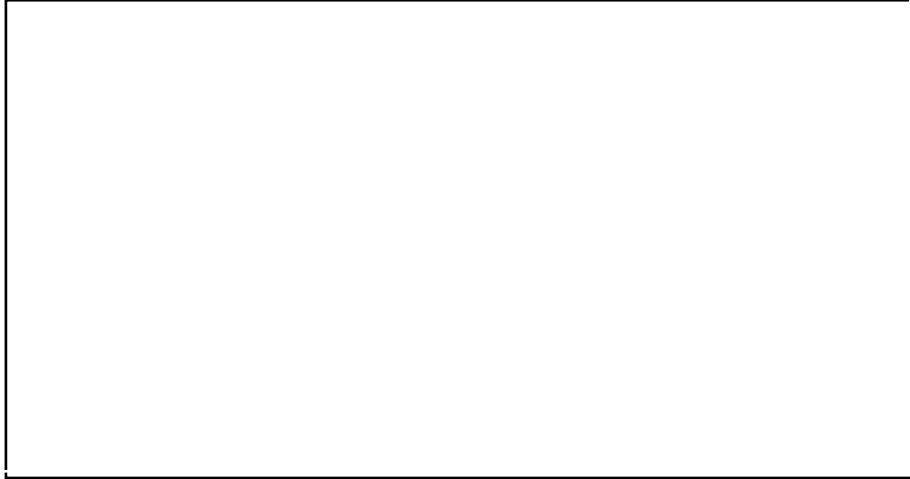


Crystalfontz America, Inc.



MODULE: CFAF128160C-T

CUSTOMER: _____

REV	DESCRIPTION	DATE
1	FIRST ISSUE	2008.01.05
4	SIZE CHANGES LCM	2008.02.21
5	MONDIFY THE FPC DIMENSION	2008.06.19

	INITIAL	DATE
APREPARED BY		2008.02.21
CHECKED BY		2008.01.21
APPROVED BY		2008.01.21

CUSTOMER	INITIAL	DATE
APPROVED BY		

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REV	DATE	CHANGE DETAIL	ORIGINATOR	REMARKS
1	2008.01.05	FIRST ISSUE		
2	2008.01.15	PERFECT SPE		
3	2008.01.16	PACKAGE		
4	2008.02.21	SIZE CHANGES LCM		
5	2008.06.19	MONDIFY THE FPC DIMENSION		

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1.0 General Specifications

Item	Standard Value	Unit
Display Pattern	<input checked="" type="checkbox"/> Graphic <input type="checkbox"/> Character <input type="checkbox"/> Segment <input type="checkbox"/> _____ <input type="checkbox"/> with ICON	
Color	<input type="checkbox"/> Mono. <input type="checkbox"/> Grayscale <input checked="" type="checkbox"/> 262K	
Module Dimension (W x H x T)	35.60(W) × 47.00 (H) ×3.50(T)	mm
Viewing Area (W x H)	\	mm
Active Area (W x H)	35.04(W)X28.03(H)	mm
Character Size (W x H)	\	mm
Character Pitch (W x H)	\	mm
Pixel Format	128(RGB)X160	
DOT Pitch (W x H)	\	mm
LCD Type	<input type="checkbox"/> TN, Positive <input type="checkbox"/> TN, Negative <input type="checkbox"/> HTN, Positive <input type="checkbox"/> HTN, Negative	
	<input type="checkbox"/> STN, Yellow-Green <input type="checkbox"/> STN, Gray <input type="checkbox"/> STN, Blue <input type="checkbox"/> FSTN, Positive <input type="checkbox"/> FSTN, Negative	
	<input type="checkbox"/> _____ <input type="checkbox"/> FM LCD <input type="checkbox"/> Color STN <input checked="" type="checkbox"/> TFT	
Polarizer Type	<input type="checkbox"/> Transflective <input checked="" type="checkbox"/> Transmissive <input type="checkbox"/> Reflective <input type="checkbox"/> Anti-Glare	
View Direction	<input checked="" type="checkbox"/> 6H <input type="checkbox"/> 12 <input type="checkbox"/> _____	
LCD Controller & Driver	HX8345(or Equivalent)	
LCD Driving Method	\	
Interface Type	<input type="checkbox"/> Serial <input type="checkbox"/> I ² C <input type="checkbox"/> 4-line SPI <input type="checkbox"/> 8-bits SPI	
	<input type="checkbox"/> 6800 18-bit 8080 <input type="checkbox"/> 4-bit <input checked="" type="checkbox"/> 16-bit 8080	
Backlight Type	<input checked="" type="checkbox"/> LED <input type="checkbox"/> Bottom <input checked="" type="checkbox"/> Single Side <input type="checkbox"/> Dual Side	
	<input type="checkbox"/> _____ <input type="checkbox"/> EL <input type="checkbox"/> CCFL	
Backlight Color	<input type="checkbox"/> Yellow-Green <input checked="" type="checkbox"/> White <input type="checkbox"/> Amber <input type="checkbox"/> Blue <input type="checkbox"/> Red <input type="checkbox"/> _____	
EL/CCFL Driver type	<input type="checkbox"/> Build-in <input type="checkbox"/> External	
DC-DC Converter	<input checked="" type="checkbox"/> Build-in <input type="checkbox"/> External	
Operation Temperature	T _{OPL} = -20 T _{OPH} = 70	°C
Storage Temperature	T _{STL} = -30 T _{STH} = 80	°C

