FCC COMPLIANCE STATEMENT:

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.

INFORMATION TO USER:

This equipment has been tested and found to comply with the limits of a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation; if this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. *Reorient / Relocate the receiving antenna.*
2. *Increase the separation between the equipment and receiver.*
3. *Connect the equipment into an outlet on a circuit difference from that to which the receiver is connected.*
4. *Consult the dealer or an experienced radio/TV technician for help.*

CAUTION: Changes or modifications not expressly approved by the manufacturer responsible for compliance could void the user's authority to operate the equipment

SPECIFICATION
MODEL NO : HL-1510G

REVISION HISTORY

REV.	PAGE	DESCRIPTION OF CHANGE	REV. BY	DATE	APPROVED BY
0	1~27	- INITIALLY ISSUED			

PAGE	1	2	3	4	5	6	7	8	9	10	11	12	13	14
REV NO	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PAGE	15	16	17	18	19	20	21	22	23	24	25	26	27	
REV NO	0	0	0	0	0	0	0	0	0	0	0	0	0	
PAGE														
REV NO														

WRITTEN BY	DATE WRITTEN	CHECKED BY	DATE CHECKED	APPROVED BY	DATE APPROVED
H.S RHO	2000.03.28				

Harsper Co., Ltd.

SPEC NO.	MODEL NAME	REVISION NO.	DATE	SHEET
	HL-1510G	0		1 of 27

1 FORWORD

This document defines design and performance requirements for Daehyun 15.1" On Screen Display Color TFT LCD monitor HL-1510G. It is capable of displaying maximum 1,024 horizontal dots and 768 vertical lines resolution image, and also can accept analog RGB VGA, SVGA and XGA signals, TV function, Video Composite signal, Y, Cb, Cr video signal.

It also offers Power Management and DDC 1/2B features according to VESA proposal.

2 GENERAL DESCRIPTION

The monitor described in the followings is based on a multi- scanning, digital control display, 15.1" diagonally measured active display area with XGA resolution (768 vertical by 1024 horizontal pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots that is arranged in vertical stripes.

Gray scale or the brightness of the sub-pixel color is determined with an 8-bit gray scale signal for each dot, thus, presenting a palette of more than 16M colors. The monitor is intended to be a finished product, basically a display device mounted inside a plastic enclosure that will provide the aesthetic, ergonomic and safety requirements.

The monitor is designed to support frame rate conversion of both graphics and digital video (Y,Cb,Cr) data, allowing a variety of input formats to be interfaced to a single format display device.

It provides a digital RGB or an optional LVDS output suitable for driving a variety of LCD display panels, and producing images of the highest quality at 1x or larger magnifications.

2.1 TFT LCD Descriptions

- Active Display Area : 15.1 inches(385(H) diagonal , 307.2w*230.4h mm
- Outside dimensions : 352.8w*264.6h*15.7(typ)mm (without Inverter)
- Pixel pitch : 0.30 mm X 0.30 mm
- Drive system : a- Si Tin Film Transistor as the active element
- Color depth : 8-bit (16 M colors)
- Number of pixels : 1024h * 768v pixels
- Display operating mode : transmissive mode, normally white
- Weight : 1,500g (typ.)
- Contrast ratio : 200:1 (Typ.)
- Luminance : 200cd/m² (Typ.)

SPEC NO.	MODEL NAME	REVISION NO.	DATE	SHEET
	HL-1510G	0		4 of 27

2.2 Power Requirements

2.2.1 General (Input Power)

This display device shall maintain the specified performances in the range described below :

Frequency 47~63Hz
Voltage 100 ~ 240 VAC

The following consumption requirements shall be met :

Power Consumption : 35W (max absolute value)
Current consumption : < 1.2 Aac RMS
Input Voltage : 100~240Vac, 47~63Hz
Input Current : Max 1.2A (Vin : 90Vac, 50Hz)
Inrush Current : 20 Apeak (At 100Vac Max.Load),
40 Apeak (At 240Vac Max. Load)
Output Voltage : 11.4~12.6Vdc (At 100Vac/240Vac Max.Load)
Output Current : 3.5Adc

2.2.2 Power Management

The monitor requires a signal based on VESA DPMS (Display Power Management Signaling) proposal, and runs in four stages ;

On : Normal Operation
Stand by : State of Minimal powar reduction with quick recovery time
Suspend : State of Substantial power reduction with longer recovery time
Off : Non Operation

This monitor shall comply with the following specifications.

