

Display Elektronik GmbH

# DATA SHEET

## LCD MODULE

### **DEM 640480A TMH-PW-N**

5,7“ Colour-TFT  
with 8-Bit-Interface

Product Specification

Ver.: 1

04/10/2010

Version	DATE	DESCRIPTION	CHANGED BY
0	25.Oct.2009	First Issue	MH
0.1	08.03.2010	Update	MH
1	04.10.2010	Correct Supply Current for Backlight	MH

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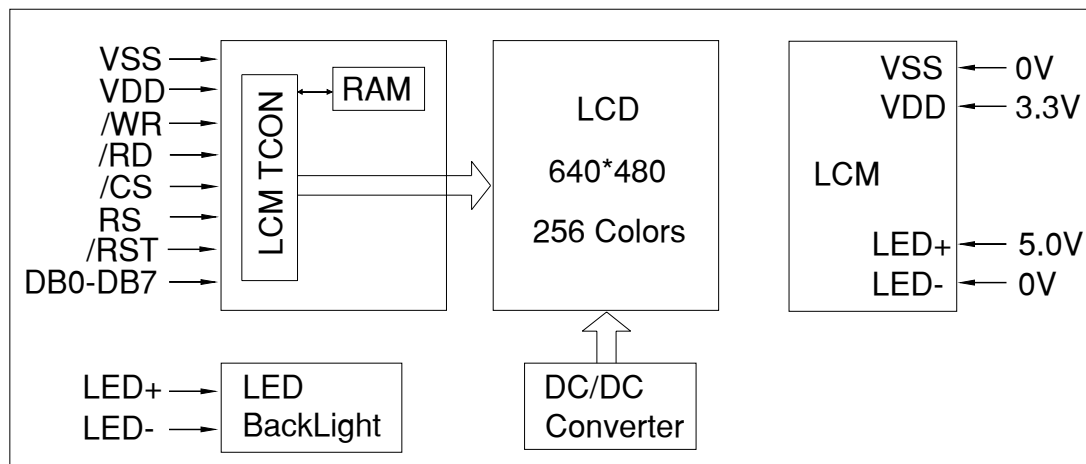
## **1. Functions & Features**

Display Format	: 5,7"-TFT, 640 x RGB x 480 Dots
LCD mode	: TFT, Normally White, Transmissive
Viewing Direction	: 6 o'clock
Display Color	: 256 Colors (Industrial)
Operation Temperature	: -20°C to +70°C
Storage Temperature	: -30°C to +80°C
Power Supply Voltage (V <sub>DD</sub> )	: 3.3 Volt (typ.)
LED Power Voltage	: 5.0 Volt (typ.)
Backlight	: LED, White
LCM Contrast Ratio	: 500:1
LCM Brightness	: 200 Nits
Interface	: 8080, 8-Bit-Parallel
Integrated RAM	: min. 1024k RAM