Note:

T_{OPL}: Lowest Operation Temperature.

T_{OPH}: Highest Operation Temperature.

T_{STL}: Lowest Storage Temperature.

T_{STH}: Highest Storage Temperature.

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3.0 Interface PIN Function Description

PIN NO	SYMBOL	FUNCTION
1	/RESET	Reset pin. Setting this pin low initializes the LSI. Must be reset after power is supplied.
2	/CS	Chip select signal. Low: chip can be accessed; High: chip cannot be accessed. Must be connected to VSSD if not in use.
3	AO	The signal for register index or register command select. Low: Register index or internal status (in read operation); High: Register command.
4	/WR	Write enable clock input pin The data on DB0 to DB15 are latched at the rising edge of the /WR signal
5-20	DB0-DB15	Data bus
21	VDD	Power supply for logic circuit (+2.8V)
22	GND	Ground.(0V)
23	LED_K1	LED Back Light operating power supply (0V)
24	LED_A	LED Back Light operating power supply (+3.2V)
25	LED_K2	LED Back Light operating power supply (0V)
26	NC	NO connection

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4.0 Maximum Absolute Limit

Item	Symbol	Min	Type	Max	Unit
Supply Voltage for logic	VDD-VSS	-0.3	—	+3.3	Volt
Supply voltage for I/O	VDD-VSS	-0.3	—	+5.0	Volt
Input Voltage Range	VIN	-0.3	—	VDD3+0.3	Volt
Operating temperature	Topr	-20	—	+70	°C
Storage temperature	Tstg	-30	—	+80	°C
Power Supply for logic	VDD-VSS	—	2.8	—	Volt
Power Supply Current for LCM	IDD	—	1.55	2.17	mA

5.0 BL Characteristics (unless specified , The ambient temperature Ta=25°C)

Item	Symbol	min.	typ.	max.	Unit.	Condition.
Forward Voltage	Vf	3.1	3.2	3.3	V	If= 60 mA
Reverse Current	Ir			--	μA	Vr= --V
Wavelength	λ_p	--	X=0.26-0.315 Y=0.26-0.315	--	nm	If=60 mA
Spectral width at half height	$\Delta\lambda$	--	--	--	nm	If=-- mA
Luminance	Lv Sub.	2800	3000	--	cd/m ²	If=60 mA
Unifromity	Δ	80%	--	--		MIN/MAX*100%
Color	White					

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6.0 Optical Characteristics (light source: C light, using CMO

TN LC + Polarizer , reference only)

Item		Symbol	Conditions	Specifications			Unit	Note
				Min.	Typ.	Max.		
Transmittance		T%	Viewing normal angle $\theta_x = \theta_y = 0^\circ$		6.5		%	All left side data are based on CMO's following condition -- Type 6 NTSC: 58% LC: 5066 Light : C light (Machine:BM5A) Polarizer without DBEF Reference Only
Contrast Ratio		CR		150	250	-	--	
Response Time		T _R		-	10	20	ms	
		T _F		-	20	30	ms	
Chromaticity	Red	X _R		0.611	0.641	0.671		
		Y _R		0.315	0.345	0.375		
	Green	X _G		0.266	0.296	0.326		
		Y _G		0.554	0.584	0.614		
	Blue	X _B		0.102	0.132	0.162		
		Y _B		0.106	0.136	0.166		
	White	X _W		0.279	0.309	0.339		
		Y _W		0.318	0.348	0.378		
Viewing Angle	Hor.	θ_{X+}	Center CR≥10	-	45		deg.	
		θ_{X-}		-	45			
	Ver.	θ_{Y+}		-	35			
		θ_{Y-}		-	15			