State	Signals			Power Consumption	Recovery time	LED Description
	H- Sync	V- Sync	Video			
On	Pulses	Pulses	Active	Less than 35W	-	Green On
Stand by	no pulse	Pulses	Blanked	Less than 5W	Within 2 sec	Green On
Suspend	Pulses	No pulse	Blanked	5W	Within 2 sec	Green On
Off	no pulses	no pulses	Blanked	Less than 5W	Within 2 sec	Orange On

Table 3.03 - Power Management

2.3 R,G,B-Video Signal (VGA)

The input signal shall be applied to the display device through a signal cable, which must be intended as part of the monitor.
A signal connector shall be a shielded 15pin D- Sub connector and signal cable shall be Black or Ivory 1,800 ± 50 m/m long.

The interfacing method described above requires 7 input lines :

1 - Red (red video)
2 - Green (green video)
3 - Blue (blue video)
4 - H.Sync (horizontal synchronization)
5 - V.Sync (vertical synchronization)
6 - SDA (DDC)
7 - SCL (DDC)

The reference video controller (the device used for adjustment and test) will guarantee the performances described below (measured on the output connector).

2.3.1 Video
Input
Video signals on 75 ohm termination to the ground
Red, Green & Blue Video (refer to Fig.3.01)
Level : 0 to 0.700 Vpp
Polarity : Positive

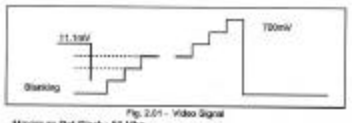

Fig. 2.01 - Video Signal

Maximum Dot Clock : 80 Mhz
Rise/Fall Time
Rise : Less than 28ns Fall : Less than 30ns
Rise and fall times are measured 10% to 90% using less than 5pF probe.
Display colors : 16,581,375 (8bit)

2.3.2 Synchronization signals

Polarity : Positive or Negative

This monitor shall not be damaged by improper sync timing and pulse duration, absence of sync, or abnormal input amplitude (video and/or sync too large too small).

Horizontal Deflection
H sync Frequency : 31.47 ~ 60.24 KHz

Vertical Deflection
Scanning Frequency : 56.42 ~ 75.02Hz

Support Video Timing
This monitor shall be capable of displaying following video timing chart.

* Timing Chart

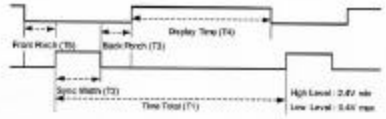

Fig. 2.02 - H-Sync

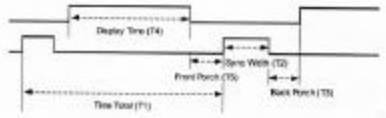

Fig. 2.03 - V-Sync

Support Modes

Mode	Resolution	H Frequency (KHz)	V freq (Hz)	H polarity	V polarity	Dot Clock (MHz)
VGA	640 x 350	31.469	70.087	+	-	25.175
	720 x 400	31.469	70.087	-	+	28.321
	640 x 480	31.469	59.940	-	-	25.175
	640 x 480	37.861	72.809	-	-	31.500
	640 x 480	37.500	75.000	-	-	31.500
SVGA	800 x 600	35.156	56.250	+	+	36.000
	800 x 600	37.879	60.317	+	+	40.000
	800 x 600	48.077	72.188	+	+	50.000
	800 x 600	46.875	75.000	+	+	49.500
XGA	1024 x 768	48.363	60.004	-	-	65.000
	1024 x 768	56.476	70.069	-	-	75.000
	1024 x 768	60.023	75.029	+	+	78.750
Macintosh	640 x 480	35.000	66.667	-	-	30.000
	1024 x 768	60.241	74.927	+	+	80.000

Preset Timing
The timing shown in the following table will be factory preset for display.