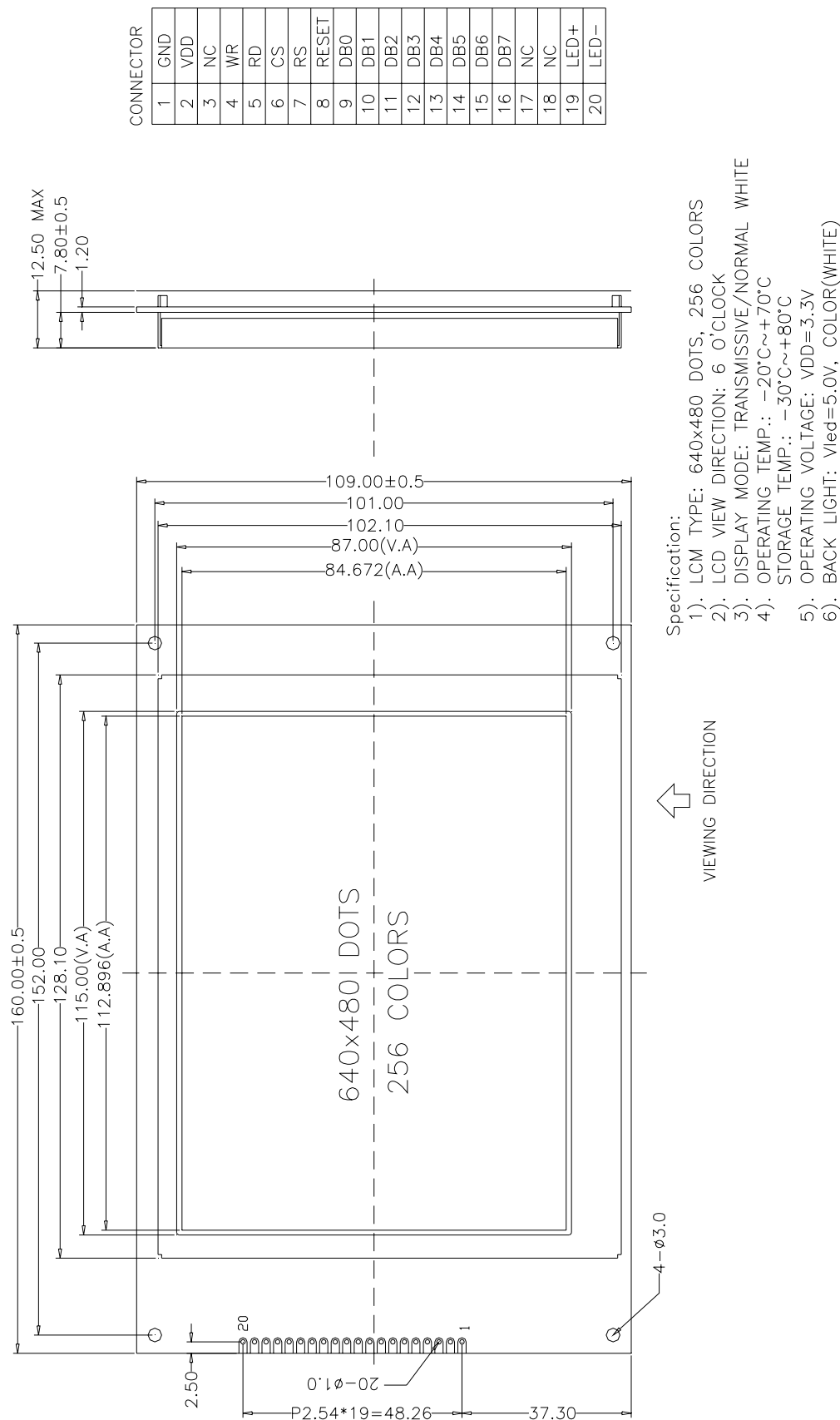
## **2. MECHANICAL SPECIFICATIONS**

Module Size	: 160.00 x 109.00 x 12.5 mm (max.)
Viewing Area	: 115.00 x 87.00 mm
Active Area	: 112.896 x 84.672 mm
Dot Pitch	: 0.0588 x 0.1764 mm

## **3. BLOCK DIAGRAM**



4. DIMENSIONAL OUTLINE



## 5. PIN DESCRIPTION

No.	Symbol	Function
1	VSS	GND
2	VDD	Logic supply voltage (+3.3V)
3	NC	No connection
4	/WR	Write signal
5	/RD	Read signal
6	/CS	Chip enable signal
7	RS	Register selection (H:Data register, L:Instruction register)
8	/RST	Reset signal (L)
9-16	DB0~DB7	Data bus line
17	NC	No connection
18	NC	No connection
19	LED+	Power supply for backlight(+5.0V)
20	LED-	Power supply for backlight(0V)

## 6. MAXIMUM ABSOLUTE LIMIT

Item	Symbol	MIN	MAX	Unit
Supply Voltage for Logic	$V_{DD}$	-0.3	7.0	V
Input Voltage	$V_{in}$	-0.3	$V_{DD}+0.3$	V
Supply Current ( Without Backlight )	$I_{DD}(Ta = 25^{\circ}C)$		240	mA
Supply Current for Backlight	$I_F(Ta = 25^{\circ}C)$	---	380	mA
Reverse Voltage for Backlight	$V_R(Ta = 25^{\circ}C)$	---	5.5	V
Operating Temperature	$T_{op}$	-20	70	$^{\circ}C$
Storage Temperature	$T_{st}$	-30	80	$^{\circ}C$