*Note (1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

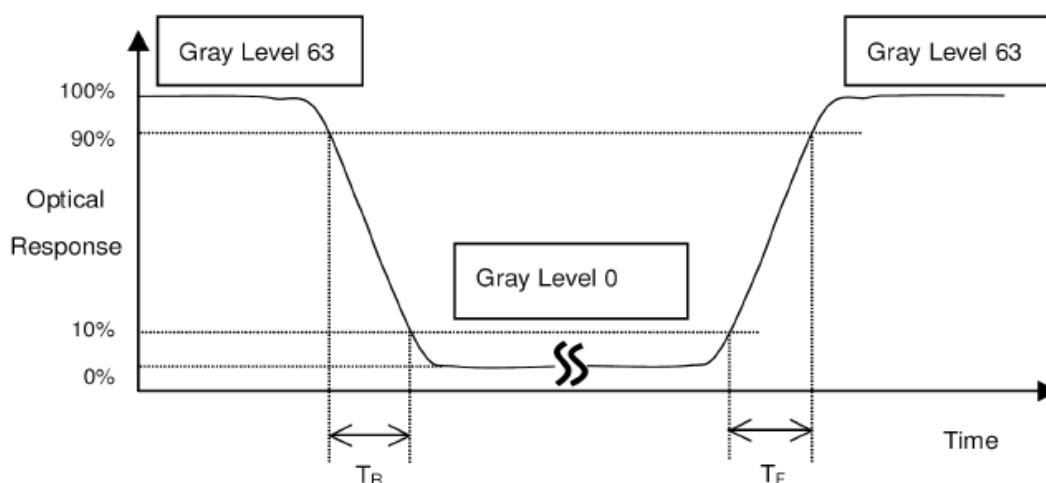
L₆₃: Luminance of gray level 63

L₀: Luminance of gray level 0

$$CR = CR(10)$$

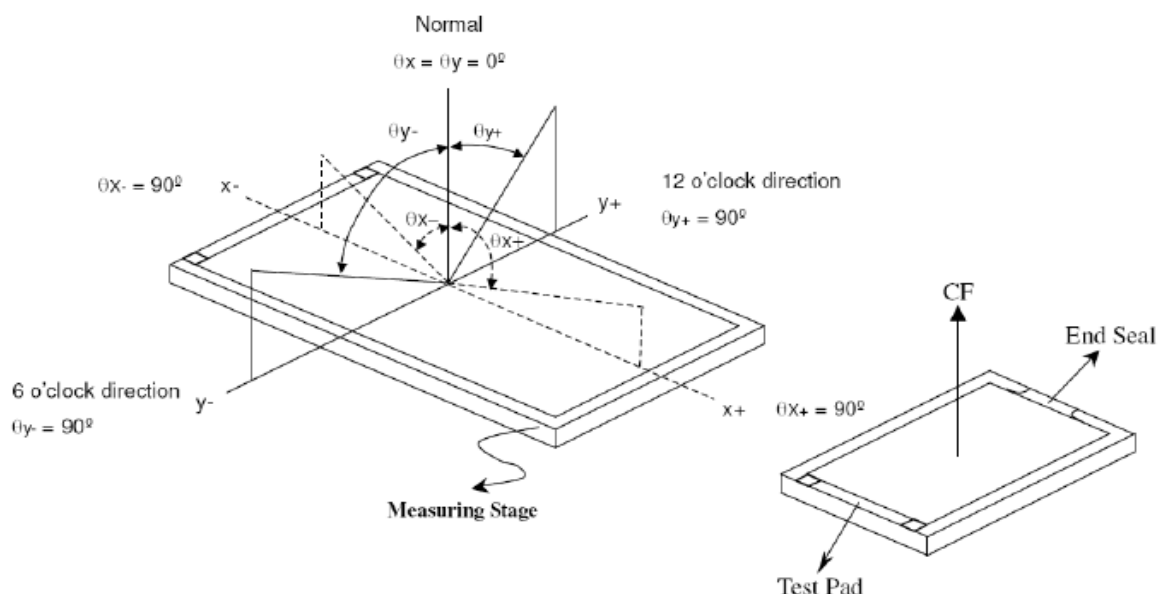
CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

