DISPLAYTRONIC

XIAMEN ZETTLER ELECTRONICS CO., LTD.

SPECIFICATIONS FOR
LIQUID CRYSTAL DISPLAY

AGM1964D SERIES GRAPHIC MODULE   VER1.4

CUSTOMER APPROVAL		
※ PART NO. :		
APPROVAL		**COMPANY CHOP**
CUSTOMER COMMENTS		

DISPLAYTRONIC ENGINEERING APPROVAL		
DESIGN BY	**CHECKED BY**	**APPROVED BY**
丁良金 24/5-07	美伏茂 24/5-07	前扫尹权 24/5-07

REVISION RECORD

REVISION	REVISION DATE	PAGE	CONTENTS
VER1.1	15/6-2006		1.MODIFY THE COVER,ADD CONTENT AND REVISION RECORD.
VER1.2	26/4-2007		2.ADD PRECAUTION FOR USING LCM
			3. MODIFY THE NO. 9.0 RELIABILITY
VER1.3	21/5-2007		4. MODIFY THE NO. 9.0 RELIABILITY
VER1.4	24/5-2007		5. ADD NUMBER OF DOTS

※ CONTENTS

1.0 MECHANICAL DIAGRAM

2.0 GENERAL SPECIFICATION

1. Overall Module Size	120.0mm(W) x 62.0mm(H) x max 13.5mm(D) for LED backlight version
2. Dot Size	0.458 x 0.458mm
3. Dot Pitch	0.508 x 0.508mm
4. Number of dots	192 x 64 dots
5. Duty	1/64 DUTY, 1/9 BIAS
6. Controller IC	KS0108 or Compatible
7. LC Fluid Options	STN /YELLOW-GREEN
8. Polarizer Options	Reflective, Transflective, Transmissive
9. Backlight Options	LED
10. Temperature Range Options	Operating: -20°C ---- +70°C Storage: -30°C ---- +80°C
11. View Angle	6 Clock
11. Active Area	97.49 x 32.46mm
12. View Size	104.0 x 39.0mm

3.0 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min	Typ	Max	Unit
Operating temperature (Wide temperature)	Top	-20	-	70	ºC
Storage temperature (Wide temperature)	Tst	-30	-	80	ºC
Input voltage	Vin	-0.3	-	Vdd+0.3	V
Supply voltage for logic	Vdd- Vss	-0.3	-	6.0	V
Supply voltage for LCD drive	Vdd- V0	8	-	17.0	V

4.0 ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Power Supply	V_{DD}-V_{SS}		4.5	5.0	5.5	V
Input voltage (high)	Vih	H level	$0.8\ V_{DD}$	-	V_{DD} +0.3	V
Input voltage (low)	Vil	L level	0	-	$0.2\ V_{DD}$	V
Recommended LC Driving Voltage	Vdd -Vo	-20ºC	-		13.8-	V
		0ºC	-	10.2	-	
		25ºC	-	9.5	-	
		50ºC	-	9.2	-	
		70ºC	8.5	9.0	-	
Power Supply Current	Idd	Vdd=5.0V	-		12.0	mA
LED Power Supply Voltage	V_{LED}+ - V_{LED}-	-	4.4	5.0	5.8	V
Y-G LED Power Supply Current	I_{BL}	RL=5Ω	-	160	400	mA
White LED Power Supply Current	I_{BL}	RL=12Ω	-	160	320	mA

5.0 OPTICAL CHARACTERISTICS

Item Mode		Cr (Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25ºC		25ºC		25ºC	
		MIN.	TYP.	MIN	TYP.	MIN	TYP.
R	A						
	B	7.10	7.70	80°	85°	-	35°
	C	-	-	-	-	-	-
S	A						
	B	7.05	7.55	80°	85°	-	35°
	C	-	-	-	-	-	-

Note:

R: Reflective

S: Transflective

A: STN Gray

B: STN Yellow

C: FSTN

At: $\phi = 0°$, $\theta = 0°$

Item	Symbol	Condition	Min	Typ	Max	Unit
Response time (rise)	Tr	25 ºC	-	120	250	ms
Response time (fall)	Tf	25ºC	-	130	250	ms

