PRODUCTS SPECIFICATION
for
46” LCD Hyper Slim Multi Display

MODEL NAME : KT-LS46SMKX

Revision 0.0
2009. 12.08

Designed by : K.R.JUNG

Checked by : B.H.NAM

Approved by : Y.C.OH

RoHS
Compliant
2002/95/EC

Note : The specification is subject to change without prior notice.

Revision History

Date	Rev .No	Page	Summary
2009,12,08	0.0	All	Initial

46” Hyper Slim Multi Display Monitor
Model Name : KT-LS46SMKX

Item			Specification
LCD Module	Model		LTI460AA04
	Pixel Pitch		0.7455(H)x0.7455(V) [mm]
	Active Display Area		1018.353(H) x 572.544(V) [mm]
	Resolution		WXGA 1366 x 768 pixels (16:9)
	Colors		16,777,216 (8 bit)
	Luminance of white		500cd/m^2 (Typ,) 700cd/m^2 (Max)
	Contrast Ratio		3,000:1 (Typ)
	Viewing Angel		U/D/L/R = 89^o
	Response Time		8ms (GTG)
	Bezel		Super narrow bezel
Pixel Clock			25.2MHz-165MHz
Power Management			None
Plug and Play			Yes / DDC2B
Control			IR(Remote Control) , OSD Key(8 keys), RS-232(DSUB 9 Pin)
Speaker / Audio Output			None
Input / Output Signal	Horizontal Range		30.0 – 68.0 KHz
	Vertical Range		50 +/- 1Hz, 60Hz +/- 1Hz
	Pixel Clock		25.2MHz-165MHz
	VGA / DVI	Connector	DSUB-15P IN/OUT , DVI-D IN/OUT
		Sync	Separate
		Resolution	640x480-60,800x600-60,1024x768-60,1280x1024-60, 1366x768-60,1366x768-50, 720p-60,1080p-60, 720p-50,1080p-50
	Component	Connector	BNC IN/OUT
		Resolution	480i,480p,720p-60,1080i-60,1080p-60, 576i,576p,720p-50,1080i-50,1080p-50
	S-Video	Connector	S-Terminal IN/OUT
		Color System	NTSC / PAL
	CVBS	Connector	BNC IN/OUT
		Color System	NTSC / PAL
Control Signal			DSUB 9 Pin IN / OUT(Through DVI cable) For RS-232 Control
Power Supply			Universal 300W(Max) (100-240)
Current Rating			2.73A @110V , 1.36A @220V
Operational(*1)	Temperature		0 ~ 40 ºC
	Humidity		20 – 80% (without condensation)
Storage(*1)	Temperature		-20 ~ 60 ºC
	Humidity		10 – 90% (without condensation)
MTBF			>50,000 Hours

Accessories			- Remote Controller (with Battery) - RS232 CABLE(Optional DVI to RS-232 Cable) - DVI Cable(1800mm) - D-SUB Cable(1850mm) - User's Manual
Complied regulatory and Guidelines			Defined at 1.2 Regulation
Dimension	**Net without stand**		W 1026.1mm / H 580.2mm / D 98.1 mm
	Net without stand(Glass)		N/A
	Gross		W: 1200mm / H: 778mm D: 370mm
Weight	**Without Glass**	**Net**	< 29.8 kg
		Gross	< 39.6 kg
	With Glass	**Net**	N/A
		Gross	N/A

Note 1) Temperature and Relative humidity range

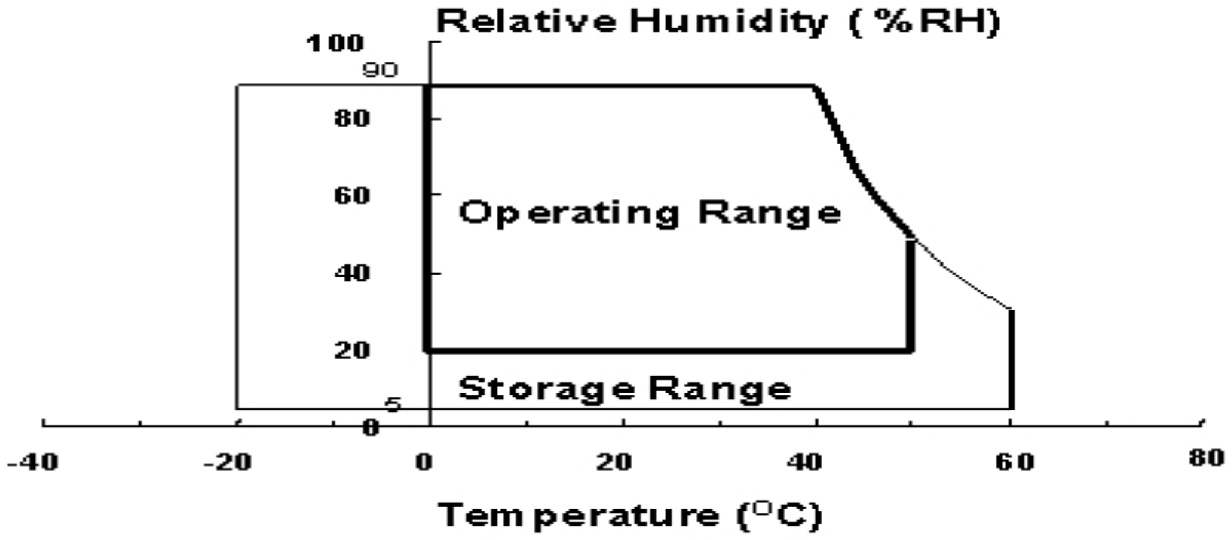


Fig. Temperature and Relative humidity range

General Description

This document is the specification of 46” TFT-LCD MULTI VISION MONITOR for application of DID.
KT-LS46SMKX is a High quality TFT-LCD multi vision solution for display device having RoHS.

General Features

- Resolution : WXGA (1366 * 768 @ 60Hz) Recommend
  PC(VGA)/DVI : 1920 * 1080 @ 60Hz at Multi
  COMPONENT : 1080p at Multi
- Image Screen Input Signal: PC(VGA) / DVI / COMPONENT / SVHS / CVBS
- ROHS Compliance
- Supports VESA DDC 2B
- Support RS-232 Data transmission
- On Screen display(OSD)

Electrical Specification

Input Power **:** Input power is required as below
Voltage : Universal Voltage [90Vac – 264Vac / 47Hz – 63Hz]
Consumption : 300 [W] (Max)

Power Management

Mode	V-Sync	H-Sync	Video	Power Consumption
ON	Pulse	Pulse	Active	Less than 300 [W]
Off (Stand by)	-	-	Blank	Less than 1 [W]

Table of Contents Page

1 . Foreword

1.1 Model Name : KT-LS46SMKX

1.2 Regulation

The monitor shall be approved / licensed / certified as the Model KT-LS46SMKX

* NOTE : USE RESTRICTIONS AND LIMITATIONS

This product is not authorized for use in life support devices or systems, military application, or other application which propose a significant risk of personal injury.

Therefore, the product shall not be used for such purpose.

