

MEASUREMENT/TECHNICAL REPORT

FCC PART 15, Class B (ANSI C63.4:1992)

Issued: March 22, 1998

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Test Item: 15 Inch Color LCD Display Monitor

FCC ID: ACJ93312135

Identification: TX-D5L31NMF (TX-D5L31F, TX-D5L31**F) } *

Serial No.: FX8110014

Sample No.: 1

Sample Receipt Date: March 20, 1998

Test Result: PASS

* ALSO REPRESENTS
 VIEWSONIC MODEL VLCD521434-1
 UNDER FCC ID: GSS15018

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 3. All measurement data contained in this report may have uncertainty. A judgement for the Limitation should be taken into the count. Refer to the Appendix for the model calculation.

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1. General Information

1.1 Product Description

The Matsushita Electric Industrial Co., Ltd., Model TX-D5L31NMF (TX-D5L31F, TX-D5L31**F) (referred to as the EUT in this report) is a 15 Inch Color LCD Display Monitor.

Rated input voltage is AC 120V.

EUT is featuring a 12.5, 32.5 MHz processor.

1.2 Related Submittal(s)/Grant(s)

Related Submittal Grant is not covered in this report.

1.3 Tested System Details

The FCC IDs for all equipment, plus descriptions of all cables used in the tested system(including inserted cards, which have grants) are:

Model No.	Serial No.	FCC ID	Description	Cable Description
TX-D5L31NMF (TX-D5L31F, TX-D5L31**F)	FX8110014	ACJ93312135	EUT (15 Inch Color LCD Display Monitor)	AC Power Cord 1.8m Unshielded USB Cable 1.8m Shielded
D4557A	SG71201054	Doc	Persona Computer	AC Power Cord 1.8m Unshielded
C4565A	SG731140TZ	B94C4555X	Printer	AC Power Cord 1.8m Unshielded Printer Cable 3.0m Shielded
RT6656TWJP	52372112	AQ6-MTN4C15	Keyboard	Keyboard I/F Cable 2.5m Shielded
PS/2 Compatible Mouse	1003773	C3K76F400PS2	Mouse	Mouse I/F Cable 2.5m Shielded
5300AM	A2175300K30G	BFJ5300AM	Modem	Modem I/F Cable 2.7m Shielded

1. General Information (Continued)

1.3 Tested System Details (Continued)

Model No.	Serial No.	FCC ID	Description	Cable Description
T41-090800-A01	None	BFJ5300AM	AC Adapter	AC Power Cord 1.9m Unshielded
ECM-S3906	0000162	EW4ECM-S3906	USB Mouse	USB Mouse Cable 1.6m Shielded
ECM-S3906	0000163	EW4ECM-S3906	USB Mouse	USB Mouse Cable 1.6m Shielded
ECM-S3906	0000164	EW4ECM-S3906	USB Mouse	USB Mouse Cable 1.6m Shielded
ECM-S3906	0000168	EW4ECM-S3906	USB Mouse	USB Mouse Cable 1.6m Shielded
LT100	None	N/A	Headphone	Headphone Cable 2.4m Unshielded
None	None	IXW-PAS16	Sound Board	Audio Cable 1.8m Unshielded
DSV3365	S630USEICEC6	JF9- I128BBPCIPRO	Video Board	Video I/F Cable 1.8m Shielded

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4:1992. Radiated testing was performed at an antenna to EUT distance of 10 meters. Final Result was converted in 3m, using $20 \log 10m / 3m$.

1.5 Test Facility

The open area test site, Cosmos EMC Lab., and conducted measurement facility used to the radiated data is located at 543 Shimesasu, Watarai-cho, Watarai-gun, Mie-ken, 516-2119, Japan. This site has been fully described in a report dated May 23, 1996 submitted to FCC, and accepted in a letter dated July 10, 1996 (31040/SIT 1300F2).

2. System Test Configuration

2.1 Justification

EUT was measured by max radiation mode user specified.
The measurement was conducted for the resolution 1024×768 and 640×480 and Video I/F Cable length 1.5m and 1.8m.

Following is the worst condition:

Conducted Emission: 1024×768
Dot Clock Frequency: 80 MHz
Vertical Frequency: 75.0 Hz
Horizontal Frequency: 60.24 kHz
Video I/F Cable length 1.8m

Radiated Emission: 1024×768
Dot Clock Frequency: 80 MHz
Vertical Frequency: 75.0 Hz
Horizontal Frequency: 60.24 kHz
Video I/F Cable length 1.8m

2.2 EUT Exercise Software

EUT did not exercise program during radiated and conducted testing.

2.3 Special Accessories

This cable model and part numbers are instructed with their installation manual.

2.4 Equipment Modifications

No equipment modification to achieve compliance to Class B levels was done during test.