## 7. ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	$V_{DD}-V_{SS}$	$Ta = 25^{\circ}C$	3.1	3.3	3.5	V
Input High Voltage	$V_{IH}$	$Ta = 25^{\circ}C$	$0.8V_{DD}$	---	$V_{DD}$	V
Input Low Voltage	$V_{IL}$	$Ta = 25^{\circ}C$	0	---	$0.2V_{DD}$	V
Output High Voltage	$V_{OH}$	$Ta = 25^{\circ}C$	$0.8V_{DD}$	---	$V_{DD}$	V
Output Low Voltage	$V_{OL}$		0	---	$0.2V_{DD}$	V
Supply Current ( Without Backlight )	$I_{DD}$	$Ta = 25^{\circ}C$	--	200	240	mA

## 8. BACKLIGHT CHARACTERISTICS

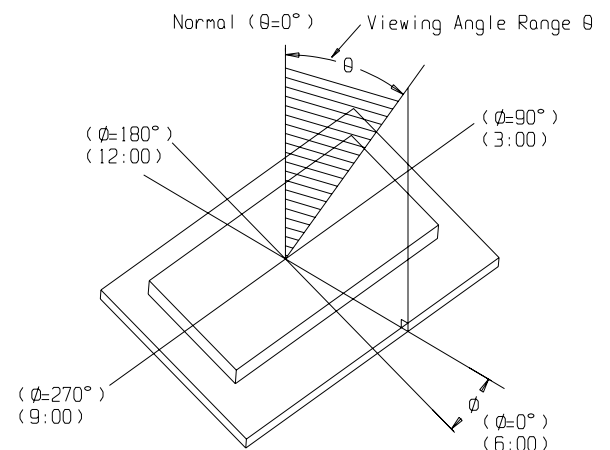
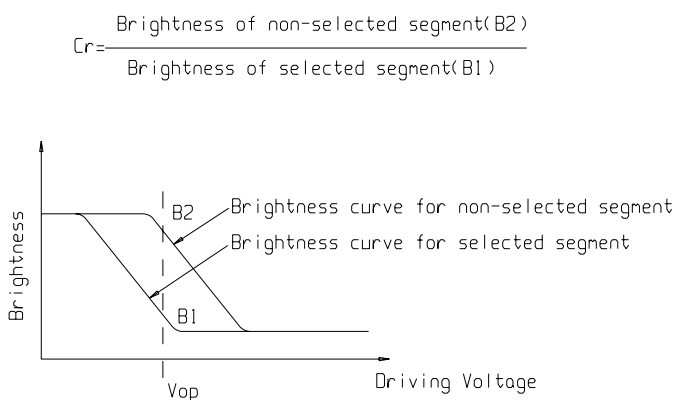
Ta = 25°C

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	Vled=5.0V	4.8	5.0	5.2	V
Reverse Current	IR	Vled=5.0V	---	135	---	mA
Luminous Intensity (With LCD dots off)	IV	Vled=5.0V	150	200	---	Cd/m <sup>2</sup>
LED Backlight Color	White					

## 9. ELECTRO-OPTICAL CHARACTERISTICS

( V<sub>DD</sub>=3.3V, Vled=5.0V, Ta = 25°C )

Item	Symbol	Condition	Min	Typ	Max	Unit
Viewing angle (CR≥10)	θ <sub>L</sub>	Φ=180°(9 o'clock)	60	70	---	degree
	θ <sub>R</sub>	Φ=0°(3 o'clock)	60	70	---	
	θ <sub>T</sub>	Φ=90°(12 o'clock)	40	50	---	
	θ <sub>B</sub>	Φ=270°(6 o'clock)	60	70	---	
Response time	T <sub>on</sub>	Normal θ=Φ=0°	---	10	20	ms
	T <sub>off</sub>		---	15	30	ms
Contrast ratio	Cr		450	500	---	---
Luminance	L1		150	200		Cd/m2



