LCD Module Technical Specification

Type No. **T-55562D090J-LW-A-AAN**

Customer   :

Customer's Product No   :

OPTREX CORPORATION

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APPROVED

By _____

Signature :

Date :

Please return this specification within two month with your signature.
If not returned within two month ,specification will be considered
as having been accepted.

CONTENTS

Revision History

Rev.	Date	Page	Comment

1. APPLICATION

This specification applies to color TFT-LCD module, T-55562D090J-LW-A-AAN.

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OPTREX classifies the usage of the TFT-LCD module as follows. Please confirm the usage before using the product.

(1) Standard Usage

Computers, office equipment, factory automation equipment, test and measurement equipment, communications, transportation equipment(automobiles, ships, trains, etc.), provided, however, that operation is not influenced by TFT-LCD directly.

(2) Special Usage

Medical equipment, safety equipment, transportation equipment, provided, however, that TFT-LCD is necessary to its operation.

(3) Specific Usage

Cockpit Equipment, military systems, aerospace equipment, nuclear reactor control systems, life support systems and any other equipment. OPTREX should make a contract that stipulate apportionment of responsibilities between OPTREX and our customer.

The product specified in this document is designed for "Standard Usage" unless otherwise specified in this document. If customers intend to use the product for applications other than those specified for "Standard Usage", they should first contact OPTREX sales representative for it's intended use in writing.

OPTREX has been making continuous effort to improve the reliability of its products. Customers should implement sufficient reliability design of their application equipments such as redundant system design, fail-safe functions, anti-failure features.

OPTREX assumes no responsibility for any damage resulting from the use of the product that does not comply with the instructions and the precautions specified in this document.

Please contact and consult OPTREX sales representative for any questions regarding this product.

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2. OVERVIEW

T-55562D090J-LW-A-AAN is 9.0" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit, and backlight unit.

By applying 6 bit or 8 bit digital data, 800 × 480, 262k-color or 16.7M-color images are displayed on the 9.0" diagonal screen. Input power voltage is 3.3V for LCD driving.

The type of data and control signals are digital and transmitted via LVDS interface per Typ. 30.4 MHz clock cycle.

Driver circuit for LED backlight is not included in this module. General specifications are summarized in the following table:

ITEM	SPECIFICATION
Display Area (mm)	196.8 (H) × 118.08 (V) (9.0-inch diagonal)
Number of Dots	800 × 3 (H) × 480 (V)
Pixel Pitch (mm)	0.246 (H) × 0.246 (V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white TN
Number of Color	262k(6 bit/color), 16.7M(8 bit/color)
Luminance (cd/m^2)	800
Wide Viewing Angle Technology	Optical Compensation Film
Viewing Angle (CR ≥ 10)	–80~80°(H), –60~80°(V)
Surface Treatment	Anti-glare and hard-coating 3H
Electrical Interface	LVDS (6 bit/8 bit)
Optimum Viewing Angle(Contrast ratio)	6 o'clock
Module Size (mm)	219.0 (W) × 136.2 (H) × 9.5 (D)
Module Mass (g)	340
Backlight Unit	LED, edge-light, replaceable

Characteristic value without any note is typical value.

3. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX	UNIT
Power Supply Voltage for LCD	VCC	0	4.0	V
Logic Input Voltage	VI	−0.3	VCC+0.3	V
Backlight (LED) Current	IF	0	180	mA
Operation Temperature (Panel) Note 1,2)	$T_{op(Panel)}$	−30	80	°C
Operation Temperature (Ambient) Note 2)	$T_{op(Ambient)}$	−30	80	°C
Storage Temperature Note 2)	T_{stg}	−30	80	°C

[Note]
1) Measured at the center of active area and at the center of panel back surface
2) Top,Tstg ≤ 40°C : 90%RH max. without condensation
   Top,Tstg > 40°C : Absolute humidity shall be less than the value of 90%RH at 40°C without condensation.