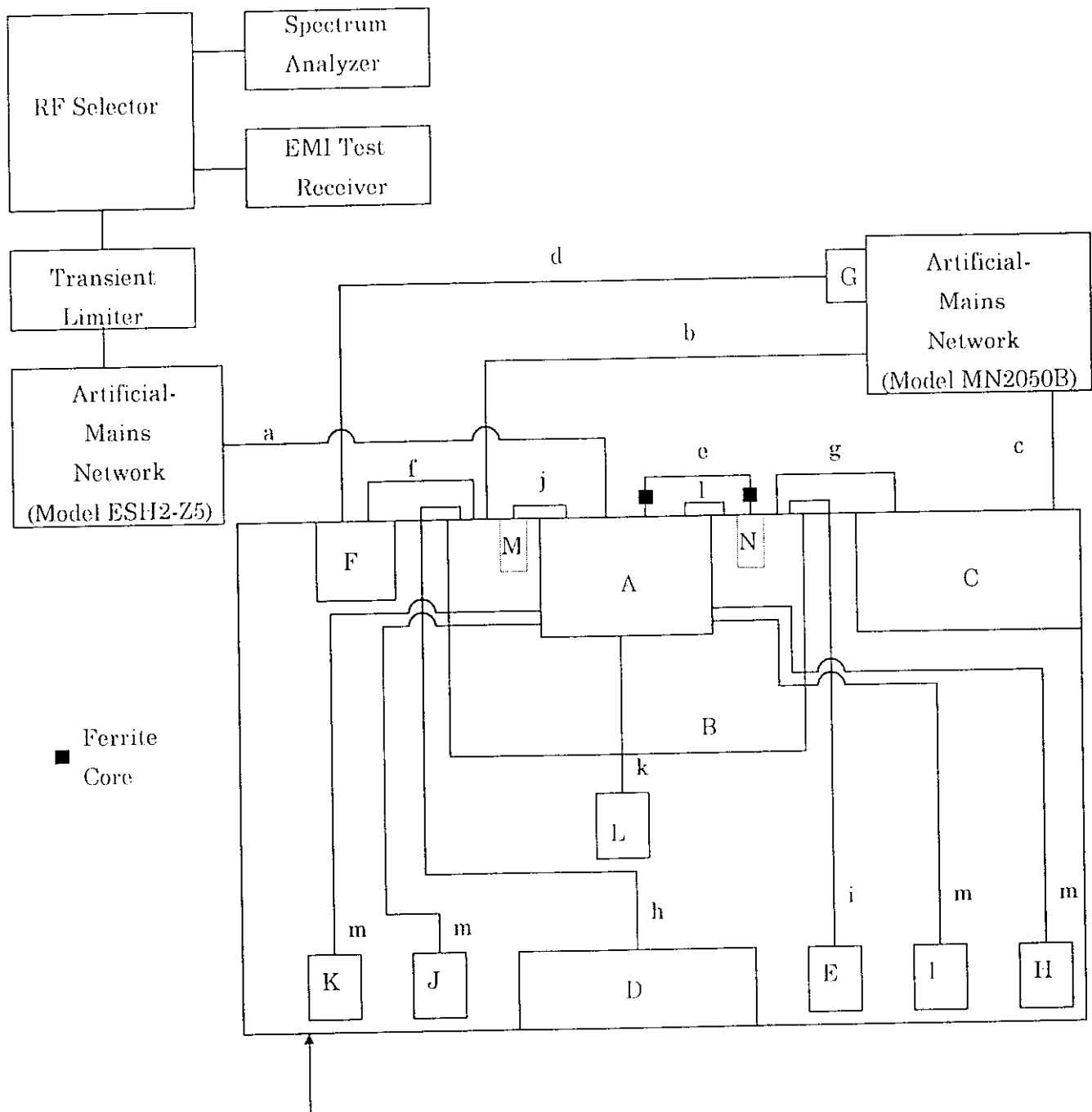
2. System Test Configuration (Continued)

2.5 Configuration of Tested System

	Instrument		Cord / Cable
A)	EUT	a)	AC Power Cord 1.8m Unshielded
B)	Personal Computer	b)	AC Power Cord 1.8m Unshielded
C)	Printer	c)	AC Power Cord 1.8m Unshielded
D)	Keyboard	d)	AC Power Cord 1.9m Unshielded
E)	Mouse	e)	Video I/F Cable 1.8m Shielded
F)	Modem	f)	Modem I/F Cable 2.7m Shielded
G)	AC Adapter	g)	Printer Cable 3.0m Shielded
H)	USB Mouse (S/N: 0000162)	h)	Keyboard I/F Cable 2.5m Shielded
I)	USB Mouse (S/N: 0000163)	i)	Mouse I/F Cable 2.5m Shielded
J)	USB Mouse (S/N: 0000164)	j)	Audio Cable 1.8m Unshielded
K)	USB Mouse (S/N: 0000168)	k)	Headphone Cable 2.4m Unshielded
L)	Headphone	l)	USB Cable 1.8m Shielded
M)	Sound Board	m)	USB Mouse Cable 1.6m Shielded
N)	Video Board		

