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Report No. : FG10-016EFC (1/10)

EMI Test report

CATEGORY : FCC Part-15 (2008); Class B

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

PRODUCT TYPE : Personal computer TH700
Grouping model: T730
AC Adapter ADP-80NB A SEE100P2-19.0
Port Replicator FPCPR94
Wireless LAN 622ANHMW AR5B97
Bluetooth module BSMAN3

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

DATE TESTED : March 11, 2010 20℃ 40%

TESTED BY : Hiroyuki Aikawa

EUT conforms to the above mentioning regulation.

APPROVED BY : DATE : March 12 2010
for Hiroyuki Shimanoe, 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.

NVLAP LAB CODE 200373-0

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1. Description of EUT

The EUT: TH700 is personal computer using CPU; Core i7 M620 2.66 GHz microprocessor. The EUT has a 12.1 inch WXGA LCD, a DVD-super multi drive and a system disk (160 GB×1). The EUT has the interface for IEEE1394③, DVI⑯, RGB, Mic-in②, Phone-out②, Line-out⑰, LAN⑦, USB×5①⑤⑥⑧⑩, PC card slot, Memory card slot, Bluetooth and wireless LAN module.

The following type code is given according to the market.

Type code	Market
TH700	Consumer
T730	Commercial

The EUT has anyone of the following wireless LAN module.

Type	Manufacturer
622ANHMW	Intel
AR5B97	Atheros

Internal clock frequency : 2.768 kHz 4.000 MHz, 14.318 MHz, 24.576 MHz, 25.000 MHz, 33.300 MHz, 48.000 MHz, 96.000 MHz, 100.000 MHz, 266.000 MHz

Input power : AC 100 V-240 V, 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 radiated emission measurement was performed with the worst case configuration of the preliminary measurement, TH700 with CPU; Core i7 M620 2.66 GHz, port replicator; FPCPR94, AC adapter; ADP80-NB A, each of internal wireless LAN module; 622ANHMW and AR5B97, Bluetooth module; BSMAN3, and all related equipments as the maximum personal computer system as shown in figure-1.
The conducted emission measurement was performed using TH700 with CPU; Core i7 M620 2.66 GHz, port replicator FPCPR94, each of AC adapter; ADP80-NB A and SEE100P2-19.0 as shown in figure-1.

The EUT was selected from the pre-production line.

1.2 Operating condition

The following EUT and dependent devices were tested using "EMC32.exe", "CRTU" or "ART.exe" and "Blue test" program under continuous operating condition to obtain maximum emission.

① PC-1	LCD-1:	Displaying "H" character on screen (Maximum contrast / Luminescence Display resolution 1280×800 / Refresh rate 60Hz)
	LAN:	Continuous transmission and receiving ping command (1000 M Max)
	HDD-1:	Reading / writing the test data
	Wireless LAN:	Continuous transmission of the RF signal
	Bluetooth:	Continuous transmission of the RF signal
	DVD:	Playing the test disk
	CAMERA:	Monitoring the picture of web camera
② Express card:		Reading / writing the test data
③ SD memory card:		Reading / writing the test data
④ LCD-2:		Displaying "H" character on screen (Maximum contrast / Luminescence)
⑤ Headset:		Connecting only
⑥ USB mouse:		Connecting only
⑦ USB memory(USB2.0):		Reading / writing the test data (480 M Max)
⑧ HDD-2(IEEE1394):		Reading / writing the test data (400 M Max)
⑨ PC-2:		Continuous transmission and receiving ping command (1000 M Max)

2. EMI test results summary

Applied standards: FCC Part-15 (2008)
Limit value: Class B

The limit of radiated emission(30 MHz to 1,000 MHz) was applied limit of CISPR22(2005).
The test samples met the class B limit of CISPR22(2005) and applicable below regulations as shown the following highest 6 points of each emission profiles.

The test result is effective in only the EUT.

