LCD Module Technical Specification

First Edition
Jun 12, 2007

Final Revision
******

Type No. **T-55265GD057J-LW-AAN**

OPTREX CORPORATION

Approved : Toshiyuki Okamoto
MOBILE,CONSUMER&INDUSTRY DESIGN DIV.

Checked : Satoshi Sano
MOBILE,CONSUMER&INDUSTRY DESIGN DIV.

Prepared : Takashi Yuchi
MOBILE,CONSUMER&INDUSTRY DESIGN DIV.

PRELIMINARY

APPROVED

By

Signature :
Date :

Please return this specification within two month with your signature.
If not returned within two month ,specification will be considered
as having been accepted.

Table of Contents

PRELIMINARY

Revision History

Rev.	Date	Page	Comment

1.General Specifications

Operating Temp.	:	min. -20°C ~max. 70°C
Storage Temp.	:	min. -30°C ~max. 80°C
Dot Pixels	:	320×3 [R.G.B] (W) × 240 (H) dots
Dot Size	:	0.12×3 [R.G.B] (W) ×0.36 (H) mm
Pixel Arrangement	:	RGB-Stripe
Color Depth	:	262,144 colors
Viewing Area	:	117.88 (W) × 88.24 (H) mm
Outline Dimensions	:	144.0 (W) × 104.6* (H) × 13.0max. (D) mm * Without LED Cable and FPC
Weight	:	180.0g max.
LCD Type	:	ATS-25316 (TFT / Normally white-mode / Transmissive)
Viewing Angle	:	6:00
Interface	:	18-bit RGB interface(6-bit / color)
Backlight	:	LED Backlight / White
Drawings	:	Dimensional Outline T-55265AA base
RoHS regulation	:	To our best knowledge, this product satisfies material requirement of RoHS regulation. Our company is doing the best efforts to obtain the equivalent certificate from our suppliers.

PRELIMINARY

2.Electrical Specifications

2.1.Absolute Maximum Ratings

VSS=0V

Parameter	Symbol	Conditions	Min.	Max.	Units
Supply Voltage for LCD (Digital)	VCC	-	-0.3	+7.0	V

2.2.DC Characteristics

Ta=25°C, VSS=0V

Parameter	Symbol	Min.	Typ.	Max.	Units
Supply Voltage for LCD (Digital)	VCC	3.0	3.3	3.6	V
High Level Input Voltage	V_{IH}	0.7× VCC	-	VCC	V
Low Level Input Voltage	V_{IL}	0	-	0.3× VCC	V
Power Supply Current for LCD(Digital)	I_{CC}	-	100	150	mA

A) Typical current condition
Allblack pattern with frame 240 line mode.
VCC=+3.3V, f_H=15.7kHz, f_V=60Hz, f_{CLK}=6.4MHz

PRELIMINARY

2.3.AC Characteristics

2.3.1.Digital Parallel RGB Interface

Parameter		Symbol	Min.	Typ.	Max.	Units
CLK Period		t_{OSC}	141	156	171	ns
Data Setup Time		t_{SU}	12	-	-	ns
Data Hold Time		t_{HD}	12	-	-	ns
IHS Period		t_H	-	408	-	t_{OSC}
IHS Pulse Width		t_{HS}	5	30	-	t_{OSC}
IHS Rising Time		t_{Cr}	-	-	700	ns
IVS Falling Time		t_{Cf}	-	-	300	ns
IVS Pulse Width		t_{VS}	1	3	5	t_H
IVS Rising Time		t_{Vr}	-	-	700	ns
IVS Falling Time		t_{Vf}	-	-	1.5	μs
IVS Falling to IHS Rising Time for for odd field		t_{HVO}	1	-	-	t_{OSC}
IVS Falling to IHS Rising Time for for even field		t_{HVE}	1	-	-	t_{OSC}
IVS-DEN Time	NTSC	t_{VSE}	-	18	-	t_H
	PAL	t_{VSE}	-	26	-	t_H
HIS-DEN Time		t_{HE}	36	68	88	t_{OSC}
DEN Pulse Width		t_{EP}	-	320	-	t_{OSC}
DEN-STH Time		t_{DES}	-	1	-	t_{OSC}
IVS Period	NTSC		-	262.5	-	t_H
	PAL		-	312.5	-	t_H