Regulation		Country	Configuration
			KT-LS46SMKX
Safety	CB Report	International	Y
	NRTL	North America	Y
	CE-Marking	EU	Y
	TUV-GS	Germany	-
	GOST-R	Russia	-
	CCC	China	-
	PSB	Singapore	-
	NOM	Mexico	-
	IRAM	Argentina	-
	SASO	Saudi Arabia	-
EMC (Class A)	FCC-A	USA	Y
	KCC	Korea	Y
	CE-Marking	EU	Y
	C-Tick-B	Australia	-
	GOST-R	Russia	-
Others	WEEE	International	-
	SB 50	US (California)	-
	RoHS	EU	Y
	Mercury Regulation	USA	-
	EuP	EU	-

• Regulation:

Safety(*: Include EMI or EMC Requirements)

- CE-Marking : EN 60950-1
- NRTL : UL 60950-1 , CAN/CSA C22.2 No60950-1
- CB : IEC 60950-1

EMI / EMC

- FCC (USA) : Part 15B

- CE : EN55022(EMI), EN55024(EMS)
  : EN 61000-4-2(ESD)
  : EN 61000-4-4(EFT) / EN 61000-4-5(SURGE)
  : EN 61000-4-6(CS) / EN 61000-4-11(DIP)
  : EN 61000-3-2 / EN 61000-3-3 / EN 61000-4-8

2. TFT LCD Panel Specifications

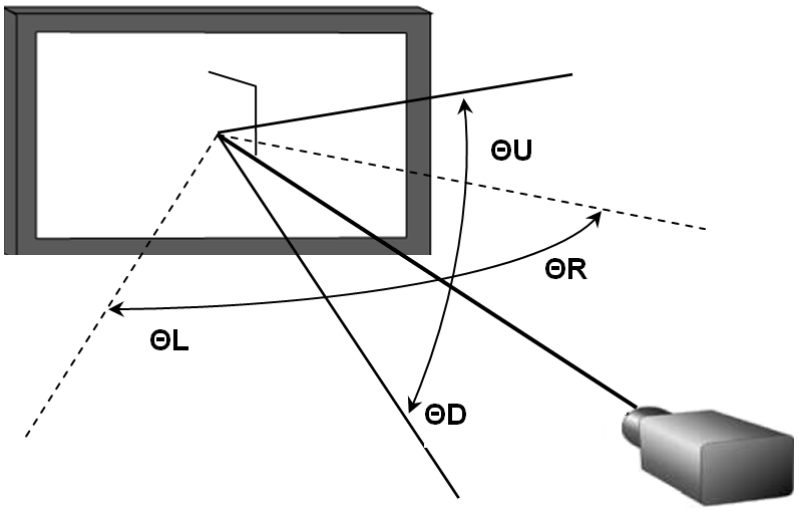
Item			Specifications	Unit	Remarks
Module Size			1025.653(W_{TYP})x579.844(H_{TYP})	mm	
			59.43(D_{MAX})		
Weight			16,000(Max)	g	
Pixel Pitch			0.7455(H)x0.7455(V)	mm	
Active Display Area			1018.353(H) x 572.544(V)	mm	
Surface Treatment			Haze 40%, Hard-coating(3H)		
Display Colors			8 bit – 16.7M	colors	
Number of Pixels			1366 (H) 768 (V)	pixel	
Color Filter			RGB vertical stripe		
Display Mode			SPVA, Normally Black		
Luminance of White			700(Typ)	cd/m^2	
Contrast ratio (Center of Screen)			2500:1(Min) , 3000:1 (typ.)		(*1)
Back light unit operating life time			50,000(50% will reach 50% Brightness)	Hour	
Response Time	Rising		10(typ)	msec	(*3)
	Falling		6(typ)		
	G-to-G		8(typ)		
Color Chromaticity (CIE 1931)	Red	Rx	0.643	TYP. +/- 0.03	
		Ry	0.328		
	Green	Gx	0.271		
		Gy	0.599		
	Blue	Bx	0.143		
		By	0.0060		
	White	Wx	0.280		
		Wy	0.290		
Color Temperature			10000	K	
Viewing Angle(Typ.)	Horizontal		-89 to 89	Degree	CR>=10(*2)
	Vertical		-89 to 89		
Brightness Uniformity (9 Points)			25	%	(*4)

Notes

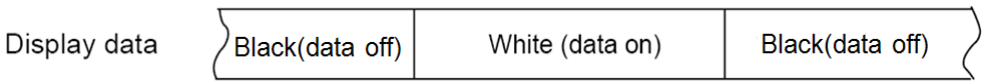
(Note 1) Contrast ratio is defined as the following formula.

$$\text{Contrast ratio} = \frac{\text{Brightness (luminace) with pixels at "white"}}{\text{Brightness with all pixels at "black"}}$$

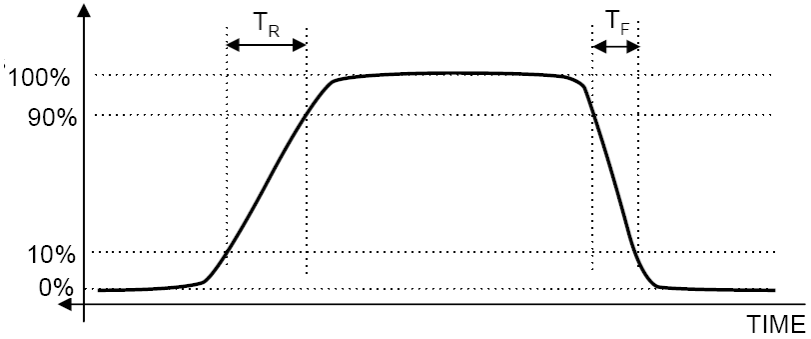
(Note2) Viewing angle is measured as follows:



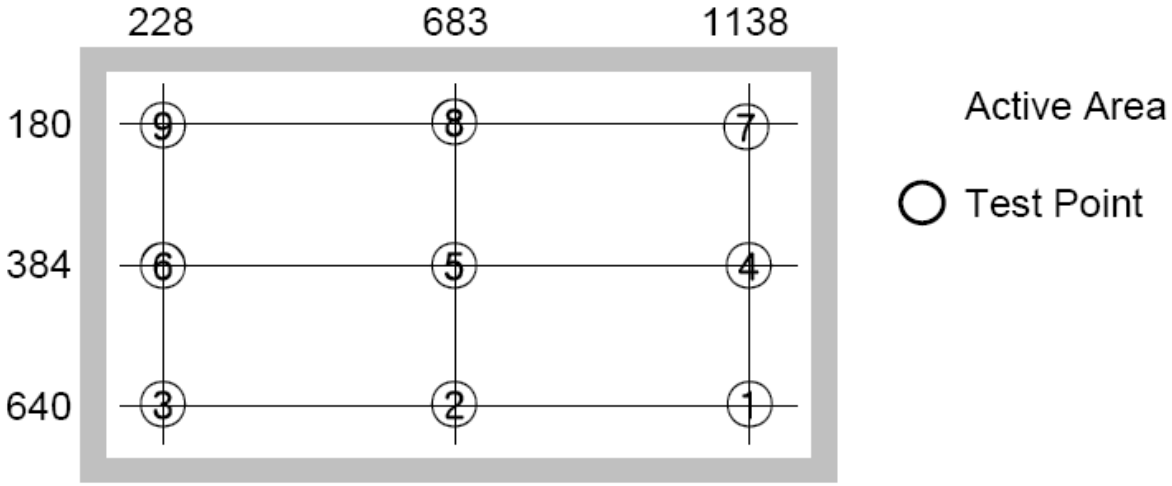
(Note 3) Definition of response time : Sum of Tr, Tf