4. ELECTRICAL CHARACTERISTICS
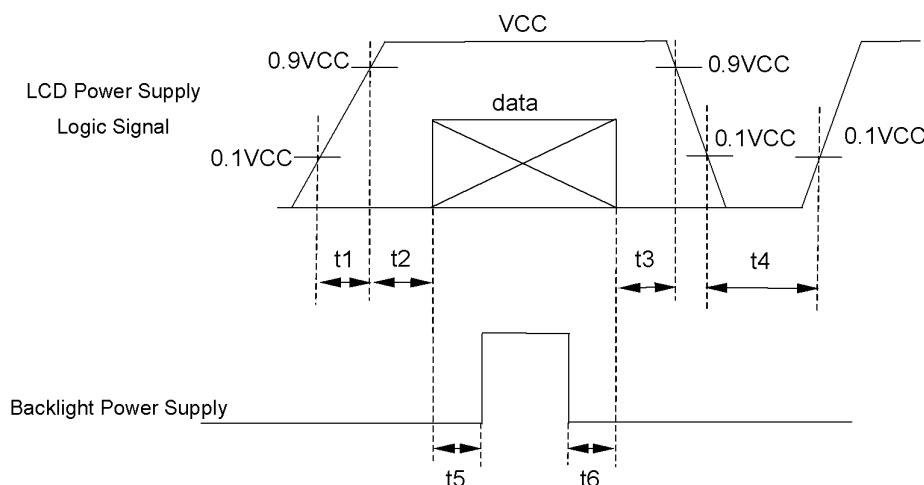
(1) TFT-LCD

Ambient temperature: Ta =25°C

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	Remarks
Power Supply Voltages for LCD		VCC	3.0	3.3	3.6	V	*1)
Power Supply Currents for LCD		ICC	--	340	500	mA	*2)
Permissive Input Ripple Voltage		VRP	--	--	100	mVp-p	VCC = +3.3V
Logic Input Voltage	High	VIH	0.8×VCC	--	VCC	V	MODE, SC
	Low	VIL	0	--	0.2×VCC	V	MODE, SC

*1) Power and signals sequence:

t1 ≤ 10 ms   200 ms ≤ t4
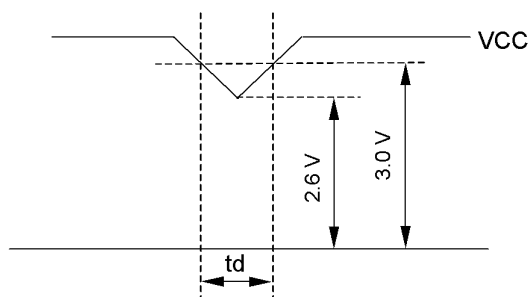0 < t2 ≤ 50 ms   200 ms ≤ t5
0 < t3 ≤ 50 ms   0 ≤ t6

data: RGB DATA, DCLK, DENA, MODE, SC

VCC-dip conditions:
        1) When $2.6\ V \leq VCC < 3.0\ V$, $td \leq 10\ ms$
        2) When $VCC < 2.6\ V$
            VCC-dip conditions should also follow the power and signals sequence.

*2) VCC = +3.3 V , f_H=31.7 kHz, f_V=60 Hz, f_{CLK}=30.4 MHz
    Display image at typical power supply current value is 256-gray-bar pattern (8 bit), 480 line mode.