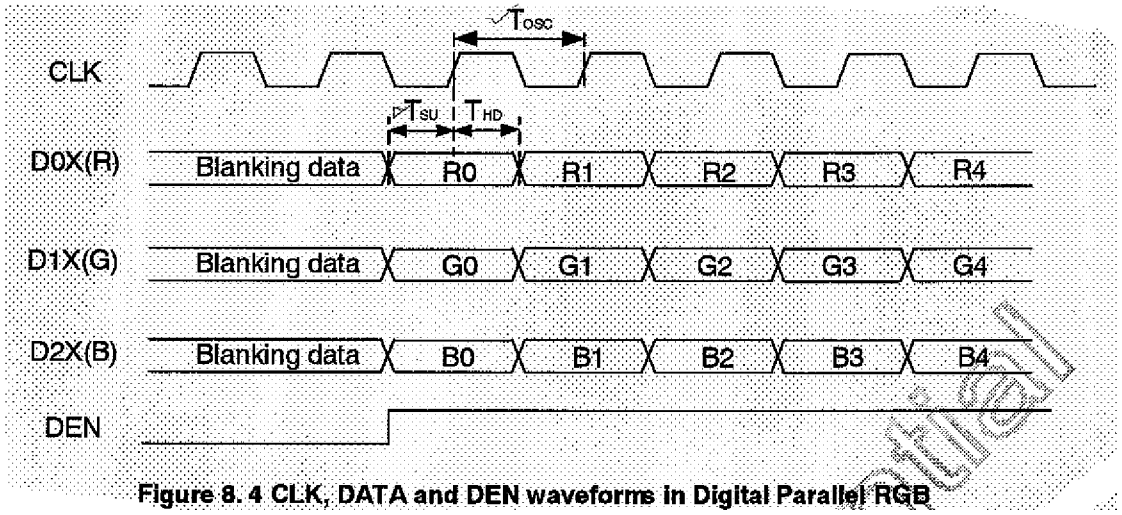


Figure 8. 4 CLK, DATA and DEN waveforms in Digital Parallel RGB

PRELIMINARY

HIS and IVS Timing

● Odd field

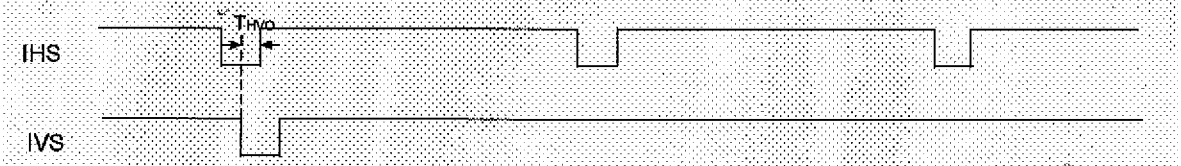


Figure 8. 6 IHS and IVS waveforms in odd field

● Even field

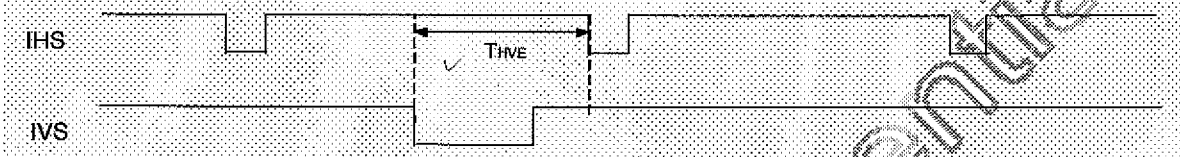


Figure 8. 7 IHS and IVS waveforms in even field

● Timing waveform

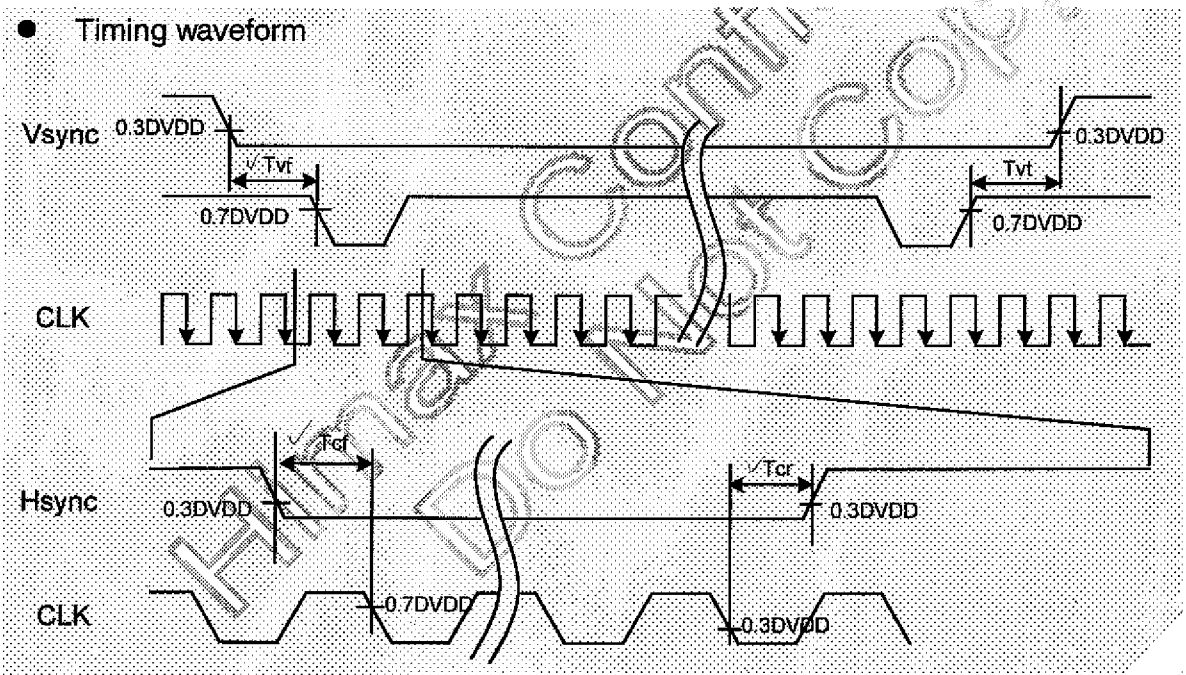


Figure 8. 8 IHS and IVS timing waveform

Preliminary Content Not Final

HIS and horizontal control timing waveforms

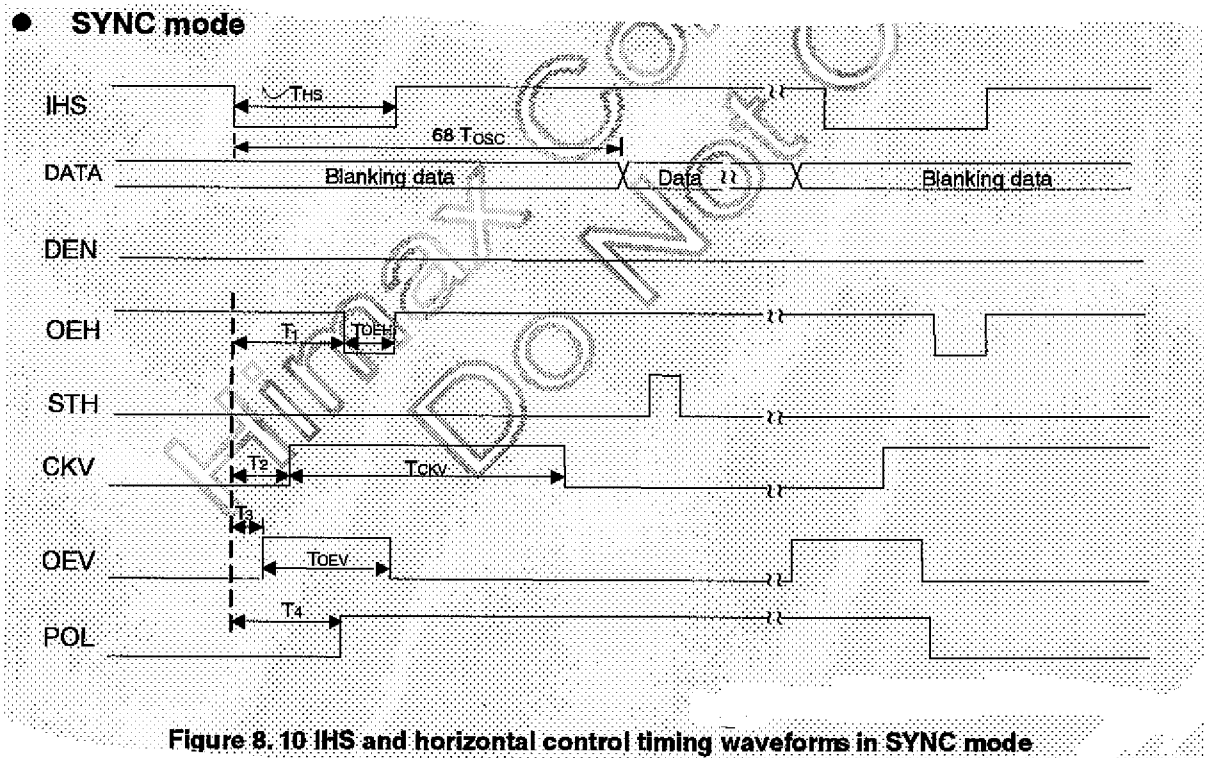


Figure 8. 10 IHS and horizontal control timing waveforms in SYNC mode

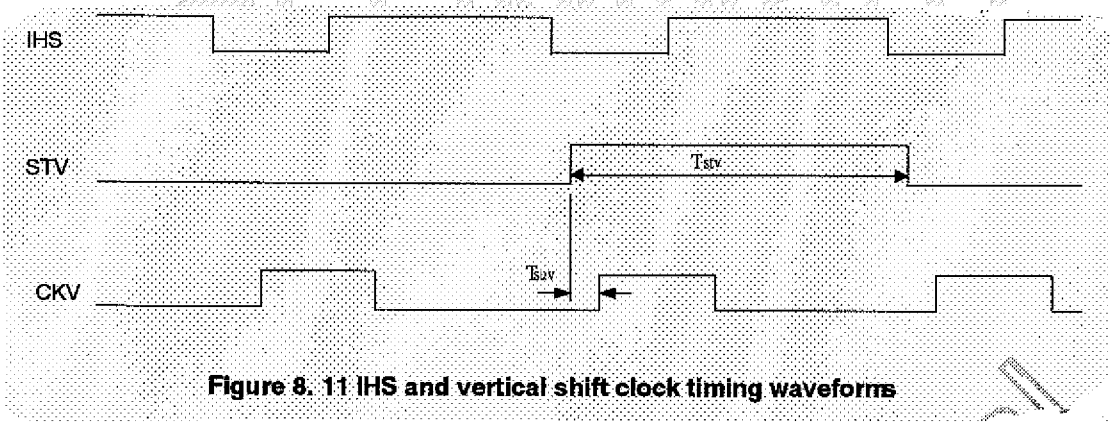


Figure 8. 11 IHS and vertical shift clock timing waveforms

HIS and vertical control timing waveform

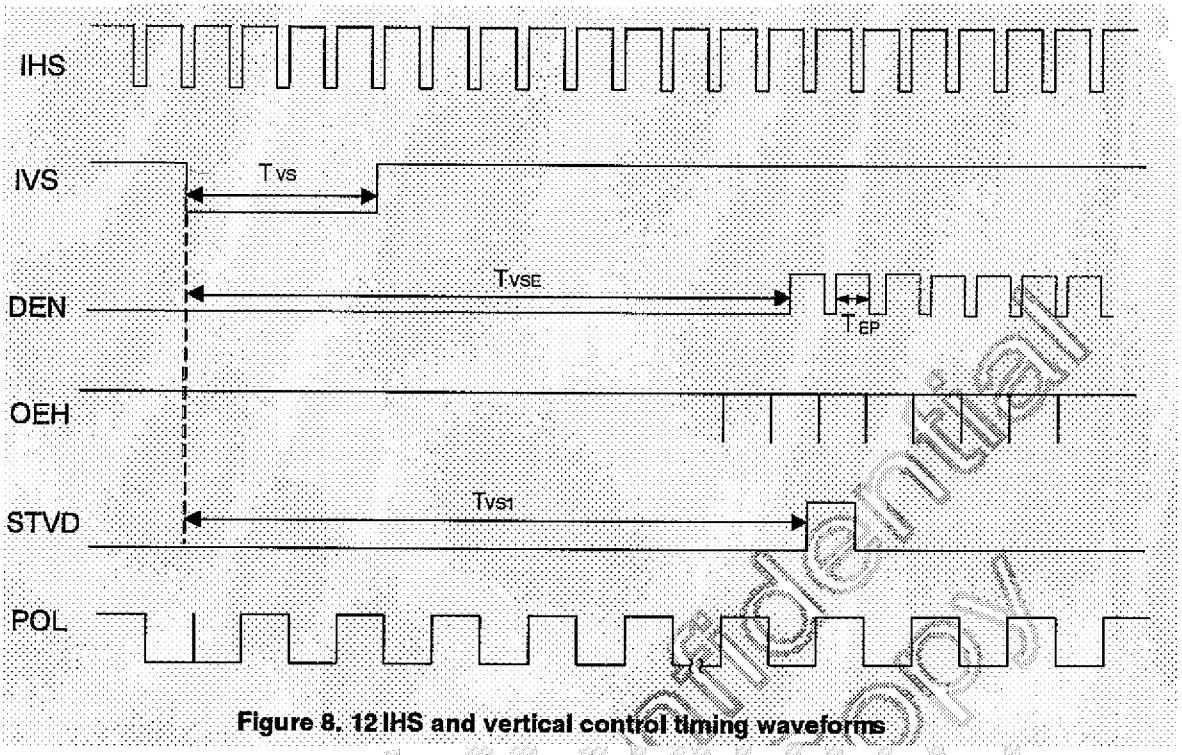
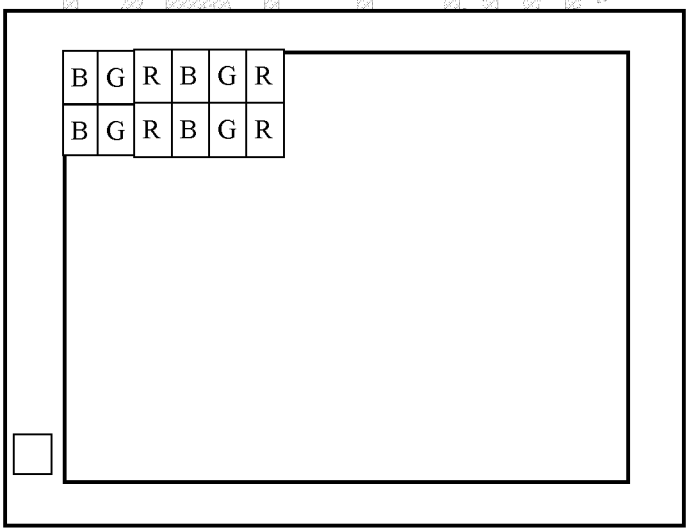


Figure 8. 12 IHS and vertical control timing waveforms

2.5. Pixel Alignment



PRELIMINARY

2.4.Lighting Specifications

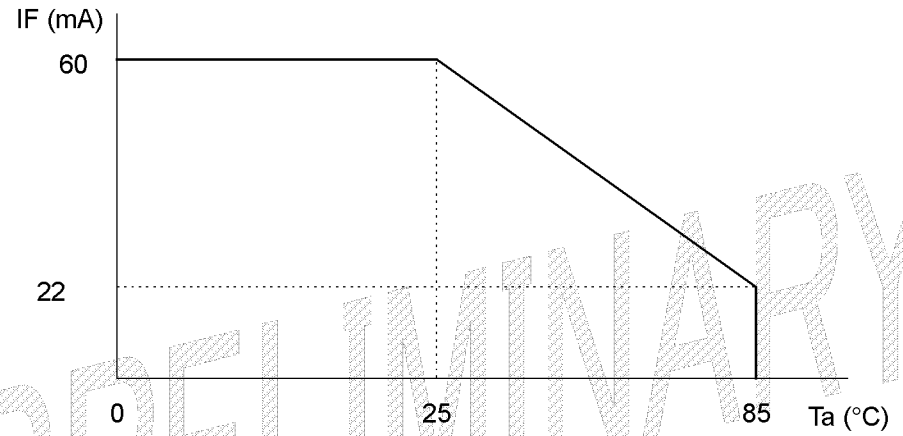
2.4.1.Absolute Maximum Ratings

Ta=25°C

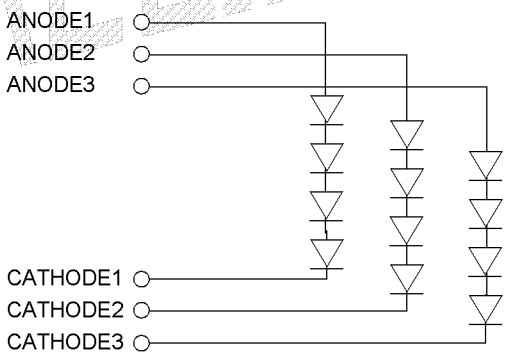
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Foward Current	I_F	Note 2	-	-	100	mA
Reverse Voltage	V_R	-	-	-	20	V
