

Attachment 3

FCC PART 15B TEST REPORT

REPORT NUMBER: FG07_171EAL

Report No. : FG07-171EAL (1/10)

EMI Test report

CATEGORY : EN55022(2006) / CISPR 22(2005) ; Class B
AS/NZS CISPR22 (2002)
FCC Part-15 (2007)
VCCI (2007)
EN301 489-01 V1.4.1

MANUFACTURER : FUJITSU LIMITED
4-1-1, Kamikodanaka, Nakahara-ku, Kawasaki 211-8588 JAPAN

PRODUCT TYPE : Personal computer P8010
Port Replicator FPCPR82
AC Adapter SED80N2-16.0 PXW1637N
WL-LAN Module 4965AGN 4965AG-
Bluetooth module EYSMJCS

TEST SITE : FUJITSU GENERAL EMC LABORATORY
1116, Suenaga, Takatsu-ku, Kawasaki 213-8502 JAPAN

DATE TESTED : December 19, 2007 22°C 40%

TESTED BY : Akio Ogawa

Above EUT conforms mentioned all regulations.

APPROVED BY : for K. Shimano DATE : December 25, 2007
Hiroyuki Shimano, President

FUJITSU GENERAL EMC LABORATORY LIMITED

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CLIENT : Global Business Division, FUJITSU LIMITED

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※ The description of the EUT and the system configuration in this report are provided by the client.



Accredited by NVLAP.
Authorized by TÜV SÜD PS.
Appointed by TÜV Rheinland Japan
Registered on VCCI.

1. Description of EUT

The EUT: P8010 personal computer using selected CPU; Core2 Duo SL7100 1.2 GHz microprocessor has a 12.1 inch WXGA Display, 1024 MB Memory and a system disk (250 GB). The EUT has the interface for RGB④, Mic-in/Phone-out①, LAN⑦, TEL④, 1394⑧, USB×3②⑩⑪⑫⑬⑭⑮⑯, SD card slot, PC card slot, direct memory slot, Bluetooth and wireless LAN.

The following wireless LAN module type codes are given according to the communication method.

Type	Communication method.
4965AGN	IEEE802.11a/ b/ g/ n
4965AG_	IEEE802.11a/ b/ g

Internal clock frequency : 32.678 kHz, 4.000 MHz, 12.000 MHz, 14.318 MHz, 24.000 MHz, 25.000 MHz, 33.330 MHz, 48.000 MHz, 96.000 MHz, 100.000 MHz, 200.000 MHz

Input power : AC 100 - 230V, 50 / 60 Hz, Single-phase 2 wires

The EUT is intended to use generally in the residential / domestic area or commercial and light industrial area; category class B.

1.1 Test system configuration

The measurement was performed using P8010 with all related equipment as a maximum personal computer system shown in figure-1.

The preliminary measurement was performed using P8010 only or P8010 with FPCPR82. Then final measurement was performed using P8010 only that had worse result (more sever margin) than the combination of P8010 with FPCPR82 for radiated emission.

The EUT was selected from the pre-production line.

1.2 Operating condition

The following EUT and dependent devices were tested using “EMC.exe”, “Blue test” and “CRTU” program under continuous operating condition to obtain maximum emission.

- ① PC-1 LCD-1: Display “H” character on screen (Maximum contrast/ Luminescence)
(Display resolution 1280×800 / Refresh rate 60Hz)
- HDD: Read/write the test data
- LAN: Continuous transmission and reception of the ping command (1000 M Max)
- TEL: Continuous transmission of the test data (56 kbps)
- Bluetooth: Continuous transmission of the RF signal.
- Wireless LAN: Continuous transmission of the RF signal.
- ② PC card: Read/write the test data
- ③ CF card: Read/write the test data
- ④ USB2.0 Memory: Read/write the test data (480 M max)
- ⑤ HDD-2(IEEE1394): Read/write the test data (480 M max)
- ⑥ LCD-2: Display “H” character on screen (Maximum contrast / Luminescence)
- ⑦ Headset: Connecting only
- ⑧ USB mouse: Connecting only
- ⑨ PC-2: Receiving ping command and test data.
- ⑩ PC-3: Receiving test data.