Horizontal	Pixel	640	640	640	640	640	720	800	800	800	800	1024	1024
Frequency	KHz	31.469	30.950	31.469	37.861	37.500	31.469	35.156	37.879	46.875	48.077	48.363	56.476
Period (T1)	us	31.778	32.471	31.778	26.413	26.667	31.778	28.444	26.400	21.333	20.800	20.677	17.707
Active (T4)	us	25.420	21.164	25.422	20.317	20.317	25.422	22.222	20.000	15.102	16.000	15.754	13.653
Sync Width (T2)	us	3.813	2.116	3.813	1.270	2.032	3.813	2.095	3.200	1.616	2.400	2.090	1.813
Back Porch (T3)	us	1.907	3.175	1.880	3.810	3.810	1.907	3.556	3.200	3.232	1.200	2.462	1.920
Front Porch (T5)	us	0.636	2.116	0.318	0.508	0.508	0.635	0.667	1.006	0.323	1.120	0.309	0.200

Vertical	Lines	350	400	400	480	480	480	600	600	600	600	768	768
Frequency	Hz	70.087	60.607	59.940	72.809	75.000	75.000	56.25	60.317	75.000	72.188	60.004	70.069
Period (T1)	ms	14.268	16.502	16.683	13.735	13.333	13.333	17.778	16.579	13.333	13.853	16.666	14.272
Active (T4)	ms	11.123	13.714	15.253	12.478	12.800	12.711	17.067	15.840	12.800	12.480	15.360	13.995
Sync Width (T2)	ms	0.064	0.086	0.064	0.072	0.080	0.064	0.057	0.106	0.064	0.125	0.125	0.106
Back Porch (T3)	ms	1.907	1.714	1.840	0.935	0.427	1.880	0.035	0.897	0.448	0.479	0.809	0.919
Front Porch (T5)	ms	1.178	0.986	0.318	0.826	0.027	0.415	0.028	0.026	0.321	0.770	0.092	0.093
Interlaced	Y/N	N	N	N	N	N	N	N	N	N	N	N	N
Sync Polarity	H	+	-	-	-	-	-	+	+	+	+	-	-
	V	+	-	-	-	-	+	+	+	+	+	-	-

	Pixel	1024	1024
Frequency	MHz	68.003	80.241
Period (T1)	us	19.668	39.800
Active (T4)	us	13.003	12.800
Sync Width (T2)	us	1.319	1.280
Back Porch (T3)	us	2.235	3.280
Front Porch (T5)	us	0.203	0.480

Vertical	Lines	768	768
Frequency	Hz	75.029	74.927
Period (T1)	ms	13.329	13.342
Active (T4)	ms	12.799	12.749
Sync Width (T2)	ms	0.050	0.066
Back Porch (T3)	ms	0.460	0.497
Front Porch (T5)	ms	0.017	0.050
Interlaced	Y/N	N	N
Sync Polarity	H	+	-
	V	+	-

Table 2.01 - Preset Timings
The monitor is compatible with additional modes within the one of following specified frequency ranges as tolerance.
Horizontal frequency : ± 1kHz (* Now we are improving this point)
Vertical frequency : ± 1Hz

Plug & Play : DDC 1/2B (EDID Version : 1.0) : VESA Standard

2.4 TV Function (OPTION)

2.4.1 Broadcasting system
PAL D/K, PAL I
NTSC 3.58Mhz

2.4.2 Receiving channel
VHF : E2-E12
UHF : E21-E69
CATV / HYPER : S1-S41

2.4.3 Tuning method
110 ch Program

2.4.4 Speaker output
Impedance : 8 ohm
Output : STEREO (3.0W + 3.0W)

2.4.5 OSD Control
With Remote-control

2.5 External Connection

2.5.1 Input
ANT : NTSC bl Receiving (Option : PAL) (OPTION)
AV1 : NTSC 3.58 Mhz Composite Signal and Audio L+R Input (OPTION)
AV2 : Y, Cb, Cr Video Signal and Audio L+R Input (OPTION)
VGA-IN : VGA Signal Input (MONITOR) (STANDARD)
SOUND-IN : Stereo Input (STANDARD)

2.5.2 Output

SOUND-OUT : Stereo Output for External Speaker (STANDARD)

