Display Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 240064D FGH

Product Specification   **Ver.: 0**

16.03.2010

DOCUMENT REVISION HISTORY

Version	DATE	DESCRIPTION	CHANGED BY
0	16.03.2011	First Issue	MH

CONTENTS

1. FUNCTIONS & FEATURES

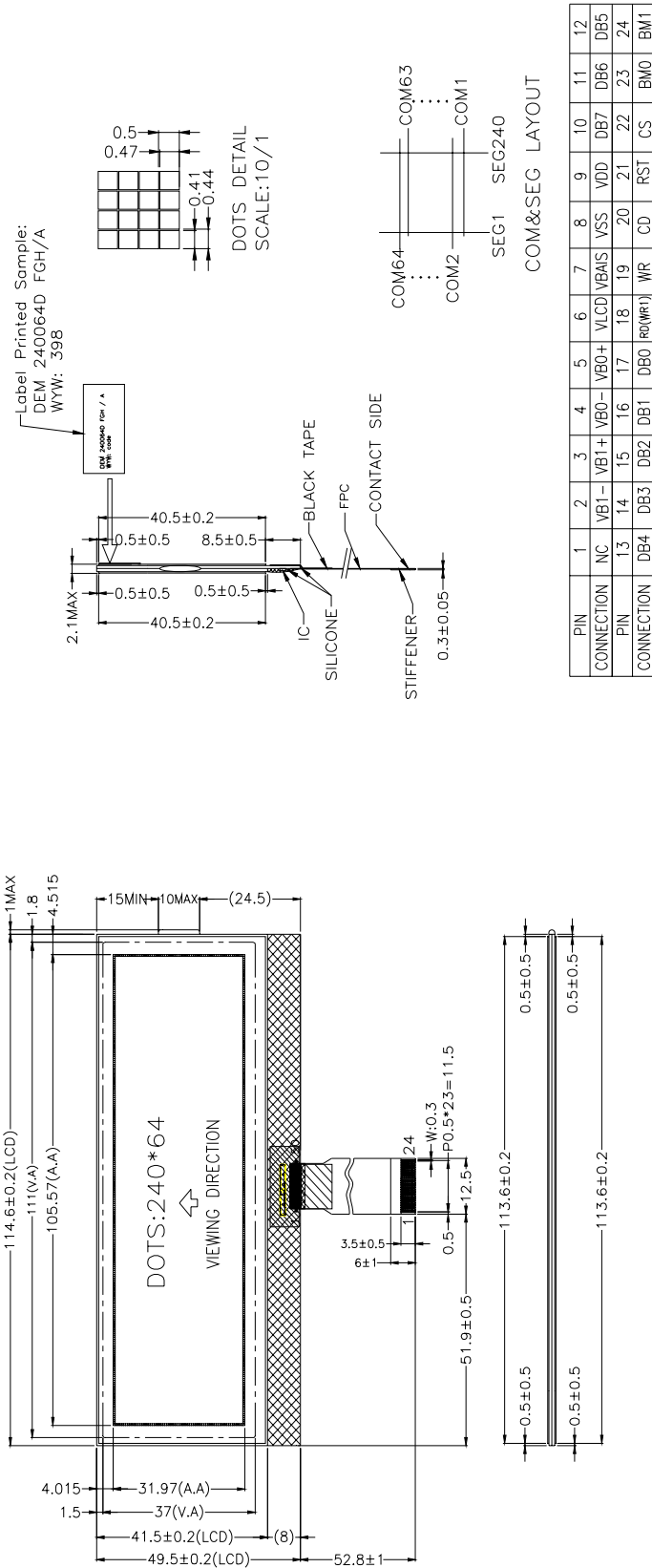|	
Display Format	: 240 x 64 Dots
LCD Mode	: FSTN, Reflective, Positive
Viewing Direction	: 6:00
Driving Scheme	: 1/96 Duty, 1/10 Bias
Power Operation	: 3.3 Volt (typ.)
V_{LCD} Adjustable for Best Contrast	: 14.1 Volt (typ.)
Operation Temperature	: -20°C to +70°C
Storage Temperature	: -30°C to +80°C
Backlight	: None

