AZ DISPLAYS, INC.

COMPLETE LCD SOLUTIONS

SPECIFICATIONS FOR
LIQUID CRYSTAL DISPLAY

PART NUMBER: AGM1212I Series
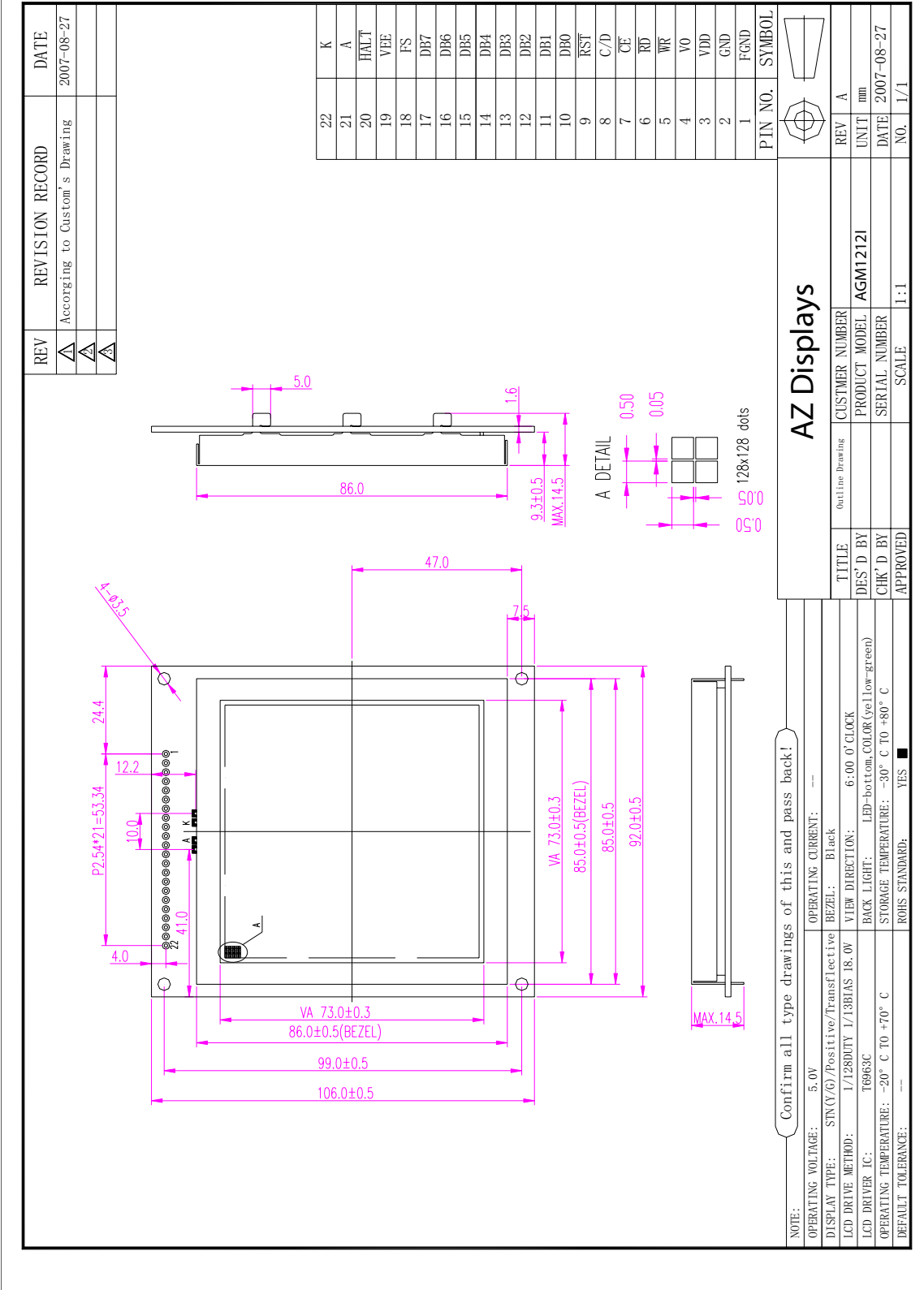
REVISED: August 31, 2007