3 USER INTERFACE

3.1 User Controls
This display device shall have following On- Screen Display controls.

3.1.1 Front Side

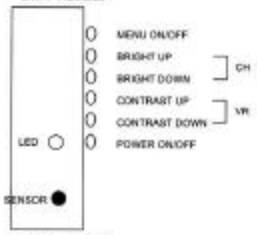

Fig. 3. 01 – Front Side

3.1.2 Remote-control
(Option 1)

PWR : POWER ON/OFF
M : MENU
RET CH : RETURN CHANNEL
MODE SEL : MODE(INPUT) SELECTION
VGA,TV(ANT), VIDEO(AV1), DVD(AV2)

Fig. 3. 02 – Remote- Control (option 1)
(Option 2)

POWER on/off
M : Menu
RET CH : RETURN CHANNEL
INPUT SEL : INPUT SELECTION
VGA,TV(ANT), VIDEO(AV1), DVD(AV2)

Fig. 3. 03 – Remote- Control (option 2)

3.1.3 Rear Side

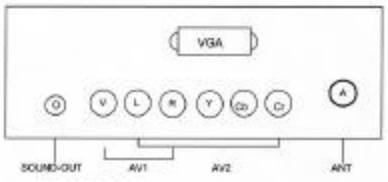

Fig. 3. 04 – Rear Side

3.2 OSD MENU

VGA

(MENU Page #1)
Horizontal Position
Vertical Position
Horizontal Size
Phase
Brightness
Contrast
Colour - Red
- Green
- Blue
Video Mode Resolution 1024 X 768
H. Frequency 60.2 Kh-z
V. Frequency 60 Hz
Factory Preset
OSD Language

Eng	Deu	Ita	Fra	Esp

(MENU Page #2)
Audio - Volume
- Balance
- Treble
- Base
- Mute
- Stereo

Input Selection
VGA, TV(ANT), VIDEO(AV1), DVD(AV2)
Automatic Adjustment

TV

MENU

- SETUP
  - INPUT SELECTION
    - VGA
    - TV
    - VIDEO
    - DVD
  - BACK LIGHT
    - DARK
    - NORMAL
    - BRIGHT
- PICTURE
  - BRIGHTNESS
  - CONTRAST
  - COLOUR
  - HUE
  - SHARPNESS
- SOUND
  - TREBLE
  - BASS
  - BALANCE
  - STEREO
    - PSEUDO
    - LINEAR
    - MONO

- CHANNEL
  - FINE TUNE
  - SCAN
  - ADD
  - ERASE
  - TV / CATV
    - TV
    - CATV

VIDEO

MENU

- SETUP
  - INPUT SELECTION
    - VGA
    - TV
    - VIDEO
    - DVD
  - BACK LIGHT
    - DARK
    - NORMAL
    - BRIGHT
- PICTURE
  - BRIGHTNESS
  - CONTRAST
  - COLOUR
  - HUE
  - SHARPNESS
- SOUND
  - TREBLE
  - BASS
  - BALANCE
  - STEREO
    - PSEUDO
    - LINEAR
    - MONO

4 VISUAL CHARACTERISTICS

4.1 Test Condition

The display shall be set as described below before any visual output test is performed. Particular instructions are specified anywhere additional setting or different patterns are required.

Resolution	1024x768 at H : 60 kHz V : 75 Hz
Input level	700mV
Pattern	Central white box covering 20% of the data area
Brightness Control	Default Position
Contrast Control	Adjust to 150cd/m^2 of Luminance (center of the white field)

Unless otherwise specified, the display shall meet the requirements of this section under any combination of the following operation ranges :

Image duty cycle	10% to 90%
Input power	As per section 2.2.1
Operating temperature	As per section 7.1
Humidity	As per section 7.1

4.2 Display Dimensions

The dimensions of the data area, measured along the horizontal and vertical axes of the screen, shall be as follows :

Width : 308.6mm
Height : 231.7mm
This check shall be performed using the pattern described in figure 4.01.

4.3 Display Centering

Figure 4.01 describes the pattern for this test (This test is made by XGA resolution). Basically it is composed by a single pixel white line around the perimeter of the data area, with marks for the horizontal and vertical axes. The background is black. The maximum variation of the display centering shall be such that the following relationship shall be met :

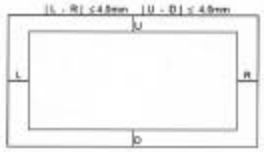

Fig. 4.01 - Display Centering

4.4 Jitter, Ripple, Swimming

Not perceivable jitter will be present on the display, when displaying a cross- talk pattern, at a distance of 500mm from the screen. In any case it is not admitted a measured jitter, ripple, swimming value greater than 0.1mm (both on X- axis and on Y- axis).