6.0   BLOCK DIAGRAM
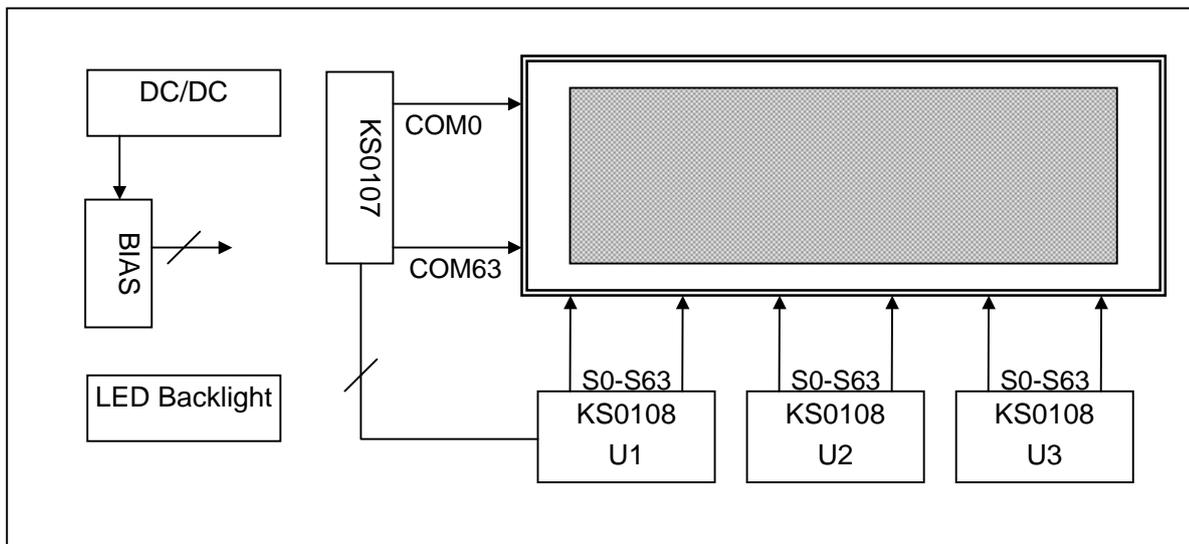
7.0   PIN ASSIGNMENT

Pin No.	Symbol	Function	Level
1	VSS	Power Ground.	-
2	VDD	Power Supply. (+5V)	-
3	VADJ	Contrast Adjust Voltage.	-
4	VLCD	LCD Driving Power supply (-8 ~ -10V)	
5	RS	Data/Command Select Input.	-
6	R/W	Read/Write Select. R/W=1,Read Mode; R/W=0,Write Mode.	
7	E	Enable clock	
8	DB0	Data bit 0	H/L
9	DB1	Data bit 1	H/L
10	DB2	Data bit 2	H/L
11	DB3	Data bit 3	H/L
12	DB4	Data bit 4	H/L
13	DB5	Data bit 5	H/L
14	DB6	Data bit 6	H/L
15	DB7	Data bit 7	H/L
16	CSA#	Chip Select for U1. Low Active.	
17	CSB#	Chip Select for U2. Low Active.	
18	CSC#	Chip Select for U3. Low Active.	
19	RST#	Reset for LCM. When RST#=L, Reset.	
20	LED+	Power supply for LED+	5.0V
21	LED-	Power supply for LED-	0V