2. System Test Configuration (Continued)

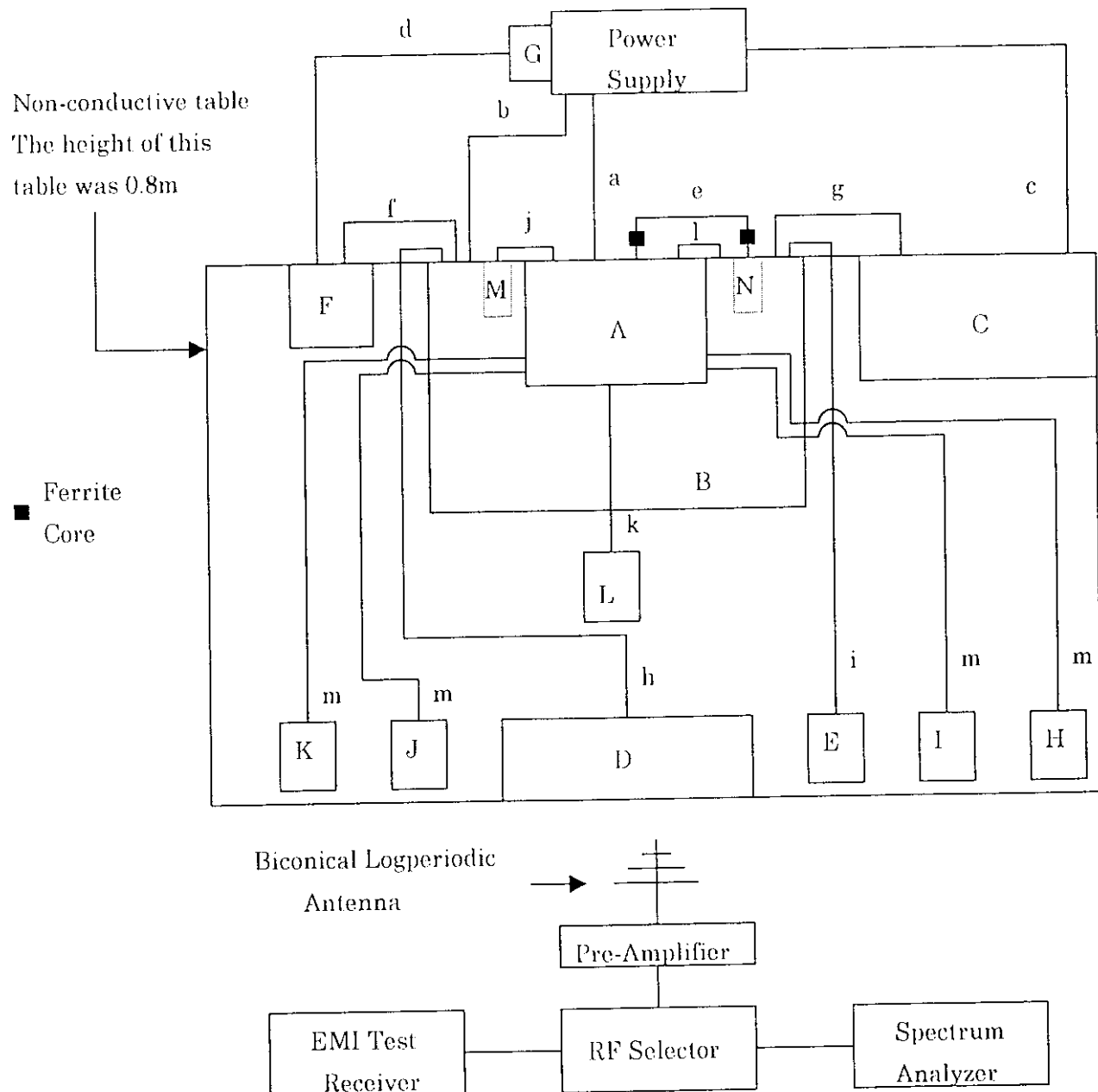
2.5 Configuration of Tested System (Continued) Conducted Emission



2. System Test Configuration (Continued)

2.5 Configuration of Tested System (Continued)

Radiated Emission



2. System Test Configuration (Continued)

2.5 Configuration of Tested System (Continued)

Conducted Emission

- 1) EUT is put on the Personal Computer.
- 2) Sound Board is inserted in Personal Computer.
- 3) Video Board is inserted in Personal Computer.
- 4) Personal Computer and Modem located at 0.1m intervals.
- 5) Personal Computer and Printer located at 0.1m intervals.
- 6) Keyboard and Mouse located at 0.1m intervals.
- 7) Keyboard and USB Mouse (S/N 0000164) located at 0.1m intervals.
- 8) USB Mouse (S/N 0000164) and USB Mouse (S/N 0000168) located at 0.1m intervals.
- 9) Mouse and USB Mouse (S/N 0000163) located at 0.1m intervals.
- 10) USB Mouse (S/N 0000163) and USB Mouse (S/N 0000162) located at 0.1m intervals.
- 11) EUT is connected to Artificial-Mains Network (Model ESH2-Z5) by the AC Power Cord.
- 12) Personal Computer is connected to Artificial-Mains Network (Model MN2050B) by the AC Power Cord.
- 13) Printer is connected to Artificial-Mains Network (Model MN2050B) by the AC Power Cord.
Extended Cord was folded at the center of Cord by 0.4m length, and the Cord was hung in the middle between ground and table.
- 14) AC Adapter is connected to Artificial-Mains Network (Model MN2050B).
- 15) Modem is connected to AC Adapter by the AC Power Cord.
- 16) EUT is connected to Video Board by the Video I/F Cable.
Extended Cable was folded at the center of Cable by 0.3m length, and the Cable was hung in the middle between ground and table.
- 17) Personal Computer is connected to Modem by the Modem I/F Cable.
Extended Cable was folded at the center of Cable by 0.4m length, and the Cable was hung in the middle between ground and table.
- 18) Personal Computer is connected to Printer by the Printer Cable.
Extended Cable was folded at the center of Cable by 0.4m length, and the Cable was hung in the middle between ground and table.
- 19) Personal Computer is connected to Keyboard by the Keyboard I/F Cable.
- 20) Personal Computer is connected to Mouse by the Mouse I/F Cable.
Extended Cable was folded at the center of Cable by 0.4m length, and the Cable was hung in the middle between ground and table.
- 21) EUT is connected to Sound Board by the Audio Cable.
Extended Cable was folded at the center of Cable by 0.3m length, and the Cable was hung in the middle between ground and table.