4.5 White Color Adjustment

The chromaticity coordinates of the white color shall be verified with standard full white screen (at 25° C) at 700mV input level with brightness control at cut off point and contrast control adjusted to 70cd/m^2 of luminance on the center of the screen. The 1931 CIE chromaticity diagram (x, y) coordinates for the screen center shall be :

X = 0.310 ± 0.020 = Xref
Y = 0.340 ± 0.020 = Yref

4.6 Brightness Uniformity

The variation in average display luminance, between any area (with dimension approximate 2cm of diameter) on standard flat white screen, must be less than 30% of the luminance of the brightest area. The screen has to be set to 70cd/m^2 in the center using the standard white pattern as described in section 4.7.

Brightness Color Tracking Error

The initial setting shall be as follows :

Pattern :	full white field
Input level :	700mV
Brightness control :	maximum
Contrast control :	adjust to 70cd/m^2 of screen luminance in the center of the LCD

The contrast control shall be moved from 70cd/m^2 (max) and 20cd/m^2 (min) of screen luminance or to the mechanical stop if the limits cannot be reached. The white color coordinates in the center of the LCD at all the allowed settings of the brightness control shall be :

X = Xref ± 0.020
Y = Yref ± 0.020

4.7 Stroke Width

The width of any stroke 1 pixel width displayed in resolution 1024 x 768 / 75Hz with Green color shall be less than 0.5mm (center) and 0.7mm (corner).
Width is measured with a surface (straight line) fit or a Gaussian fit method at 50% of peak luminance.

Luminance shall be set on white area in the center of a black screen, with input signals at 700 mV, brightness control adjusted to the background cut- off and contrast at maximum level.

4.6 Moire

While displaying a white raster, no Moire effect shall be visible at any luminance setting within 60 to 100cd/m^2 on the four resolutions. In the same conditions, when the displayed image is changed to a full screen of the critical patterns described in figure 4.02 and in figure 4.03, the clouding effect shall not rise to disturbing levels anywhere on the screen, at any luminance setting of the displayed patterns.

A reference monitor may be agreed for check purpose.

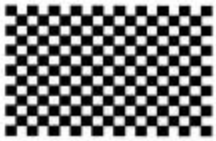

Fig. 4.02 - Chess Board Pattern

Fig. 4.03 - Line Pattern

5 DISPLAY PANEL CHARACTERISTICS

5.1 General Descriptions

This display unit shall employ a TFT LCD module complying with the following specifications.

Items	Description
Display Size	307.2(w) x 230.4(h) mm 15.1 inch diagonal
Drive System	a- Si TFT active matrix
Display Color	8 bit, 16,581,375 colors
Number of pixels	1024 x 768
Pixel arrangement	RGB vertical stripe
Pixel pitch	0.30(H) x 0.30(V) mm
Module Size	362.6(w) x 264.0(h) x 15.7 typ(t) mm
Weight	1,580 g (typ)
Contrast ratio	200 : 1 (typ)
Viewing angle	Horizontal (+/- 55, Vertical : +/- 40,
Response time	40 msec (typ)
Luminance	200 cd/㎡ (typ)
Signal system	Analog RGB signals, Synchronous signals(H,V sync) Dot Clock(CLK)
Supply voltage	5.0V
Back Light	CCFT
Power consumption	7.9 W (typ)

Table 5.01 LCD Module Specifications

5.2 Electrical Characteristics

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	Vcc	4.75	5.0	5.25	V	Note 1
Power Supply Current	Icc		1000	1500	mA	
Data Low Input Voltage	V_{IL}	-0.5		0.3XVcc	V	
Data High Input Current	V_{IH}	0.7XVcc		Vcc+0.5	V	
Back-Light Input Voltage	V_{BL}	628	580	535	Vrms	
Back-Light Input Current	I_{BL}	5.0	8.0	9.0	mA	Note 2
Back-Light Lamp Operating Frequency	F_L	30	50	80	KHz	
Lamp Kick-Off Voltage		1,240 1,360			Vrms	(25℃) (0℃)
Lamp Life		10,000			Hrs	Note 3

Table 5.02 Electrical Characteristics

Notes : 1. The input current shall be measured at Vcc of 3.3 V at 25°C, refresh rate of 60Hz, and clock frequency of 65Mhz under 9 gray pattern.