8.0 APPLICATION
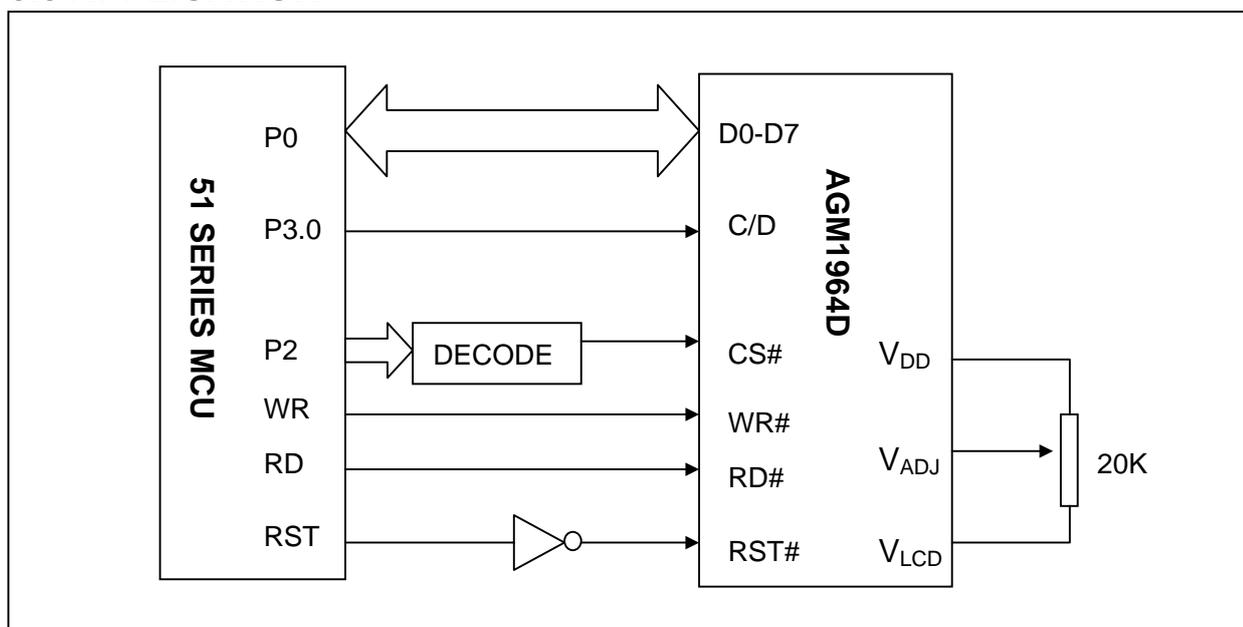
9.0 TIMING CHARACTERISTICS

6800 MCU Writing

6800 MCU Reading
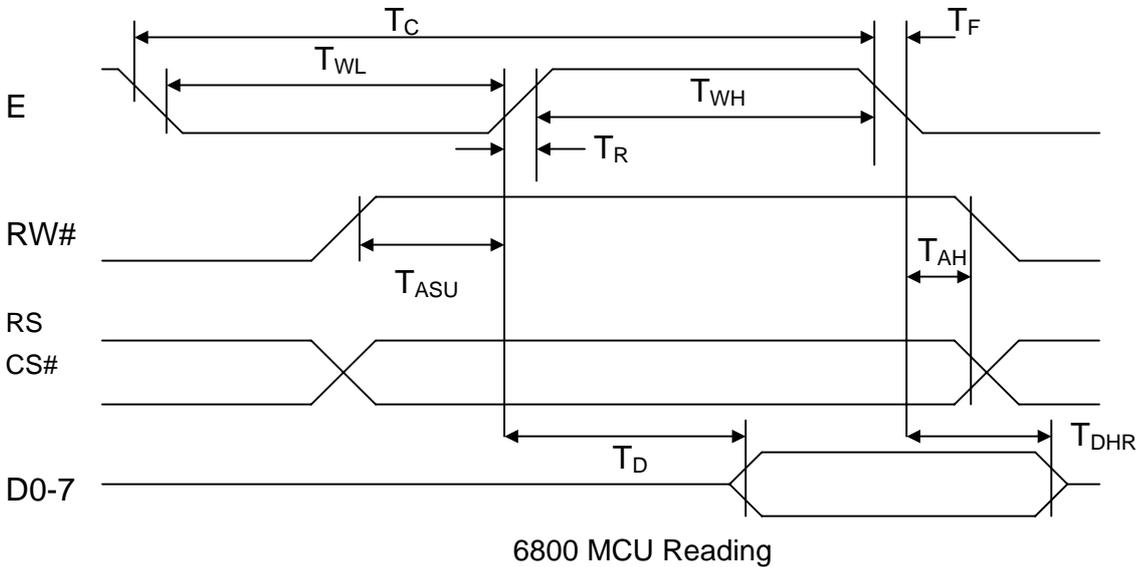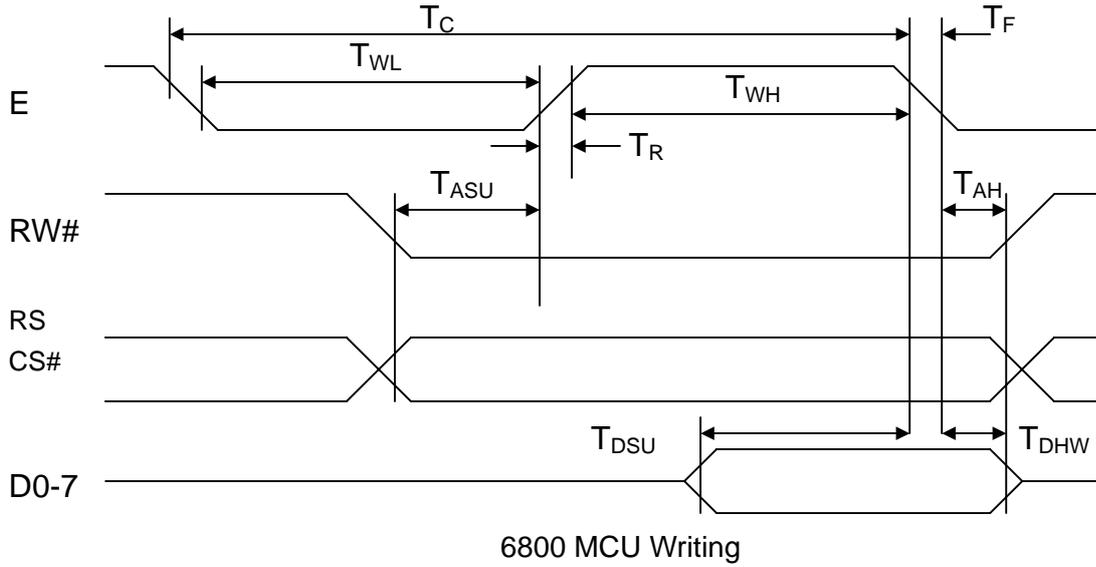
Condition:（VDD=5.0±10%,VSS=0V,Ta=-10～+60°C）

ITEM	SYMBLE	MIN	MAX	UNIT
E Clock Cycle	T_C	1000	—	ns
E Clock Pulse High Width	T_{WH}	450	—	ns
E Clock Pulse Low Width	T_{WL}	450	—	ns
E Rising Time	T_R	—	25	ns
E Falling Time	T_F	—	25	ns
Address Setup Time	T_{ASU}	140	—	ns
Address Hold Time	T_{AH}	10	—	ns
Data Setup Time	T_{DSU}	200	—	ns
Data Delay Time	T_D	—	320	ns
Data Hold Time (Write)	T_{DHW}	10	—	ns
Data Hold Time (Read)	T_{DHR}	20	—	ns

10.0   RELIABILITY TEST

ITEM	CONDITIONS	CRITERIA
High temperature operation	70℃ for 120 hours	
Low temperature operation	-20℃ for120 hours	
High humidity storage	45℃, 85%RH for 240 hours	
High temperature storage	80℃ for 240 hours	
Low temperature storage	-30℃ for 240 hours	
Temperature cycling	-30℃ (30 min) ↓ ↑ 25℃ (5 min) ↓ ↑ 80℃ (30 min) CYCLES: 10 times	OK
ESD TEST	The air turns on electricity mode;±9KV;	
LIFE TIME	AT 25℃ RH 40±20% 50000HR	

*Evaluations and assessment to be made two hours after returning to room temperature (25**⁰**C±5**⁰**C).

*The LCDs subjected to the test must not have dew condensation.

