MEASUREMENT / TECHNICAL REPORT

Fujitsu Siemens Computers

Model: Keyboard KBPC S2 (K297)

FCC ID: HSS01TASTK297

Oct. 27, 1999

This report concerns:	Original grant	☐ Class II change
Equipment type:	Keyboard	

Request issue of grant:

- Immediately upon completion of review
- ☐ Defer grant per 47 CFR 0.457(d)(1)(ii) until _____ date _____. Company Name agrees to notify the Commission by _____ date _____ of the intended date of announcement of the product so that the grant can be issued on that date.

Measurement procedure used:

- ANSI C63.4-1992
- ☐ FCC/OET MP-4(1987)
- ☐ other _____

Limits on compliance with: CISPR 22 resp. FCC class B

Application for Certification
prepared by:
Guenther Roesch
Siemens PC Systeme GmbH & Co. KG
Buergermeister-Ulrich-Str. 100
86199 Augsburg
Germany
Tel.: +49 821 804-2821
Fax: +49 821 804 2675

Applicant for this device:

Siemens PC Systeme GmbH & Co. KG
Buergermeister-Ulrich-Str. 100
86199 Augsburg
Germany
Tel.: +49 821 804-0

Table of Contents

1 GENERAL INFORMATION

1.1 Product Description

The Siemens Keyboard KBPC S2 with the product number S26381-K297 is a MF-II-compatible keyboard for personal computers. The connection between the keyboard and the personal computer is done by a cable which has on one end a western plug connection and on the other end a PS/2-connecton.

Description of the keyboard K297: *S26381-K297-V****

Functions and features:

Industry standard	MF-II-compatible
System compatibility	AT, XT and PS/2 system, automatic AT/XT switch over
Keyboard to the system unit	Western plug to PS/2/DIN (200 cm length)
Design	− Low-profile compact design, special ergonomic key design − Adjustable keyboard slope
Technology	Key matrix on foil, single chip processor mounted on PC board

Electrical:

Power consumption	< 50 mA at 5 V

Temperature:

Operating temperature	5° C to 40° C (as per IEC721)

Dimensions at minimum adjustment angles and without palm rests:

Dimensions (H x W x D)	36 x 463 x 164 mm
Adjustment range	
Keyboard slope	6° and 12°
Standards met	
Product safety	EN 60950 VDE 0805
Ergonomics	"Safety-tested" mark (ZH1/618) ISO 9241-4 / EN 29241-4 ISO 9995, DIN 2137
Electromagnetic Compatibility	CE symbol to EC Guideline 89/336/EWG (EN 55022/B, EN 50082-1)

The keyboard is assembled by Siemens PC Systeme GmbH & Co. KG, Bürgermeister-Ulrich-Str. 100, 86199 Augsburg.

1.2 Related Submittal Grant

N/A

1.3 Tested System Details

The FCC IDs for all equipment, plus description of all cables used in the tested system are:

Pos	Model Number (Serial Number)	FCC ID	Description	Cable Description (length in [cm])
1	Siemens KBPC S2 S26381-K297-****	HSS01TASTK297	Keyboard **EUT**	shielded keyboard cable [200]
2	Fujitsu Siemens Computers Scenic Pro M7 YBJF000509	HSSSCENICM701	Personal Computer (PII 350 MHz)	unshielded power cord [292]
3	Fujitsu Siemens Computers MCM 1707 NTD PZ226632	A3LCGS762	Monitor	unshielded power cord [175] shielded video cable [168]
4	Cherry MY3000USB4A 000468K37	DOC	USB-Keyboard	shielded keyboard cable [143]
5	Microsoft MS 2.1A 6221424-40000	C3KKMP3	Mouse	shielded mouse cable [183]

Pos	Model Number (Serial Number)	FCC ID	Description	Cable Description (length in [cm])
6	Microsoft Intelli Mouse 1.1A 0015096-00000	DOC: m/n:IM1	USB-Mouse	shielded mouse cable [183]
7	Hewlett Packard HP 2225C+ (3012S70819)	DSI6XU2225	Printer, parallel I/F	unshielded AC cable [180], shielded centronics cable [190]
8	Hewlett Packard HP 2225D+ (2952S61229)	DSI6XU2225	Printer, serial I/F	unshielded power cord [185], shielded serial cable [190]
	Pos 1 contains:			
a	C26381-K297-C5*	N/A	Membrane switch	
b	S26381-D291	N/A	PCB-board	

Remark:

1.4 Test Methodology

Both, conducted and radiated tests were performed according to the procedures in ANSI C63.4-1992. Radiated testing was performed at an antenna to EUT distance of 10 meters. All radiated emission measurements were done in an anechoic chamber. Limits for radiated and conducted emission are in compliance with CISPR 22 resp. FCC class B.