2. The back-light input current shall be measured at the ground cable and does not include loss of external inverter.

3. The life time is defined as the time at which brightness of lamp is 50 % compare to that of initial value at the typical lamp current..

5.3 Optical Specification

Parameter	Symbol	Min.	Typ.	Max.	Units	Remarks
Contrast Ratio	CR	150	200	-		
Average Brightness, white	B_{ave}	170	200	-	cd/㎡	
Brightness Variation	δB_V	-	-	30	%	
Response Time	Tr		40	60	msec	
Rise Time	T_{rR}	-	10	15		
Decay Time	T_{rD}	-	30	45		
CIE Color Coordinates						
Red	X_R	0.600	0.630	0.660		
	Y_R	0.310	0.340	0.370		
Green	X_G	0.270	0.300	0.330		
	Y_G	0.570	0.600	0.630		
Blue	X_B	0.110	0.140	0.170		
	Y_B	0.070	0.100	0.130		
White	X_W	0.290	0.320	0.350		
	Y_W	0.310	0.340	0.370		
Viewing Angle By CR = 10					Degree.	
x axis, right (θ =0°)	θ	55	60	-	-	
x axis, left (θ= 180°)	θ	55	60	-		
y axis, up (θ= 90°)	θ	40	45	-		
y axis, down (θ=270°)	θ	40	45	-		
Cross talk				4	%	
Gamma value		-	-	-		

Table 5.03 Optical Specification

6 MECHANICAL CHARACTERISTICS

6.1 Power Cord
Power shall be applied to A/D adapter through detachable power supply code conforming to Electrical Appliance and Material control Law of Japan.
This code shall be Black, VCTF 3C X 0.75 mm^2 and 1,800 ± 50 mm long.

6.2 Signal Cable
Signals shall be supplied to the display device through a shielded cable 1,800 ± 50mm long which must be intended as part of the monitor. This cable shall be of a suitable type in order to comply with any specification item, and shall be terminated in a 15 pin D- sub male connector type or equivalent, with pin assignment as follows ;

Pin No.	Assignment	Composite
1	Red	Red
2	Green	Green
3	Blue	Blue
4	GND	GND
5	DDC Return	DDC Return
6	GND- R	GND- R
7	GND- G	GND- G
8	GND- B	GND- B
9	NC	NC
10	Logic GND	Logic GND
11	GND	GND
12	SDA	SDA
13	H- sync (TTL)	H- sync (TTL)
14	V- sync (VCLK)	V- sync (VCLK)
15	SCL	SCL

Table 6.01 15 pin mini D- Sub Male Connector

6.3 Accessory Cable (OPTION)
F-Type Cable : 1,500 mm
RCA Audio Cable : 1,500 mm
Stereo Jack Cable : 1,500 mm

6.4 Internal Signal Cable
Up on the A/S Manual

6.5 Internal Connectors
All internal connectors for the interconnection of sub assemblies must be distinct in their physical characteristics or polarization so as to prevent any misconnection, which may cause permanent damage to the display.

6.6 Monitor Enclosure
The monitor, intended as a finished product, shall comply with any ergonomic and safety specification contained therein. In particular, the mechanical and physical characteristics of the plastic cabinet shall conform to any regulation of the Agencies which the monitor or the complete system shall be submitted to.
In particular, plastic materials must not include harmful substances. The supplier must explicitly declare absence of the following substances.