2. EMI test results summary

Applied standard: EN55022 (2006)

Limit value: Class B

The test samples met the class B limit of EN55022(2006)/ CISPR22(2005) and applicable below regulations as shown the following highest 6 points of each emission profiles.

Australia, New Zealand: AS/NZS CISPR22(2002)

USA: FCC Part-15(2007), Canada: CAN/CSA-CEI/IEC CISPR22-02

Japan: VCCI(2007), Taiwan: CSN 13438(2006)

The telecommunication conducted emission is not covered VCCI registered.

The test result is effective in only for the EUT.

2.1 Radiated emission (30 MHz to 1,000 MHz) : Measured at 10 m distance

< AC 230 V / 50 Hz single phase >

Freq. (MHz)	pol.	Noise level (QP; dB μ V/m)	Class B limit (QP; dB μ V/m)	Margin (dB)
34.31	Vert	29.2	30.0	0.8
129.58	Vert	27.6	30.0	2.4
160.03	Horiz	27.0	30.0	3.0
240.01	Horiz	36.0	37.0	1.0
338.87	Horiz	33.7	37.0	3.3
355.83	Horiz	34.4	37.0	2.6

< AC 120 V / 60 Hz single phase >

Freq. (MHz)	pol.	Noise level (QP; dB μ V/m)	Class B limit (QP; dB μ V/m)	Margin (dB)
34.32	Vert	28.8	30.0	1.2
73.75	Vert	27.0	30.0	3.0
160.00	Horiz	29.2	30.0	0.8
336.01	Horiz	32.8	37.0	4.2
516.09	Horiz	35.2	37.0	1.8
552.96	Horiz	32.4	37.0	4.6

• Limit value ; CISPR 22(2005)

• Measurement uncertainty : \pm 3.3 dB (K=2, 95 %)

2.2 Over 1 GHz RF Radiated emission(1 GHz to 6 GHz) : Measured at 3 m distance

Freq. (GHz)	Pol	Noise level (dB μ V/m) Peak	FCC Part-15 Class B limit (dB μ V/m)		Margin (dB to AV)
			Peak	A V	
1.3335	Horiz	44.6	74.0	54.0	9.4
1.6666	Horiz	46.5	74.0	54.0	7.5
1.9999	Horiz	40.6	74.0	54.0	13.4
2.1253	Horiz	43.2	74.0	54.0	10.8
2.9999	Horiz	41.1	74.0	54.0	12.9
3.9998	Horiz	46.5	74.0	54.0	7.5

2.3 AC power line conducted emission (150 kHz to 30 MHz)

2.3.1 AC adapter : SED80N2-16.0

< AC 230 V / 50 Hz single phase >

Freq. (MHz)	Line #	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB)	
		Q P	A V	Q P	A V	Q P	A V
0.188	# 1	55.1	40.7	64.1	54.1	9.0	13.4
0.188	# 2	54.1	39.7	64.1	54.1	10.0	14.4
0.318	# 1	44.7	31.2	59.8	49.8	15.1	18.6
0.318	# 2	45.6	33.7	59.8	49.8	14.2	16.1
0.548	# 1	40.5	24.9	56.0	46.0	15.5	21.1
18.244	# 2	37.4	32.3	60.0	50.0	22.6	17.7

< AC 120 V / 60 Hz single phase >

Freq. (MHz)	Line #	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB)	
		Q P	A V	Q P	A V	Q P	A V
0.189	# 1	52.1	34.1	64.1	54.1	12.0	20.0
0.189	# 2	52.9	37.2	64.1	54.1	11.2	16.9
0.381	# 1	41.6	28.8	58.3	48.3	16.7	19.5
0.381	# 2	42.2	30.6	58.3	48.3	16.1	17.7
0.512	# 1	39.4	25.9	56.0	46.0	16.6	20.1
18.242	# 2	36.9	32.5	60.0	50.0	23.1	17.5

