MEASUREMENT / TECHNICAL REPORT

SIEMENS PC SYSTEME GmbH & Co. KG

Model: Keyboard K280

FCC ID: HSS01TASTK280

July 23, 1999

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

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

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Applicant for this device:

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Table of Contents

1 GENERAL INFORMATION

1.1 Product Description

The Siemens Keyboard K280 with the product number S26381-K280 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 USB type B header and on the other end a type A header. Additionally three down stream ports with USB type A receptacles are integrated.

Description of the keyboard K280: *S26381-K280-V****

Functions and features:

Industry standard	MF-II-compatible
Embedded keyboard function	USB H/D device class Rev 1 compliant
Keyboard to the system unit	USB type B to USB type A (cable length 191 cm)
Design	− Low-profile compact design, special ergonomic key design − Adjustable keyboard slope
Technology	Integration of all components on a single PCB

Electrical:

Power consumption	< 500 mA at 5 V

Temperature:

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

Dimensions:

Dimensions (H x W x D)	25 x 383 x 166 mm

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 USB S26381-K280-V***	HSS01TASTK280	USB-Key-board (**EUT)**	shielded keyboard cable [191]
2	Siemens Scenic Pro 850 S26361-K516-V122	HSSSCENIC8501	PC PII 400 MHz	unshielded power cord [292]
3	Siemens MCM 1705 NTD BQ804519	A3LCGH760	Monitor	unshielded power cord [175] shielded video cable [168]
4	Siemens S26381-K210-V120 OG611BKIGL	HSS01TASTK210	Keyboard	shielded keyboard cable [143]
5	Microsoft MS 2.1 A 1826047-00000	C3KKMP1	Mouse	shielded mouse cable [183]

Pos	Model Number (Serial Number)	FCC ID	Description	Cable Description (length in [cm])
6	Microsoft Intelli mouse 1.1 A 0015096-00000	DOC: m/n:IM1	USB-Mouse	shielded mouse cable [197]
7	Microsoft Intelli mouse 1.1 A 0014853-00000	DOC: m/n:IM1	USB-Mouse	shielded mouse cable [197]
8	Microsoft Intelli mouse 1.1 A 0014934-00000	DOC: m/n:IM1	USB-Mouse	shielded mouse cable [197]
9	Hewlett Packard HP 2225C (3011S70627)	DSI6XU2225	Printer, parallel I/F	unshielded AC cable [180], shielded centronics cable [190]
10	Hewlett Packard HP 2225D+ (3019S70991)	DSI6XU2225	Printer, serial I/F	unshielded power cord [185], shielded serial cable [190]
	Pos 1 contains:			
a	C26381-K240-C3	N/A	Connection silicon rubber	
b	C26381-K240-C2	N/A	Connection matrix foil	
c	PCB S26381-D295	N/A	Controller	
d	Siemens, E129760 2C/28AWG	N/A	USB-cable	shielded [191]

Remark:

1.4 Test Methodology

Both, conducted and radiated tests were performed according to the procedures in ANSI C63.4-1992. Radiated testing below 1 GHz 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 AG, Bürgermeister Ulrich Str. 100, 86199 Augsburg, Germany. This site has been fully described in a report dated January 24, 1997 submitted 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 files

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 1,91 m length.

3.2 Video mode Justification

The system was tested in video graphic modes 1024 x 768/85 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 ports (continuous “ ” keyboard character pressed