*Note (2) Definition of Response Time (T_R, T_F):



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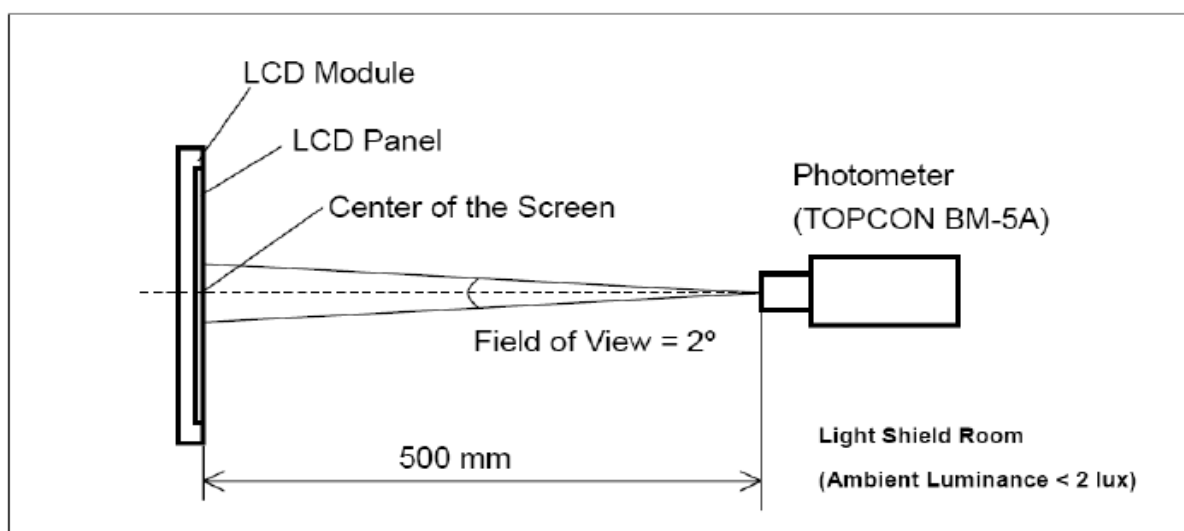
***Note(3) Definition of Viewing Angle**



*** The above "Viewing Angle" is the measuring position with Largest Contrast Ratio; not for good image quality. View Direction for good image quality is 6 O'clock. Module maker can increase the "Viewing Angle" by applying Wide View Film.

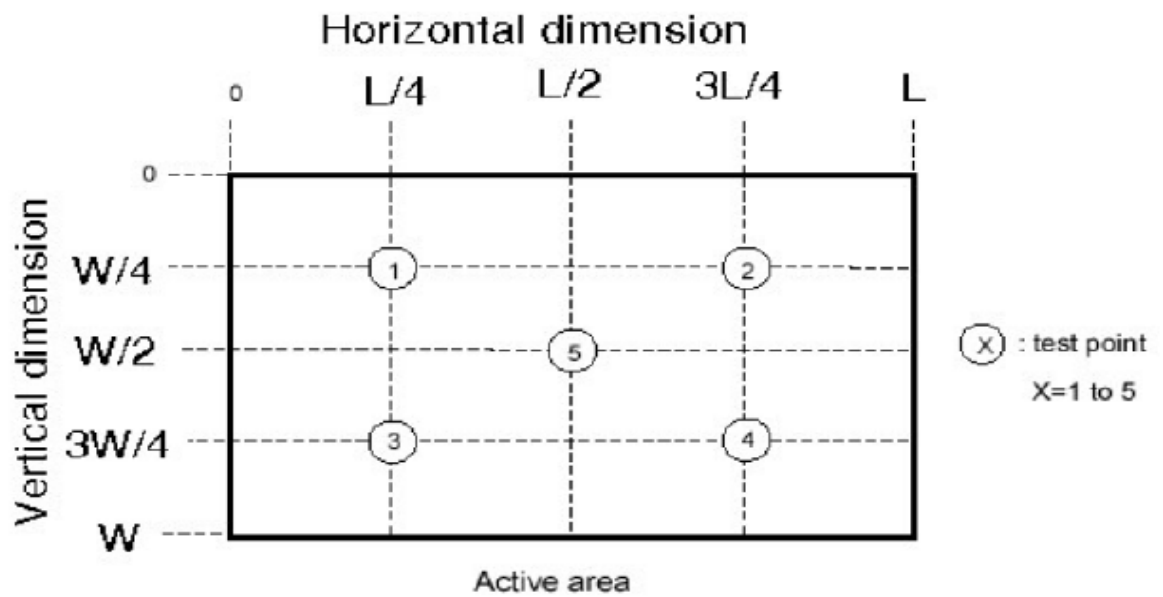
***Note (4) Measurement Set-Up:**

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.