2. System Test Configuration (Continued)

2.5 Configuration of Tested System (Continued)

Conducted Emission (Continued)

- 22) EUT is connected to Headphone by the Headphone Cable.
- 23) EUT is connected to Personal Computer by the USB Cable.
Extended Cable was folded at the center of Cable by 0.4m length,
and the Cable was hung in the middle between ground and table.
- 24) EUT is connected to USB Mouse (S/N 0000162) by the USB Mouse Cable.
- 25) EUT is connected to USB Mouse (S/N 0000163) by the USB Mouse Cable.
- 26) EUT is connected to USB Mouse (S/N 0000164) by the USB Mouse Cable.
- 27) EUT is connected to USB Mouse (S/N 0000168) by the USB Mouse Cable.

Radiated Emission

- 1) EUT is put on the Personal Computer.
- 2) Sound Board is inserted in Personal Computer.
- 3) Video Board is inserted in Personal Computer.
- 4) Personal Computer and Modem located at 0.1m intervals.
- 5) Personal Computer and Printer located at 0.1m intervals.
- 6) Keyboard and Mouse located at 0.1m intervals.
- 7) Keyboard and USB Mouse (S/N 0000164) located at 0.1m intervals.
- 8) USB Mouse (S/N 0000164) and USB Mouse (S/N 0000168)
located at 0.1m intervals.
- 9) Mouse and USB Mouse (S/N 0000163) located at 0.1m intervals.
- 10) USB Mouse (S/N 0000163) and USB Mouse (S/N 0000162)
located at 0.1m intervals.
- 11) EUT is connected to Power Supply by the AC Power Cord.
- 12) Personal Computer is connected to Power Supply by the AC Power Cord.
Extended Cord was folded at the center of Cord by 0.4m length,
and the Cord was hung in the middle between ground and table.
- 13) Printer is connected to Power Supply by the AC Power Cord.
- 14) AC Adapter is connected to Power Supply.
- 15) Modem is connected to AC Adapter by the AC Power Cord.
Extended Cord was folded at the center of Cord by 0.4m length,
and the Cord was hung in the middle between ground and table.
- 16) EUT is connected to Video Board by the Video I/F Cable.
Extended Cable was folded at the center of Cable by 0.3m length,
and the Cable was hung in the middle between ground and table.
- 17) Personal Computer is connected to Modem by the Modem I/F Cable.
Extended Cable was folded at the center of Cable by 0.4m length,
and the Cable was hung in the middle between ground and table.

2. System Test Configuration (Continued)

2.5 Configuration of Tested System (Continued)

Radiated Emission (Continued)

- 18) Personal Computer is connected to Printer by the Printer Cable. Extended Cable was folded at the center of Cable by 0.4m length, and the Cable was hung in the middle between ground and table.
- 19) Personal Computer is connected to Keyboard by the Keyboard I/F Cable.
- 20) Personal Computer is connected to Mouse by the Mouse I/F Cable. Extended Cable was folded at the center of Cable by 0.4m length, and the Cable was hung in the middle between ground and table.
- 21) EUT is connected to Sound Board by the Audio Cable. Extended Cable was folded at the center of Cable by 0.3m length, and the Cable was hung in the middle between ground and table.
- 22) EUT is connected to Headphone by the Headphone Cable.
- 23) EUT is connected to Personal Computer by the USB Cable. Extended Cable was folded at the center of Cable by 0.4m length, and the Cable was hung in the middle between ground and table.
- 24) EUT is connected to USB Mouse (S/N 0000162) by the USB Mouse Cable.
- 25) EUT is connected to USB Mouse (S/N 0000163) by the USB Mouse Cable.
- 26) EUT is connected to USB Mouse (S/N 0000164) by the USB Mouse Cable.
- 27) EUT is connected to USB Mouse (S/N 0000168) by the USB Mouse Cable.

4. Conducted Emission Data

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

	Frequency (MHz)	Measured * (dB μ V)	Limit (dB μ V)
Neutral Line	0.65301	39.3	48.0
Neutral Line	0.86670	37.7	48.0
Neutral Line	15.00224	40.1	48.0
Neutral Line	16.50831	38.1	48.0
Neutral Line	21.00356	44.6	48.0
Neutral Line	22.50532	41.9	48.0
L Line	1.10027	35.8	48.0
L Line	1.52802	36.1	48.0
L Line	15.00182	39.3	48.0
L Line	16.50129	41.8	48.0
L Line	19.50225	40.5	48.0
L Line	21.00402	44.4	48.0

* All readings are quasi-peak unless stated otherwise.

Environment:

Temperature 17 °C

Humidity 51 %

Tested Personnel:

Tester Signature Hiroshi Wakabayashi

Typed/Printed Name Hiroshi Wakabayashi

5. Radiated Emission Data

The following data lists the significant emission frequencies, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, plus the limit. Explanation of the Correction Factor is given in paragraph.