2. MECHANICAL SPECIFICATIONS

Module Size	: 114.60 x 49.50 x 2.1mm
Viewing Area	: 111.00 x 37.00 mm
Dot Pitch	: 0.44 x 0.52 mm
Dot Size	: 0.41 x 0.47 mm

3. BLOCK DIAGRAM
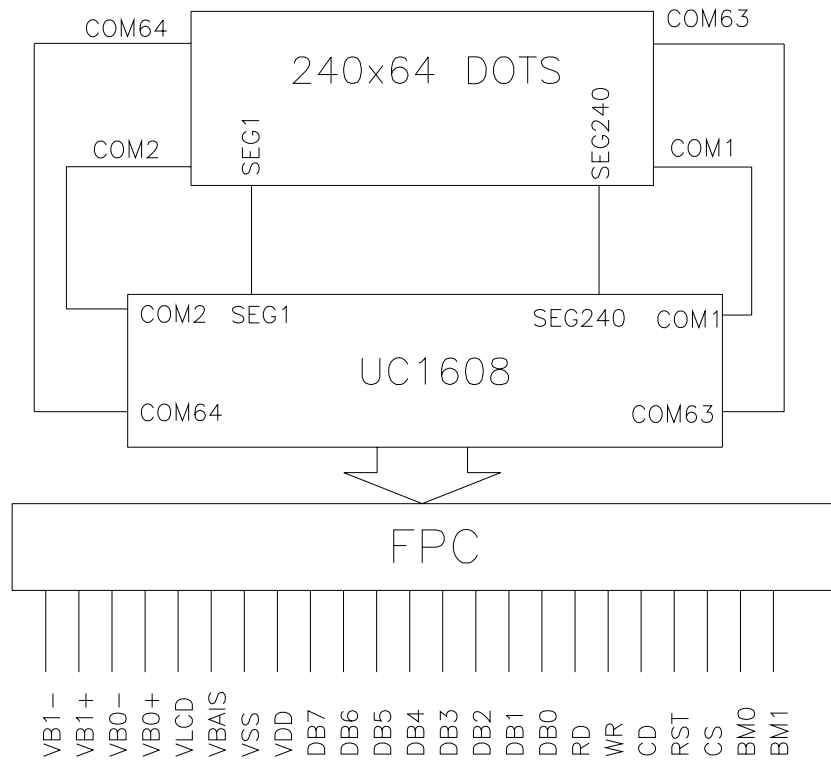
4. DIMENSIONAL OUTLINE

5. PIN DESCRIPTION

No.	Symbol	Function
1	NC	No connection
2	VB1-	
3	VB1+	LCD Bias Voltages.
4	VB0-	
5	VB0+	
6	VLCD	Main LCD Power Supply.
7	VBAIS	This is the reference voltage to generate the actual SEG driving voltage
8	VSS	Ground(0V)
9	VDD	Power supply for logic (+3.3V)
10~17	DB7~DB0	Bi-directional bus for both serial and parallel host interfaces.
18	RD(WR1)	WR[1:0] controls the read/write operation of the host interface.
19	WR	
20	CD	Select Command or Display Data for read/write operation. ”L”: Command ”H”: Display data
21	RST	Reset input pin
22	CS	Chip Select. The chip is selected when CS=”H”.
23	BM0	Parallel/Serial. 4-bit bus modes: “LL”: 8080 “LH”: 6800
24	BM1	8-bit bus modes: “HL”: 8080 “HH”: 6800

6. MAXIMUM ABSOUTE LIMIT

Maximum Ratings (Voltage Reference to VSS)

Item	Symbol	MIN	MAX	Unit
Supply Voltage for Logic	V_{DD}	-0.3	4.0	V
Supply Voltage for LCD	V0	0.3	17.0	V
Input Voltage	Vin	-0.4	$V_{DD}+0.5$	V
Operating Temperature	Top	-20	70	°C
Storage Temperature	Tst	-30	80	°C