*3) Fuse

Parameter	Fuse Type Name	Supplier	Remark
VCC	FCC16162AB	Kamaya Electric Co., Ltd.	*)

  *) The power supply capacity should be designed to be more than the fusing current.
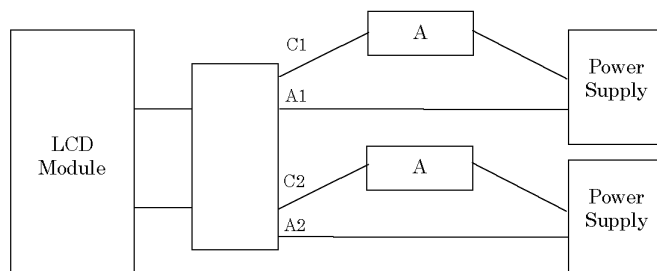
(2) Backlight

Ta = 25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	Remarks
LED Voltage	VF	--	(24)	29.9	V	IF = 80 mA, Ta = 25°C
		--	--	31.0	V	IF = 80 mA, Ta = 0°C
		--	--	32.3	V	IF = 80 mA, Ta = –30°C
LED Current	IF	--	80	90	mA	*1), *3)
LED Life Time	LT	60000	--	--	h	IF = 80 mA, Ta = 25°C *4), *5), Continuous operation

[Note]
  *1) Constant Current Drive
  *2) The Voltage deviation between strings: $|V_{f1} - V_{f2}| \leq 2V$
  *3) LED Current measurement method

  *4) LED life time is defined as the time when the brightness becomes 50% of the initial value.
  *5) The life time of the backlight depends on the ambient temperature. The life time will decrease under low/high temperature.

5. INTERFACE PIN CONNECTION

(1) CN 1(Interface Signal)

        Used connector: FI-SE20P-HFE (JAE)

        Corresponding connector: FI-S20S[for discrete Wire], FI-SE20ME[for FPC] (JAE)

Pin No.	Symbol	Function (ISP 6 bit compatibility mode)		Function (ISP 8 bit compatibility mode)
		6 bit input	8 bit input	
1	VCC	+3.3 V Power supply		←
2	VCC	+3.3 V Power supply		←
3	GND	GND		←
4	GND	GND		←
5	Link 0–	R0, R1, R2, R3, R4, R5, G0	R2, R3, R4, R5, R6, R7, G2	R0, R1, R2, R3, R4, R5, G0
6	Link 0+	R0, R1, R2, R3, R4, R5, G0	R2, R3, R4, R5, R6, R7, G2	R0, R1, R2, R3, R4, R5, G0
7	GND	GND		←
8	Link 1–	G1, G2, G3, G4, G5, B0, B1	G3, G4, G5, G6, G7, B2, B3	G1, G2, G3, G4, G5, B0, B1
9	Link 1+	G1, G2, G3, G4, G5, B0, B1	G3, G4, G5, G6, G7, B2, B3	G1, G2, G3, G4, G5, B0, B1
10	GND	GND		←
11	Link 2–	B2, B3, B4, B5, DENA	B4, B5, B6, B7, DENA	B2, B3, B4, B5, DENA
12	Link 2+	B2, B3, B4, B5, DENA	B4, B5, B6, B7, DENA	B2, B3, B4, B5, DENA
13	GND	GND		←
14	CLKIN–	Clock –		←
15	CLKIN+	Clock +		←
16	GND	GND		←
17	Link3–	See: *2)	R0, R1, G0, G1, B0, B1	R6, R7, G6, G7, B6, B7
18	Link3+	See: *2)	R0, R1, G0, G1, B0, B1	R6, R7, G6, G7, B6, B7
19	MODE	Low=ISP 6 bit compatibility mode		High=ISP 8 bit compatibility mode
20	SC	Scan direction control (Low=Normal, High=Reverse)		←

*1) Metal frame is connected to signal GND.

*2) Recommended wiring of Pin 17,18 (6 bit input)
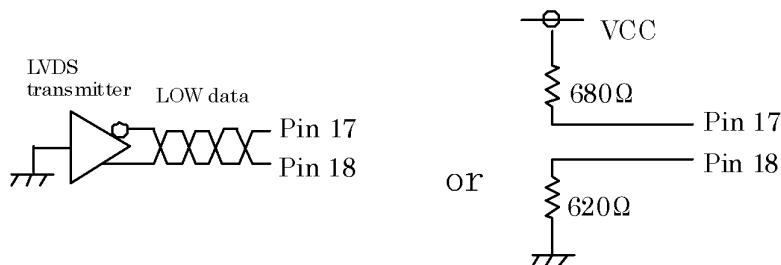
(2) CN 2(Backlight)