REVISION RECORD

REVISION	REVISION DATE	PAGE	CONTENTS
VER1.0	**28/08-2007**		FIRST ISSUE
VER1.1	**31/08-2007**		MODIFY 3.0 ETC

※ **CONTENTS**

1.0   MECHANICAL DIAGRAM

2.0 MECHANICAL SPECS

1.	Overall Module Size	92.0mm(W) x 106.0mm(H) x max 14.5mm(D) for LED backlight version
2.	Viewing Area	73.0mm(W) x73.0mm(H)
3.	Dot Size	0.50mm(W) x 0.50mm(H)
4.	Dot Pitch	0.55mm(W) x 0.55mm(H)
5.	Driving Method	1/128Duty,1/13Bias,18.0V
6.	Controller IC	T6963C
7.	LC Fluid Options	STN-Y/G Positive/ Transflective
8.	Viewing Direction	6 O'Clock
9.	Backlight Options	LED/Yellow-green
10.	Operating temperature	(-20ºC ~ 70ºC)
11.	Storage temperature	(-30ºC ~ 80ºC)
12.	Rohs	Conforms to EU Directive 2002/95/EC of January 2003(Rohs)

3.0 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min	Typ	Max	Unit
Operating temperature	Top	-20	-	70	ºC
Storage temperature	Tst	-30	-	80	ºC
Input voltage	Vin	-0.3	-	Vdd+0.3	V
Supply voltage for logic	Vdd- Vss	-0.3	-	7.0	V
Supply voltage for LCD drive	Vdd- V0	6		28	V

4.0 ELECTRICAL CHARACTERISTICS

4.1 Electrical Characteristics Of LCM

Item	Symbol	Condition	Min	Typ	Max	Unit
Power Supply Voltage	VDD	Ta=25ºC	4.8	5.0	5.2	V
Power Supply Current	Idd	Vdd=5.0V	17.0	22.0	30.0	mA
Input voltage (high)	Vih	H level	0.8Vdd	-	Vdd	V
Input voltage (low)	Vil	L level	0	-	0.2Vdd	V
Recommended LC Driving Voltage	Vdd -Vo	-20ºC	-		19.5	V
		25ºC		18.0		
		70ºC	16.5		-	

4.2 The Characteristics Of   Backlight

Item	Symbol	Condition	Min	Typ	Max	Unit
Operate Current	IBL	VBL=5V,RL=5 Ω	-	180	220	mA
Color		Yellow-green(λ =570$\pm$5 nm)				

5.0 OPTICAL CHARACTERISTICS

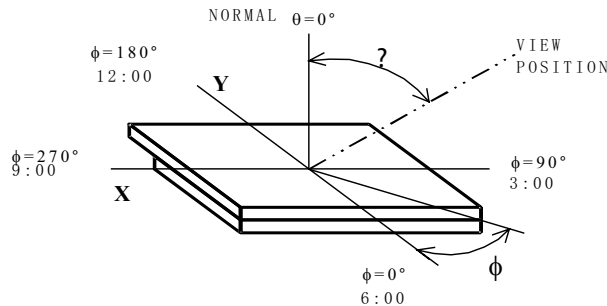| Item	Symbol	Condition	Min	Typ	Max	Unit
Viewing angle (horizontal)	θ	$Cr \geq 2.0$	-35	-	35	deg
Viewing angle (vertical)	ϕ	$Cr \geq 2.0$	-25	-	45	deg
Contrast Ratio	Cr	$\phi=0°, \theta=0°$	3.0	6.0	-	
Response time (rise)	Tr	$\phi=0°, \theta=0°$	-	150	250	ms
Response time (fall)	Tf	$\phi=0°, \theta=0°$	-	160	280	ms