Optical Instruments Response



(Note 4) Definition of Luminance test point



3. Electrical Specifications

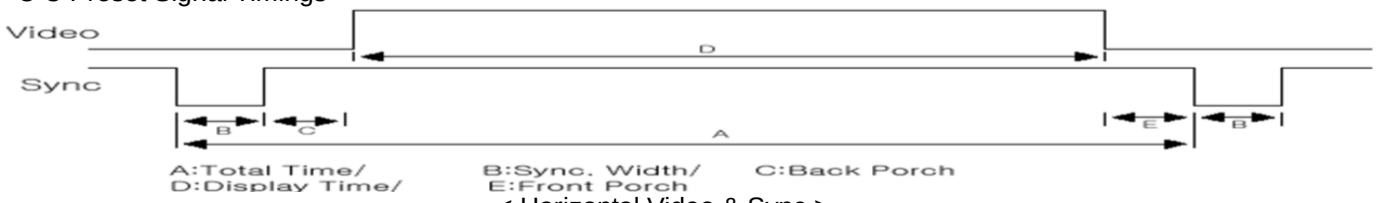
3.1 Input signal

Input			Specification			Unit	Remark
			Min	Typ	Max		
PC(VGA) / DVI	Signal	RGB	0.714			Vp-p	
		DVI	T.M.D.S				
	Frequency	H	30.0	-	68.0	KHz	
		V	49	-	61	Hz	
	Separate (H,V) Sync (TTL)	High	2.0	-	5.0	V	
		Low	0	-	0.8		
	DVI (PC to MNT)		Max length : 10			m	
	DVI (Set1 to Set2)		Max length : 1.8			m	
Component	YPbPr	Y		1.0		Vp-p	
		Pb/Pr		0.7			
VIDEO	CVBS (Composite)	NTSC		0.714			
				0.286			Sync Signal
		PAL		0.7			
				0.3			Sync Signal
	S-VHS (Y/C)	NTSC		1.0			
				0.286			Sync Signal
		PAL		1.0			
				0.3			Sync Signal
CONTROL	RS-232C(PC to MNT)		Max length : 10			m	TBD

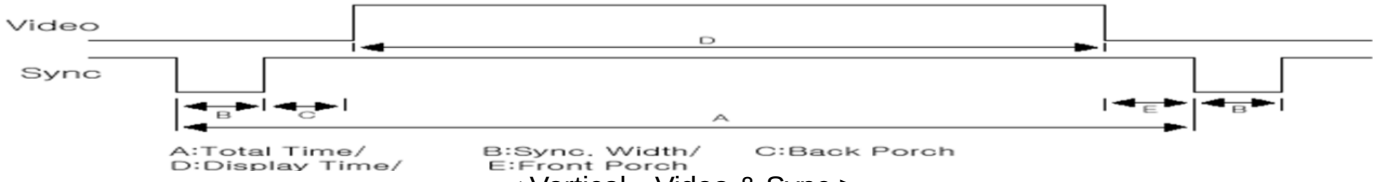
3.2 Output Signals

Output			Specification			Unit	Remark
			Min	Typ	Max		
PC(VGA) / DVI	Signal	RGB	0.714			Vp-p	
		DVI	T.M.D.S				
	Frequency	H	30.0	-	68.0	KHz	
		V	49	-	61	Hz	
	Separate (H,V) Sync (TTL)	High	2.0	-	5.0	V	
		Low	0	-	0.8		
Component	YPbPr	Y		1.0		Vp-p	
		Pb/Pr		0.7			
VIDEO	CVBS (Composite)	NTSC		0.714			
				0.286			Sync Signal
		PAL		0.7			
				0.3			Sync Signal
	S-VHS (Y/C)	NTSC		1.0			
				0.286			Sync Signal
		PAL		1.0			
				0.3			Sync Signal
CONTROL	RS-232C (‘n’ MNT to ‘n+1’ MNT)		Max sets : 16			sets	

3-3 Preset Signal Timings



< Horizontal Video & Sync >



< Vertical Video & Sync >

3-3-1. Component signal

Signal Timing	480i	480p	576i	576p	720p		1080i		1080p	
Frame Frequency [Hz]	29.97	59.94	25.0	50	59.94	50	29.97	25.0	59.94	50
Entire Lines	525	525	625	625	750	750	1125	1125	1125	1125
Effective Lines	480	480	576	576	720	720	1080	1080	1080	1080
Aspect Ratio	4:3	16:9	4:3	16:9	16:9	16:9	16:9	16:9	16:9	16:9
Line Frequency [KHz]	15.73	31.46	15.62	31.25	44.95	37.50	33.71	28.125	67.42	56.25

3-3-2. PC(VGA) / DVI signal

Description		Resolution				
		640	800	1024	1280	1366
		480	600	768	1024	768
HORIZONTAL	Freq [KHz]	31.468	37.879	48.780	63.981	47.700
	A: Total [Dot]	800	1056	1936	1688	1782
	B: Sync width [Dot]	96	128	96	112	144
	C: Back Porch [Dot]	56	88	752	248	208
	D: Active [Dot]	640	800	1024	1280	1366
	E: Front Porch [Dot]	8	40	64	48	64
	Polarity	-	+	-	+	+
VERTICAL	Freq [Hz]	59.94	60.317	60.001	60.02	60.00
	A:Total [Line]	525	628	813	1066	795
	B: Sync width [Line]	2	4	6	3	3
	C: Back Porch [Line]	41	23	33	38	23
	D: Active [Line]	480	600	768	1024	768
	E: Front Porch [Line]	2	1	6	1	1
	Polarity	-	+	-	+	+
Pixel Clock [MHz]		31.5	40.000	94.43	108.0	85.03

Description		Resolution				
		1366	1280		1920	
		768	720(720p)		1080(1080p)	
HORIZONTAL	Freq [KHz]	47.7	37.5	45	56.25	67.5
	A: Total [Dot]	1766	1980	1650	2640	2200
	B: Sync width [Dot]	144	40	40	44	44
	C: Back Porch [Dot]	200	160	220	148	148
	D: Active [Dot]	1366	1280	1280	1920	1920
	E: Front Porch [Dot]	56	440	110	528	88
	Polarity	+	+	+	+	+
VERTICAL	Freq [Hz]	50	50	60	50	60
	A:Total [Line]	954	750	750	1125	1125
	B: Sync width [Line]	3	5	5	5	5
	C: Back Porch [Line]	23	20	20	36	36
	D: Active [Line]	768	720	720	1080	1080
	E: Front Porch [Line]	1	5	5	4	4
	Polarity	+	+	+	+	+
Pixel Clock [MHz]		84.238	74.25	74.25	148.50	148.50

3.4 Power Supply(SMPS)

Input Voltage	90 to 264 Vac
Frequency	47 to 53 / 57 to 63 Hz
Power Consumption	300W(MAX) 2.73A @110V , 1.36A @220V
AC Leakage Current	IEC 60950 STD Under 5mA
Inrush Current (Cold Start)	40 A_{peak} / 220V
Power Factor	> 0.9