1.5 Test Facility

The anechoic chamber and conducted measurement facility used to collect the emission data is located at Siemens PC Systeme GmbH & Co. KG, Bürgermeister Ulrich Str. 100, 86199 Augsburg, Germany. This site has been fully described in a report dated January 24, 1997 sub-mitted to your office, and accepted in a letter dated March 03, 1997 (31040/SIT).

1.6 Referenced Rules Sections

N/A

2 PRODUCT LABELING

2.1 FCC ID Label: see attached file

2.2 Location of Label on EUT: see attached file

3 SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a maximum fashion (as a customer can use it). Each type of external ports was connected with a peripheral unit (e.g. serial port connected to a serial printer, external keyboard port connected to a keyboard and so on). The EUT was configured with a cable of 2 m length.

3.2 Video mode Justification

The system was tested in video graphic mode 1024 x 768, 85/100 Hz, because this is the most commonly used resolution and reflects the worst case.

3.3 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 typical use.

The used sequence is:

- scrolling ”H” with applicable video mode (see 3.2)
- internal Floppy drive writes to the HD and reads back
- internal CD-ROM writes to the HD
- ”H`s” are sent to the printer ports
- data is sent to USB port

3.4 Special Accessories

As shown in Figure 3.1, all interface cables used for compliance testing are shielded like normally supplied by the manufacturer. All cable connectors feature integral metal hoods for shielding.

3.5 Equipment Modifications

To achieve compliance to Class B levels, the following modifications were made during compliance testing:

no modifications

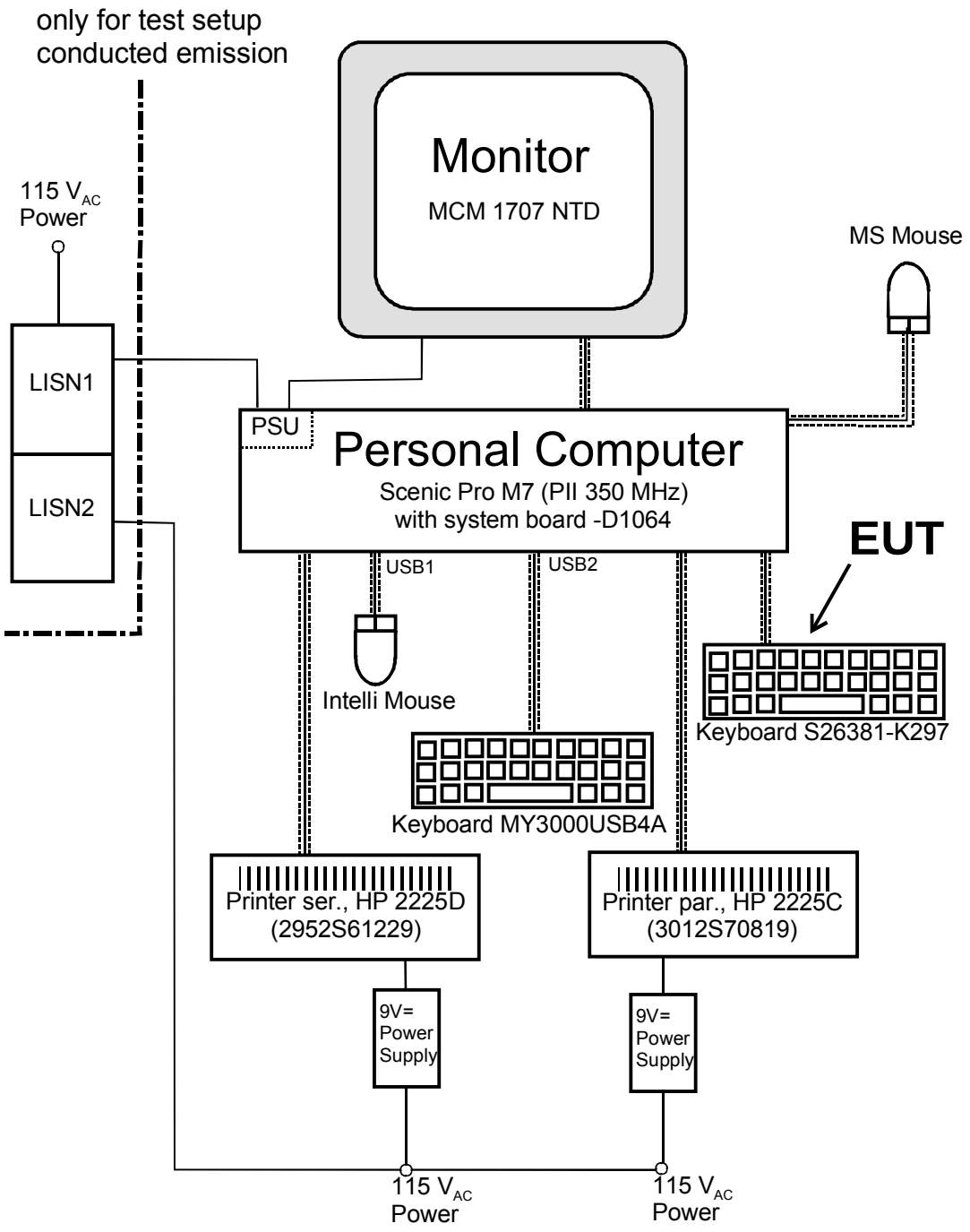
Applicant Signature _____ Date _____

Typed/Printed Name _____ Position _____

3.6 Configuration of Tested System

All necessary tests were carried out like figure 3.1. The system was used according to paragraph 1.1. During test for conducted emission the EUT was connected to a LISN. All peripherals were supplied by a second LISN. The equipment was configured according to ANSI C63.4-1992 Fig 11.

Figure 3.1 Configuration of Tested System



4 BLOCK DIAGRAM OF EUT

see fig 4.1 page 16

4.1 Block Diagram Description (see fig. 4.1)

The major parts of the system are (fig 4.1).

- Keyboard controller
- Key matrix

The keyboard works exactly like a traditional keyboard.

4.2 Clockfrequency of EUT

Ceramic resonator frequency: 2,0 MHz ± 15 %

The external clock frequency is divided by 2 in the keyboard controller.