Frequency (MHz)	Polarity (H/V)	Receiver * Reading (dB μ V)	Correction Factor (dB/m)	Corrected Reading (dB μ V/m)	3 Meter Limit (dB μ V/m)
37.745	Vertical	47.6	-14.2	33.4	40.0
76.832	Vertical	55.3	-21.2	34.1	40.0
141.844	Vertical	51.7	-15.9	35.8	43.5
156.618	Vertical	56.3	-16.7	39.6	43.5
162.541	Vertical	58.5	-17.1	41.4	43.5
227.561	Vertical	57.1	-16.1	41.0	46.0

*All readings are quasi-peak unless stated otherwise, with an 1F bandwidth of 120 kHz, along with an 1 S sweep time. A video filter was not used.

Environment:

Temperature 13 °C
Humidity 45 %

Tested Personnel:

Tester Signature Hiroshi Wakabayashi

Typed/Printed Name Hiroshi Wakabayashi

5. Radiated Emission Data (Continued)

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) 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 7.4 and a Cable Factor of 1.1 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.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dBuV/m}$$

$$\text{Level in uV/m} = \text{Common Antilogarithm} [(32 \text{ dBuV/m})/20] = 39.8 \text{ uV/m}$$

6. List of Test and Measurement Instruments

Conducted Emission

Manufacturer	Instruments	Model / Type	Serial No.	Calibration Date Next Calibration
ROHDE & SCHWARZ	Spectrum Analyzer	FSB / DISPLAY	838497/005 /	May, 1997
			838301/009	May, 1998
ROHDE & SCHWARZ	EMI Test Receiver	ESHS10	842121/012	April, 1997
				April, 1998
ROHDE & SCHWARZ	Artificial-Mains Network	ES112-Z5	842210/010	May, 1997
				May, 1998
CHASE ELECTRONICS LIMITED	Artificial-Mains Network	MN2050B	1140	April, 1997
				April, 1998

Radiated Emission

Manufacturer	Instruments	Model / Type	Serial No.	Calibration Date Next Calibration
ROHDE & SCHWARZ	Spectrum Analyzer	FSB / DISPLAY	838497/005 /	May, 1997
			838301/009	May, 1998
ROHDE & SCHWARZ	EMI Test Receiver	ESVS10	842122/014	April, 1997
				April, 1998
CHASE ELECTRONICS LIMITED	Pre-Amplifier	CPA9231	3045	February, 1998
				February, 1999
CHASE ELECTRONICS LIMITED	Biconical Logperiodic Antenna	CBL6111A	1732	March, 1997
				March, 1998

7. The Treatment of Uncertainty In EMC Measurement

Uncertainty Budget

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7.1 RADIATED EMISSION	19 to 20
7.2 CONDUCTED EMISSION	21

7.1 Radiated Emission

Measurement of vertically polarised field strength between 30 dB μ V/m and 60 dB μ V/m over the frequency range 30 MHz to 1 GHz on an open area test site at 10m and 30m

Contribution	Probability Distribution	Uncertainty $\pm$ [dB]	
		Biconical Logperiodic Antenna	
		10m	30m
Ambient Signals		—	—
Antenna factor calibration	normal [k = 2]	1.0	1.0
Cable loss calibration	normal [k = 2]	0.5	0.8
Receiver specification	rectangular	1.5	1.5
Antenna directivity	rectangular	0.3	0
Antenna factor variation with height	rectangular	2.2	2.2
Antenna phase centre variation	rectangular	0.2	0.1
Antenna factor frequency interpolation	rectangular	0.2	0.2
Measurement distance variation	rectangular	0.4	0.2
Site imperfections	rectangular	1.5	1.5
Mismatch Receiver VRC: $\Gamma_1=0.2$ Antenna VRC: $\Gamma_R=0.67$ [Bi] 0.3 [Lp] Uncertainty limits $20\text{Log } [1 \pm \Gamma_1 \Gamma_R]$	U-shaped	1.1	1.1
System repeatability [previous assessment of $s(q_k)$ from 5 repeats, 1 reading on EUT]	Std Deviation	0.5	0.5
Repeatability of EUT*		—	—
Combined standard uncertainty u_c [y]	normal	2.09	2.098
Expanded uncertainty U	normal [k = 2]	4.18	4.197

7.1 Radiated Emission (Continued)

Calculation for 10m biconical Logperiodic antenna, positive value:

$$u_{\text{e}} \text{ [y]} = \sqrt{\left(\frac{1.0}{2}\right)^2 + \left(\frac{0.5}{2}\right)^2 + \frac{1.5^2 + 0.3^2 + 2.2^2 + 0.2^2 + 0.2^2 + 0.4^2 + 1.5^2}{3} + \frac{1.1^2}{2} + 0.5^2}$$

k=2:

$$U = 2 u_{\text{e}} \text{ [y]} = 2 \times \pm 2.09 = \pm 4.18 \text{ dB}$$

7.2 Conducted Emission

Measurement of conducted emissions between 30 dB μ V and 60 dB μ V over the frequency range 9 kHz to 30 MHz .