< AC 100 V / 50 Hz single phase >

Freq. (MHz)	Line #	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB)	
		Q P	A V	Q P	A V	Q P	A V
0.189	# 1	51.4	30.3	64.1	54.1	12.7	23.8
0.189	# 2	52.7	34.9	64.1	54.1	11.4	19.2
0.377	# 1	40.1	27.0	58.4	48.4	18.3	21.4
0.377	# 2	41.6	28.5	58.4	48.4	16.8	19.9
0.500	# 1	39.3	25.1	56.0	46.0	16.7	20.9
0.500	# 2	40.3	25.7	56.0	46.0	15.7	20.3

• Limit value ; CISPR 22(2005)

• Measurement uncertainty : ± 2.5 dB (K=2, 95 %)

2.3.2 AC adapter : PXW1637N

< AC 230 V / 50 Hz single phase >

Freq. (MHz)	Line #	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB)	
		Q P	A V	Q P	A V	Q P	A V
18.243	# 1	45.9	40.6	60.0	50.0	14.1	9.4
18.243	# 2	47.9	42.6	60.0	50.0	12.1	7.4
22.255	# 1	42.5	37.9	60.0	50.0	17.5	12.1
22.255	# 2	42.9	38.7	60.0	50.0	17.1	11.3
25.097	# 1	42.9	39.5	60.0	50.0	17.1	10.5
25.097	# 2	43.2	39.7	60.0	50.0	16.8	10.3

• Limit value ; CISPR 22(2005)

• Measurement uncertainty : ± 2.5 dB (K=2, 95 %)

< AC 120 V / 60 Hz single phase >

Freq. (MHz)	Line #	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB)	
		Q P	A V	Q P	A V	Q P	A V
		18.244	# 1	46.1	41.2	60.0	50.0
18.244	# 2	47.3	42.5	60.0	50.0	12.7	7.5
21.663	# 1	43.8	38.9	60.0	50.0	16.2	11.1
21.663	# 2	45.0	40.0	60.0	50.0	15.0	10.0
25.097	# 1	42.8	39.0	60.0	50.0	17.2	11.0
25.097	# 2	43.0	39.6	60.0	50.0	17.0	10.4

< AC 100 V / 50 Hz single phase >

Freq. (MHz)	Line #	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB)	
		Q P	A V	Q P	A V	Q P	A V
		18.244	# 1	46.1	41.5	60.0	50.0
18.244	# 2	47.1	42.5	60.0	50.0	12.9	7.5
21.663	# 1	43.3	39.0	60.0	50.0	16.7	11.0
21.663	# 2	44.7	39.8	60.0	50.0	15.3	10.2
25.098	# 1	42.9	39.6	60.0	50.0	17.1	10.4
25.098	# 2	43.1	39.7	60.0	50.0	16.9	10.3

• Limit value ; CISPR 22(2005)

• Measurement uncertainty : ± 2.5 dB (K=2, 95 %)

2.4 Telecommunication line conducted emission

< Telecom port >

Freq. (MHz)	Noise level (dB μ V)		Class B limit (dB μ V)		Margin (dB to AV)
	Q P		Q P	A V	
	0.168	55.1	83.1	73.1	
1.606	52.2	74.0	64.0	11.8	
5.511	51.1	74.0	64.0	12.9	
7.008	53.4	74.0	64.0	10.6	
14.212	47.0	74.0	64.0	17.0	
16.228	50.5	74.0	64.0	13.5	