LED Power Dissipation	P_D	-	-	-	1.6	W

Note 1 : Tiis value is for each 1 line.

Note 2 : Refer to the foward current derating curve.



PRELIMINARY



2.4.2.Operating Characteristics

Ta=25°C

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Foward Voltage	V_F	I_F=60mA / 1 line	-	(13.2)	-	V

2.7. Color Data Assignment

COLOR	INPUT DATA	R DATA						G DATA						B DATA					
		MSB					LSB	MSB					LSB	MSB					LSB
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED (2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	GREEN (2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	GREEN (62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

[Note]

1) Definition of gray scale

Color (n) --- n indicates gray scale level.

Higher n means brighter level.

2) Data 1:High, 0: Low

Relation of IC and LCD Modul Data Bus

LCD Module	RGB5	RGB4	RGB3	RGB2	RGB1	RGB0	*	*
IC	RGB7	RGB6	RGB5	RGB4	RGB3	RGB2	RGB1	RGB0

*Connected to “L” in the LCD Module

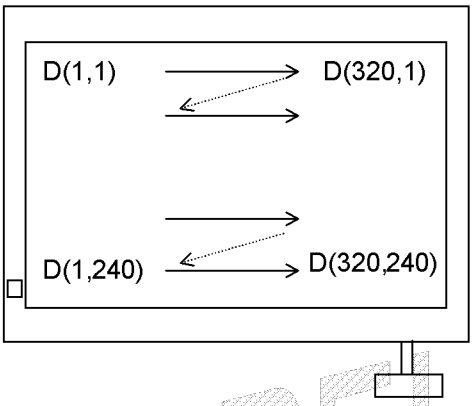
2.8. Inverted Scan Capability

This module has the capability of inverting scan direction by signaling from controller.
Note that scan direction cannot be changed during operation.
The following figure shows the relation between the display position and the scan direction.