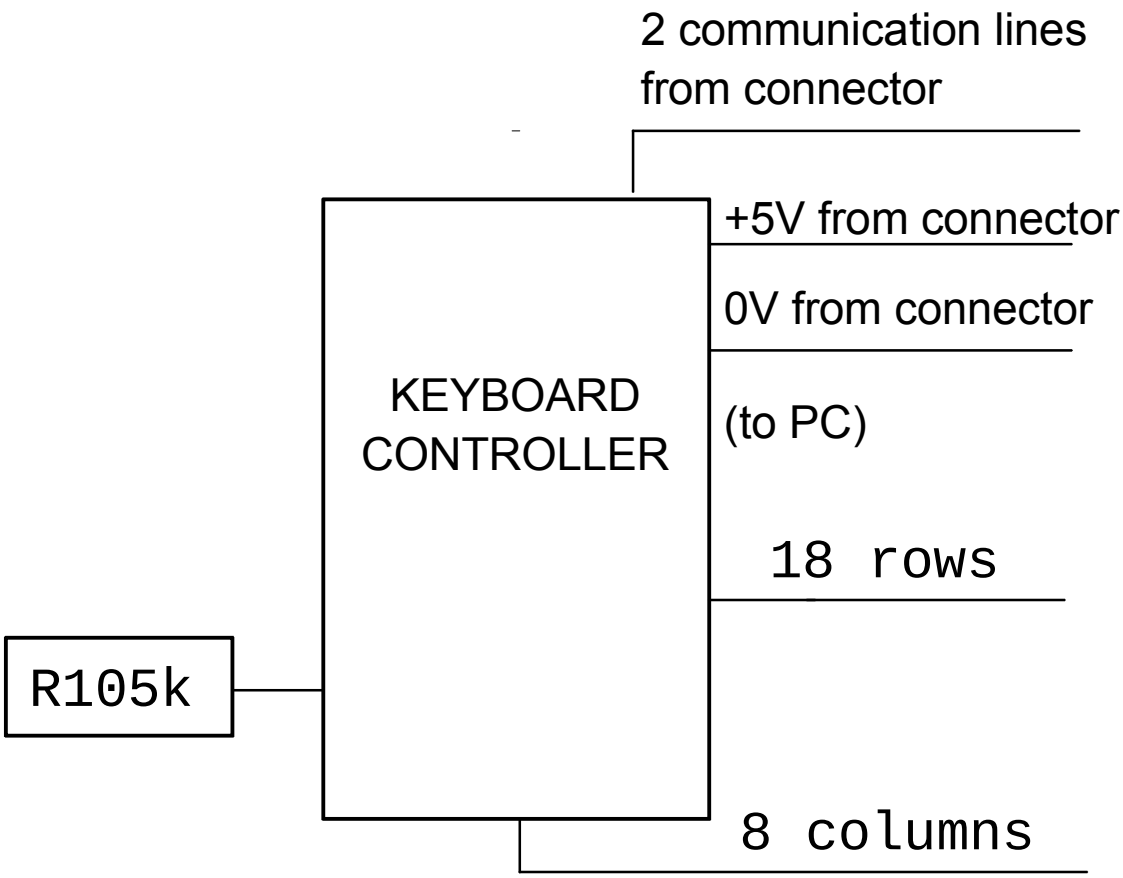
4.3 Theory of Operation

The control of all keyboard functions is done by a micro controller MOTOROLA MC68HC05SU3. The external frequency is 2 MHz, the internal is 1 MHz.

The controller scans a matrix of 18 x 8 (144 keys). The matrix is scanned all time by the controller with a high level pulse. The input is an A/D-converter part of the controller which analyses, if a key is pressed or released.

The communication to the system is realised by two lines, a clock- and a data line. It is a synchronous data transmission.

4.1 Block Diagram of the EUT



Frequency: 2 MHz +/- 15%

5 CONDUCTED EMISSION DATA

5.1 Test Procedure

The initial step in collecting conducted emission data is a Rohde & Schwarz Test Receiver (ESHS10). During first scan all data in peak mode is measured, then all significant peaks are explored either in quasi-peak mode or in average mode. In case of low noise (no peak value reaches the quasi peak limit), only average checks are done.

5.2 Measured Data

The conducted emission was measured the following way:

1. Peak noise on L
2. Peak noise on N

During the emission measurement the printers and the monitor are supplied with power via a second LISN.

The worst case results of the measurement is given next:

Judgement: Passed by

	Frequency [MHz]	Measured [dB(µV)]	Kind of value	Limit [dB(µV)]
neutral	0,204	49,3	QP	63,0
phase	0,342	45,5	QP	59,0
neutral	0,876	42,5	QP	56,0
neutral	1,380	42,9	QP	56,0
neutral	1,506	43,5	QP	56,0

Judgement: Passed by

	Frequency [MHz]	Measured [dB(µV)]	Kind of value	Limit [dB(µV)]
neutral	0,876	41,8	AV	46,0
neutral	1,002	39,0	AV	46,0
neutral	1,380	42,2	AV	46,0
neutral	1,506	42,7	AV	46,0
neutral	1,632	39,5	AV	46,0

AV: average
QP: quasi peak

Test Personnel:

Tester Signature: _____ Date: _____

Printed Name: R. Schaufler

Measurement Protocols: see attached files

EUT with Personal Computer Scenic Pro M7
PII 350 MHz
video resolution 1024 x 768/100 Hz

5.3 Referenced Rules Sections

N/A

5.4 Test Instrumentation Used, Conducted Measurement

Type	Manufacturer/ Model No.	Serial No.	Last Cal.	Cal. Interval
Receiver	ESHS10 Rohde&Schwarz	842884/011	May 99	12 months
Receiver	ESH3 Rohde&Schwarz	879599/019	May 99	12 months
LISN	ESH2-Z5 Rohde&Schwarz	871884/004	May 99	12 months
LISN	ESH3-Z5 Rohde&Schwarz	883650/027	May 99	12 months
Pulse limiter	ESH3-Z2 Rohde&Schwarz	---	May 99	12 months

6 RADIATED EMISSION DATA

6.1 Test Procedure

The radiated emission was measured between 30 MHz to 1000 MHz. The bandwidth of the EMI-receiver was set to 120 kHz and the detector was set to peak. During prescan all data in peak mode are accumulated automatically. At final measurement the detector was set to CISPR quasi peak and values above the acceptance line were verified automatically.

The test was performed in a semi anechoic chamber, in a distance of 10 meters between antenna and EUT. During tests the EUT was turned 360° the receiving antenna was moved from 1 to 4 meters and the antenna polarisation was changed from horizontal to vertical for finding the maximum levels of emission.

For the whole range one antenna was used:

30 MHz to 1000 MHz: Bilog antenna

After automatic tests during manual verification the cables and the equipment were placed and moved within the range of position in order to find the maximum of emission.

For further data see enclosed test results.