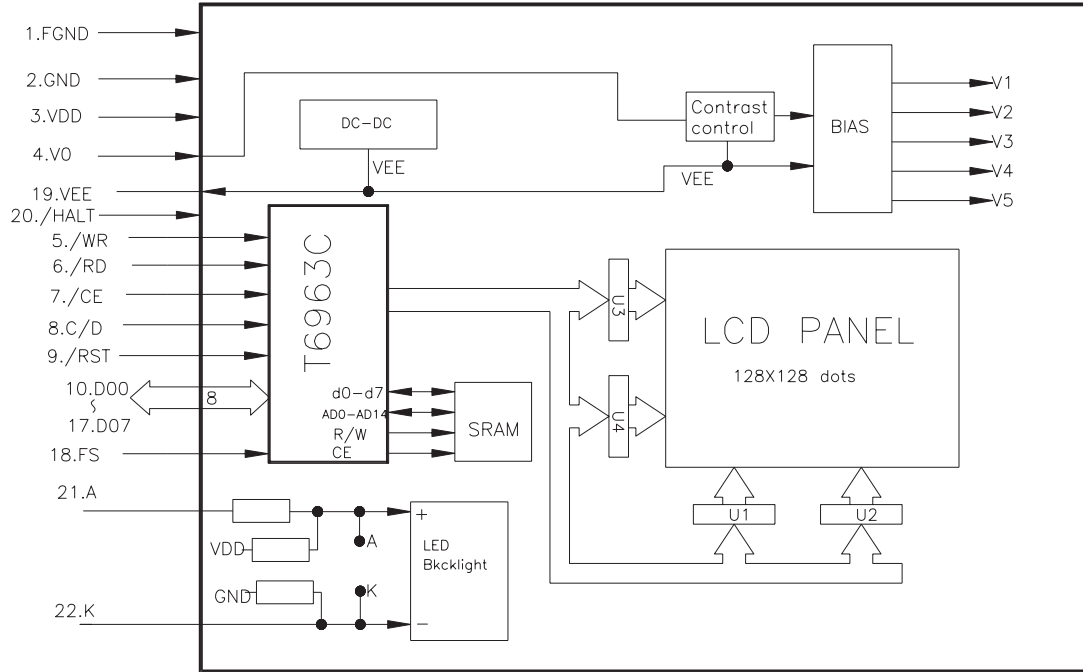# (1). Definition of Optical Response Time
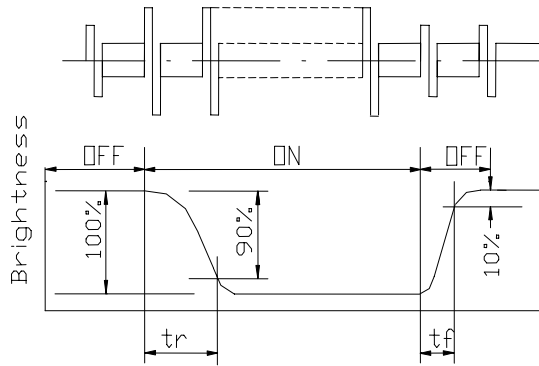
(2). Definition of Driving Voltage (Vlcd)
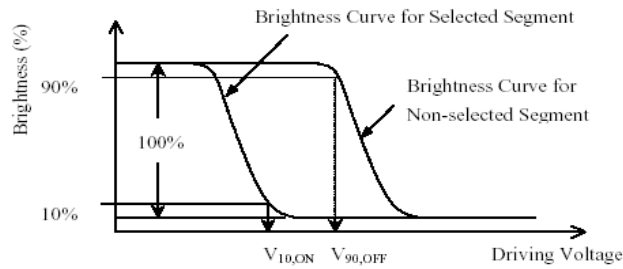
(3). Definition of Viewing Angle θ and Φ