< LAN port >

Freq. (MHz)	Noise level (dB μ A)		Class B limit (dB μ A)		Margin (dB)	
	Q P	A V	Q P	A V	Q P	A V
	2.049	17.3	16.6	30.0	20.0	12.7
4.096	21.0	18.9	30.0	20.0	9.0	1.1
6.144	16.0	15.2	30.0	20.0	14.0	4.8
10.239	9.9	6.2	30.0	20.0	20.1	13.8
18.487	9.8	1.5	30.0	20.0	20.2	18.5
20.325	9.1	2.3	30.0	20.0	20.9	17.7

• Limit value ; CISPR 22(2005)

3. EUT modification under the test

The following countermeasures were implemented for the radiated emission.
A copper tape is added to the USB connector board.

4. Measurement procedure and test equipment

The measurement was performed without deviation from CISPR22 (2005)

4.1 Radiated emission

4.1.1 Radiated emission (30MHz~1,000MHz)

The EUT was set on the 80 cm height desk placed on the turntable in the 10 m RF semi-anechoic chamber.

The PC-2, PC3 and HUB were placed at outside of the chamber to make usual install condition at the different place. The maximum noise level in the frequency range from 30 MHz to 1,000 MHz were measured by 10 m method with scanning the antenna height from 1 m to 4 m above the ground plane and rotating the EUT through 360 degrees for both horizontal and vertical polarization.

Preliminary measurement using spectrum analyzer peak detection was performed to arrange the minimum margin spectrum. The settings of the interface cables and the mouse were adjusted to obtain maximum level at the minimum margin spectrum. The final measurement was performed using the RFI receiver (CISPR Quasi-peak, 120 kHz band width) and calibrated broadband antennas or dipole antennas about the main spectrums that was obtained by the preliminary measurement.

Test equipment	Manufacturer	Type	S/N	Cal. Date	Due. Date
Bi Log antenna	Schwarzbeck	VULB9160	3118	2007.01.04	2008.01.04
Dipole antenna	Schwarzbeck	VHA9103	VHA91031573	2006.12.28	2008.12.28
Dipole antenna	Schwarzbeck	UHA9105	UHA91052119	2006.12.28	2008.12.28
Field strength meter	Rohde & Schwarz	ESCS30	849650/003	2007.04.25	2008.04.25
Spectrum analyzer	HP	85422E	3746A00242	2007.04.24	2008.04.24
RF switch	Rohde & Schwarz	PSU	848290/003	2007.05.07	2008.05.07
RF cable	-----	CF013	-----	2007.05.07	2008.05.07
2nd semi-anechoic chamber	Riken eletech	-----	-----	2007.01.16	2009.01.16
EMI test program	FGE	Version 1.3			

4.1.2 Radiated emission (1 GHz~6 GHz)

The EUT was set on the 80 cm height non-reflective desk on the turntable. The radiated emission measurement from 1 GHz to 6 GHz: Operating rate 1.2 GHz was performed using the spectrum analyzer (Peak detection, 1MHz band width) and the horn antenna that was positioned at 3 m from the EUT for class B. The measurement was performed with rotating the EUT through 360 degrees and fixing the antenna height to the 1 m for both horizontal and vertical polarization.

Test equipment	Manufacturer	Type	S/N	Cal. Date	Due. Date
Horn antenna	Schwarzbeck	BBHA9120D	414	2007.02.23	2009.02.23
Spectrum analyzer	Advantest	R3371A	75060396	2007.05.27	2008.05.27
Pre amplifier	HP	8449B	3008A01110	2007.03.24	2009.03.24
2nd semi-anechoic chamber	Riken eletech	-----	-----	2007.01.16	2009.01.16

4.2 AC power line conducted emission

The conducted emission measurement was performed using the 50Ω/50μH artificial mains network: AMN in the shielded room. The EUT was set on the 80 cm height wooden desk and operated by AC 100 V/ 50 Hz, AC 120 V/ 60 Hz and AC 230 V/ 50 Hz. Preliminary measurement using spectrum analyzer peak detection was performed in the frequency range from 150 kHz to 30 MHz to arrange the minimum margin spectrum. The setting of the cables was adjusted to obtain maximum level at the minimum margin spectrum. The final measurement was performed using the RFI receiver (CISPR Quasi-peak, 9 kHz band width) and recorded the maximum value in the monitored interval about the main spectrum that was obtained by the preliminary measurement.