6.2 Measured Data

The EUT was measured with the Personal Computer Scenic Pro M7 (PII 350 MHz) in video mode 1024 x 768, 85/100 Hz. The test results below reflect the worst case with:

Frequency range 30 MHz - 1000 MHz:

Judgement: Passed by

Frequency [MHz]	Level* [dB(µV/m)]	10 Meter Limit [dB(µV/m)]	Exceeding [dB]	Ant Pol	Height in [m]	Angle in deg
96.66000	26.28	30.000	-3.2	ver	1.60	239.000
132.90000	22.80	30.000	-7.2	ver	1.00	270.000
144.96000	22.90	30.000	-7.1	hor	3.40	210.000
185.07000	22.70	30.000	-7.3	hor	4.00	59.000
992.22000	34.30	37.000	-2.7	hor	2.80	300.000

all levels are quasi-peak levels

*****The correction factor is considered automatically by the test receiver. A table of correction factors is listed in paragraph 7.4.

Test Personnel:

Tester Signature: _____ Date: _____

Printed Name: H. Zenkner

Measurement Protocols: see attached files

EUT with Personal Computer Scenic Pro M7
PII 350 MHz
video resolution 1024 x 768/85 Hz

6.3 Referenced Rules Sections

N/A

6.4 Test Instrumentation Used, Radiated Measurement

Type	Manufacturer/ Model No.	Serial No.	Last Cal.	Cal. Interval
Receiver	ESMI Rohde&Schwarz	840607/006	May 99	15 months
Antenna	CBL 6111 Chase	1345	May 99	12 months
Antenna	CBL 6112 Chase	2041	Aug. 99	15 months

6.5 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor automatically to the measured value. The display of the Receiver shows the corrected value. The complete table of correction factors is given on next page. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF

where FS = Field Strength

AF = Antenna Factor (incl. Preamplifier factor)

CF = Cable Attenuation Factor

Assume a receiver reading of 28,5 dBµV is obtained. The Antenna Factor of 10,5 and a Cable Factor of 1,3 is added, giving a field strength of 40,3 dBµV/m.

FS = 28,5 + 10,5 + 1.3 = 40,3 dBµV/m

The 40,3 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

Level in µV/m =
Common Antilogarithm [(40,3 dBµV/m)/20] =

103,5 µV/m

6.6 Table of Correction Factors

Frequency range: 30 MHz to 1000 MHz

Frequency [MHz]	Correction Bilog Antenna [dB]	Correction Cable [dB]	Correction Antenna + Cable [dB]
30,0	17,80	0,65	18,45
35,0	15,10	0,67	15,77
40,0	12,40	0,68	13,08
45,0	9,80	0,73	10,53
50,0	7,70	0,74	8,44
55,0	6,20	0,82	7,02
60,0	5,10	0,84	5,94
70,0	5,00	0,90	5,90
80,0	6,60	0,95	7,55
90,0	8,50	0,99	9,49
100,0	10,30	1,10	11,40
120,0	11,40	1,14	12,54
140,0	10,40	1,27	11,67
160,0	9,40	1,35	10,75
180,0	8,50	1,45	9,95
200,0	9,10	1,51	10,61
250,0	11,80	1,71	13,51
300,0	13,00	1,84	14,84
350,0	14,10	2,00	16,10
400,0	16,00	2,18	18,18
450,0	16,30	2,35	18,65
500,0	17,10	2,43	19,53

Frequency [MHz]	Correction Bilog Antenna [dB]	Correction Cable [dB]	Correction Antenna + Cable [dB]
550,0	18,80	2,62	21,41
600,0	18,60	2,73	21,33
650,0	19,00	2,88	21,88
700,0	19,10	2,91	22,01
750,0	19,80	3,01	22,81
800,0	19,80	3,21	23,01
850,0	20,40	3,32	23,72
900,0	20,50	3,40	23,90
950,0	20,80	3,49	24,29
1000,0	21,10	3,69	24,79

7 Conducted And Radiated Emission Measurement Photos: see attached files

7.1 Test setup, conducted emission, front side view

7.2 Test setup, conducted emission, rear side view

7.3 Test setup, radiated emission, front side view

7.4 Test setup, radiated emission, rear side view

8 External Photos of EUT: see attached files

8.1 Front side view of EUT

8.2 Rear side view of EUT

9 Internal Photos of EUT: see attached files

9.1 Inside view with membrane switch of EUT

9.2 PCB-board, front side view

9.3 PCB-board, rear side view

10 User Manual: see attached files