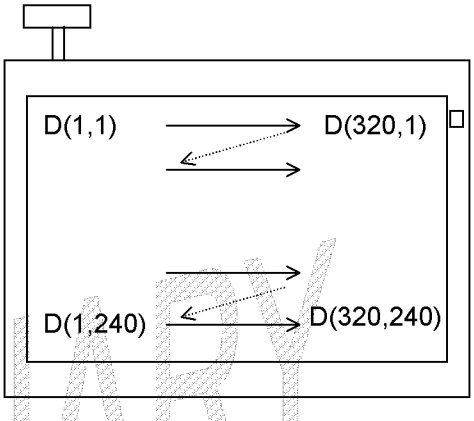
DISPLAY POSITION

The following drawing shows the relationship between the viewing direction and the scan direction.

Normal scan(U/D:H R/L:L)



Reverse scan(U/D:L R/L:H)



PRELIMINARY

3.Optical Specifications

Item		Symbol	Conditions			Standard Value			Unit	Method of Measure	Remark
			θ	ϕ	C	Min.	Typ.	Max.			
Brightness		B	0°	0°		350	500	-	cd/m^2	(Fig.5-1)	Note5-1
Contrast		CR	Best Viewing			210	350	-	-		
Color Coordinates	Red	Rx	0°	0°		-	(0.630)	-	-		
		Ry	0°	0°		-	(0.350)	-	-		
	Green	Gx	0°	0°		-	(0.310)	-	-		
		Gy	0°	0°		-	(0.590)	-	-		
	Blue	Bx	0°	0°		-	(0.140)	-	-		
		By	0°	0°		-	(0.120)	-	-		
	White	Wx	0°	0°		(Note5-2)			-		
		Wy	0°	0°					-		
Brightness Uniformity		-	0°	0°		70	75	-	-	(Fig.5-2)	
Vertical Viewing Angle	Up	θ_U	-	0°	≥5	-	70	-	Degree	(Fig.5-3)	
	Down	θ_D	-	0°	≥5	-	70	-	Degree		
Horizontal Viewing Angle	Left	ϕ_L	0°	-	≥5	-	70	-	Degree		
	Right	ϕ_R	0°	-	≥5	-	70	-	Degree		
Response Time	Rise	τr	0°	0°		-	21	-	ms	(Fig.5-4)	
	Decay	τd	0°	0°		-	10	-	ms		

Note5-1:Under the condition of maximum brightness.

◆ Conditions for Measuring

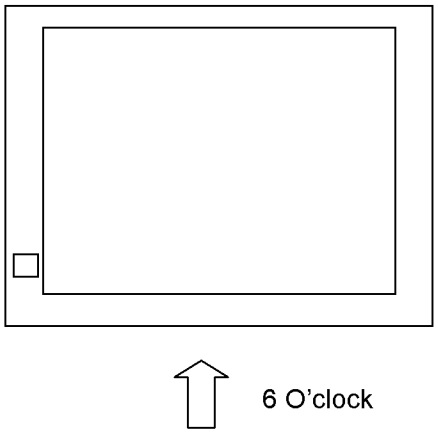
◇ Environment: Dark room with no light or close to no light.

◇ Temperature: 25±5°C

◇ Humidity: 40~70%RH

◇ Driving voltage is set for optimal contrast to measure center of display.

◆ Optimal viewing angle (The angle with best contrast)

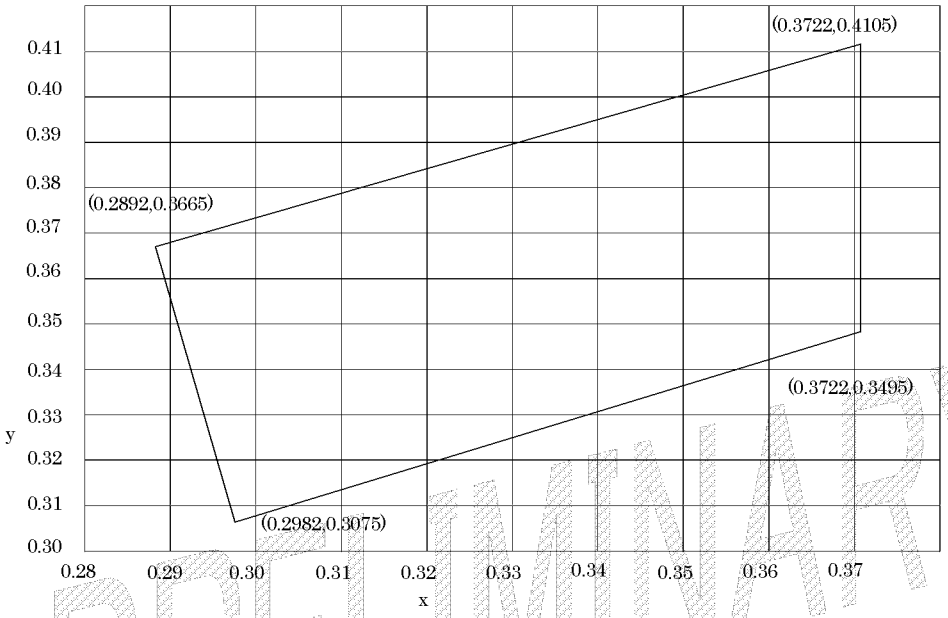


PRELIMINARY

Note5-2

X	(0.2892)	(0.2982)	(0.3722)	(0.3722)
Y	(0.3665)	(0.3075)	(0.4105)	(0.3495)

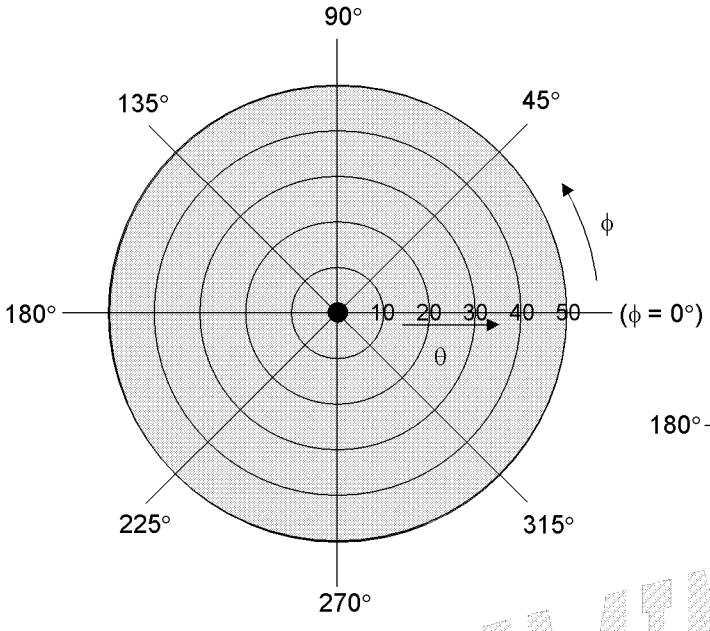
Color tone range

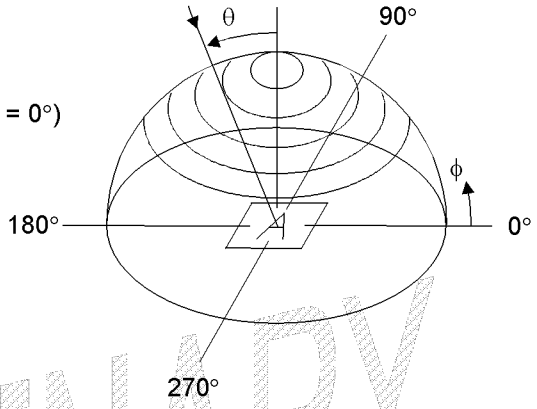


PRELIMINARY

3.1. Definition of Viewing Angle and Optimum Viewing Area

*Point • shows the point where contrast ratio is measured. : θ= 0°, ϕ= -°
*Driving condition: f_F=60Hz





*Area ▭ shows typ. CR≥5

PRELIMINARY

(Fig.5-1)