6.0 BLOCK DIAGRAM

7.0 PIN ASSIGNMENT

Pin No.	Symbol	atio	Level
1	FGND	Frame Ground	-
2	GND	Ground	-
3	Vdd	+5V	-
4	V0	LCD contrast adjust	-
5	/WR	Write Data	H/L
6	/RD	Read Data	H/L
7	/CE	Chip Enable	H, H→L
8	C/D	Command/Data	H/L
9	/RST	Reset	L
10	DB0	Data bit 0	H/L
11	DB1	Data bit 1	H/L
12	DB2	Data bit 2	H/L
13	DB3	Data bit 3	H/L
14	DB4	Data bit 4	H/L
15	DB5	Data bit 5	H/L
16	DB6	Data bit 6	H/L
17	DB7	Data bit 7	H/L
18	FS	Font select	H/L
19	VEE	Power supply for LCD driving	-
20	/HALT	Halt controller Operation	H/L
21	A	Power Supply for LED+	-
22	K	Power Supply for LED-	-

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8.0   POWER SUPPLY
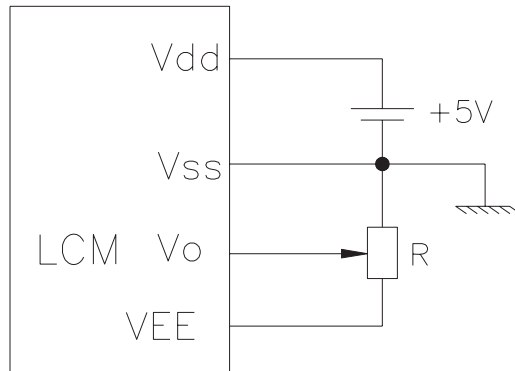
R=10K~20K

9.0 TIMING CHARACTERISTICS

Item	Symbol	Test Condition	Min.	Typ.	Max.	Unit
C/D Set-up Time	t_{CDS}	Fig.a	100	-	-	ns
C/D Hold Time	t_{CDH}	Fig.a	10	-	-	ns
CE,RD,WR Pulse Width	$t_{CE,}$ $t_{RD,}$ t_{WR}	Fig.a	80	-	-	ns
Data Set-up Time	t_{DS}	Fig.a	80	-	-	ns
Data Hold time	t_{DH}	Fig.a	40	-	-	ns
Access Time	t_{ACC}	Fig.a	-	-	150	ns
Output Hold Time	t_{OH}	Fig.a	10	-	50	ns
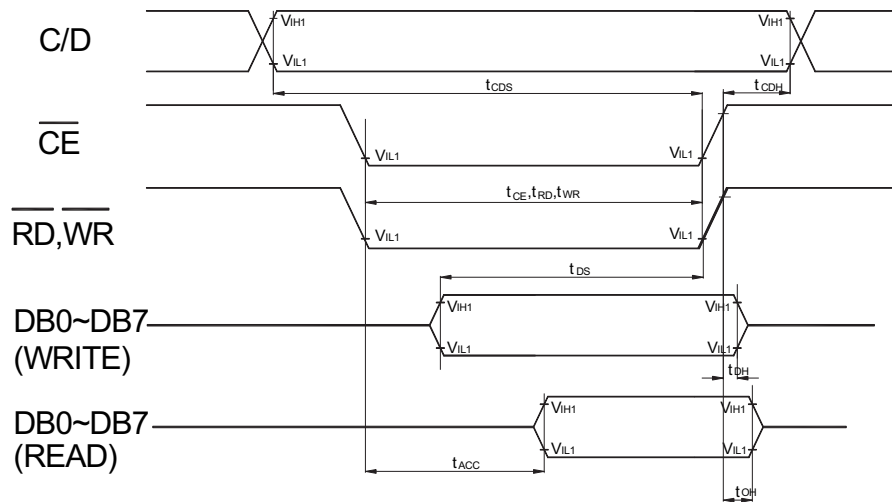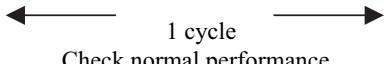
Fig. a Interface timing (data write/read)