3.5 Power Management

This function conforms DPMS of VESA

Table 3.4.1 . Power Management condition and status

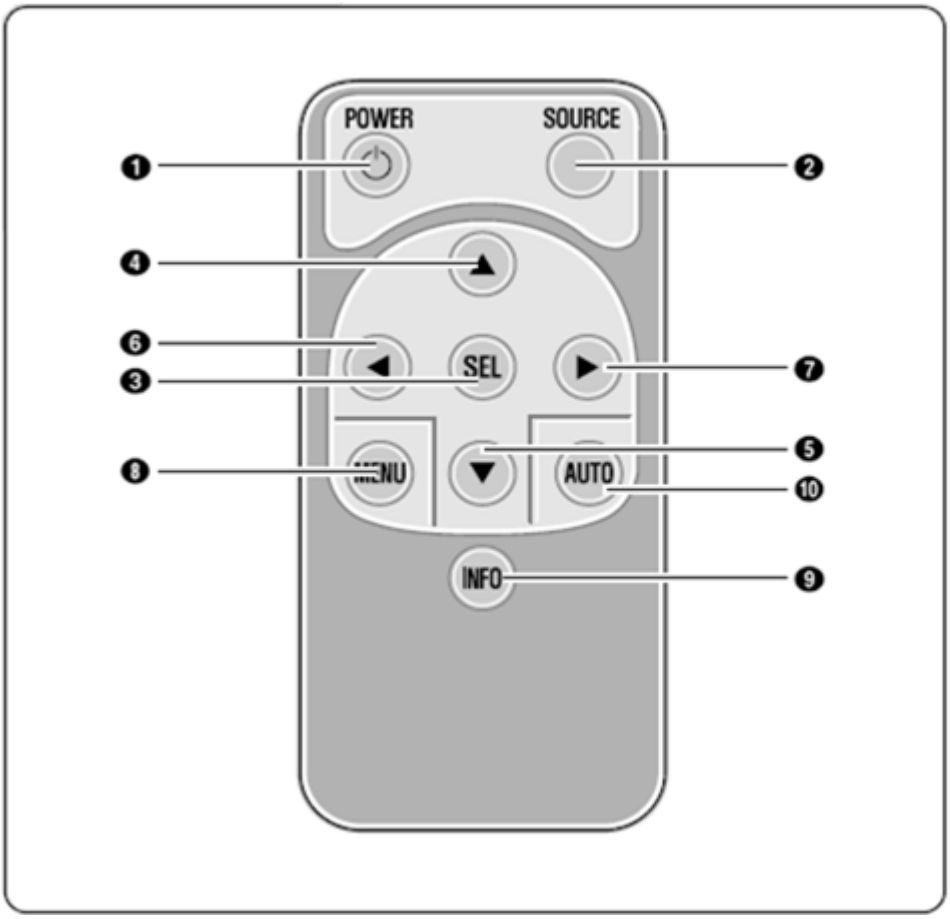
DPMS	H-sync	V-sync	Display	LED	Power Consumption (W)	Remarks
On state	ON	ON	Normal	GREEN	<300 W	
Not Connected	OFF	OFF	“No Signal” Display	GREEN	< 300 W	
Active off	OFF	ON	“No Signal” Display	GREEN	< 300 W	
	ON	OFF	“No Signal” Display	GREEN	< 300 W	
Stand by (Power off)	N/A	N/A	No Display	RED	< 1W	
Complete	N/A	N/A	No display	OFF	0W	

4. Function

4.1 OSD Control Key

UP	▶ This button is used to navigate OSD menu. ▶ When the OSD main menu or sub-menu is popped up, if this button Is pushed the active menu will move to upper menu
DOWN	▶ This button is used to navigate OSD menu. ▶ When the OSD main menu or sub-menu is popped up, if this button Is pushed the active menu move to lower menu
LEFT	▶ This button is used to decrease the value of OSD menu. ▶ After choosing the OSD menu and this button is pushed the value of OSD will be decreased.
RIGHT	▶ This button is used to increase the value of OSD menu. ▶ After choosing the OSD menu and this button is pushed the value of OSD will be increased.
SELECT	▶ When the OSD menu is popped up, if this button is pushed The current menu will be selected
MENU	▶ This button has two functions, the one is to active and deactivate OSD menu and the other is to return to previous menu
SOURCE	▶ This button is used to active and deactivate source select OSD.
POWER	▶ Power On / Off Button

4.2 Remote Control



(1) Power : Power On / Off button
(2) SOURCE : Selects the external input source
(3) SEL : Confirm your choice
(4) ▲ : UP (Function Control in the OSD)
(5) ▼ : Down (Function Control in the OSD)
(6) ◀ : Left (Function Control in the OSD)
(7) ▶ : Right (Function Control in the OSD)
(8) MENU(On Screen Display) : Activates the OSD menu returns to the previous menu
(9) INFO : Information Display
(10) Auto : Automatically adjust position & horizontal size, phase (PC mode only)

4.3 OSD functions

Main Menu	Sub Menu	Adjust item		option
Picture	Picture Mode	User, Dynamic, Standard, Movie, Mild		
	User	Contrast, Brightness, Sharpness(S-Video/AV/Component), Color (S-Video/AV/Component), Tint(S-Video/AV)		
	Color Tone	User(Red, Green, Blue) , Cool1(9300K), Cool2(10000K), Normal(6500K) Warm1(6200K), Warm2(5500K),		
	Size	PC/DVI input – Wide(16:9), 4:3 Component/S-Video/CVBS input – Wide(16:9), 4:3, Zoom, Panorama, Zoom, 14:9		
	PC	Auto Adjust	H/V position, clock, clock phase,	
		Phase	Adjust the PC Phase.	
		H-Position	Adjust the PC input H-Position	
		V-Position	Adjust the PC input V-Position	
		Frequency	Adjust the PC input Frequency	
Setup	Reset	All of user setting to be reset as defaults.		
	Time	Clock	Adjust present time setting	
		On Timer	Turn on time setting	
		Off Timer	Turn off time setting	
	Language	English, Spanish, German, French		
	OSD Tone	Turn on /off OSD background blending		
	Key Lock	Turn on/off Key Lock function(Power Key is not locked)		
Multi (OSD Language English only)	Multi Function	H Cell Max	Adjust Horizontal Max Cell	
		V Cell Max	Adjust Vertical Max Cell	
		Cell Number	Adjust display No	
		H Gap Adjust	Adjust Horizontal Gap	
		V Gap Adjust	Adjust Vertical Gap	
		1:1 Gap Adjust	Gap adjust On/Off at 1:1 display	
		SET ID X	Display Set ID X (Read Only)	
		SET ID X	Display Set ID Y (Read Only)	

4.4 Auto adjust function

Auto adjust function is performed to detect the input signal format (H/V frequency, video active area, sync pulse and back-porch) by the internal scaler at PC(VGA) input mode.

Adjustment items are H/V-position, Frequency (Clock) and Phase.
Auto adjust function cannot setup perfectly at some PCs.
In this case, the fine turning of “Frequency (Clock)” and “Phase” by manual are necessary.
If you precede the “Auto Adjust” on character mode such as “Dos Prompt mode”, you also cannot setup perfectly.
And if you precede the “Auto Adjust” on dark moving picture, you also cannot setup perfectly too.
So you need preceding “Auto Adjust” at the bright, full sized and still image to get good “Auto Adjust” result.

4.4.1 Auto Calibration Command and Protocol

1. Start and End Command

	Command 1Byte	Length 1Byte	Cell No 1Byte	Ceck sum(Command+Length) 1Byte
Start(Single)	0xE0	0x03		0xE3
Start(Cell)	0xE0	0x04	0x00	0xE4 (in case Cell No = 0)
End	0xE1	0x03		0xE4

2. Ack and Nack (From Monitor)

Ack	0x55	If check sum is correct.
Nack	0xAA	If check sum is not correct.