Test equipment	Manufacturer	Type	S/N	Cal. Date	Due. Date
AMN for EUT	Kyoritsu	KNW-407	8-823-18	2007.01.15	2008.01.15
AMN for AE	Kyoritsu	KNW-242C	8-1387-7	2007.01.15	2008.01.15
Field strength meter	Rohde & Schwarz	ESCS30	849650/001	2007.04.25	2008.04.25
Spectrum analyzer	HP	85422E	3746A00240	2007.04.24	2008.04.24
RF switch	Rohde & Schwarz	PSU	848290/005	2007.05.07	2008.05.07
Band pass filter	Advantest	TR14202	03560025	2007.05.07	2008.05.07
10 dB Transient Limiter	Rohde & Schwarz	ESH3-Z3	0357.8810.54	2007.05.07	2008.05.07
RF cable	----	CF009	----	2007.05.07	2008.05.07
EMI test program	FGE	Version 1.3			

4.3 Telecommunication line conducted emission

The conducted emission measurement was performed using the impedance stabilization network: ISN LCL; 55 dB for telecom port, current probe for LAN port in the shielded room. The EUT was set on the 40 cm height wooden desk and operated by AC 230 V/ 50 Hz. Preliminary measurement using spectrum analyzer peak detection was performed in the frequency range from 150 kHz to 30 MHz to arrange the minimum margin spectrum. The setting of the cables was adjusted to obtain maximum level at the minimum margin spectrum. The final measurement was performed using the RFI receiver (CISPR Quasi-peak, 9 kHz band width) and recorded the maximum value in the monitored interval about the main spectrum that was obtained by the preliminary measurement.

Test equipment	Manufacturer	Type	S/N	Cal. Date	Due. Date
ISN	Kyoritsu	KNW-2202	8S-2945-2	2007.09.03	2008.09.03
Current probe	Rohde & Schwarz	EZ-17	100007	2006.12.21	2007.12.21
Field strength meter	Rohde & Schwarz	ESCS30	849650/001	2007.04.25	2008.04.25
Spectrum analyzer	HP	85422E	3746A00240	2007.04.24	2008.04.24
RF switch	Rohde & Schwarz	PSU	848290/005	2007.05.07	2008.05.07
Band pass filter	Advantest	TR14202	03560025	2007.05.07	2008.05.07
10 dB plus limiter	Rohde & Schwarz	ESH3-Z3	0357.8810.54	2007.05.07	2008.05.07
RF cable	----	CF009	----	2007.05.07	2008.05.07

5. Test site and traceability

The FUJITSU GENERAL EMC LABORATORY performs the test for VCCI / EN / CISPR regulation and Fujitsu / Fujitsu General internal regulations. The test procedures and test facilities are comply with international standard. The laboratory is filed on VCCI (Japan), accredited from NVLAP (U.S.A.), authorized from TÜV SÜD PS (Germany) and appointed from TÜV Rheinland (Germany).

VCCI : 1st semi-anechoic chamber(R-753/C-776), 1st shielded room(C-777)
 Large shielded room(C-778)
 2nd semi-anechoic chamber(R-1460/C-1547), 2nd shielded room(C-1548)
 3rd shielded room(C-1549)