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

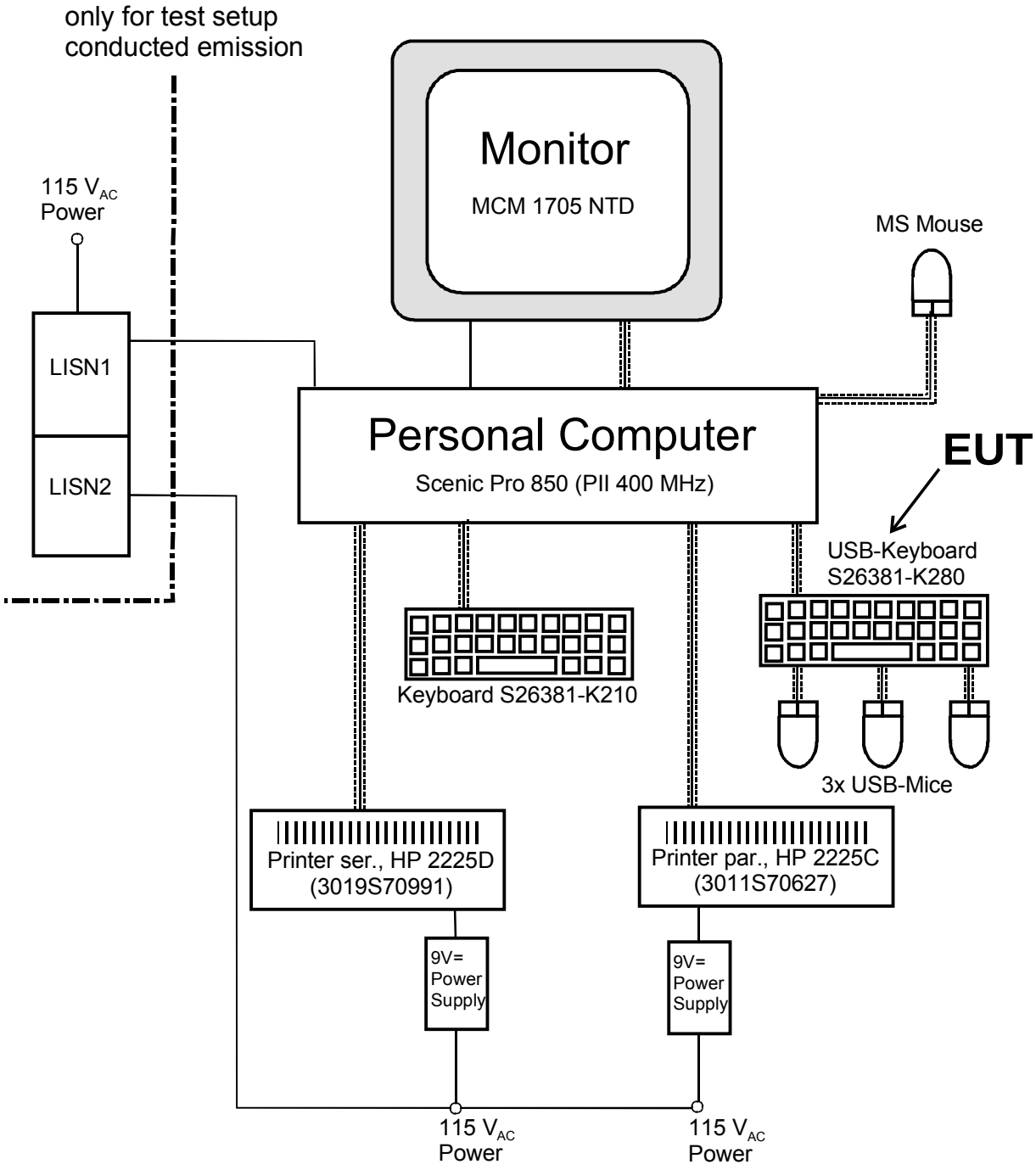
Applicant Signature _____ Date _____

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 15

4.1 Block Diagram Description (see fig. 4.1)

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

- Keyboard Controller
- Keymatrix

The detailed diagram of the keyboard is shown in fig 4.1

4.2 Clockfrequencies of EUT

- Quarz frequency 6 MHz
- Internal controller frequency 48 MHz

4.3 Theory of Operation

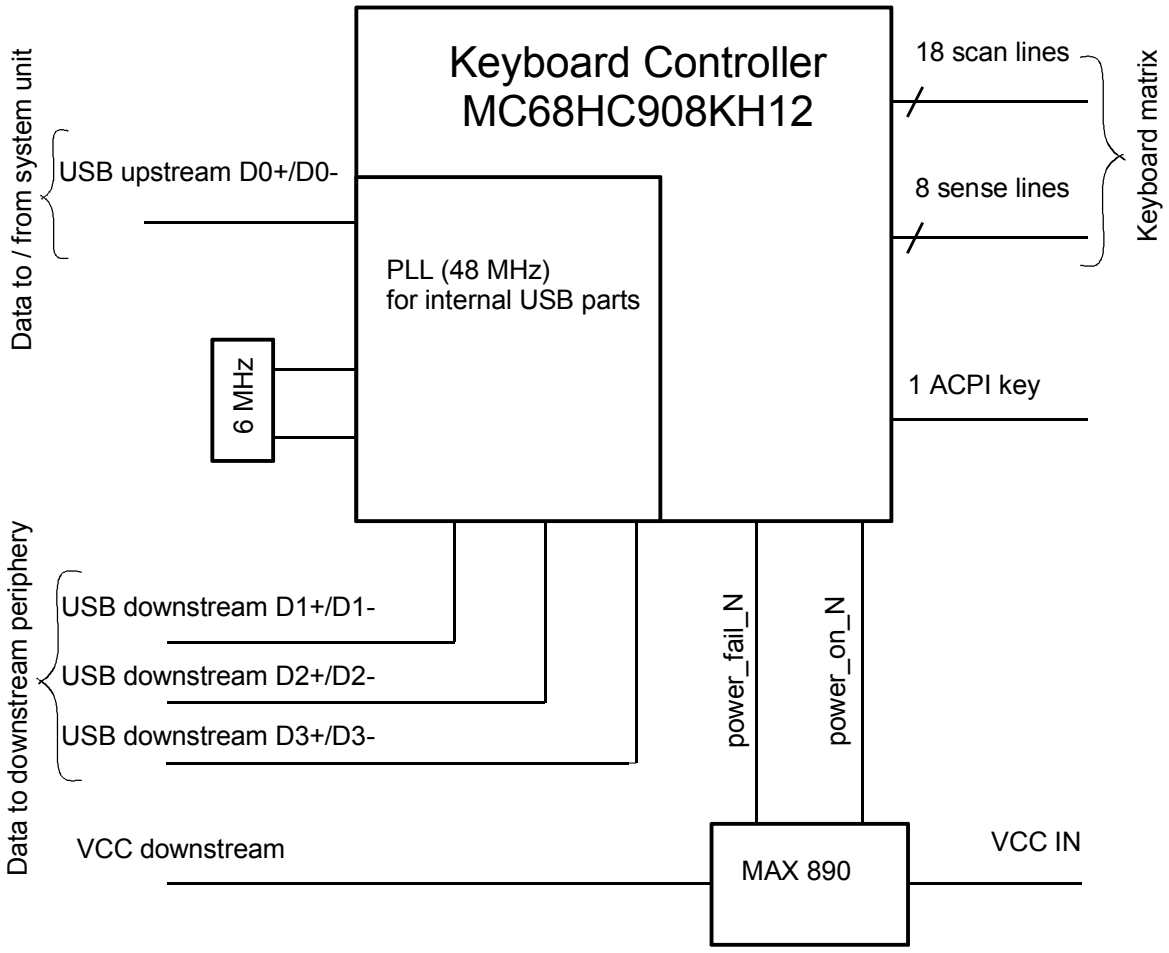
The keyboard works exactly like a traditional keyboard.