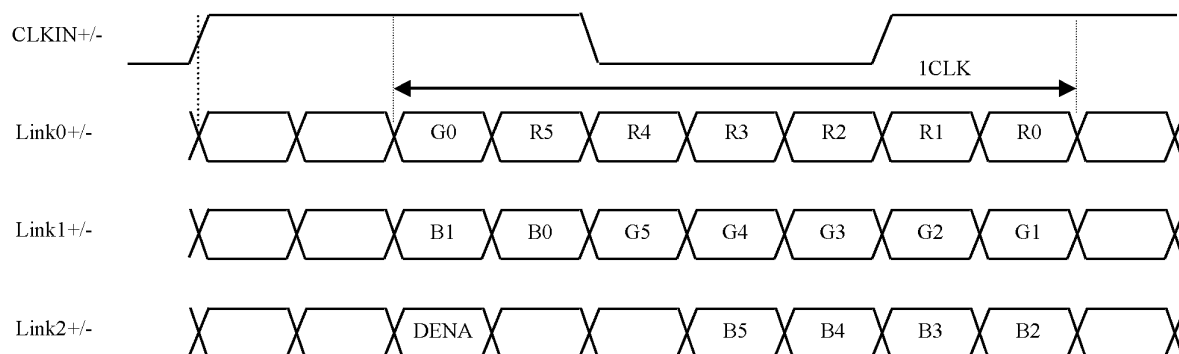   Backlight-side connector: SM06B-SHLS-TF(LF)(SN) (JST)

        Corresponding connector: SHLP-06V-S-B (JST)

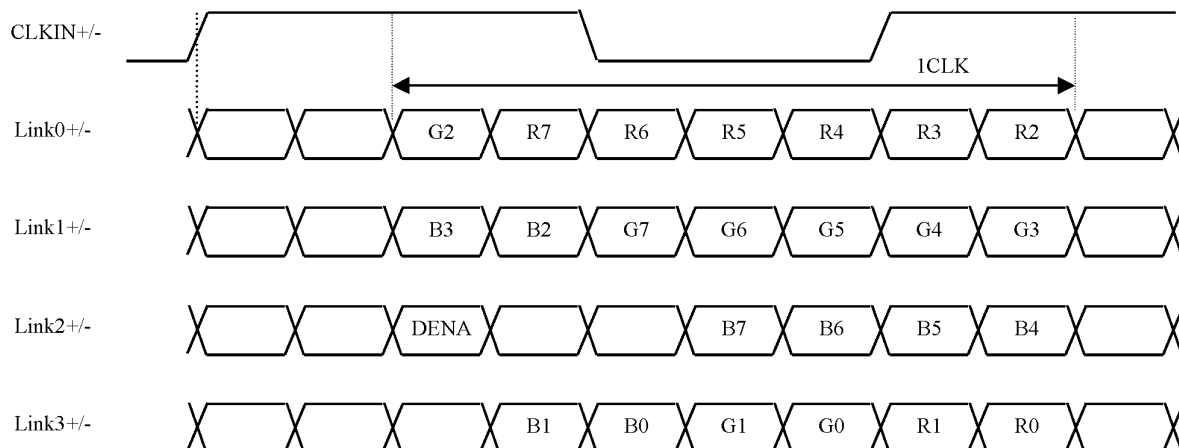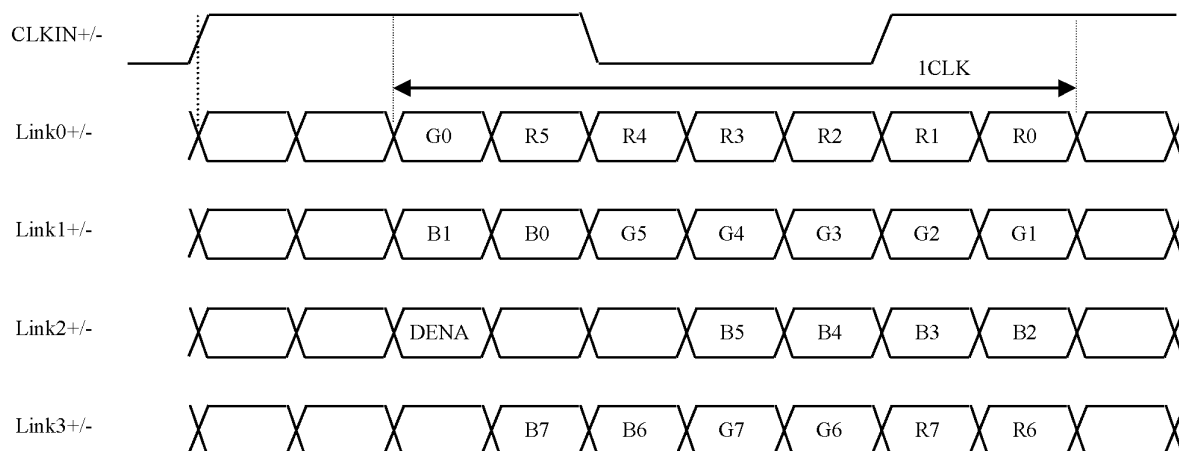| Pin No.	Symbol	Function
1	NC	This pin should be open.
2	NC	This pin should be open.
3	LED C 1	LED cathode 1
4	LED A 1	LED anode 1
5	LED A 2	LED anode 2
6	LED C 2	LED cathode 2