Contribution	Probability Distribution	Uncertainty ($\pm$ dB)	
		9 kHz - 150 MHz	150 - 30 MHz
Receiver specification	rectangular	1.3	1.3
LISN coupling specification	rectangular	1.3	1.3
Cable and input attenuator calibration	normal ($k = 2$)	0.3	0.5
Mismatch Receiver VRC: $\Gamma_1 = 0.03$ LISN VRC: $\Gamma_2 = 0.8$ [9 kHz] - 0.2 [30 MHz] Uncertainty limits $20\text{Log} [1 \pm \Gamma_1 \Gamma_2]$	U-shaped	0.2	0.05
System repeatability [previous assessment of $s(q_k)$ from 10 repeats, 1 reading on EUT]	Standard dev.	0.2	0.35
Repeatability of EUT*		---	---
Combined standard uncertainty u_c (y)	normal	1.12	1.13
Expanded uncertainty U	normal ($k = 2$)	2.24	2.26

Calculation for 9 kHz to 150 kHz range:

$$u_c \text{ (y)} = \pm \sqrt{\frac{1.3^2 + 1.3^2}{3} + \left(\frac{0.3}{2}\right)^2 + \frac{0.2^2}{2} + 0.2^2} = \pm 1.12 \text{ dB}$$

k=2:

$$U = 2 \times u_c \text{ (y)} = 2 \times \pm 1.12 = \pm 2.24 \text{ dB}$$

DISPLAY MONITOR DIVISION AVC COMPANY MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.

ENGINEERING SPECIFICATIONS (TENTATIVE)

TX-D5L31F (HL3F 15") DIGITAL MULTI-SCAN CHASSIS

<FEATURES>	(1)	STEREO SPEAKERS FOR HIGH QUALITY STEREO SOUND
	(2)	USB function in the pedestal : Upstream 1, Downstream 4
	(3)	1024 x 768 RESOLUTION MAX. WITH EQUIVALENT OF 16.2 MILLION COLORS
	(4)	MULTI-SCANNING FROM 30kHz TO 61kHz
	(5)	HIGH CONTRAST WITH 200:1, HIGH BRIGHTNESS WITH 250 cd/m ²
	(6)	WIDE VIEWING ANGLE (R/L : $\pm 70^\circ$, UP : 40° , DOWN : 60°)
	(7)	FAST RESPONSE (30ms) SUITABLE FOR MOTION PICTURES
	(8)	ON-SCREEN DISPLAY CONTROL (5 LANGUAGES)
	(9)	FULL-SCREEN DISPLAY BETWEEN VGA AND XGA
	(10)	CLEAR CHARACTERS AND GRAPHICS BY ORIGINAL PIXEL TRANSFORMATION
	(11)	BACK LIGHT WITH A LIFE SPAN OF 50,000 HOURS (TYP.)
	(12)	UPGRADED AUTO SIZE FUNCTION

[1] PANEL :	TYPE	15.0" TFT Active Matrix, Pixel Pitch 0.297mm	
	COLOR FILTER	RGB Vertical Stripe	
	SURFACE	Anti-Glare Hard Coat	
	OPTICAL RESPONSE	30ms (typ.)	
	CONTRAST RATIO	200 : 1 (typ.)	
[2] INPUT SIGNAL :	VIDEO	RGB Analog (75 Ω , 0.7/1.0Vp-p)	
	SYNC	H/V Separate (TTL)	
		fH = (24) 30~61kHz, fV = 50~77Hz	
	PRESET MODES	1024 x 768 (Non-I/L), etc. / Factory : 16 USER : 6	
[3] CONNECTOR :	AUDIO	TBD Vrms (max.) (TBD k Ω typ.)	
	VIDEO IN	15Pin mini D-Sub (IBM PS/2 Compatible)	<Rear>
	AUDIO IN	3.5mm Mini Jack (stereo)	
	HEADPHONE OUT	3.5mm Mini Jack (stereo)	<Front>
	USB	Upstream : 1, Downstream : 4	<Pedestal>
	POWER (USB)	Jack x 2	<Rear, Ped.>
[4] POWER :	POWER (Monitor)	3-Pin Plug (CEE22)	<Rear>
	VOLTAGE	90~132, 198~264Vac (Auto-switching)	
	CONSUMPTION	65W (typ.)	
	POWER SAVE	VESA STANDARD (DPMS)	
[5] CONTROLS :	SIDE	Power On/Off	
	FRONT	Audio Volume (Up and Down), Audio Mute	
	OSD	Contrast, Brightness, Back Light, H/V Size, H/V Position, Color,	
		Video Level, Recall, Disp Frequency, Language, H.Finetune, V.Finetune, Auto Size, OSD position	
[6] MAX. BRIGHTNESS :		250 cd/m ² (typ.) at White Flat Field	
[7] DISPLAY AREA :		304(H) x 228(V) mm (typ.)	
[8] OPERATING CONDITION :	TEMPERATURE	0~35°C	
	HUMIDITY	5~90% (Non-condensation)	
[9] DIMENSIONS :		385(W) x 391(H) x 200(D) mm	
[10] WEIGHT :		6.7kg (typ.) (Net)	
[11] SAFETY/REGULATIONS :		UL, CSA, TUV/GS, NORDIC, FCC-B, IC-B, CISPR-B, MPR II, TCO'92/'95, CE	
[12] AUDIO :		1W x 2 Speakers	
[13] USB :		Upstream : 1, Downstream : 4	

6.3 STANDARD TIMING

Following 15 modes are reserved in the memory as standard timings at the factory. But the best adjustment conditions are different due to the characteristics of each video board in your Computer. Please re-adjust for your Computer.