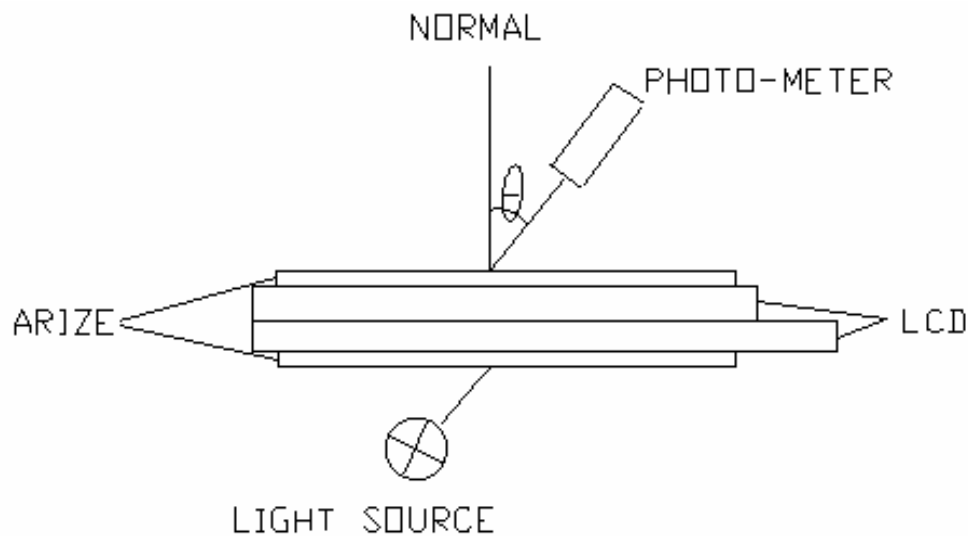


PRELIMINARY

*Note (5)

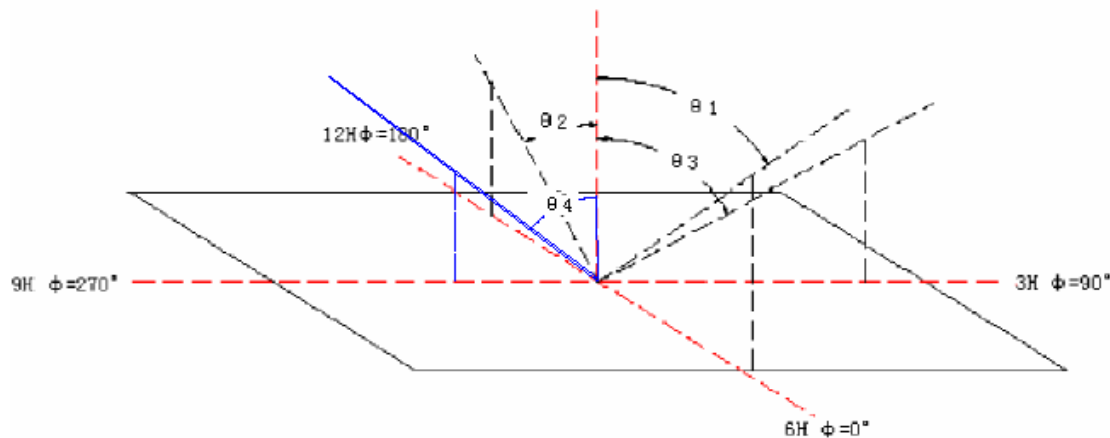


7.0 Optical Measurement System



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8.0 Definition Of θ And Φ



9.0 Display Control Instruction

Reference the HX8345 DATASHEET

10.0 Quality Units

10.0.1 Inspection Standard

See Data sheet of Inspection Standard for detail.

10.0.2 Reliability Test

10.0.2.1 Standard Specifications for Reliability

10.0.2.1.1 Test method

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There should be no existing conspicuous failure of functions and appearance in LCD after the following tests.