7. ELECTRICAL CHARACTERISTICS

DC Electrical Characteristics(continued)(VDD=3.3V,GND=0V,T_A=25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	V_{DD}-V_{SS}	Ta = 25°C	2.8	3.3	3.6	V
Input High Voltage	V_{IH}	Ta = 25°C	V_{DD}-2.5	---	V_{DD}	V
Input Low Voltage	V_{IL}	Ta = 25°C	0	---	0.8	V
Output High Voltage	V_{OH}	Ta = 25°C	V_{DD}-0.3	---	V_{DD}	V
Output Low Voltage	V_{OL}	Ta = 25°C	0	---	0.3	V
Supply Current	I_{DD}	Ta = 25°C	---	---	2	mA

8.TIMING CHARACTERISTICS
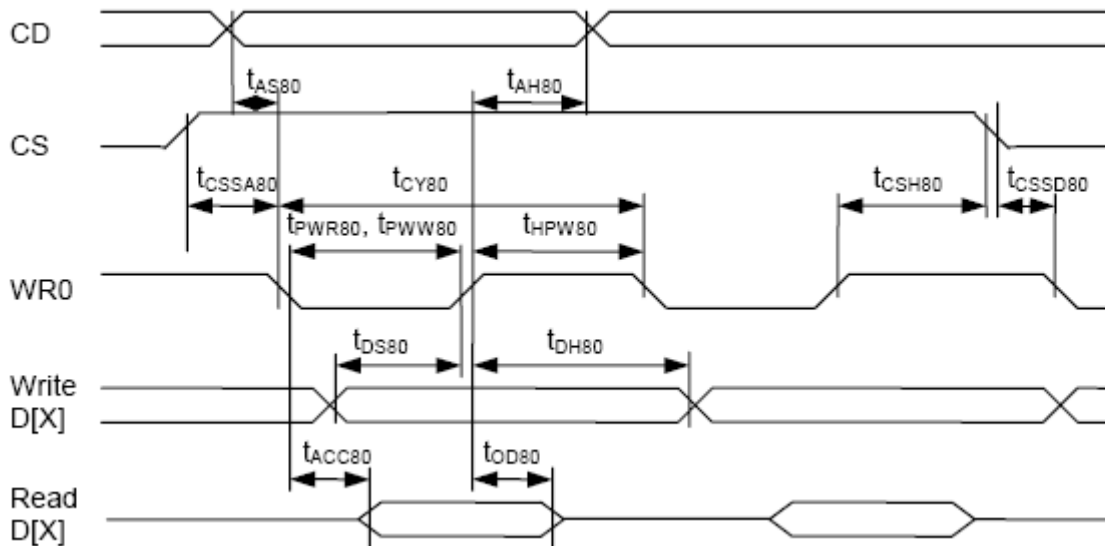
Parallel Bus Timing Characteristics (for 8080 MCU)

(VDD=2.4V to 3.3V, Ta= −20 to +70 ̆C)

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{AS80} t_{AH80}	CD	Address setup time Address hold time		0 10	– 	ns

t_{CY80}		System cycle time
		  8 bits bus (read)
		                  (write)
		  4 bits bus (read)
		                  (write)
				
				140
				140
				80
				80
					–
					
						ns

t_{PWR80}	WR1	Pulse width 8 bits (read) 4 bits		65 35	– 	ns
t_{PWW80}	WR0	Pulse width 8 bits (write) 4 bits		65 35	– 	ns

t_{HPW80}	WR0, WR1	High pulse width
		  8 bits bus (read)
		                  (write)
		  4 bits bus (read)
		                  (write)
				
				65
				65
				35
				35
					–
					
						ns

t_{DS80} t_{DH80}	D0~D7	Data setup time Data hold time		30 10	– 	ns
t_{ACC80} t_{OD80}		Read access time Output disable time	C_L = 100pF	– 10	50 50	ns
t_{CSSA80} t_{CSSD80} t_{CSH80}	CS	Chip select setup time		10 10 20		ns