## 10. TIMING CHARACTERISTICS

### 10.1 Interface Timing

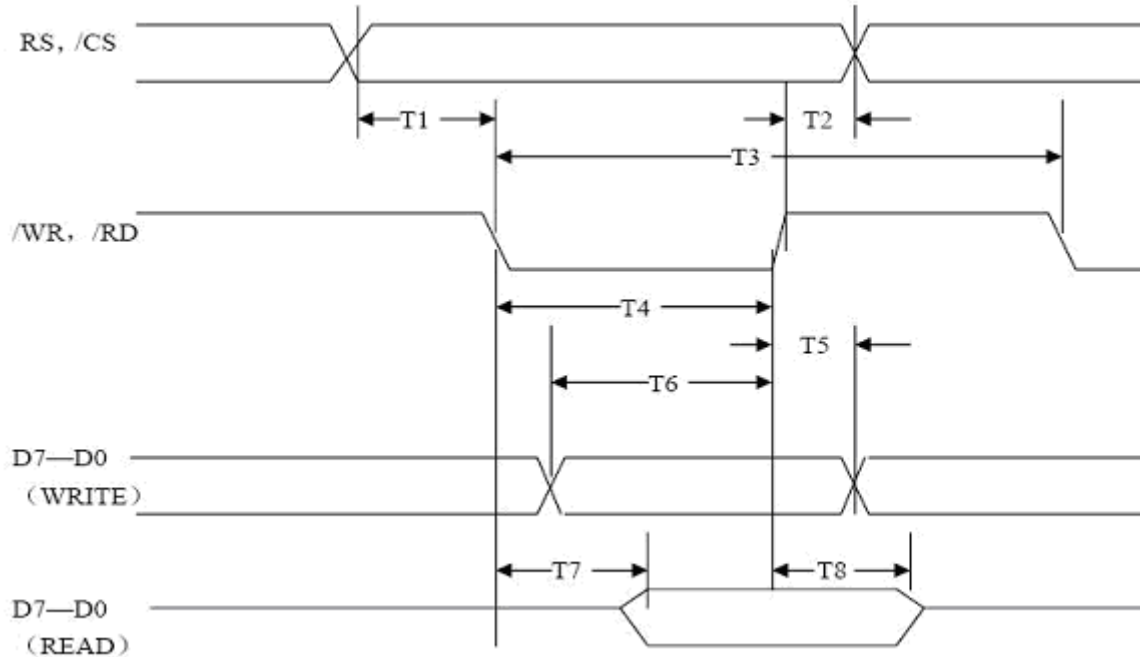


Figure 4. 8080 family Interface Timing

### 10.2 MCU Interface

Signal	Symbol	Parameter	VDD=3.1-3.5V		Unit	Condition
			Min	Max		
RS,/CS	T2	Address hold time	10	-	ns	CL=100pF
	T1	Address setup time	0	-	ns	
/WR,/RD	T3	System cycle time	350	-	ns	
	T4	Strobe pulsewidth	180	-	ns	
D0-D7	T5	Data hold time	80	-	ns	
	T6	Data setup time	120	-	ns	
	T7	/RD Access time	-	50	ns	
	T8	Output disable time	10	50	ns	

### 10.3 Power Sequence

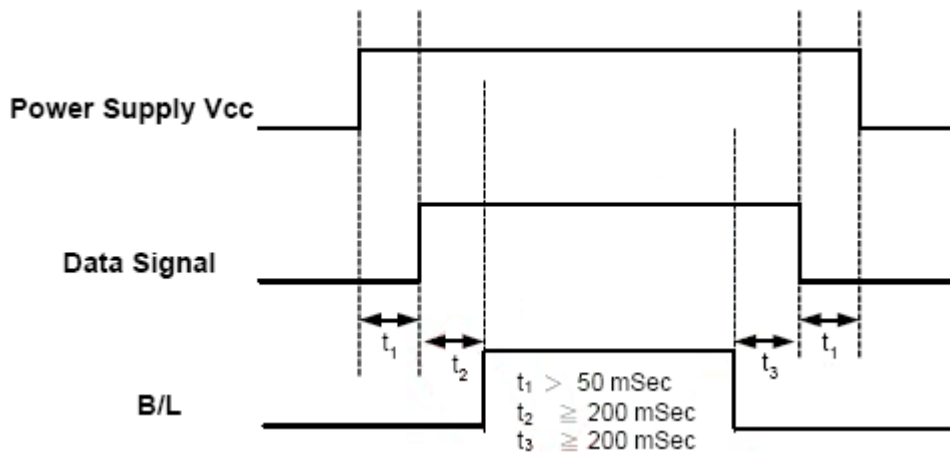


Figure 5. Power Sequence

## 11. CONTROL AND DISPLAY INSTRUCTION

### 11.1 Instruction

/CS	RS	/WR	/RD	DB0~DB7
H	H/L	H/L	H/L	Command non-active
L	L	L	H	Write display data
L	H	L	H	Write Address(X,Y) X_Address: 0~ 639 Y_Address: 0~480
L	L	H	L	Command non-active
L	H	H	L	Read display data

Example:

```
wcomd(0x00); wcomd(0x00); wcomd(0x00); wcomd(0x00); wdata(0xe0);
```

X-Address(H), X-Address(L), Y-Address(H), Y-Address(L), Display data

Continuum write display data, Address is increased by 1 automatically.