◆ Method of Brightness Measurement

（1） Measuring Device

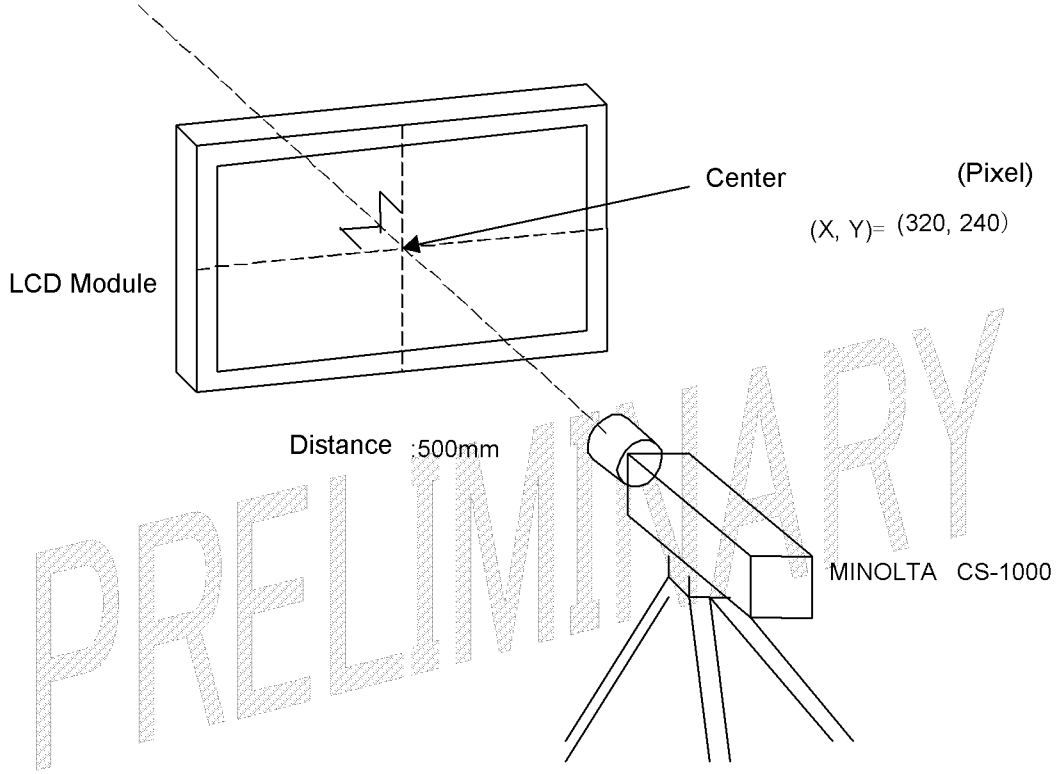
MINOLTA CS-1000

（2） Measuring Point

Center of Display θ=0°, ϕ=0°

On condition θ: A vertical angle from measuring direction to perpendicular.

ϕ: A horizontal angle from measuring direction to perpendicular.



PRELIMINARY

（3） Method of Measuring

Apply signal voltage (displayed in white) to maximize brightness and measure brightness B (cd/m^2).

The distance between CS-1000's front lens to surface panel is 500mm.

Measured after backlight has been lit for more than 30 minutes.

◆ Method of Contrast Measurement

（1） Measuring Device

MINOLTA CS-1000,Measuring Field:1°

（2） Measuring Point

Center of display: same as Method of Brightness Measurement

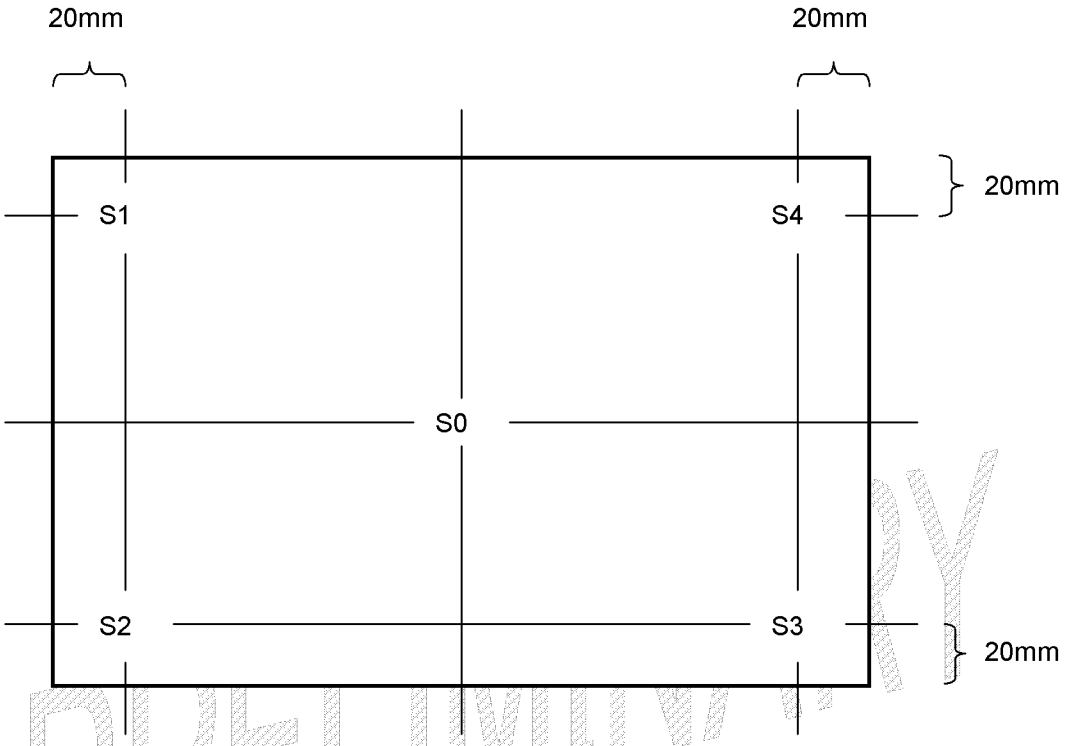
（3） Method of Measuring

- Set LCD module toθ=0°, ϕ=0°.
- Change signal voltage to measure maximum brightness Y1 and minimum brightness Y2.
- Contrast is derived from CR=Y1/Y2.

(Fig.5-2)

◆ Definition of Brightness Uniformity

Definition is calculated from the four points (S0-S4) on the diagram below.



PRELIMINARY

$$\text{Standard Value of Brightness Uniformity} = \frac{\text{Minimum Value of S1-S4}}{\text{S0}}$$

(Fig.5-3)