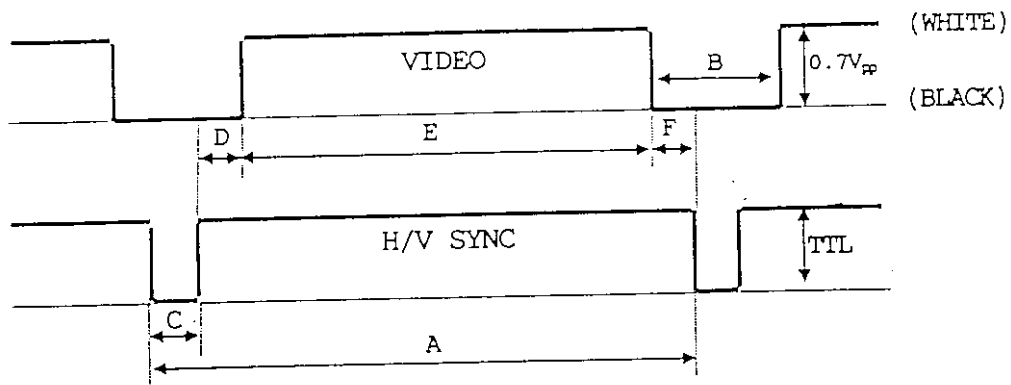
Fig-1 shows a definition of timing and signal level.

Electrical performance is specified based on 1024x768 mode unless otherwise mentioned.

Fig-1:TIMING CHART

< HORIZONTAL / VERTICAL >

- A: Period
B: Blanking
C: Sync Width
D: Back Porch
E: Active
F: Front Porch



RESERVATION TIMING

		MODE 1	MODE 2	MODE 3	MODE 4
		VGA480(Industry STD) 640×480 @60Hz	VGA400(Industry STD) 640×400 @70Hz	YESA Standard 640×480 @72Hz	MAC 13 640×480 @67Hz
DOT CLOCK		25.1745MHz	25.1745MHz	31.500MHz	30.2410MHz
H O R I Z	FH	31.4681kHz	37.861kHz	35.0012kHz	31.4681kHz
	A-Period	31.778 us(800 dots)	26.413 us(832 dots)	28.570 us(864 dots)	31.778 us(800 dots)
	B-Blanking	6.355 us(160 dots)	6.096 us(192 dots)	7.407 us(224 dots)	6.355 us(160 dots)
	C-Sync width	3.813 us(96 dots)	1.270 us(40 dots)	2.083 us(63 dots)	3.813 us(96 dots)
	D-Back porch	1.907 us(48 dots)	4.063 us(128 dots)	3.241 us(98 dots)	1.907 us(48 dots)
	E-Active	25.423 us(640 dots)	20.317 us(640 dots)	21.163 us(640 dots)	25.423 us(640 dots)
	F-Front porch	0.636 us(16 dots)	0.762 us(24 dots)	2.083 us(63 dots)	0.636 us(16 dots)
V E R T	FV	59.9393Hz	72.8088Hz	66.6689Hz	70.0849Hz
	A-Period	16.684 ms(525 lines)	13.735 ms(520 lines)	15.000 ms(525 lines)	14.268 ms(449 lines)
	B-Blanking	1.430 ms(45 lines)	1.057 ms(40 lines)	1.286 ms(45 lines)	1.557 ms(49 lines)
	C-Sync width	0.064 ms(2 lines)	0.079 ms(3 lines)	0.086 ms(3 lines)	0.064 ms(2 lines)
	D-Back porch	1.049 ms(33 lines)	0.740 ms(28 lines)	1.114 ms(39 lines)	1.112 ms(35 lines)
	E-Active	15.254 ms(480 lines)	12.678 ms(480 lines)	13.714 ms(480 lines)	12.711 ms(400 lines)
	F-Front porch	0.318 ms(10 lines)	0.238 ms(9 lines)	0.086 ms(3 lines)	0.381 ms(12 lines)
Sync polarity (H/V)		Negative / Negative	Negative / Positive	Negative / Negative	Negative / Negative

Note: The aspect ratio of MODE 2 is not 4:3, but display image of these timings is expanded into the full size (Aspect Ratio 4:3).

RESERVATION TIMING

		MODE 5	MODE 6	MODE 7	MODE 8
		VESA Standard 640×480 @75Hz	VESA Standard 800×600 @56Hz	VESA Proposal (SVGA) 800×600 @60Hz	VESA Proposal 800×600 @75Hz
DOT CLOCK		31.5000MHz	36.000MHz	40.0000MHz	49.5000MHz
H O R I Z	fH	37.500kHz	37.8788kHz	46.875kHz	35.1562kHz
	A-Period	26.667 us(840 dots)	26.400 us(1056 dots)	21.333 us(1056 dots)	28.444 us(1024 dots)
	B-Blanking	6.350 us(200 dots)	6.400 us(256 dots)	5.171 us(256 dots)	6.222 us(224 dots)
	C-Sync width	2.032 us(64 dots)	3.200 us(128 dots)	1.616 us(80 dots)	2.000 us(72 dots)
	D-Back porch	3.810 us(120 dots)	2.200 us(88 dots)	3.232 us(160 dots)	3.556 us(128 dots)
	E-Active	20.317 us(640 dots)	20.000 us(800 dots)	16.162 us(800 dots)	22.222 us(800 dots)
	F-Front porch	0.508 us(16 dots)	1.000 us(40 dots)	0.323 us(16 dots)	0.667 us(24 dots)
V E R T	fV	75.000Hz	60.3165Hz	75.0000Hz	56.250Hz
	A-Period	13.333 ms(500 lines)	16.579 ms(628 lines)	13.333 ms(625 lines)	17.778 ms(625 lines)
	B-Blanking	0.533 ms(20 lines)	0.739 ms(28 lines)	0.533 ms(25 lines)	0.711 ms(25 lines)
	C-Sync width	0.080 ms(3 lines)	0.106 ms(4 lines)	0.064 ms(3 lines)	0.057 ms(2 lines)
	D-Back porch	0.427 ms(16 lines)	0.607 ms(23 lines)	0.448 ms(21 lines)	0.626 ms(22 lines)
	E-Active	12.800 ms(480 lines)	15.840 ms(600 lines)	12.800 ms(600 lines)	17.067 ms(600 lines)
	F-Front porch	0.027 ms(1 lines)	0.026 ms(1 lines)	0.021 ms(1 lines)	0.028 ms(1 lines)
Sync polarity (H/V)		Negative / Negative	Positive / Positive	Positive / Positive	Positive / Positive