3. PWM Adjust Command

	Command 1Byte	**Length 1Byte**	**Data1(Reserved) 1Byte**	**Data2(Adjust Value) 1Byte**	**Check sum(Command+Length+Data1+Data2) 1Byte**
PWM Adjust	0xE6	0x05	0x00	0x32	0x1D

4. Scaler Gamma LUT Adjust Command

	Command 1Byte	**Length 1Byte**	**Data1(Reserved) 1Byte**	**Data2 1Byte**	**Data3 1Byte**	**Data4 1Byte**	**Data5 1Byte**
Gamma LUT Adjust	0xE4	0x08	0x00	Color	LUT Level	LUT Fraction value	LUT Integer value
				0x00 - Red	255 ~ 0	0x08 = 0.50	255 ~ 0
				0x01 - Green		0x04 = 0.25	
				0x02 - Blue		0x0C = 0.75	
						0x00 = 0.00	

	Data5 1Byte	**Check sum(Command+Length+Data1+Data2+Data3+Data4+Data5) 1Byte**
Gamma LUT Adjust	LUT Integer value	Command+Length+Data1+Data2+Data3+Data4+Data5
	255 ~ 0	

4.4.2 Auto calibration Example

1. PWM Adjust Command

Sequence	**Command**					**Remarks**	
1	0xE0	0x03	0xE3			-> Autocalibration Start	<- Ack from Monitor
2	0xE6	0x05	0x00	0x32	0x1D	-> PWM(BackLight) Adjust to 50	<- Ack from Monitor
3	0xE1	0x03	0xE4			-> Autocalibration End	<- Ack from Monitor

2. Scaler Gamma LUT Adjust Command

Sequence	**Command**								**Remarks**	
1	0xE0	0x03	0xE3						-> Autocalibration Start	<- Ack from Monitor
2	0xE4	0x08	0x00	0x00	0xFF	0x08	0xFE	0xF1	-> Color=Red / LUT level=255 / LUT value=254.50	<- Ack from Monitor
3	0xE4	0x08	0x00	0x01	0xFF	0x04	0xFE	0xEE	-> Color=Green / LUT level=255 / LUT value=254.25	<- Ack from Monitor
4	0xE4	0x08	0x00	0x02	0xFF	0x0C	0xFE	0xF7	-> Color=Blue / LUT level=255 / LUT value=254.75	<- Ack from Monitor
5	0xE4	0x08	0x00	0x00	0xFE	0x00	0xFD	0xE7	-> Color=Red / LUT level=254 / LUT value=253.00	<- Ack from Monitor
6	0xE4	0x08	0x00	0x01	0xFE	0x08	0xFD	0xF0	-> Color=Green / LUT level=254 / LUT value=253.50	<- Ack from Monitor
7	0xE4	0x08	0x00	0x02	0xFE	0x04	0xFD	0xED	-> Color=Blue / LUT level=254 / LUT value=253.25	<- Ack from Monitor
8					...					
9					to 0x00					
10	0xE1	0x03	0xE4						-> Autocalibration End	<- Ack from Monitor

*Enter factory mode and Save adjusted Gamma Lookup Table data to EEPROM

IR : INFO > DOWN > SEL > Factory mode > Gamma save > Sel > Sel ➔ Adjusted Gamma LUT Save to EEPROM > Power Off(Auto) > Power On(Auto)

4.5 RS-232 Control

You can control this monitor by using a personal computer with RS-232 terminal.
RS-232 data transmit through DVI Cable between each set.(w/o First set, using DDC data line- Pin no.6, 7)

4.5.1 RS-232 data flow

Option 1 : Using DVI Cable)

PC ⟶ 1st SET ⟶ 2ND SET ⟶ 3TH SET ……

(using by 9P RS-232 CABLE) (using by DVI cable – DDC data line)

- PC should be connected with 1st set only by using RS-232 CABLE for access EDID data.
  Other sets are connected together for RS-232 data transmission by using DDC data line in DVI cable.
  (Otherwise, only 1st set needs to check EDID DATA with PC.)

Option 2 : Using DVI to RS-232 Cable)

PC ⟶ 1st SET ⟶ 2ND SET ⟶ 3TH SET ……

(using by 9P RS-232 CABLE) (using by DVI to RS-232 Cable)

- PC should be connected with 1st set only by using RS-232 CABLE.
  Other sets are connected together for RS-232 data transmission by using DDC data line in DVI to RS-232 cable.

4.5.2 COM Port setting

Protocol	RS-232
Baud rate	9600bps
Data Bits	8 Bit
Parity bit	None
Stop bit	1 bit
Flow control	None

4.5.3 Control command format

1) Direct control command.

Head	**Set Id**	**Command**	**End**
2 Bytes	3 Bytes	3 Bytes	1 Byte
K:	**ALL**	**PON**	**.**

EX) **K:ALLPON. => ALL SET POWER ON**
K:001CTU. => SET ID 001 SET CONTRAST 1 STEP UP

2) Value adjust command.

Head	**Set Id**	**Command**	**Value**	**End**
2 Bytes	3 Bytes	3 Bytes	3 Bytes	1 Byte
K:	**ALL**	**PON**	**095**	**.**

EX) **K:ALLCON095. => ALL SET CONTRAST ADJUST TO 95 LEVEL**
K:012BRT080. => SET ID 012 SET BRIGHTNESS ADJUST TO 80 LEVEL

3) Status check command (Only for one set)

(1) Request (from PC)

Head	**Set Id**	**Command**	**End**
2 Bytes	3 Bytes	3 Bytes	1 Byte
K:	**001**	**CON**	**?**

(2) Reply (at Monitor set id 001) – reply within 3sec.

Command	**=**	**Value**
3 Bytes		3 Bytes
CON		**095**

EX) **PC => K:001CON? (SET ID 001 SET CONTRAST REQUEST)**
MONITOR => CON=095 (SET ID 001 SET CONTRAST VALUE=095)

4.5.4 Direct control command table.

No	Command	Description	No	Command	Description
1	PON / POF	Power On / Off	21	STU / STD	Saturation(Color) 1step Up/ Down
2	SPC	Source change to PC	22	SPU / SPD	Sharpness 1step Up/ Down
3	SDV	Source change to DVI	23	BLU / BLD	Backlight 1step Up/ Down
4	SC1	Source change to COMPONENT	24	SBU / SBD	Sub Brightness 1step Up/ Down
5	SSV	Source change to S-VIDEO	25	ROU / ROD	Red Offset 1step Up/Down
6	SAV	Source change to CVBS	26	GOU / GOD	Green Offset 1step Up/Down
7	MHU / MHD	Multi window H Cell max 1step Up/Down	27	BOU / BOD	Blue Offset 1step Up/Down
8	MVU / MVD	Multi window V Cell max 1step Up/Down	28	SCU / SCD	Sub Contrast 1step Up/Down
9	DNU / DND	Multi window Cell No 1step Up/ Down	29	RGU / RGD	Red Gain 1step Up/Down
10	HEU / HED	Multi window H Gap(Edge) 1step Up/ Down	30	GGU / GGD	Green Gain 1step Up/Down
11	VEU / VED	Multi window V Gap(Edge) 1step Up/ Down	31	BGU / BGD	Blue Gain 1step Up/Down
12	CT0	Color temperature set to USER	32	PM0	Picture Mode USER
13	CT1	Color temperature set to COOL1	33	PM1	Picture Mode DYNAMIC/ HIGH(pc/dvi)
14	CT2	Color temperature set to COOL2	34	PM2	Picture Mode STANDARD/ MIDDLE(pc/dvi)
15	CT3	Color temperature set to Normal	35	PM3	Picture Mode MOVIE/ LOW(pc/dvi)
16	CT4	Color temperature set to WARM1	36	PM4	Picture Mode MILD
17	CT5	Color temperature set to WARM2	37	PS0	Size set to WIDE(All source)
18	CTU / CTD	Contrast 1step Up/Down	38	PS1	Size set to 4:3(All source)
19	BRU / BRD	Brightness 1step Up/ Down	39	PS2	Size set to ZOOM(component,svideo,cvbs)
20	HUU / HUD	Tint(Hue) 1step Up/ Down	40	PS3	Size set to PANORAMA(component,svideo,cvbs)