NO	Item	Description
1	Low Temperature Operating	The sample should be allowed to stand at $(-10\pm 2)^{\circ}\text{C}$ for 96 Hours under driving condition.
2	High Temperature Operating	The sample should be allowed to stand at $(70\pm 2)^{\circ}\text{C}$ for 96 Hours under driving condition.
3	Low Temperature Storage	The sample should be allowed to stand at $(-30\pm 3)^{\circ}\text{C}$ for 96 Hours under no-load condition, and then returning it to normal temperature condition, and allowing it stand for 24 hours
4	High Temperature Storage	The sample should be allowed to stand at $(80\pm 2)^{\circ}\text{C}$ for 96Hours under no-load condition, and then returning it to normal temperature condition, and allowing it stand for 24 hours
5	Moisture resistance	The sample should be allowed to stand at $(40\pm 2)^{\circ}\text{C}$, $(90\pm 2)\%\text{RH}$ for 96Hours under no-load condition excluding the polarizer, then taking it out and drying it at normal temperature, and allowing it stand for 24 hours
6	Thermal Shock Resistance	The sample should be allowed to stand the following 5 cycles of operation: T_{STL} for 30 minutes \rightarrow normal temperature for 5 minutes $\rightarrow T_{\text{STH}}$ for 30 minutes \rightarrow normal temperature for 5 minutes, as one cycle, then taking it out and drying it at normal temperature, and allowing it stand for 24 hours

10.0.2.1.2 Testing Conditions and Inspection Criteria:

For the final test, the testing sample must be stored at room temperature for 24 hours, after the tests listed above; Standard specifications for Reliability have been executed in order to ensure stability.

NO	Item	Inspection Criteria
1	Current Consumption	The current consumption should be under double of initial test.
2	Contrast	The contrast must be larger than half of initial test.
3	Appearance	Appearance defects should not happen.

10.0.2.2 Life Time:

Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature $(25\pm 10^{\circ}\text{C})$, normal humidity $(45\pm 20\%\text{RH})$, and in area not exposed to direct sunlight. Definition on the termination of life time is deterioration of contrast ratio by one fifth against initial value or human eyes can not recognize each dots.

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11.0 Precautions For Use

11.0.1 Handling Precautions

- A. No mechanical SHOCK!
 - LCD may be broken because it is made of glass.
- B. DO NOT SCRATCH!
 - Polarizer is a soft material and can easily be scratched.
- C. No DC VOLTAGE TO LCD!
 - The electric characteristics of LCD deteriorates.
 - Please control DC content inside driving circuits.
- D. Wash your hands or clothes if you touch liquid crystal.
 - Liquid crystal may be leaked when LCD is broken.
 - Never tastes it if your hands or clothes touch it, please immediately wash using soap.
- E. WEAR GLOVES while handling
 - It is preferable to wear gloves to avoid damaging the LCD.
 - Please do not touch electrodes with bare hands or make them dirty.
- F. SLOWLY PEEL OFF protective film!
 - Static electricity may be charged.
- G. KEEP AWAY from extreme HEAT, HUMIDITY and direct SUNLIGHT!
 - LCD deteriorates.

11.0.2 Installation Precautions

- A. The LCD shall be installed flat, without twisting or bending.
- B. The display window size should be the same as the effective viewing area.
- C. The LCD screen may be cleaned with a soft cloth or cotton pad. Methanol, or Isopropyl Alcohol may be used, but insure that all solvent residue is removed.

11.0.3 Operation Precautions

- A. The LCD shall be operated within the limits specified, or it will shorten the LCD's life, and/or harm display images.
- B. The driving conditions must be supply to optimize viewing angle and contrast.
- C. Operation of the LCD at temperature below the limit specified may cause image degradation and/or bubbles. It may also change the characteristics of the liquid crystal. This phenomenon may not recover. The LCD shall be operated within the temperature limits specified.
- D. Control DC content inside driving circuits or the LCD's life will shorten.

11.0.4 Storage Precautions

- A. The LCD shall be stored within the temperature and humidity limits specified.
- B. Store in a dark area, and protected the LCD from direct sunlight or fluorescent light.
- C. The LCD should be packaged to prevent damage.
- D. Water may cause damage or discoloration of the polarizer. Clean any condensation or moisture from any source immediately.

Always keep the LCD free from condensation during testing. Condensation may permanently spot or stain the polarizers.

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