### 11.2 Display Data format( 256 Colors)

DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
R2	R1	R0	G2	G1	G0	B1	B0
MSB		LSB	MSB		LSB	MSB	
RED (000~111)			GREEN(000~111)			BLUE(00~11)	

**11.3 Software Example**

```
#include <reg51.h>
#define uint unsigned int
#define uchar unsigned char

sbit WWR = P3^2;
sbit RDD = P3^3;
sbit CS = P3^4;
sbit RS = P3^5;
sbit RST = P3^7;

uint xx1=0;
uint xx2=0;
uint yy1=0;
uint yy2=0;
//-----
void delayms(uint ms)
{
    while(ms)
    { ms--;}
}
//-----
void delay(uint ss)
{
    uint mm;
    while(ss-->0)
        for(mm=0;mm<1000;mm++) { }
}
//-----
void wcomd(uchar ch)
{
    CS=0;
    RDD=1;
    RS=0;
    P1=ch;
    WWR=0;
    WWR=1;
    CS=1;
}
//-----
void wdata(uchar ch)
{
    CS=0;
    RDD=1;
    RS=1;
    P1=ch;
```

```
WWR=0;
WWR=1;
CS=1;
}
//-----
void waddr(uint xxdat,uint yydat)
{
    xx1=xxdat/256;
    xx2=xxdat%256;
    yy1=yydat/256;
    yy2=yydat%256;
    wcomd(xx1);
    wcomd(xx2);
    wcomd(yy1);
    wcomd(yy2);
}
//-----
void disp_all(uchar xsdat)
{
    uint j,k;
    waddr(0x00,0x00);
    for(k=0;k<480;k++)
    {
        for(j=0;j<640;j++)
        { wdata(xsdat);}
    }
}
//=====
////////// MAIN //////////
//=====
void main(void)
{
    uint i,j,k;
    RST=0;delay(50);RST=1;delay(20);
    while(1)
    {
        disp_all(0xff); delay(200); //white
        disp_all(0x00); delay(200); //black
        disp_all(0xe0); delay(200); //red
        disp_all(0x1c); delay(200); //green
        disp_all(0x03); delay(200); //blue
        disp_all(0xfc); delay(200); //yellow
    }
}
```

## **12. 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:**

1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
2. 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 isopropyl alcohol, ethyl alcohol or trichlorotrifluoroethane, do not use water, ketone or aromatics and never scrub hard.
3. Do not tamper in any way with the tabs on the metal frame.
4. Do not make any modification on the PCB without consulting DISPLAY.
5. 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.
6. 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.
7. 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:**

1. CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.
2. 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.
3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
4. The modules should be kept in anti-static bags or other containers resistant to static for storage.
5. Only properly grounded soldering irons should be used.
6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
7. The normal static prevention measures should be observed for work clothes and working benches.
8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

**Soldering Precautions:**

1. Soldering should be performed only on the I/O terminals.
2. Use soldering irons with proper grounding and no leakage.
3. Soldering temperature:  $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$
4. Soldering time: 3 to 4 second.
5. Use eutectic solder with resin flux filling.
6. If flux is used, the LCD surface should be protected to avoid spattering flux.
7. Flux residue should be removed.

**Operation Precautions:**

1. The viewing angle can be adjusted by varying the LCD driving voltage  $V_o$ .
2. 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.
3. Driving voltage should be kept within specified range; excess voltage will shorten display life.
4. Response time increases with decrease in temperature.
5. Display color may be affected at temperatures above its operational range.
6. Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
7. For long-term storage over  $40^{\circ}\text{C}$  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.

1. 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)
2. 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.
3. In returning the LCD/LCM, they must be properly packaged; there should be detailed description of the failures or defect.

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