1 - Polybromidediphenylether
2 - Polybromidediphenyloxide
3 - Polychlorinatedbiphenyl

6.7 Flammability and safety
A) The enclosures shall meet the requirements of the safety UL 94V-O better
B) PCB's shall meet the requirement of the safety(UL/CSA)
C) Finished enclosures shall meet the requirement of the safety(UL/CSA)

6.8 Weight
A) Net Weight : 7.8Kg(with Swivel Ass'y)
B) Gross Weight : 9.0Kg

6.9 Dimension
A) Picture Size should be ;
Nominal Height : 368.5 mm
Nominal Width : 231.7 mm
B) Bare enclosure size should be ;
Width : 398 +/- 3 mm
Height : 365 +/- 3 mm
Length : 138 +/- 3 mm
C) Packaged size should be ;
Width : 443 +/- 3 mm
Height : 420.5 +/- 3 mm
Length : 210 +/- 3 mm

6.10 Tilt Ass'y
A) Tilt range : 5, (down), 30 , (up) from the cover front
B) Tilt Operation Force
C) Tilt : 1~3Kg

6.11 Label and Marking
A) Brand Logo : silk printing on center / bottom area of front bezel with ( ) color.
B) Label - Rating
Location : The right & left side of rear - cover
Tilt : Label shall not lift more than 0.5 ea
Label material : Polyester Film T 0.05 ea
Base Color : Silver
C) Caution statement : Molded in negative characters on rear cover.

6.12 Packaging

A) Cushion PE
Material : 94 HB (UL94 flame class)
Weight : 280 ~ 290 g
Irregularities : broken area

B) Packing - Case (This may vary according to Buyer)
Color : Base color ——— Black
Material : 5W - 3
Press strength ——— 259Kg/㎠
Bursting strength ——— 13.86Kg/㎠
Box Taping : The top and bottom of the carton will be taped with W50 clear masking tape.

6.13 Loading Quantity

A) Individual Loading (Standard) :
20ft Container : Sets
40ft Container : Sets

B) Palletized Loading (Option) : refer to Attachment 3.3.2
20ft Container : 384 Sets (16 cotton = 32sets / 1 Pallet, 12 pallet)
40ft Container : 832 Sets (16cotton = 32 sets / 1 Pallet, 26 Pallet)

6.14 Cabinet Mounting and Tolerance

A) Lens - LED
Gap : Less than 0.15㎜ around entire LED - Lens
Mismatch : The surface of lens - led don't protrude more than 0.1㎜ from that of Cover-front, and will remain in place after drop and vibration test

B) Knob - Power
Tilt : The gap of maximum value from minimum is under 0.2㎜ all all around.
Mismatch : The surface of Knob - Power don't protrude more than 1.0㎜ from that of Cover - Front, and doesn't sink less than 0.3㎜ in.
External Appearance : refer to the appearance document and sample.

C) Knob - Function
Tilt : The gap of maximum value from minimum is under 0.5㎜
Mismatch : The surface of this don't protrude more than 2㎜, and the gap with Function-Button is not 0.5㎜
External Appearance : refer to the appearance document and sample.

D) Gap between LCD and Cover - Front (Max.)
Less than 1.6mm around entire Cover- Front.

E) Cover - Front and Cover - Rear
Mismatch (+) : The surface of Cover - Rear extends out more than that of Cover - Front)
The each surface of them must be no greater than 0.8mm.

7 ENVIRONMENTAL CHARACTERISTICS

The following sections will define the interference and susceptibility condition limits that can occur between external environment and the display device.

7.1 Temperature, Humidity and Altitude

A.) Operating Conditions
Temperature 5 ~ 35°C
Humidity 30 ~ 85% (without condensation)
Altitude 0 ~ 3,000m

B.) Transport Conditions (1 month packed)
Temperature - 5 ~ 60°C
Humidity 5 ~ 90% (without condensation)
Altitude 0 ~ 12,000m

C.) Storage Conditions
Temperature - 5 ~ 60°C
Humidity 5 ~ 90% (without condensation)
Altitude 0 ~ 15,000m

7.2 Reliability Specification

A) Drop Test
Height : 40 Cm
Method : 4 times drops in the other of 2 corner, 3 side edges and 6 faces
Check the of test based on the "Specification of reliability test."

B) Vibration test
Vibration frequency ..... : 10 ~ 55Hz, 6.65 min/Cycle
Acceleration ..... : 1.4 G'S
Test time ..... : 60 minutes
Direction ..... : 20 minutes each X / Y / Z directions

7.3 Electromagnetic Disturbances

The display must conform to the following requirements.

A. Electrostatic discharges

The display must operate correctly when the accessible parts are subjected to electrostatic discharges of 15Kvolt minimum. The source of the discharge is a capacitor of 150pF with a series resistor of 330 ohm. No damage will occur with a discharge of 4Kvolt minimum.