10.0 RELIABILITY TEST

NO	Test Item		Description	Test Condition	Remark
1	Environmental Test	High temperature/High Humidity Storage	Applying the high storage temperature Under high humidity for a long time Check normal performance	90% RH 80℃ 120hrs	
2		Low temperature storage	Applying the low storage temperature Under normal humidity for a long time Check normal performance	-30℃ 120hrs	
3		High temperature Operation	Apply the electric stress(Volatge and current) Under high temperature for a long time	≤30% RH 70℃ 120hrs	Note1
4		Low temperature Operation	Apply the electric stress Under low temperature for a long time	-20℃ 120hrs	Note1 Note2
5		Temperature Cycle	Apply the low and high temperature cycle -30℃＜＞25℃＜＞80℃ ＜＞25℃ 30min 10min 30min 10min ◄———— ————► 1 cycle Check normal performance	-30℃/80℃ 10 cycle	
6	Mechanical Test	Vibration test(Package state)	Applying vibration to product check normal performance	Freq:10-55Hz Max Acceleration 5G 1cycle time:1min time X.Y.Z direction for 15 mines	
7		Shock test(package state)	Applying shock to product check normal performance	Drop them through 70cm height to strike horizontal plane	
8	Other				

Remark

Note1:Normal operations condition (25℃±5℃).

Note2:Pay attention to keep dewdrops from the module during this test.

11.0   DISPLAY CONTROL INSTRUCTION

The display control instructions control the internal state of the T6963C. Instructions are received from MPU to T6963C for the display control.

INSTRUCTION	C/D	$\overline{RD}$	$\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0	DESCRIPTION
Status Read	1	0	1	S7	S6	S5	S4 Not used	S3	S2	S1	S0	S1~S5 0: In operation / 1: Ready S6 0:No Error / 1:Error S7 0:Display Off / 1:Normal Display
Register Set	1	1	0	0	0	1	0	0	0 0 1	0 1 0	1 0 0	Set Cursor Pointer Set Offset Register Set Address Pointer
Control Word Set	1	1	0	0	1	0	0	0	0	0 0 1 1	0 1 0 1	Set Text Home Address Set Text Area Set Graphic Home Address Set graphic Area
Mode Set	1	1	0	1	0	0	0	X X X X 0 1	0 0 0 1 X X	0 0 1 0 X X	0 1 1 0 X X	OR mode EXOR mode AND mode Text Attribute mode Internal CG ROM mode External CG RAM mode
Display Mode	1	1	0	1	0	0	1	0 X X 0 1 1	0 X X 1 0 1	0 1 1 X X X	0 0 1 X X X	Display Off Cursor on,blink off Cursor on,blink on Text on,graphic off Text off,graphic on Text on,graphic on
Cursor Pattern Select	1	1	0	1	1	0	0	0	N2	N1	N0	Cursor Set
Data Auto Read /Write	1	1	0	1	0	1	1	0	0	0 0 1	0 1 0	Set Data Auto Write Set Data Auto Read Auto Reset
Data Read Write	1	1	0	1	1	0	0	0	N2	N1	N0	Data Read/Write And ADP Increment/Decrement It should executed after setting Address using Set Address Pointer command.
Screen Peek	1	1	0	1	1	1	0	0	0	0	0	Screen Peek
Screen Copy	1	1	0	1	1	1	0	1	0	0	0	Screen Copy
Bit Set Reset	1	1	0	1	1	1	1	N3	N2	1	N0	Bit Set
Data Write	0	1	0	Write Data								Writes data DBO~DB7 from MPU to external display RAM.
Data Read	0	0	1	Read Data								Reads data DB0~DB7 from external display RAM to MPU.

X : invalid

12.0 PRECAUTION FOR USING LCM

1. When design the product with this LCD Module, make sure the viewing angle matches to its purpose of usage.

2. As LCD panel is made of glass substrate, Dropping the LCD module or banging it against hard objects may cause cracking or fragmentation. Especially at corners and edges.

3. Although the polarizer of this LCD Module has the anti-glare coating, always be careful not to scratch its surface. Use of a plastic cover is recommended to protect the surface of polarizer.