◆ Method of Viewing Angle Measurement

（1） Measuring Device

TOPCON BM-7,Measuring Field:1°

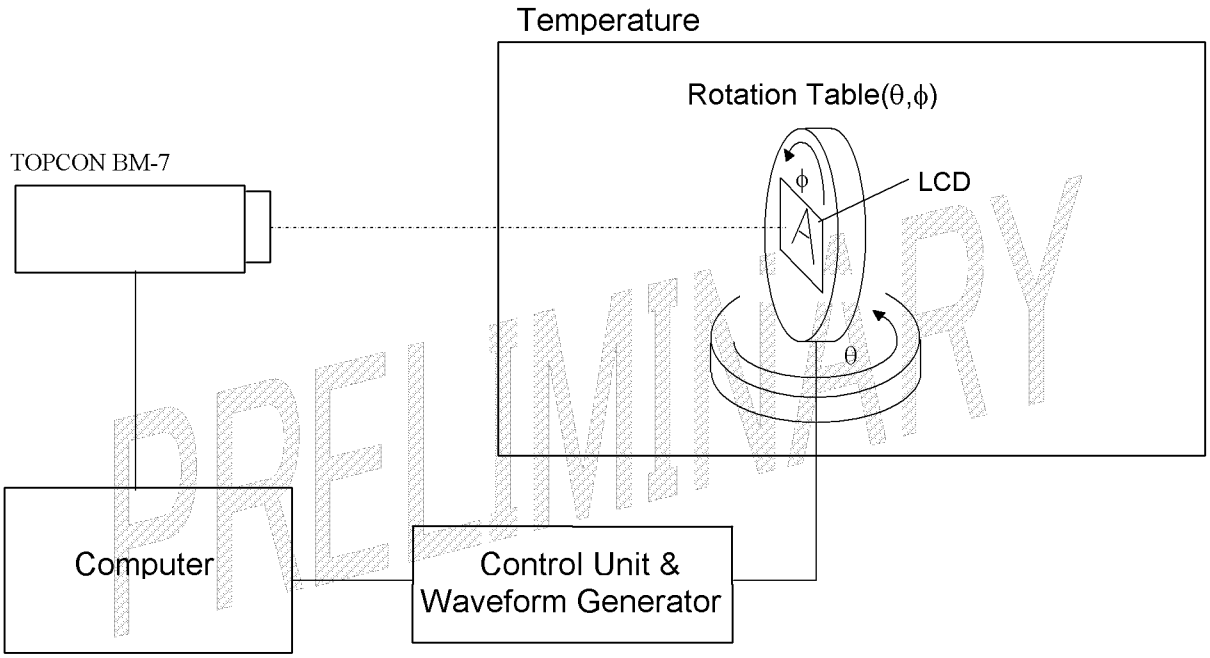
（2） Measuring Point

Center of display : Same as Method of Brightness Measurement

（3） Angle of Measuring

θ: An angle vertical to perpendicular line from the viewing direction.

ϕ: An angle horizontal to perpendicular from the viewing direction.



PRELIMINARY

（4） Method of Measuring

Set rotation table to ϕ=0° and set BM-7 to contrast 10 to measure angle±θ for left and right direction of horizontal viewing angleϕ. Also set rotation table to ϕ=90° and set BM-7 to contrast 10 to measure angle±θ for up and down direction of vertical viewing angle θ.

(Fig.5-4)

◆ Measuring Response Time

（1） Measuring Device

TOPCON BM-7,Measuring Field:1°

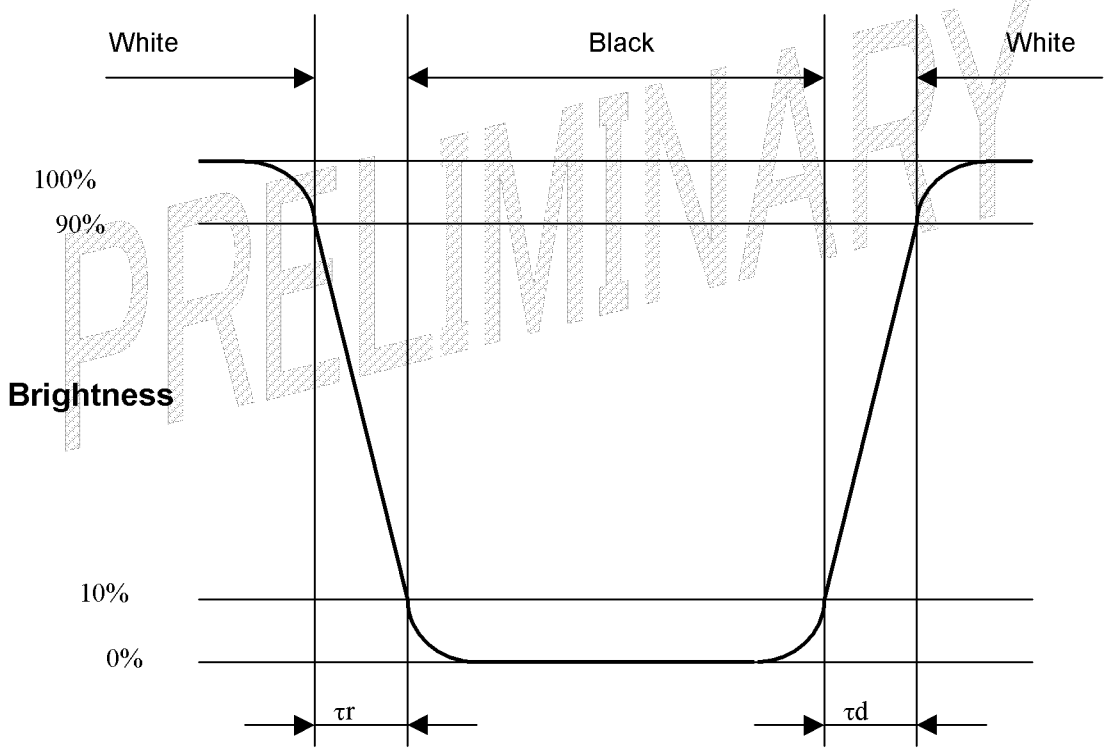
Tektronix Digital Oscilloscope

（2） Measuring Point

Center of display, same as Method of Brightness Measurement

（3） Method of Measuring

- Set LCD panel toθ=0°,and ϕ=0°.
- Input white→black→white to display by switching signal voltage.
- If the luminance is 0% and 100% immediately before the change of signal voltage, then τr is optical response time during the change from 90% to 10% immediately after rise of signal voltage, and τd is optical response time during the change from 10% to 90% immediately after decay of signal voltage.



PRELIMINARY

4.I/O Terminal

4.1.Pin Assignment

CN1 (INTERFACE SIGNAL) Used connector 08-6210-033(ELCO)
Corresponding FPC : P0.5, 33pin, t=0.3mm

No.	Symbol	Function
1	GND	Power Supply (0V, GND)
2	CK	Clock Signal
3	HSYC	Horizontal Sync Ibput
4	VSYC	Vertical Sync Input
5	GND	Power Supply (0V, GND)
6	R0	Red Data Signal
7	R1	Red Data Signal
8	R2	Red Data Signal
9	R3	Red Data Signal
10	R4	Red Data Signal
11	R5	Red Data Signal
12	GND	Power Supply (0V, GND)
13	G0	Greeen Data Signal
14	G1	Greeen Data Signal
15	G2	Greeen Data Signal
16	G3	Greeen Data Signal
17	G4	Greeen Data Signal
18	G5	Greeen Data Signal
19	GND	Power Supply (0V, GND)
20	B0	Blue Data Signal
21	B1	Blue Data Signal
22	B2	Blue Data Signal
23	B3	Blue Data Signal
24	B4	Blue Data Signal
25	B5	Blue Data Signal
26	GND	Power Supply (0V, GND)
27	ENAB	Input Data Enable Control
28	Vcc(3.3V)	Power Supply for Logic
29	Vcc(3.3V)	Power Supply for Logic
30	R/L	
31	U/D	
32	NC	Non Connection
33	GND	Power Supply (0V, GND)