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

2.1.1 Wireless module; 622ANHMW, AC adapter: ADP-80NB A

Freq. (MHz)	pol.	Noise level (QP; dBμV/m)	Class B limit (QP; dBμV/m)	Margin (dB)
159.99	Vert	24.4	30.0	5.6
400.48	Horiz	35.6	37.0	1.4
400.48	Vert	35.0	37.0	2.0
480.00	Horiz	35.9	37.0	1.1
639.03	Horiz	35.4	37.0	1.6
693.03	Vert	34.4	37.0	2.6

- Limit value ; CISPR22(2005)
- Measurement uncertainty : ± 3.2 dB (K=2, 95 %)

2.1.2 Wireless module; AR5B97, AC adapter: ADP-80NB A

Freq. (MHz)	pol.	Noise level (QP; dBμV/m)	Class B limit (QP; dBμV/m)	Margin (dB)
86.68	Vert	26.2	30.0	3.8
400.48	Horiz	35.9	37.0	1.1
400.48	Vert	35.0	37.0	2.0
480.00	Horiz	34.3	37.0	2.7
639.03	Horiz	34.2	37.0	2.8
693.03	Vert	34.9	37.0	2.1

- Limit value ; CISPR22(2005)
- Measurement uncertainty : ± 3.2 dB (K=2, 95 %)

2.2 Over 1 GHz Radiated emission (1 GHz to 13.3 GHz) : Measured at 3 m distance

2.2.1 Wireless module; 622ANHMW, AC adapter: ADP-80NB A

Freq. (GHz)	pol.	Noise level (dBμV/m)		Class B limit (dBμV/m)		Margin (dB)	
		Peak	AV	Peak	AV	Peak	AV
1.7029	Vret	57.9	49.2	74.0	54.0	16.1	4.8
2.4974	Vret	55.6	49.5	74.0	54.0	18.4	4.5
2.4975	Horiz	54.3	48.3	74.0	54.0	19.7	5.7
3.3300	Vert	56.4	50.1	74.0	54.0	17.6	3.9
3.3300	Horiz	53.5	47.1	74.0	54.0	20.5	6.9
4.1624	Vert	53.2	46.5	74.0	54.0	20.8	7.5

- Limit value ; FCC Part-15 (2008)

2.2.2 Wireless module; AR5B97, AC adapter: ADP-80NB A

Freq. (GHz)	pol.	Noise level (dBμV/m)		Class B limit (dBμV/m)		Margin (dB)	
		Peak	AV	Peak	AV	Peak	AV
1.7053	Vret	58.5	49.5	74.0	54.0	15.5	4.5
2.4974	Vret	56.2	49.7	74.0	54.0	17.8	4.3
2.4975	Horiz	52.3	46.1	74.0	54.0	21.7	7.9
3.3299	Horiz	53.8	47.5	74.0	54.0	20.2	6.5
3.3302	Vret	55.8	49.6	74.0	54.0	18.2	4.4
4.1624	Vert	54.1	48.3	74.0	54.0	19.9	5.7

- Limit value ; FCC Part-15 (2008)

2. 3 AC power line conducted emission (150 kHz to 30 MHz) : AC 120 V/ 60 Hz single phase

2.3.1 Wireless module; 622ANHMW

2.3.1.1 AC Adapter: ADP-80NB A

Freq. (MHz)	Line #	Noise level (dBμV)	Class B limit (dBμV)		Margin (dB to AV)
		QP	QP	AV	
0.504	#1	42.6	56.0	46.0	3.4
0.504	#2	42.6	56.0	46.0	3.4
0.554	#2	41.6	56.0	46.0	4.4
0.699	#2	39.7	56.0	46.0	6.3
0.742	#1	39.6	56.0	46.0	6.4
0.742	#2	39.9	60.0	50.0	6.1

- Limit value ; FCC Part-15 (2008)
- Measurement uncertainty : ± 3.3 dB (K=2, 95 %)

2.3.1.2 AC Adapter: SEE100P2-19.0

Freq. (MHz)	Line #	Noise level (dBμV)		Class B limit (dBμV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.196	#2	48.8	40.1	63.8	53.8	15.0	13.7
0.590	#1	44.2	33.4	56.0	46.0	11.8	12.6
0.590	#2	47.2	34.8	56.0	46.0	8.8	11.2
0.919	#1	45.9	34.3	56.0	46.0	10.1	11.7
1.001	#1	45.5	34.9	56.0	46.0	10.5	11.1
1.001	#2	46.5	35.9	56.0	46.0	9.5	10.1