4. If the LCD module is stored at below specified temperature, the LC material may freeze and be deteriorated. If it is stored at above specified temperature, the molecular orientation of the LC material may change to Liquid state and it may not revert to its original state. Excessive temperature and humidity could cause polarizer peel off or bubble. Therefore, the LCD module should always be stored within specified temperature range.

5. Saliva or water droplets must be wiped off immediately as those may leave stains or cause color changes if remained for a long time. Water vapor will cause corrosion of ITO electrodes.

6. If the surface of LCD panel needs to be cleaned, wipe it swiftly with cotton or other soft cloth. If it is not still clean enough, blow a breath on the surface and wipe again.

7. The module should be driven according to the specified ratings to avoid malfunction and permanent damage. Applying DC voltage cause a rapid deterioration of LC material. Make sure to apply alternating waveform by continuous application of the M signal. Especially the power ON/OFF sequence should be kept to avoid latchup of driver LSIs and DC charge up to LCD panel.

8. Mechanical Considerations

    a) LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.

    b) Do not tamper in any way with the tabs on the metal frame.

    c) Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.

    d) Do not touch the elastomer connector; especially insert a backlight panel (for example, EL).

    e) When mounting a LCM makes sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.

    f) Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

    9. Static Electricity

    a) Operator

    Ware the electrostatics shielded clothes because human body may be statically charged if not ware shielded clothes.

    Never touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals

    with any parts of the human body.

    b) Equipment

    There is a possibility that the static electricity is charged to the equipment, which has a function of peeling or friction

action (ex: conveyer, soldering iron, working table). Earth the equipment through proper resistance (electrostatic

earth: 1x108 ohm).

Only properly grounded soldering irons should be used.

If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

The normal static prevention measures should be observed for work clothes and working benches; for the latter

conductive (rubber) mat is recommended.

c) Floor

Floor is the important part to drain static electricity, which is generated by operators or equipment.

There is a possibility that charged static electricity is not properly drained in case of insulating floor. Set the

electrostatic earth (electrostatic earth: 1x108 ohm).

d) Humidity

Proper humidity helps in reducing the chance of generating electrostatic charges. Humidity should be kept over

50%RH.

e) Transportation/storage

The storage materials also need to be anti-static treated because there is a possibility that the human body or storage

materials such as containers may be statically charged by friction or peeling.

The modules should be kept in antistatic bags or other containers resistant to static for storage.

f) Soldering

Solder only to the I/O terminals.Use only soldering irons with proper grounding and no leakage.

Soldering temperature : 280° C $\pm$ 10° C

Soldering time: 3 to 4 sec.

Use eutectic solder with resin flux fill.

If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed afterwards.

g) Others

The laminator (protective film) is attached on the surface of LCD panel to prevent it from scratches or stains. It should

be peeled off slowly using static eliminator.

Static eliminator should also be installed to the workbench to prevent LCD module from static charge.

10. Operation

a) Driving voltage should be kept within specified range; excess voltage shortens display life.

b) Response time increases with decrease in temperature.

c) Display may turn black or dark blue at temperatures above its operational range; this is (however not

pressing on the viewing area) may cause the segments to appear "fractured".

d) Mechanical disturbance during operation (such as pressing on the viewing area) may cause the

segments to appear "fractured".

11. If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. The toxicity is extremely low but caution should be exercised at all the time.

12. Disassembling the LCD module can cause permanent damage and it should be strictly avoided.

13. LCD retains the display pattern when it is applied for long time (Image retention). To prevent image retention, do not apply the fixed pattern for a long time. Image retention is not a deterioration of LCD. It will be removed after display pattern is changed.

14. Do not use any materials, which emit gas from epoxy resin (hardener for amine) and silicone adhesive agent (dealcohol or deoxym) to prevent discoloration of polarizer due to gas.

15. Avoid the exposure of the module to the direct sunlight or strong ultraviolet light for a long time.

16. The brightness of LCD module may be affected by the routing of CCFL cables due to leakage to the chassis through coupling effect. The inverter circuit needs to be designed taking the level of leakage current into consideration. Thorough evaluation is needed for LCD module and inverter built into its host equipment to ensure specified brightness.