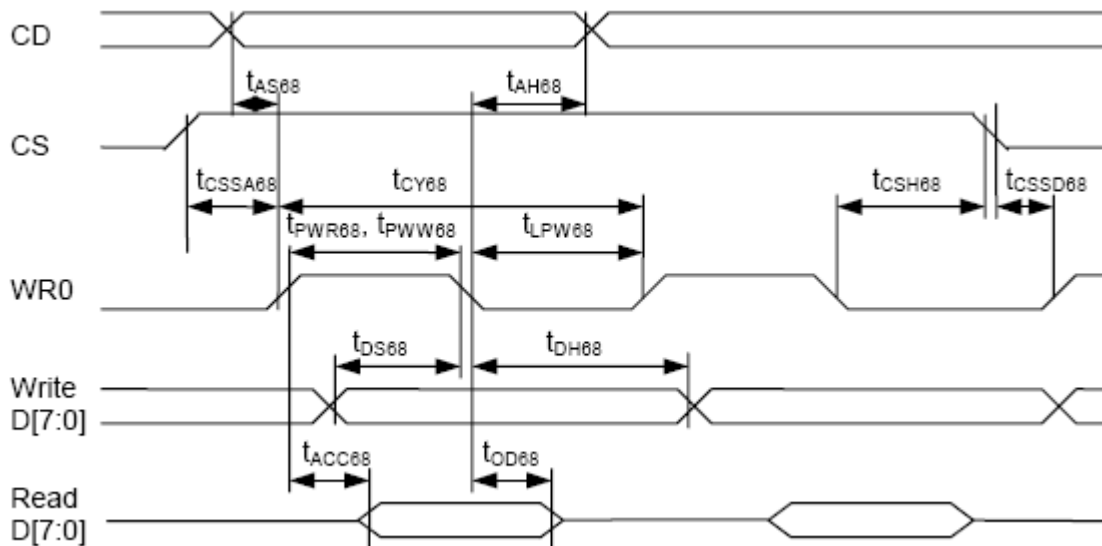**High-Voltage Mixed-Signal IC**

Parallel Bus Timing Characteristics (for 6800 MCU)

(VDD=2.4V to 3.3V, Ta= −20 to +70 °C)

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{AS68} t_{AH68}	CD	Address setup time Address hold time		0 10	–	ns

t_{CY68}		System cycle time
		  8 bits bus (read)
		              (write)
		  4 bits bus (read)
		              (write)
				
				140
				140
				80
				80
					–	ns

t_{PWR68}	WR1	Pulse width 8 bits (read) 4 bits		65 35	–	ns
t_{PWW68}		Pulse width 8 bits (write) 4 bits		65 35	–	ns

t_{LPW68}		Low pulse width
		  8 bits bus (read)
		              (write)
		  4 bits bus (read)
		              (write)
				
				65
				65
				35
				35
					–	ns

t_{DS68} t_{DH68}	D0~D7	Data setup time Data hold time		30 10	–	ns
t_{ACC68} t_{OD68}		Read access time Output disable time	C_L = 100pF	– 10	50 50	ns
T_{CSSA68} T_{CSSD68} T_{CSH68}	CS	Chip select setup time		10 10 20		ns

9. Reset Timing
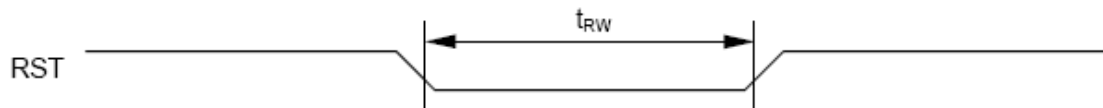
(VDD=2.4V to 3.3V, Ta= −20 to +70 °C)

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{RW}	RST	Reset low pulse width		1000	–	ns

