of Cable used: Shielded**
Cable Connector Type: Metal	**Cable Length: 1 m**
Bundled During Tests: No	**Data Traffic Generated: Yes**
Remark: N/A	

CABLE NO: 4	
I/O Port: Parallel	Number of I/O ports of this type: 1
Number of Conductors: 25	**Connector Type: DB25**
Capture Type: Screw-In	**Type of Cable used: Shielded**
Cable Connector Type: Metal	**Cable Length: 2 m**
Bundled During Tests: Yes	**Data Traffic Generated: Yes**
Remark: N/A	

CABLE NO: 5	
I/O Port: VGA	Number of I/O ports of this type: 1
Number of Conductors: 15	**Connector Type: D-SUB 15**
Capture Type: Screw-In	**Type of Cable used: Shielded**
Cable Connector Type: Molded	**Cable Length: 1.5 m**
Bundled During Tests: Yes	**Data Traffic Generated: Yes**
Remark: 2 ferrite cores at both ends of cable.	

CABLE NO: 6	
I/O Port: Power	Number of I/O ports of this type: 4
Number of Conductors: 3	**Connector Type: USA 110 Type**
Capture Type: Snap-In	**Type of Cable used: Unshielded**
Cable Connector Type: Molded	**Cable Length: 1.8 m**
Bundled During Tests: No	**Data Traffic Generated: No**
Remark: N/A	

Configuration Block Diagram