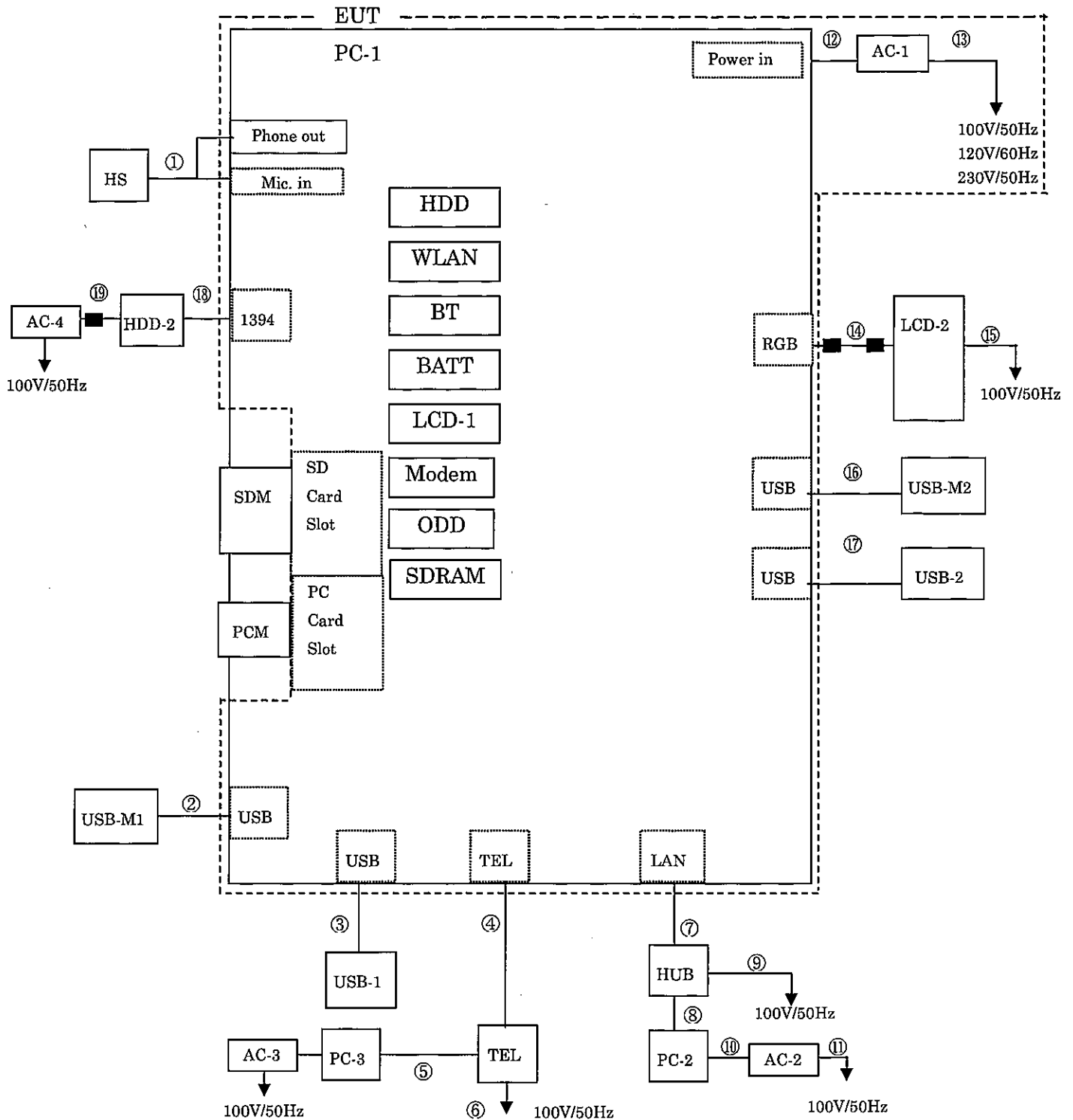
NVLAP : 1998.12.01 Accredited: Lab code 200373-0

TÜV SÜD PS : 1999.01.29 Authorized

TÜV Rheinland Japan : 2005.08.25 Appointed

The measuring equipments were used in the laboratory and test data are traceable to the national or international standard. Each equipment is maintain by periodical calibration and by daily check as a total measurement system to keep those accuracy.