10. CONTROL AND DISPLAY INSTRUCTION

The following is a list of host commands supported by UC1608

C/D: 0: Control,   1: Data
W/R: 0: Write Cycle,   1: Read Cycle
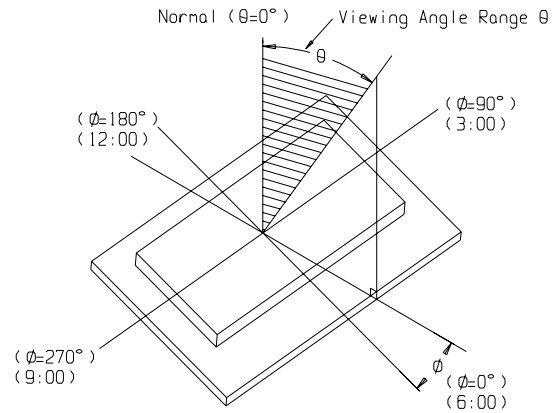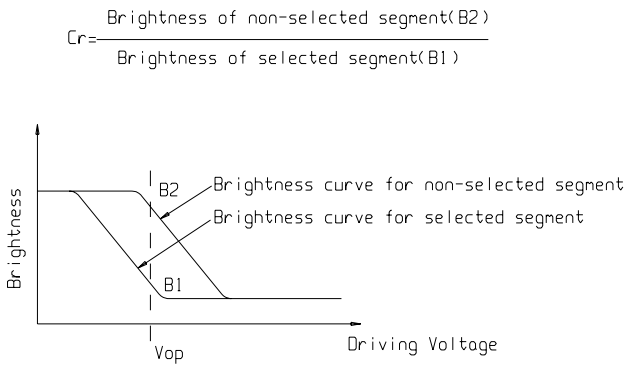
\# Useful Data bits
– Don't Care

	Command	C/D	W/R	D7	D6	D5	D4	D3	D2	D1	D0	Action	Default value
1	Write Data Byte	1	0	#	#	#	#	#	#	#	#	Write 1 byte	N/A
2	Read Data Byte	1	1	#	#	#	#	#	#	#	#	Read 1 byte	N/A
3	Get Status	0	1	BZ	MX	DE	RS	WA	GN1	GN0	1	Get Status	N/A
4	Set Column Address LSB	0	0	0	0	0	0	#	#	#	#	Set CA[3:0]	0
	Set Column Address MSB	0	0	0	0	0	1	#	#	#	#	Set CA[7:4]	0
5	Set Mux Rate and temperature compensation.	0	0	0	0	1	0	0	#	#	#	Set {MR, TC[1:0]}	MR: 1 TC: 0
6	Set Power Control	0	0	0	0	1	0	1	#	#	#	Set PC[2:0]	111b
7	Set Adv. Product Config. (double byte command)	0	0	0	0	1	1	0	0	0	R	For UltraChip only. Do not use.	N/A
		0	0	#	#	#	#	#	#	#	#		
8	Set Start Line	0	0	0	1	#	#	#	#	#	#	Set SL[5:0]	0
9	Set Gain and Potentiometer (double-byte command)	0	0	1	0	0	0	0	0	0	1	Set {GN[1:0], PM[5:0]}	GN=3 PM=0
		0	0	#	#	#	#	#	#	#	#		
10	Set RAM Address Control	0	0	1	0	0	0	1	#	#	#	Set AC[2:0]	000b
11	Set All-Pixel-ON	0	0	1	0	1	0	0	1	0	#	Set DC[1]	0=disable
12	Set Inverse Display	0	0	1	0	1	0	0	1	1	#	Set DC[0]	0=disable
13	Set Display Enable	0	0	1	0	1	0	1	1	1	#	Set DC[2]	0=disable
14	Set Page Address	0	0	1	0	1	1	#	#	#	#	Set PA[3:0]	0
15	Set LCD Mapping Control	0	0	1	1	0	0	#	#	#	#	Set LC[3:0]	0
16	System Reset	0	0	1	1	1	0	0	0	1	0	System Reset	N/A
17	NOP	0	0	1	1	1	0	0	0	1	1	No operation	N/A
18	Set LCD Bias Ratio	0	0	1	1	1	0	1	0	#	#	Set BR[1:0]	10b=12
19	Reset Cursor Mode	0	0	1	1	1	0	1	1	1	0	AC[3]=0, CA=CR	N/A
20	Set Cursor Mode	0	0	1	1	1	0	1	1	1	1	AC[3]=1, CR=CA	N/A
21	Set Test Control (double byte command)	0	0	1	1	1	0	0	1	TT		For UltraChip only. Do not use.	N/A
		0	0	#	#	#	#	#	#	#	#		