- Limit value ; FCC Part-15 (2008)
- Measurement uncertainty : ± 3.3 dB (K=2, 95 %)

2.3.2 Wireless module; AR5B97, AC adapter: ADP-80NB A

Freq. (MHz)	Line #	Noise level (dBμV)		Class B limit (dBμV)		Margin (dB)	
		QP	AV	QP	AV	QP	AV
0.501	#1	43.6	31.2	56.0	46.0	12.4	14.8
0.501	#2	44.2	32.9	56.0	46.0	11.8	13.1
0.615	#1	41.9	23.6	56.0	46.0	14.1	22.4
0.615	#2	43.7	28.8	56.0	46.0	12.3	17.2
0.784	#1	41.9	26.0	56.0	46.0	14.1	20.0
0.784	#2	43.0	28.0	56.0	46.0	13.0	18.0

- Limit value ; FCC Part-15 (2008)
- Measurement uncertainty : ± 3.3 dB (K=2, 95 %)

3. EUT modification under the test

The following countermeasures are added for the over 1GHz radiated emission measurement.
① Radio wave absorbing sheet was added on the main board.

4. Measurement procedure and test equipment

The measurement was performed without deviation from ANSI C63.4 (2003).

4.1 Radiated emission

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

The radiated emission measurement was performed in the 10 m RF semi-anechoic chamber. The EUT was set on the 80 cm height non-reflective desk (W: 150 cm×D: 100 cm) placed on the turntable. The HUB and PC-2 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 for the main spectrum that was obtained by the preliminary measurement.

Test equipment	Manufacturer	Type	S/N	Cal. Date	Due. Date
Bi Log antenna	Schwarzbeck	VULB9160	3118	2009.05.12	2010.05.12
Dipole antenna	Schwarzbeck	VHA9103	VHA91031573	2008.03.26	2010.03.26
Dipole antenna	Schwarzbeck	UHA9105	UHA91052119	2008.03.26	2010.03.26
Field strength meter	Rohde & Schwarz	ESCS30	849650/001	2009.07.08	2010.07.08
Spectrum analyzer	HP	85422E	3746A00242	2009.07.30	2010.07.30
RF switch	Anritsu	MP59B	M87079	2009.05.02	2010.05.02
RF cable	——	TF0207	——	2009.05.02	2010.05.02
2nd semi-anechoic chamber		Riken eletech	——	2009.03.26	2010.03.26
EMI test program	FGE	Version 1.3			

4.1.2 Over 1 GHz radiated emission

The radiated emission measurement was performed in the 10 m RF semi-anechoic chamber. The EUT was set on the 80 cm height styrene foam desk (W: 150 cm×D: 100 cm) on the turntable. The radiated emission measurement from 1 GHz to 13.3 GHz; Operating rate 2.66 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 for both horizontal and vertical polarization. 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.
The measurement was performed using the RF signal "off" mode of the wireless LAN and Bluetooth.

Test equipment	Manufacturer	Type	S/N	Cal. Date	Due. Date
Horn antenna	Schwarzbeck	BBHA9120D	414	2009.04.22	2010.04.22
Spectrum analyzer	Advantest	U3772	161200140	2009.05.15	2010.05.15
Pre amplifier	HP	8449B	3008A01020	2008.03.26	2010.03.26
2nd semi-anechoic chamber		Riken eletech	——	2009.06.10	2010.06.10

4. 2 AC power line conducted emission

The conducted emission measurement was performed in the shielded room. The EUT was set on the 80 cm height non-reflective desk and connected to the 50Ω/50μH artificial mains network: AMN, and operated by AC 120 V/ 60 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 of 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	2010.01.09	2011.01.09
AMN for AE	Kyoritsu	KNW-242C	8-1387-6	2010.01.09	2011.01.09
Field strength meter	Rohde & Schwarz	ESCS30	849650/003	2009.07.08	2010.07.08
Spectrum analyzer	HP	85422E	3746A00240	2009.07.30	2010.07.30
RF switch	Rohde & Schwarz	PSU	848290/005	2009.04.10	2010.04.10
Band pass filter	Advantest	TR14202	03560025	2009.04.10	2010.04.10
Pulse limiter	Rohde & Schwarz	ESH3-Z2	0357.8810.54	2009.04.10	2010.04.10
RF cable	———	TF0110	———	2009.04.10	2010.04.10
1st shielded room					
EMI test program	FGE	Version 1.3			