No	Command	Description	No	Command	Description
41	PS4	Size set to 14:9(component,svideo,cvbs)	61	AGW	Aging mode Full White
42	HPU / HPD	H-Position 1step Up/Down	62	AGR	Aging mode Full Red
43	VPU / VPD	V-Position 1step Up/Down	63	AGG	Aging mode Full Green
44	CKU / CKD	Clock 1step Up/Down	64	AGG	Aging mode Full Blue
45	PHU / PHD	Phase1step Up/Down	65	AGF	Aging mode Off
46	ATU	Auto Adjust (only VGA input)	66		
47	RPW	Remote control Power key	67		
48	RSO	Remote control Source Key	68		
49	RUP	Remote control Up key	69		
50	RDN	Remote control Down key	70		
51	RRT	Remote control Right key	71		
52	RLT	Remote control Left key	72		
53	REN	Remote control Select key	73		
54	RMN	Remote control Menu key	74		
55	RAU	Remote control Auto key	75		
56	RIF	Remote control Info key	76		
57	KLN / KLF	Osd Key Lock On/Off	77		
58	EIN	Reset(Color) – Note4	78		
59	FMN	Factory Mode On	79		
60	FMF	Factory Mode Off	80		

4.5.5 Value adjust command table.

No	Command	Description	No	Command	Description
1	MHC	Multi window H Cell max (1 ~ 15)	21	VPS	V-Position Setting(0 ~ 100)
2	MVC	Multi window V Cell max (1 ~ 15)	22	CLK	Clock Setting(0 ~ 100)
3	DNO	Multi window Cell No (1 ~ 255)	23	PHS	Phase Setting(0 ~ 100)
4	MHG	Multi window H Gap(Edge) (0 ~ 40)	24		
5	MVG	Multi window V Gap(Edge) (0 ~ 40)	25		
6	CON	Contrast value Setting (0 ~ 100)	26		
7	BRT	Brightness value Setting(0 ~ 100)	27		
8	TIN	Tint(Hue) Setting (0 ~ 100)	28		
9	SAT	Saturation Setting(0 ~ 100)	29		
10	SHA	Sharpness value Setting(0 ~ 100)	30		
11	BLT	Back Light Setting (0 ~ 100)	31		
12	SBR	Sub Brightness Setting (0 ~ 255)	32		
13	ROF	Red Offset Setting (0 ~ 255)	33		
14	GOF	Green Offset Setting (0 ~ 255)	34		
15	BOF	Blue Offset Setting (0 ~ 255)	35		
16	SCO	Sub Contrast Setting (0 ~ 255)	36		
17	RGN	Red Gain Setting (0 ~ 255)	37		
18	GGN	Green Gain Setting (0 ~ 255)	38		
19	BGN	Blue Gain Setting (0 ~ 255)	39		
20	HPS	H-Position Setting(0 ~ 100)	40		

4.5.6 Status check command table.

No	Command	Description	No	Command	Description
1	CSR	Current Source status	23	CRT	Color temperature Setting status
2	CPS	Current Power status	24	AGI	Aging mode Setting status
3	MHC	Multi window H Cell max value	25	FWV	Firmware Version Read - Note2
4	MVC	Multi window V Cell max value	26		
5	DNO	Cell No value	27		
6	MHG	Multi window H Gap value	28		
7	MVG	Multi window V Gap value	29		
8	CON	Contrast Value	30		
9	BRT	Brightness value	31		
10	SAT	Saturation(Color) value	32		
11	TIN	Tint(Hue) value	33		
12	SHA	Sharpness value	34		
13	BLT	Backlight value	35		
14	SBR	Sub Brightness value	36		
15	ROF	Red Offset value	37		
16	GOF	Green Offset value	38		
17	BOF	Blue Offset value	39		
18	SCO	Sub Contrast value	40		
19	RGN	Red Gain value	41		
20	GGN	Green Gain value	42		
21	BGN	Blue Gain value	43		
22	PSZ	Picture Size Setting status	44		

5. Product Performance

5.1 Test condition

AC voltage	100/240 VAC 60/50Hz
Video signal	1366x768 @60Hz 0.7Vp-p
Aging times	30min in Aging mode(Full White)
Viewing distance	2 to 3 m
Ambient temperature	20 to 25 deg C.
Relative humidity	40 ~ 80 %
Setting	Middle Picture Mode at DVI input (Max condition : Brightness=100,Contrast=100 at User Picture mode)
Ambient illumination	300 to 700 (normal 500) Lux
Luminance meter	Topcon BM-7 or same equivalent
Inspection area	Active area

5.2 Luminance

Luminance	more than 500 cd/m^2 at backlight setting 72 (normal)
Brightness Uniformity	less than 25 %

(note) Judge point for brightness uniformity
Brightness uniformity is judged at nine(9) points on display area:
The brightness uniformity (Buni) is defined as the following equation.

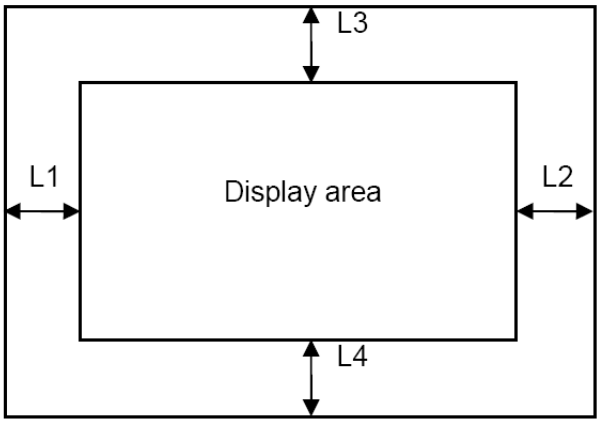
$$\text{Buni} = \frac{(\text{Bmax} - \text{Bmin})}{\text{Bmax}} * 100$$

Bmax = Maximum brightness among nine(9) measuring points.
Bmin = Minimum brightness among nine(9) measuring points

5.3 Geometry

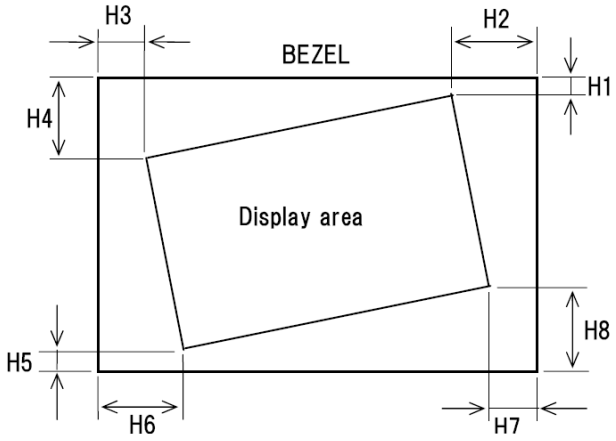
1366 x 768 @ 60Hz(all White) Display area does not hide in Front Cabinet.

BEZEL



L1, L2, L3, L4 >= 0mm
Display area does not hide in Front Cabinet.