* Other than commands listed above, all other bit patterns may result in undefined behavior.

11. ELECTRO-OPTICAL CHARACTERISTICS

(V_{DD} = 3.3V, Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage for LCD	Vop	Ta = -20°C	14.2	14.5	14.7	V
		Ta = 25°C	13.8	14.1	14.4	
		Ta = 70°C	13.4	13.7	14.0	
Response time	Tr	Ta = 25°C	---	250	500	ms
	Tf		---	300	600	ms
Contrast	Cr	Ta = 25°C	---	12	---	---
Viewing angle range	θ	Cr≥ 2	-35	---	+35	deg
	Φ		-35	---	+40	deg

$$Cr = \frac{Brightness\ of\ non-selected\ segment(B2)}{Brightness\ of\ selected\ segment(B1)}$$

12. PRECAUTION FOR USING LCD/LCM

After reliability test, recovery time should be 24 hours minimum. Moreover, functions, performance

and appearance shall be free from remarkable deterioration within 50,000 hours（average）under

ordinary operating and storage conditions room temperature (20±8°C), normal humidity (below 65%

RH), and in the area not exposed to direct sun light. Using LCM beyond these conditions will

shorten the life time. Precaution for using LCD/LCM

LCD/LCM is assembled and adjusted with a high degree of precision. Do not attempt to make any

alteration or modification. The followings should be noted.

General Precautions:

- LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
- The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isoproply alcohol, ethyl alcohol or trichlorotriflorothane, do not use water, ketone or aromatics and never scrub hard.
- Do not tamper in any way with the tabs on the metal frame.
- Do not make any modification on the PCB without consulting DISPLAY.
- When mounting a LCM, make 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.
- Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.
- Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal adheres to skin or clothes, wash it off immediately with soap and water.

Static Electricity Precautions:

- CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.
- Do not 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.
- Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
- The modules should be kept in anti-static bags or other containers resistant to static for storage.
- Only properly grounded soldering irons should be used.
- If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
- The normal static prevention measures should be observed for work clothes and working benches.
- Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

Soldering Precautions:

- Soldering should be performed only on the I/O terminals.
- Use soldering irons with proper grounding and no leakage.
- Soldering temperature: 350°C$\pm$10°C
- Soldering time: 3 to 4 second.
- Use eutectic solder with resin flux filling.
- If flux is used, the LCD surface should be protected to avoid spattering flux.
- Flux residue should be removed.

Operation Precautions:

- The viewing angle can be adjusted by varying the LCD driving voltage Vo.
- Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
- Driving voltage should be kept within specified range; excess voltage will shorten display life.
- Response time increases with decrease in temperature.
- Display color may be affected at temperatures above its operational range.
- Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
- For long-term storage over 40°C is required, the relative humidity should be kept below 60% and avoid direct sunlight.

Limited Warranty

DISPLAY LCDs and modules are not consumer products, but may be incorporated by DISPLAY's customers into consumer products or components thereof, DISPLAY does not warrant that its LCDs and components are fit for any such particular purpose.

- The liability of DISPLAY is limited to repair or replacement on the terms set forth below. DISPLAY will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between DISPLAY and the customer, DISPLAY will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with DISPLAY general LCD inspection standard . (Copies available on request)
- No warranty can be granted if any of the precautions state in handling liquid crystal display above has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.
- In returning the LCD/LCM, they must be properly packaged; there should be detailed description of the failures or defect.