(3) ISP data mapping

a. ISP 6 bit compatibility mode(6 bit input)

CLKIN+/-								1CLK	
Link0+/-			G0	R5	R4	R3	R2	R1	R0
Link1+/-			B1	B0	G5	G4	G3	G2	G1
Link2+/-			DENA			B5	B4	B3	B2

b. ISP 6 bit compatibility mode(8 bit input)

CLKIN+/-								1CLK	
Link0+/-			G2	R7	R6	R5	R4	R3	R2
Link1+/-			B3	B2	G7	G6	G5	G4	G3
Link2+/-			DENA			B7	B6	B5	B4
Link3+/-			B1	B0	G1	G0	R1	R0	

c. ISP 8 bit compatibility mode

CLKIN+/-								1CLK	
Link0+/-			G0	R5	R4	R3	R2	R1	R0
Link1+/-			B1	B0	G5	G4	G3	G2	G1
Link2+/-			DENA			B5	B4	B3	B2
Link3+/-			B7	B6	G7	G6	R7	R6	

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6. INTERFACE TIMING

LVDS transmitter input signal

(1) Timing Specifications

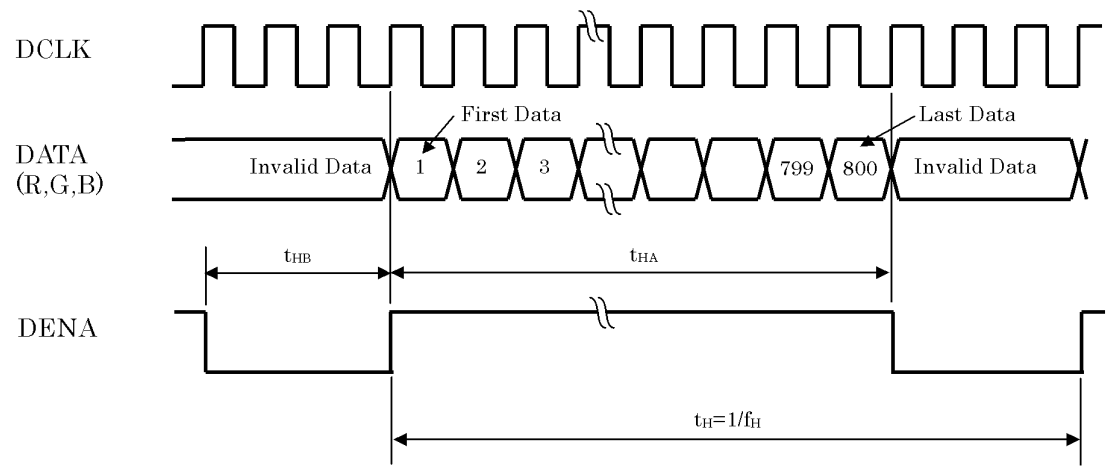| ITEM			SYMBOL	MIN	TYP	MAX	UNIT
DCLK	Frequency		f_{CLK}	25	30.4	45	MHz
	Period		t_{CLK}	22.2	32.9	40	ns
DENA	Horizontal	Active Time	t_{HA}	800	800	800	t_{CLK}
		Blanking Time	t_{HB}	20	160	--	t_{CLK}
		Frequency	f_H	26.4	31.7	45	kHz
		Period	t_H	22.2	31.6	37.9	μs
	Vertical	Active Time	t_{VA}	480	480	480	t_H
		Blanking Time	t_{VB}	3	48	--	t_H
		Frequency	f_V	55	60	75	Hz
		Period	t_V	13.3	16.7	18.2	ms

[Note]

1) DENA (Data Enable) should always be positive polarity as shown in the timing specification.