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/G-53/C-776/T-1686), 1st shielded room(C-777/T-1687)
Large shielded room(C-778)
2nd semi-anechoic chamber(R-1460/G-54/C-1547/T-1688), 2nd shielded room(C-1548/T-1689)
3rd shielded room(C-1549)

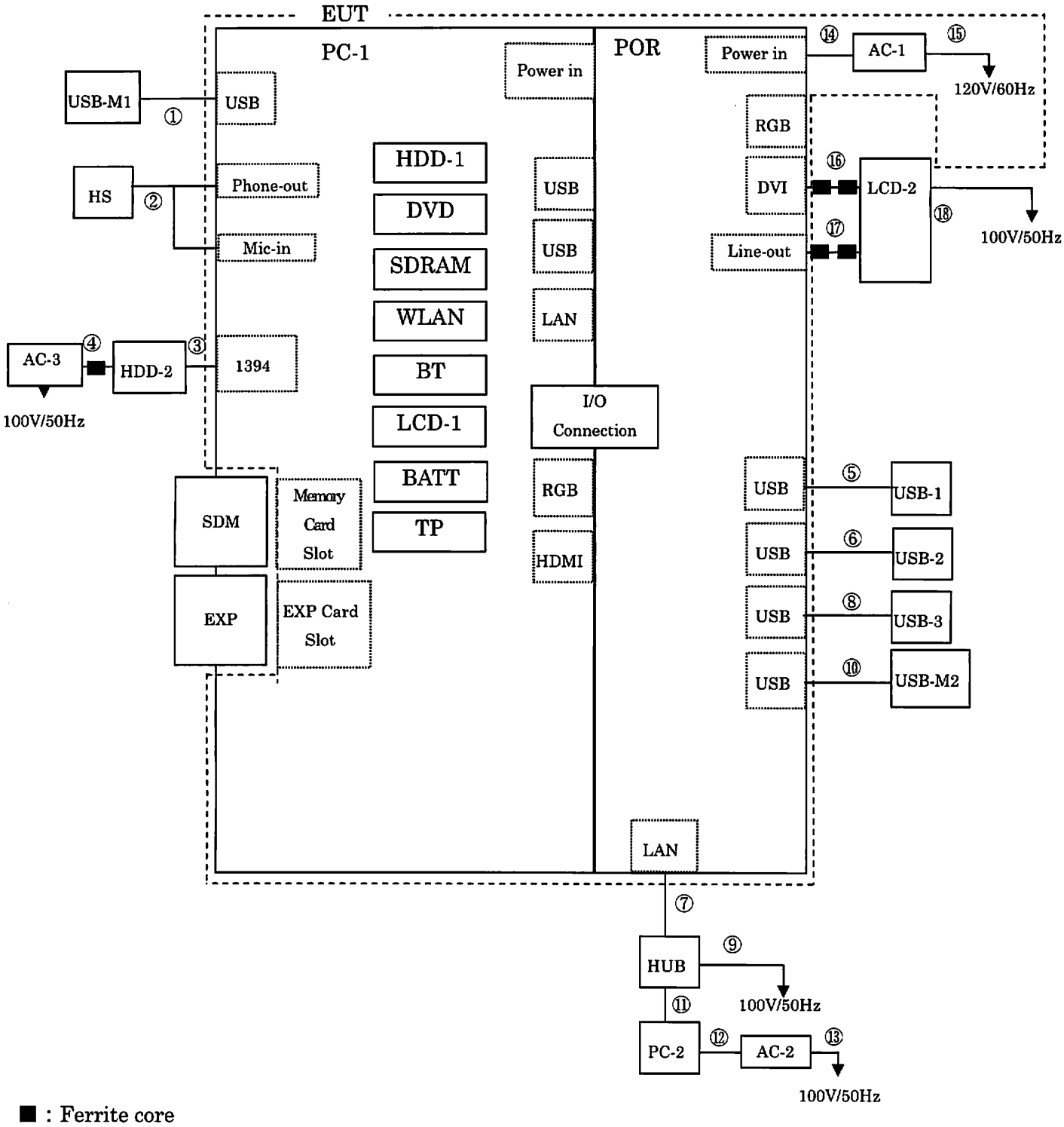
NVLAP : 1998.12.01 Accredited: Lab code 200373-0