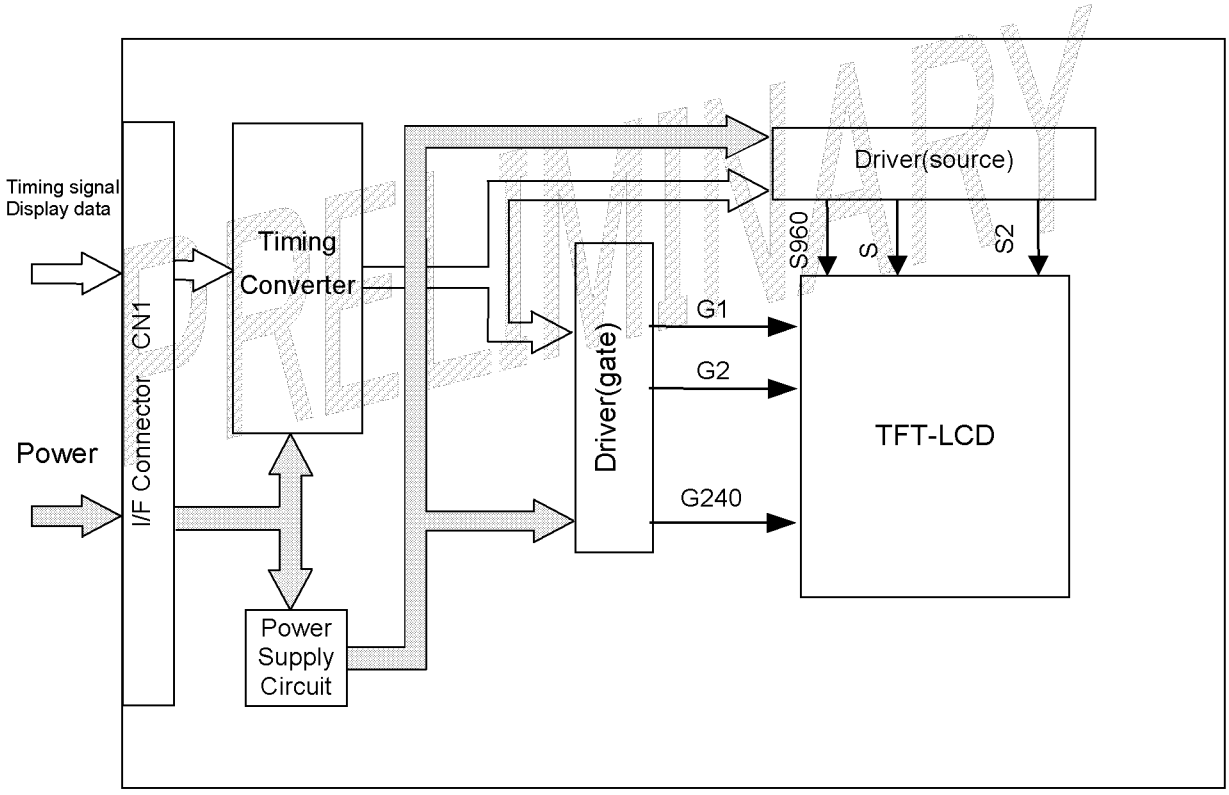
PRELIMINARY

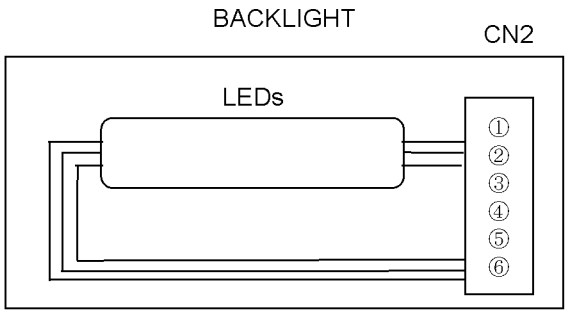
CN2(Backlight)Bac light-side connector : SHLP-06V-S-B(JST)
Incerter-side connector : SM06-SHLS-TF(JST)

No.	Symbol	Function
1	Anode 1	LED Anode Terminal
2	Anode 2	LED Anode Terminal
3	Anode 3	LED Anode Terminal
4	Cathode 1	LED Cathode Terminal
5	Cathode 2	LED Cathode Terminal
6	Cathode 3	LED Cathode Terminal

[Note]VBLH-VBLL=VL

4.2.Block Diagram



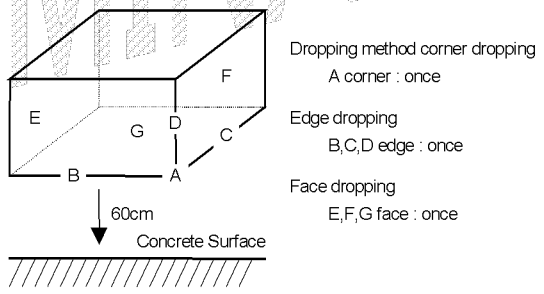


PRELIMINARY

5. Test

No change on display and in operation under the following test condition.

Conditions: Unless otherwise specified, tests will be conducted under the following condition.
Temperature: 20±5°C
Humidity : 65±5%RH
tests will be not conducted under functioning state.

No.	Parameter	Conditions	Notes
1	High Temperature Operating	70°C±2°C, 96hrs (operation state)	
2	Low Temperature Operating	-20°C±2°C, 96hrs (operation state)	1
3	High Temperature Storage	80°C±2°C, 96hrs	2
4	Low Temperature Storage	-30°C±2°C, 96hrs	1,2
5	Damp Proof Test	40°C±2°C,90~95%RH, 96hrs	1,2
6	Vibration Test	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X, Y, Z each 15 minutes	3
7	Shock Test	To be measured after dropping from 60cm high the concrete surface in packing state. 	

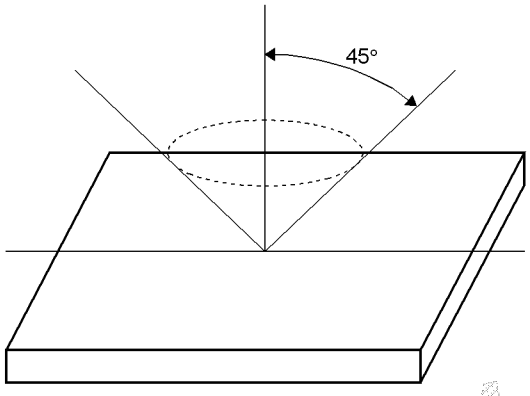
PRELIMINARY

Note 1 :No dew condensation to be observed.
Note 2 :The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after removed from the test chamber.
Note 3 :Vibration test will be conducted to the product itself without putting it in a container.

6.Appearance Standards

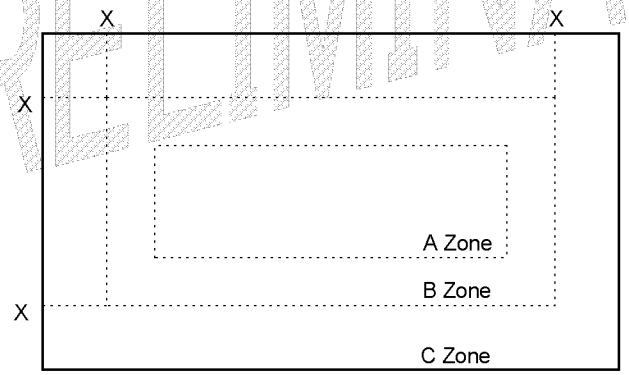
6.1.Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.
The distance between the eyes and the sample shall be more than 30cm.
All directions for inspecting the sample should be within 45°against perpendicular line.



6.2.Definition of applicable Zones

PRELIMINARY



X : Maximum Seal Line

A Zone : Active display area
B Zone : Out of active display area ~ Maximum seal line
C Zone : Rest parts

A Zone + B Zone = Validity viewing area

6.3 Standards

<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td>1</td><td>Polarizer Scratches</td><td>
<table>
<tr><th colspan="2" rowspan="2">Zone
X(mm) / Y(mm)</th><th colspan="3">Acceptable Number</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>L ≤ 15</td><td>0.01<W≤0.05</td><td colspan="2">4</td><td>*</td></tr>
<tr><td>L > 15</td><td>W > 0.01</td><td colspan="2">0</td><td>*</td></tr>
<tr><td>-</td><td>W > 0.05</td><td colspan="2">0</td><td>*</td></tr>
</table>
X : Length, Y : Width * : Disregard
</td></tr>
<tr><td>2</td><td>DENT</td><td>
<table>
<tr><th rowspan="2">Zone
Dimension (mm)</th><th colspan="3">Acceptable Number</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>0.30 < D ≤ 0.50</td><td colspan="2">4</td><td>*</td></tr>
<tr><td>0.50 < D</td><td colspan="2">0</td><td>*</td></tr>
</table>
D : Average Diameter = (long+short)/2 * : Disregard
</td></tr>
<tr><td>3</td><td>BLACK and WHITE
SPOT BUBBLE</td><td>
<table>
<tr><th rowspan="2">Zone
Dimension (mm)</th><th colspan="3">Acceptable Number</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>0.30 < D ≤ 0.50</td><td colspan="2">5</td><td>*</td></tr>
<tr><td>0.50 < D</td><td colspan="2">0</td><td>*</td></tr>
</table>
</td></tr>
<tr><td>4</td><td>LINT</td><td>
<table>
<tr><th colspan="2" rowspan="2">Zone
X(mm) / Y(mm)</th><th colspan="3">Acceptable Number</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>L ≤ 3.0</td><td>W ≤ 0.15</td><td colspan="2">4</td><td>*</td></tr>
<tr><td>L > 3.0</td><td>W ≤ 0.15</td><td colspan="2">0</td><td>*</td></tr>
<tr><td>-</td><td>W > 0.15</td><td colspan="2">According to BLACK SPOT</td><td>*</td></tr>
</table>
X : Length, Y : Width * : Disregard
</td></tr>
</table>