2) DCLK should appear during all invalid period.

3) LVDS timing follows the timing specifications of LVDS receiver IC: THC63LVDF84B(Thine).

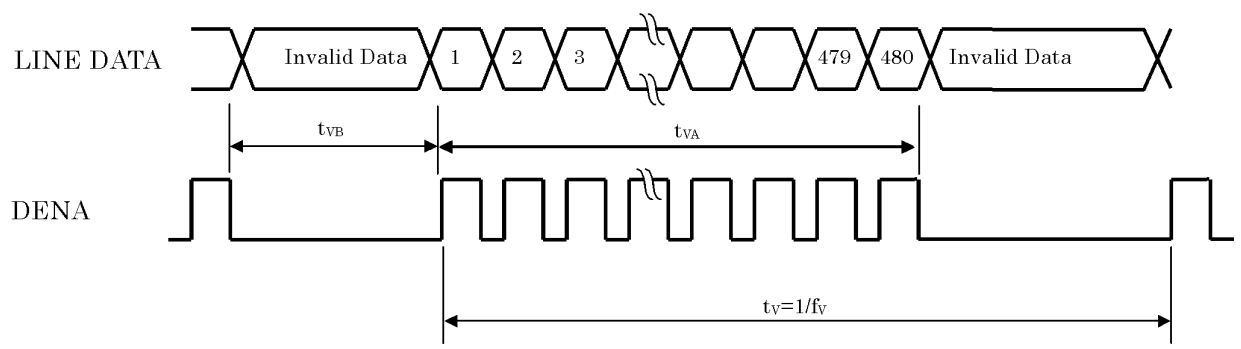4) In case of blanking time fluctuation, please satisfy following condition.

$$t_{VBn} > t_{VBn-1} - 3(t_H)$$

(2) Timing Chart

a. Horizontal Timing Chart

DCLK

DATA (R,G,B)

Invalid Data | First Data 1 | 2 | 3 | ... | 799 | 800 | Last Data | Invalid Data

t_{HB}

t_{HA}

DENA

$t_H = 1/f_H$

b. Vertical Timing Chart

LINE DATA

Invalid Data | 1 | 2 | 3 | ... | 479 | 480 | Invalid Data

t_{VB}

t_{VA}

DENA

$t_V = 1/f_V$

(3) Color Data Assignment

a. 6 bit input

COLOR		INPUT DATA																	
		R DATA						G DATA						B DATA					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	GREEN(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

[Note]
1) Definition of gray scale
Color (n) ···n indicates gray scale level.
Higher n means brighter level.
2) Data
1:High, 0: Low

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b. 8 bit input

COLOR		INPUT DATA																							
		R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

[Note]

1) Definition of gray scale

Color (n) ···n indicates gray scale level.