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	TH700	Pre-production sample	Fujitsu

Related EUT

POR	Port Replicator	FPCPR94	———	Fujitsu
AC-1	AC adapter	ADP-80NB A	———	Fujitsu
		SEE100P2-19.0	———	Fujitsu

Included device; PC-1

Code	Name	Type	S/N	Product
HDD-1	160GB HDD	MJA2160BH	———	Fujitsu
DVD	BD-Multi	UJ880A	———	Panasonic
SDRAM	2048 MB	M471B5673EH-CF8	———	Samsung
WLAN	Wireless LAN	622ANHMW	———	Intel
		AR5B97	———	Atheros
BT	Bluetooth	BSMAN3	———	CSR
LCD-1	12.1 inch WXGA	HV121WX6-100	———	Hydis
		HT121WX2-210	———	Hydis
		LT121DKXBF00	———	TMD
		LT121AT09	———	Samsung
BATT	Battery (6 cell)	FPCBP215 10.8V 5800mA/h	———	Fujitsu
WCA	Web-camera	CNF824821005130L	———	Chicony
TP	Touch panel	SU5E-12W02AS-01X	———	Wacom
		PTV2-12W05S	———	Wacom
		SU5E-12W16AS-02X	———	Wacom

Assisted equipment

Code	Name	Type	S/N	Product
LCD-2	LCD display	P22W-5 ECO	YE7G213518	FSC
HDD-2	Herd disk drive	Stragebird 40 GB	0004374	FSC
HS	Head set	GN 501FSC	———	FSC
PC-2	Personal computer	FMV	———	Fujitsu
HUB	Switching Hub	ETG-SH-8	VD7000010513N	I·O DATA
AC-2	AC adapter	FMV-AC322	———	Fujitsu
AC-3	AC adapter	0218B1260	———	Shin International
AC-4	AC adapter	ACTN-21	———	Sunfone
USB-1	USB Mouse	M-BT69e	HCA52701556	FSC
USB-2	USB Mouse	M-BJ69e	HCA52701562	FSC
USB-3	USB Mouse	M-BJ69e	HCA52701578	FSC
USB-M1	USB memory	Easy Disk 256MB	———	I·O DATA
USB-M2	USB memory	Easy Disk 256MB	———	I·O DATA
EXP	EXP card adapter	HEX-S1G	———	HAGIWARA
SDM	SD memory card	128 MB	———	Panasonic

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	USB	USB cable	———	1.0 m	SLD, MC
②	Phone-out / Mic-in	Headset cable	———	2.2 m	NSLD, MC
③	1394	IEE1394 cable	———	1.0 m	SLD, MC
④	———	AC adaptor cable	———	1.8 m	NSLD, NMC with core ＊1
⑤	USB	USB mouse cable	———	1.9 m	SLD, MC
⑥	USB	USB mouse cable	———	1.9 m	SLD, MC
⑦	LAN	LAN cable	———	20.0 m	SLD, MC
⑧	USB	USB mouse cable	———	1.9 m	SLD, MC
⑨	———	AC power cable	———	2.0 m	3P-NSLD
⑩	USB	USB mouse cable	———	1.9 m	SLD, MC
⑪	LAN	LAN cable	———	1.0 m	SLD, MC
⑫	———	AC adaptor cable	———	1.8 m	2P NSLD, NMC
⑬	———	AC power cable	———	2.0 m	2P-NSLD
⑭	———	AC adaptor cable	———	1.8 m	NSLD, NMC
⑮	———	AC power cable	———	2.0 m	2P-NSLD
⑯	DVI	DVI cable	———	1.8 m	SLD, MC with fixed core
⑰	Line-out	Line out cable	———	1.5 m	NSLD, MC with fixed core
⑱	———	AC adaptor cable	———	2.0 m	3P-NSLD

＊1: KITAGAWA industry Co.,Ltd; TFT-72SK