5.4 Rotation (TBD – defined when CS sample available)
1366 x 768 @60Hz (all White)

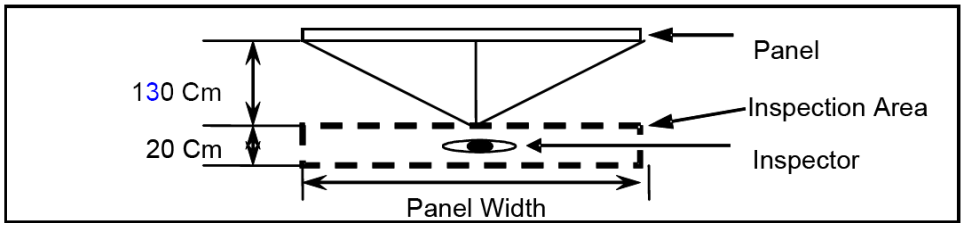


H1 >= 0.0mm H5 >= 0.0mm
H2 >= 0.0mm H6 >= 0.0mm
H3>= 0.0mm H7 >= 0.0mm
H4>= 0.0mm H8 >= 0.0mm
Display area does not hide in Front Cabinet.

6. Inspection Criteria (TBD – defined when CS sample available)

6.1 Conditions
6.1.1 Ambient condition
(1) ambient illumination : 300 to 700Lux (nominal 500Lux)
(2) ambient temperature : 25 + - 5degC
(3) ambient humidity : 50 + - 10%

6.1.2 Viewing Distance
130~150 cm apart from the surface of LCD module, means even though defect is visible within 1 m, but invisible from more 1m then, not consider as defect.



6.1.3 Viewing angle
The surface of the module and the inspector's line of view shall be at 90 degrees.

6.1.4 Test Signal
Input signal : standard preset timing (1366x768@60Hz)

6.1.5 Inspection area
Viewable (active) area (1018.3 mm x 572.5 mm)

6.2 Dot Defect Criteria

6.2.1 Definition of Dot Defect
If the luminance of dot is brighter or darker than surrounded dots, then called as dot defect.

6.2.2 Dot Inspection

Dot Defect Type Dot Defect Type		Max
High Dot	Random	**5**
	Adjacent 2 dots	**3**
	Adjacent 3 dots	**1**
Low Dot	Random	**15**
Off Dot	Random	**10**
	Adjacent 2 dots	**5**
	Adjacent 3 dots	**3**
Total amount of Dots		**20**
Minimum Distance between defects	High dot High dot	**5mm**
	Off dot Off dot	**Ignore**

6.2.3 Dot Classification Method

The criteria of dot is defined by its brightness like below.

6.2.3.1 Brightly visible dot comparing with background

Step 1) Start dot defect test at 0% Gray Pattern * If visible Go to 25% Gray Pattern

Step 2) At 25% Gray Pattern

* If brightly visible → For Red/Blue, go to 50% Gray Pattern
  For Green, go to 30% Gray Pattern
* If invisible →No count

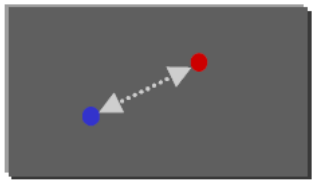
Step 3) At 50% Gray Pattern for Red/Blue
At 30% Gray Pattern for Green

* If brightly visible → High dot
* If Invisible → Low Dot

6.2.3.2 Darkly visible dot comparing with background

Looks relatively dark at 100% Gray R, G ,B , White pattern. → Off dot

6.2.4 Minimum Distance between Dot Defects



Minimum distance is direct distance like left picture.

6.3 Definition of Uniformity Defect

While operating LCD panel, if certain area is brighter or darker remarkably, then regards as uniformity defect.
However, extraneous substances which can be wiped out, like finger print, particles, are not considered as a uniformity defect.

6.4 Spot and Linear Type Inspection

Inspection

Defect Type	Criteria	Max
Spot Defect	0.1 < D <= **3** (mm)	**10**
Linear Defect	0.01 < W <= **0.7** (mm) Criteria	**15**
	2 < L <= 15.0 (mm) Criteria	
Total amount of Defects		**20**

6.5 Light Leakage

There shall be no visible light around the edges of the screen.

6.6 Visual Appearance Defect Criteria

6.6.1 Definition of Visual Appearance Defect

Visible defect at non-operating LCD panel status.

6.6.2 Visual Appearance Inspection

Inspection

Defect	Criteria	Max
Chassis Gap	Gap =< **1.5** (mm)	-
Spot Defect	0.1 < D <= **5.0** (mm)	**10**
Linear Defect	0.01 < W <= 0.7(mm)	**15**
	2.0 < L <= 20.0 (mm)	
Total amount of Defects		**20**

6.7 Accessories

User's manual	English (CD)
Cable	DVI to RS_232 Cable (2.0 m), VGA Cable (2.0 m), DVI-D Cable (2.0 m)
Remote Control	Remote Control (with battery)

7.Notice for Handling

A LCD (Liquid Crystal Display) has the following specific characteristics.
These characteristics are not indicative of a defect or malfunction.
(a) The display condition of a LCD may be affected by the ambient temperature.
(b) The LCD uses CCFL for backlight.
Optical characteristics such as brightness or uniformity will change during the LCD's life time
(c) Uneven brightness and/or small spots may appear depending on different display patterns.

(1) When the module is assembled, It should be attached to the system firmly using every mounting holes. Be careful not to twist and bend the modules.
(2) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and CCFL back-light.
(3) Note that polarizers are very fragile and could be easily damaged. Do not press or scratch the surface.
(4) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, Staining and discoloration may occur.
(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
(6) The desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
(7)If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.
(8) Protect the module from static , it may cause damage to the CMOS Gate Array IC. Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
(10) Do not disassemble the module.
(11) Do not pull or fold the lamp wire.
(12) Do not adjust the variable resistor which is located on the module. Protection sheet for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(14) Pins of I/F connector shall not be touched directly with bare hands.

(15) Image persistence

Image persistence is when a residual or “ghost” image of a previous image remains visible on the screen. Unlike CRT monitors, LCD monitors image persistence is not permanent, but constant images being displayed for a long period of time should be avoided. To alleviate image persistence, turn off the monitor for as long as the previous image was displayed. For example, if an image was on the monitor for one hour and a residual image remains, the monitor should be turned off for one hour to erase the image.

NOTE: As with all personal display devices, recommends using a moving screen saver at regular intervals whenever the screen is idle or turning off the monitor when not in use.

8. Mechanical Specifications

8.1 Cabinet

Metal material	EGI (Compatible with SECC) – ALL Mechanical Parts
Cabinet color	Black
Cabinet dimension with glass	N/A
Cabinet dimension without glass	W 1026.1 / H 580.2 / D 98.1 mm / See Fig.1
Control switch	See Fig.1
Bezel logo	See Fig.1

8.2 Rating Label

Color: Texture color BLACK on White Background / See Fig.2

8.3 Carton Box

Paper material	double wall corrugated fiberboard
Carton box print	See Fig.3
Outer Dimension	W: 1200mm H: 778mm D: 370mm
Packing style	See Fig.3

8.4 Weight

Net	< 29.8 kg
Gross	< 35.2 kg

9. Environment Conditions

9.1 Temperature, Relative Humidity

	Operating	Storage and shipment
Temperature	0 ~ 40 ºC	-20 to 60 ºC.
Related humidity	20 to 90 % $T_{ambiant}$ <= 39 ºC	10 to 90% without condensation

9.2 Random Vibration test (Packing)

Test Axis	Z-axis
Search frequency	5 - 500 Hz
Acceleration	0 – 0.0597 g^2 /Hz
Dwelling time	3 Hours per Z-axis
Mounting	Fixed firmly on the vibration table