B. Radiated disturbances

The display must operate correctly in the presence of sinusoidal electromagnetic field of frequencies from 30 to 500MHz with effective field strength 3 volt/m at a distance of 1m from the source of radiation.

C. Conducted disturbances

The display must operate correctly in the presence of disturbances conducted through the power supply network. Those disturbances will consists of :

1) Positive and negative pulses with a peak amplitude less than 1500 volt and a repetition rate of 5KHz. These pulses will have a rise time of 5ns and a pulse width at 50% of 100ns and may be

phased from 0 to 360° with respect to the network sinusoid.

2) Positive and negative pulses with peak amplitude less than 1400 volt and a repetition rate of 6Hz. These pulses will have a rise time of 300ns and a pulse width at 50% of 50μs and may be phased from 0 to 360° with respect to the network sinusoid.

3) Oscillatory exponentially decaying pulse with amplitude 1400 volt having a period of 1μs± 30% duration of 3 to 5 period and 50% of initial peak amplitude after duration time. These pulses will be applied at a repetition rate of 400Hz.

7.4 Power Source Disturbances
The display device must function correctly in the presence of random reductions of the power within the following limits :
A) Reduction of 100% duration : 20ms
B) Reduction of 20% duration : 500ms

7.5 Magnetic Disturbances
The display must function correctly in the presence of another monitor of equal leakage magnetic field, placed at a distance of 30cm, even with difference working timings.

7.6 Acoustic Noise
With the display operating, the issue of sound measured according to the DIN 45635 standard must be contained within 32dBA in the audible field.

7.7 Ionogenic Radiation
With the display operating in failure mode and without enclosure, the issue must be contained within 0.1mSv/h at 0.1m distance, under maximum operating conditions.

7.8 Inrush Current
The power supply input circuitry will employ a suitable device in order to limit the inrush current to less than 50 Amps for no more than 1 sec at AC 220V, with an input line impedance of not more than 0.4 + j 0.25 ohm at the time of cold switch- on.

7.9 Electric and/or Magnetic Fields in Nearby Environment
With the display operating the electric and/or magnetic fields existing in the immediately surrounding environment must be of such intensity so as not to disturb the correct operation of any of the system element in contact with the casing (i.e. mini floppy disk, keyboard, mouse, etc.).

8 RELIABILITY

The equipment design shall employ existing and available state of art techniques and shall utilize circuits, mechanisms, parts, etc., having histories of reliable operation in similar applications. Design shall be such that no failure of the supplied equipment shall cause damage to interfacing equipment and no permanent damage shall occur due to mis-adjustment of operator controls while the display device is operated within the ranges specified in sections 3.0 and 4.0 above.

8.1 Phosphor Protection
This display device shall employ sufficient protection against the burning of phosphors in case of repetitive power cycling and absent or incorrect synchronization signals.

8.2 LCD Flashover
This display device must be capable to withstand all spontaneous LCD flashover without damage to the display device. Moreover it must not conduct or radiate the energy of such a flashover into any connected equipment or power system.

8.3 Hypothesis of Use
The following is the hypothesis of use :
Active hours / daily : 8
Working days / year : 250
Active years : 5

8.4 Mean Time Between Failure
MTBF = 10,000 hours (excluding LCD's life)
The MTBF target value will be verified by means of a life test.

8.5 Useful Life
The equipment shall be designed for a useful life of 3 years with normal preventive maintenance, calibration, and repair to maintain specified performance.
LCD Life = 10,000 hours (with LCD brightness defined at 40% of the initial value)

9 ERGONOMICS

This display device must meet all performance requirements without regard to the orientation in either X, Y, or Z - axis after internal automatic degaussing.

9.1 Operator Controls

The operator will have access to two external luminance controls, which will allow adjustment of the brightness and the contrast of the image. Other external controls are present in the monitor for guarantee the best output request.

9.2 Anti Reflection

In order to reduce reflections, the LCD faceplate must be treated with a chemical etching process. The resulting etched surface must not produce any distortion or artifact in the display when viewed from a 25cm distance with an unaided eye. The non- glare surface of the LCD must have a range of 53~75 Gloss units as measured with a Gardner Glassmeter.