Figure-1 System configuration and cables



■ : Ferrite core

Main EUT

Code	Name	Type	S/N	Product
PC-1	Personal computer	P8010	Pre-production sample	Fujitsu

Related EUT

AC-1	AC adapter	SED80N2-16.0	---	Fujitsu
	AC adapter	PXW1637N	---	Fujitsu

Included device; PC-1

Code	Name	Type	S/N	Product
HDD	250GB HDD	HTS542525K9SA00	-----	HGST
WLAN	Wireless LAN	4965AGN	-----	Intel
BT	Bluetooth	EYSMJCS	-----	TAIYO YUDEN
DIMM	1024 MB×1	M470T2953EZ3-CE6	-----	Samsung
BATT	Battery (6 cell)	7.2V 8700mA/h	-----	Fujitsu
Modem	Tel Modem	MDC1.5 modem Model:D40	-----	Agere
LCD-1	12.1" WXGA	LTD121EWPF	-----	TMD

Assisted equipment

Code	Name	Type	S/N	Product
LCD-2	LCD display	P19-1	YEGA217491	FSC
HS	Head set	GN 501FSC	-----	FSC
HDD-2	Head Disk	KC4020-N	0004384	FSC
PC-2	Personal computer	FMV	-----	Fujitsu
PC-3	Personal computer	FMV-650MC8/W	R0Z00167	Fujitsu
HUB	Switching Hub	ETG-SH-8	VD7000010513N	-----
AC-2	AC adapter	FMV-AC312	03Y15899C	Fujitsu
AC-3	AC adapter	FMV-AC308	00Y8412A	Fujitsu
AC-4	AC adapter	ACTN-21	-----	Sunfone
TEL	Telephone line emulator	TEL101- II	309688	ASCII
USB-1	USB Mouse	M-BT69e	HCA52701556	FSC
USB-M1	USB memory	128MB	-----	I·O DATA
USB-M2	USB memory	128MB	-----	I·O DATA
PCM	PC memory card	8 MB	-----	KINGMAX
SDM	SD memory card	256 MB	-----	BUFFALO

Cables SLD: Shielded NSLD: Non-shielded CAX: Coaxial

Connector MC: Metal NMC: Non-metal PMC: Point contact metal

No.	I/O Port	Name	Type	Length	Cable type
①	Phone-out/Mic-in	Headset cable	-----	2.2m	NSLD,NMC
②	USB	USB cable	-----	1.8m	SLD,MC
③	USB	USB mouse cable	-----	2.0m	SLD,MC
④	TEL	Modular cable	-----	20.0m	NLD, NMC
⑤	-----	Modular cable	-----	1.0m	NLD, NMC
⑥	-----	AC power cable	-----	1.8m	2P-NSLD
⑦	LAN	LAN cable	-----	20.0m	SLD, MC
⑧	-----	LAN cable	-----	1.0m	NSLD, NMC
⑨	-----	AC power cable	-----	2.0m	3P-NSLD
⑩	-----	AC adaptor cable	-----	1.8m	NSLD,NMC
⑪	-----	AC power cable	-----	1.8m	2P-NSLD
⑫	-----	AC adaptor cable	-----	1.6m	NSLD,NMC
⑬	-----	AC power cable	-----	2.0m	2P-NSLD
⑭	RGB	RGB cable	-----	1.8m	SLD, MC fixed core
⑮	-----	AC power cable	-----	2.0m	3P-NSLD
⑯	USB	USB cable	-----	1.8m	SLD,MC
⑰	USB	USB mouse cable	-----	2.0m	SLD,MC
⑱	1394	IEEE 1394 cable	-----	1.5m	SLD, MC
⑲	-----	AC adapter cable	-----	2.0m	2P-NSLD, NMC with core * 1

* 1: KITAGAWA industry Co.,Ltd; TFC-23-11-14