9.3 Random Vibration test (Unpacking-Operational)

Test Axis	3 axis
Search frequency	5 - 500 Hz
Acceleration	0 – 0.0065 g^2 /Hz
Dwelling time	1 Hour per 1 axis

9.4 Drop test (Packing)

Test point	Height
Bottom side	46 cm

Fig 1 Outline Dimension

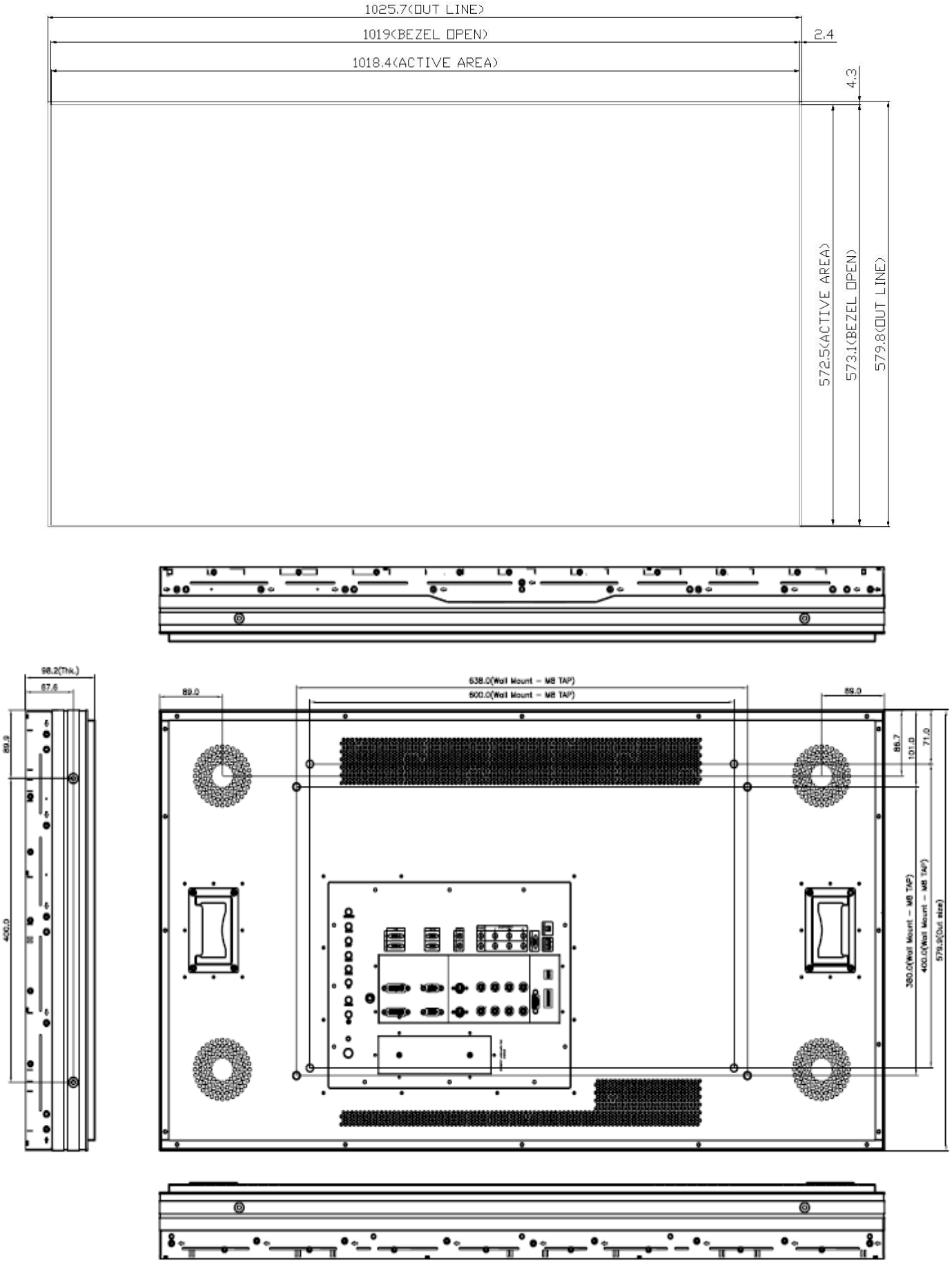
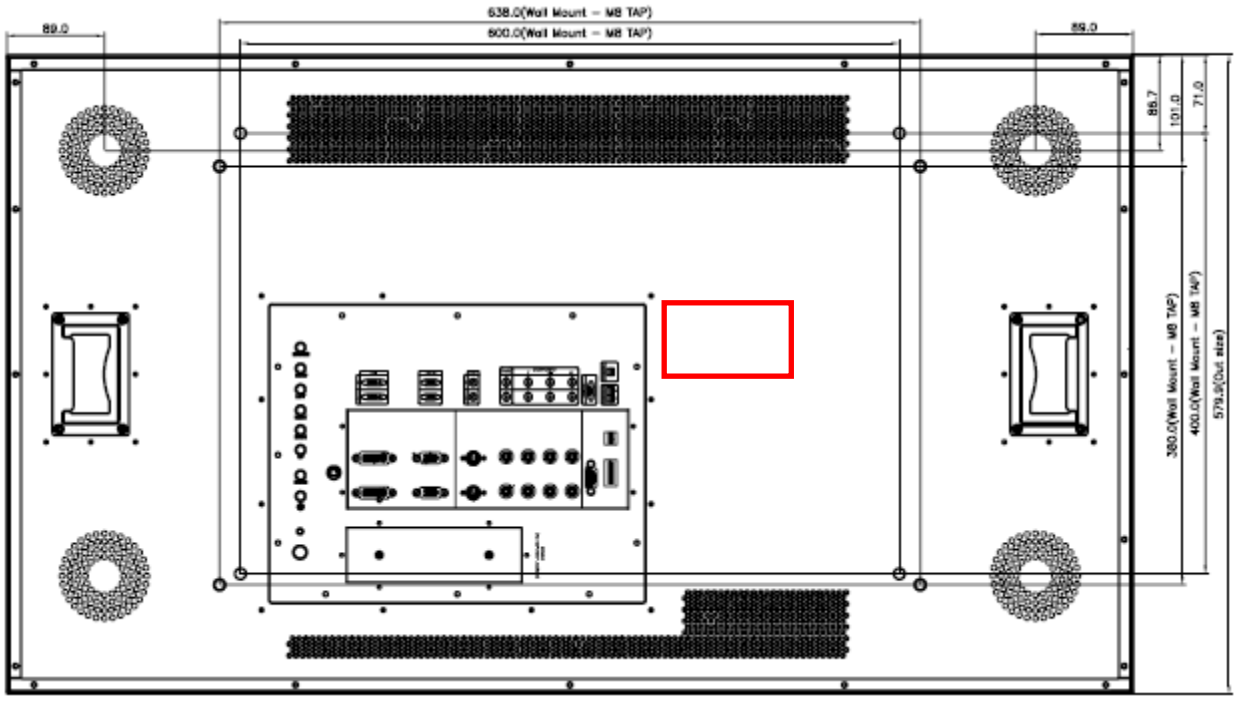


Fig 2 : Rating Label



kortek
Total Display Solution

CE

TFT LCD MONITOR

Model
Rating
Address

Manufacturer
Serial No.

TÜV NRTL C US

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions.
1) This device may not cause harmful interference, and
2) This device must accept any interference received, including interference that may cause undesired operation.

CAUTION
RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION : TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER(OR BACK).
NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

Made in Korea

Fig : 3 Carton box print