The control of all keyboard functions is done by a micro controller MOTOROLA MC68HC908KH12. The external frequency is 6 MHz, the internal USB-clock frequency is 48 MHz.

The controller scans a matrix of 18 x 8 (105 keys). The matrix is scanned all time by the controller. 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 a high speed USB. On the down stream 3 peripheral devices can be driven.

Figure 4.1 Block Diagram of the EUT



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 are supplied with power via a second LISN.

Judgement: Passed by

	Frequency [MHz]	Measured [dB(µV)]	Kind of value	Limit [dB(µV)]
phase	0,312	38,40	QP	59,9
neutral	0,366	36,60	QP	58,5
phase	0,432	33,40	QP	57,2
neutral	0,552	32,10	QP	56,0
neutral	0,576	31,40	QP	56,0
phase	0,204	38,00	AV	53,4

	Frequency [MHz]	Measured [dB(µV)]	Kind of value	Limit [dB(µV)]
neutral	0,246	39,00	AV	51,8
neutral	0,306	43,20	AV	50,0
neutral	0,366	32,90	AV	48,5
phase	0,504	30,10	AV	46,0

AV: average
QP: quasi peak

Test Personnel:

Tester Signature: _____ Date: _____

Printed Name: H. Zenkner

Measurement Protocols: see attached file

EUT with Personal Computer Scenic Pro 850
PII 400 MHz
video resolution 1024 x 768/85 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
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: log.-per 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 850 (PII 400 MHz) in video mode 1024 x 768. 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
60.30000	17.50	30.000	-12.5	ver	3.4000	90.000
84.09000	14.80	30.000	-15.2	hor	4.0000	239.000
130.35000	13.40	30.000	-16.6	ver	1.6000	210.000
133.95000	13.40	30.000	-16.6	ver	1.0000	239.000
144.00000	22.20	30.000	-7.8	ver	1.6000	180.000
618.75000	33.30	37.000	-3.7	hor	3.4000	300.000
994.95000	32.80	37.000	-4.2	hor	2.8000	0.000

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: M. Bosse

Measurement Protocols: see attached files

EUT with Personal Computer Scenic Pro 850
PII 400 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	May 98	15 months
Active Ridged antenna	Tensor 4105 Rohde&Schwarz	2063	May 98	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	17,90	0,65	18,55
35,0	15,20	0,67	15,87
40,0	12,80	0,68	13,48
45,0	10,00	0,73	10,73
50,0	8,20	0,74	8,94
55,0	6,90	0,82	7,72
60,0	6,50	0,84	7,34
70,0	6,40	0,90	7,30
80,0	7,20	0,95	8,15
90,0	9,30	0,99	10,29
100,0	11,10	1,10	12,20
120,0	12,10	1,14	13,24
140,0	11,30	1,27	12,57
160,0	10,60	1,35	11,95
180,0	9,60	1,45	11,05
200,0	9,50	1,51	11,01
250,0	12,40	1,71	14,11
300,0	13,80	1,84	15,64
350,0	15,00	2,00	17,00
400,0	16,40	2,18	18,58
450,0	16,90	2,35	19,25
500,0	17,40	2,43	19,83

Frequency [MHz]	Correction Bilog Antenna [dB]	Correction Cable [dB]	Correction Antenna + Cable [dB]
550,0	19,00	2,62	21,62
600,0	18,70	2,73	21,43
650,0	19,70	2,88	22,58
700,0	19,00	2,91	21,91
750,0	20,00	3,01	23,01
800,0	19,90	3,21	23,11
850,0	22,90	3,32	26,22
900,0	20,70	3,40	24,10
950,0	21,00	3,49	24,49
1000,0	25,00	3,69	28,69

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 of EUT
8.2 Rear side of EUT
8.3 Back side of EUT
8.4 Opened case, inside view of EUT

9 Internal Photos of EUT: see attached files

9.1 Controller, front side view
9.2 Controller rear side view

10 User Manual: see attached files

For FCC statement please refer to user manual page 7.