11.0   INSTRUCTION DESCRIPTION   (KS0108)

Command	RS	R/W	D7	D6	D5	D4	D3	D2	D1	D0	Function
Display ON/OFF	0	0	0	0	1	1	1	1	1	1/0	To control the display ON or OFF. The internal status and display RAM data are not affected. 0:OFF, 1:ON
Set address (Y address)	0	0	0	1	Y address (0~63)						To set the Y address in the Y address counter.
Set page (X address)	0	0	1	0	1	1	1	Page(0~7)			To set the X address at the X address register.
Display Start Line	0	0	1	1	Display Start Line(0~63)						To indicate the display data RAM displayed at the top of the screen.
Status Read	0	1	Busy	0	ON/OFF	Reset	0	0	0	0	To read status of the LCD controller IC: Busy 0:Ready, 1: In operation ON/OFF: 0:Display ON, 1:Display OFF Reset: 0:Normal, 1:Reset
Write display data	1	0	Write Data								To write data into display data RAM. Y address is increased by 1 after this command.
Read Display data	1	1	Read Data								To read data from display data RAM to the data bus.

12.0   DISPLAY RAM ADDRESS

| Page | Line | \
 RAM Y address(Y0 ~Y63) | | | | | | | | | | | | | Data |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1st page(X=0) | Line 0→ | 0 | 1 | 1 | 1 | 0 | 0 | ...... | 0 | 0 | 1 | 0 | 0 | 0 | ←DB0(LSB) |
| | Line 1→ | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 0 | 0 | 1 | 1 | 0 | 0 | ←DB1 |
| | Line 2→ | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 0 | 0 | 1 | 0 | 1 | 0 | ←DB2 |
| | Line 3→ | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 0 | 0 | 1 | 0 | 1 | 0 | ←DB3 |
| | | 1 | 1 | 1 | 1 | 1 | 0 | ...... | 0 | 0 | 1 | 0 | 0 | 0 | ←DB4 |
| | | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 1 | 1 | 1 | 0 | 0 | 0 | ←DB5 |
| | | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 1 | 1 | 1 | 0 | 0 | 0 | ←DB6 |
| | Line 7→ | 0 | 0 | 0 | 0 | 0 | 0 | ...... | 0 | 0 | 0 | 0 | 0 | 0 | ←DB7(MSB) |
| 2nd page(X=1) | Line 8→ | 1 | 1 | 1 | 1 | 0 | 0 | ...... | 0 | 1 | 1 | 1 | 0 | 0 | ←DB0(LSB) |
| | Line 9→ | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 0 | 1 | 0 | 0 | 1 | 0 | ←DB1 |
| | Line 10→ | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 0 | 1 | 0 | 0 | 1 | 0 | ←DB2 |
| | | 1 | 1 | 1 | 1 | 0 | 0 | ...... | 1 | 1 | 1 | 0 | 1 | 0 | ←DB3 |
| | | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 0 | 1 | 0 | 0 | 1 | 0 | ←DB4 |
| | | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 0 | 1 | 0 | 0 | 1 | 0 | ←DB5 |
| | | 1 | 1 | 1 | 1 | 0 | 0 | ...... | 0 | 1 | 1 | 1 | 0 | 0 | ←DB6 |
| | Line 15→ | 0 | 0 | 0 | 0 | 0 | 0 | ...... | 0 | 0 | 0 | 0 | 0 | 0 | ←DB7(MSB) |
| | ⋮ | | | | | | | ...... | | | | | | | |
| 8th page(X=7) | Line 56→ | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 0 | 0 | 0 | 0 | 0 | 0 | ←DB0(LSB) |
| | | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 0 | 0 | 0 | 0 | 0 | 0 | ←DB1 |
| | | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 0 | 1 | 0 | 0 | 1 | 0 | ←DB2 |
| | | 1 | 1 | 1 | 1 | 1 | 0 | ...... | 1 | 0 | 1 | 0 | 1 | 0 | ←DB3 |
| | | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 1 | 0 | 0 | 1 | 0 | 0 | ←DB4 |
| | | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 1 | 0 | 0 | 1 | 0 | 0 | ←DB5 |
| | Line 62→ | 1 | 0 | 0 | 0 | 1 | 0 | ...... | 0 | 1 | 1 | 0 | 1 | 0 | ←DB6 |
| | Line 63→ | 0 | 0 | 0 | 0 | 0 | 0 | ...... | | | | | | | ←DB7(MSB) |

13. 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 latch-up 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: $1x10^8$ 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: $1x10^8$ 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 ± 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.

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