PRELIMINARY

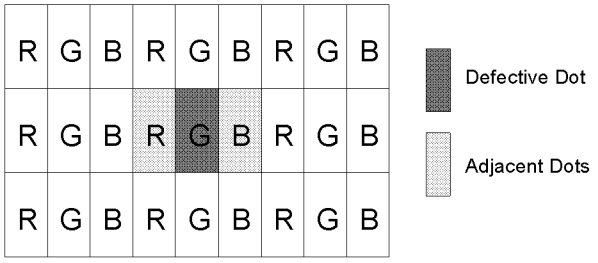
<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td>5</td><td>(a) Bright Dot
(b) Dark Dot</td><td>
<table>
<tr><th rowspan="2">Zone
Dimension (mm)</th><th colspan="3">Acceptable Number</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Bright Dot</td><td colspan="2">7 (G ≤ 3)</td><td>*</td></tr>
<tr><td>Dark Dot</td><td colspan="2">7</td><td>*</td></tr>
<tr><td>TOTAL</td><td colspan="3">10</td></tr>
</table>
</td></tr>
<tr><td>6</td><td>TWO Adjacent Dot</td><td>
<table>
<tr><th rowspan="2">Zone
Dimension (mm)</th><th colspan="3">Acceptable Number</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Bright Dot</td><td colspan="2">3 PAIRS</td><td>*</td></tr>
<tr><td>Dark Dot</td><td colspan="2">3 PAIRS</td><td>*</td></tr>
</table>
</td></tr>
<tr><td>7</td><td>Three or More Adjacent Dot</td><td>NOT ALLOWED</td></tr>
<tr><td>8</td><td></td><td>
<table>
<tr><th rowspan="2">Zone
Dimension (mm)</th><th colspan="3">Acceptable Number</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Bright Dot</td><td colspan="2">5 mm</td><td>*</td></tr>
<tr><td>Dark Dot</td><td colspan="2">5 mm</td><td>*</td></tr>
</table>
</td></tr>
<tr><td>9</td><td>Line Defect</td><td>NOT ALLOWED</td></tr>
</table>

PRELIMINARY

Note 1: Bright Dot is defined as follows:
Visible through 5% transmission ND filter under the condition that black image (color 0) is on the display.

Note 2: Dark Dot is defined as follows:
Recognizable darker than around under the condition that each R(63), G(63), B(63) image is on the display.

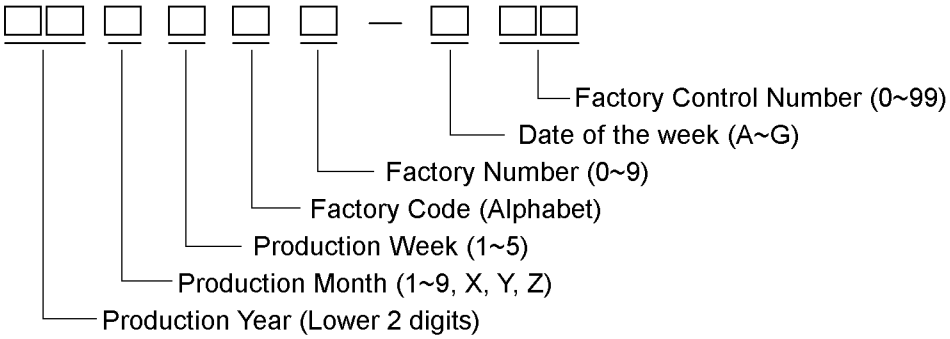
Note 3: Definition of adjacent



The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

7.Code System of Production Lot

The production lot of module is specified as follows.



8.Type Number

The type number of module is specified as follows.

355265AA

PRELIMINARY

9.Applying Precautions

Please contact us when questions and/or new problems not specified in this Specifications arise.

10.Precautions Relating Product Handling

The Following precautions will guide you in handling our product correctly.

1) Liquid crystal display devices
   1. The liquid crystal display device panel used in the liquid crystal display module is made of plate glass. Avoid any strong mechanical shock. Should the glass break handle it with care.
   2. The polarizer adhering to the surface of the LCD is made of a soft material. Guard against scratching it.

2) Care of the liquid crystal display module against static electricity discharge.
   1. When working with the module, be sure to ground your body and any electrical equipment you may be using. We strongly recommend the use of anti static mats (made of rubber), to protect work tables against the hazards of electrical shock.
   2. Avoid the use of work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
   3. Slowly and carefully remove the protective film from the LCD module, since this operation can generate static electricity.

3) When the LCD module alone must be stored for long periods of time:
   1. Protect the modules from high temperature and humidity.
   2. Keep the modules out of direct sunlight or direct exposure to ultraviolet rays.
   3. Protect the modules from excessive external forces.

4) Use the module with a power supply that is equipped with an overcurrent protector circuit,since the module is not provided with this protective feature.

5) Do not ingest the LCD fluid itself should it leak out of a damaged LCD module. Should hands or clothing come in contact with LCD fluid, wash immediately with soap.

6) Conductivity is not guaranteed for models that use metal holders where solder connections between the metal holder and the PCB are not used. Please contact us to discuss appropriate ways to assure conductivity.

7) For models which use CFL:
   1. High voltage of 1000V or greater is applied to the CFL cable connector area. Care should be taken not to touch connection areas to avoid burns.
   2. Protect CFL cables from rubbing against the unit and thus causing the wire jacket to become worn.
   3. The use of CFLs for extended periods of time at low temperatures will significantly shorten their service life.

8) For models which use touch panels:
   1. Do not stack up modules since they can be damaged by components on neighboring modules.
   2. Do not place heavy objects on top of the product. This could cause glass breakage.

9) For models which use COG,TAB,or COF:
   1. The mechanical strength of the product is low since the IC chip faces out unprotected from the rear. Be sure to protect the rear of the IC chip from external forces.
   2. Given the fact that the rear of the IC chip is left exposed, in order to protect the unit from electrical damage, avoid installation configurations in which the rear of the IC chip runs the risk of making any electrical contact.

PRELIMINARY

10) Models which use flexible cable, heat seal, or TAB:
1. In order to maintain reliability, do not touch or hold by the connector area.
2. Avoid any bending, pulling, or other excessive force, which can result in broken connections.

11) In case of buffer material such as cushion / gasket is assembled into LCD module, it may have an adverse effect on connecting parts (LCD panel-TCP / HEAT SEAL / FPC / etc., PCB-TCP / HEAT SEAL / FPC etc., TCP-HEAT SEAL, TCP-FPC, HEAT SEAL-FPC, etc.,) depending on its materials.
Please check and evaluate these materials carefully before use.

12) In case of acrylic plate is attached to front side of LCD panel, cloudiness (very small cracks) can occur on acrylic plate, being influenced by some components generated from polarizer film..
Please check and evaluate those acrylic materials carefully before use.

11. Warranty

This product has been manufactured to your company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.

1. We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.

2. We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.

3. We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed your company's acceptance inspection procedures.

4. When the product is in CFL models, CFL service life and brightness will vary According to the performance of the inverter used, leaks, etc. We cannot accept responsibility for product performance, reliability, or defect, which may arise.

5. We cannot accept responsibility for intellectual property of a third party, which may arise through the application of our product to your assembly with exception to those issues relating directly to the structure or method of manufacturing of our product.

6. Optrex will not be held responsible for any quality guarantee issue for defect products judged as Optrex-origin longer than 2 (two) years from Optrex production.

PRELIMINARY