		MODE 9	MODE 10	MODE 11	MODE 12
		VESA Proposal 800×600 @72Hz	MAC16 832×624 @75Hz	VESA Standard 1024×768 @60Hz	VESA Standard 1024×768 @70Hz
DOT CLOCK		50.0000MHz	57.2832MHz	65.0000MHz	75.0000MHz
H O R I Z	fH	48.0769kHz	48.3631kHz	56.4759kHz	49.7250kHz
	A-Period	20.800 us(1040 dots)	20.677 us(1344 dots)	17.707 us(1328 dots)	20.111 us(1152 dots)
	B-Blanking	4.800 us(240 dots)	4.923 us(320 dots)	4.054 us(304 dots)	5.587 us(320 dots)
	C-Sync width	2.400 us(120 dots)	2.092 us(136 dots)	1.813 us(136 dots)	1.117 us(64 dots)
	D-Back porch	1.280 us(64 dots)	2.462 us(160 dots)	1.920 us(144 dots)	3.910 us(224 dots)
	E-Active	16.000 us(800 dots)	15.754 us(1024 dots)	13.653 us(1024 dots)	14.524 us(832 dots)
	F-Front porch	1.120 us(56 dots)	0.369 us(24 dots)	0.320 us(24 dots)	0.559 us(32 dots)
V E R T	fV	72.1876Hz	60.0038Hz	70.0694Hz	74.5502Hz
	A-Period	13.853 ms(666 lines)	16.666 ms(806 lines)	14.272 ms(806 lines)	13.414 ms(667 lines)
	B-Blanking	1.373 ms(66 lines)	0.786 ms(38 lines)	0.673 ms(38 lines)	0.865 ms(43 lines)
	C-Sync width	0.125 ms(6 lines)	0.124 ms(6 lines)	0.106 ms(6 lines)	0.060 ms(3 lines)
	D-Back porch	0.478 ms(23 lines)	0.600 ms(29 lines)	0.513 ms(29 lines)	0.784 ms(39 lines)
	E-Active	12.480 ms(600 lines)	15.880 ms(768 lines)	13.599 ms(768 lines)	12.549 ms(624 lines)
	F-Front porch	0.770 ms(37 lines)	0.062 ms(3 lines)	0.053 ms(3 lines)	0.020 ms(1 lines)
Sync polarity (H/V)		Positive / Positive	Negative / Negative	Negative / Negative	Negative / Negative

RESERVATION TIMING

		MODE 13	MODE 14	MODE 15
		1024×768 @72Hz	YESA Standard 1024×768 @75Hz	MAC 19 1024×768 @75Hz
DOT CLOCK		75.0000MHz	78.7500MHz	80.0000MHz
H O R I Z	fH	57.8703kHz	60.241kHz	60.0229kHz
	A-Period	17.280 us(1296 dots)	16.600 us(1328 dots)	16.660 us(1312 dots)
	B-Blanking	3.627 us(272 dots)	3.800 us(304 dots)	3.657 us(288 dots)
	C-Sync width	1.920 us(144 dots)	1.200 us(96 dots)	1.219 us(96 dots)
	D-Back porch	1.387 us(104 dots)	2.200 us(176 dots)	2.235 us(176 dots)
	E-Active	13.653 us(1024 dots)	12.800 us(1024 dots)	13.003 us(1024 dots)
	F-Front porch	0.320 us(24 dots)	0.400 us(32 dots)	0.203 us(16 dots)
V E R T	fV	71.7978Hz	74.927Hz	75.0286Hz
	A-Period	13.928 ms(806 lines)	13.346 ms(804 lines)	13.328 ms(800 lines)
	B-Blanking	0.657 ms(38 lines)	0.597 ms(36 lines)	0.533 ms(32 lines)
	C-Sync width	0.104 ms(6 lines)	0.049 ms(3 lines)	0.050 ms(3 lines)
	D-Back porch	0.501 ms(29 lines)	0.498 ms(30 lines)	0.466 ms(28 lines)
	E-Active	13.271 ms(768 lines)	12.749 ms(768 lines)	12.795 ms(768 lines)
	F-Front porch	0.052 ms(3 lines)	0.049 ms(3 lines)	0.017 ms(1 lines)
Sync polarity (H/V)		Negative / Negative	Positive / Positive	Negative / Negative