Higher n means brighter level.

2) Data

1:High, 0: Low

(4) Display Position and Scan Direction

D(X,Y) shows the data number of input signal.

SC: Low

SC: High

D(1,1) ⟶ D(800,1)

D(1,480) ⟶ D(800,480)

CN2

D(800,480) ⟵ D(1,480)

D(800,1) ⟵ D(1,1)

CN2

7. BLOCK DIAGRAM

CN1

Timing signal
Display data

I/F Connector

Timing Controller

Power

Power Supply Circuit

Drivers(gate)

G1
G2
G480

TFT-LCD

S1 S2 S2399 S2400

Drivers(source)

LED

A1
C1

A2
C2

8. MECHANICAL SPECIFICATIONS
(1) Front Side

SECTION B-B

1)Tolerance is ±0.5mm unless noted.
2)Third angle projection

120.7 (BEZEL OPENING)
118.08 (ACTIVE AREA)

VIEW CENTER

199.4 (BEZEL OPENING)
196.8 (ACTIVE AREA)

SECTION A-A

4-M2
DP=5.5mm max.
screw penetration

4-R2
4-R1

(Unit: mm)

(2) Rear Side

1) Tolerance is ±0.5mm unless noted.
2) Third angle projection

CN1:FI-SE20P-HFE (JAE)
CN2:SM06B-SHLS-TF(LF)(SN) (JST)

LABEL AREA

VIEW CENTER

CN1

CN2

(13)
6.6
44.4
7.7
8.1
129.6
(44)
203.6
35
4.4
7.5
68.3

6.6
40.8
58.8
(59.3)
(2.9)

(Unit: mm)

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9. OPTICAL CHARACTERISTICS

Ta=25°C, VCC=3.3V, Input Signals: Typ. values shown in Section 6

ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	Remarks
Contrast Ratio		CR	θ_V=0°, θ_H=0°	520	800	--	--	*1)*2)*5)
Luminance		Lw	θ_V=0°, θ_H=0°	640	800	--	cd/m²	*1)*5)
Luminance Uniformity		ΔLw	θ_V=0°, θ_H=0°	--	--	30	%	*1)*3)*5)
Response Time	tr		θ_V=0°, θ_H=0°	--	4	--	ms	*1)*4)*5)
	tf		θ_V=0°, θ_H=0°	--	12	--	ms	*1)*4)*5)
Viewing Angle	Horizontal	θ_H	CR ≥ 10	−65~65	−80~80	--	°	*1)*5)
	Vertical	θ_V		−45~65	−60~80	--	°	*1)*5)
Image sticking		tis	2 h	--	--	2	s	*6)
Color Coordinates	Red	Rx	θ_V=0°, θ_H=0°	0.514	0.554	0.594	--	*1)*5)
		Ry		0.303	0.343	0.383		
	Green	Gx		0.319	0.359	0.399		
		Gy		0.525	0.565	0.605		
	Blue	Bx		0.127	0.167	0.207		
		By		0.112	0.152	0.192		
	White	Wx		0.273	0.313	0.353		
		Wy		0.289	0.329	0.369		

[Note]

These items are measured using CS1000(MINOLTA) for color coordinates, EZContrast(ELDIM) for viewing angle and CS1000 or BM-5A(TOPCON) for others under the dark room condition (no ambient light) after more than 30 minutes from turning on the backlight unless noted.

Condition: IF = 80 mA

Measurement method for luminance and color coordinates is as follows.

θ (Field)

Photodetector
Luminance : θ=2°   (BM-5A)
Color coordinates : θ=1°   (CS1000)

TFT-LCD module   500 mm
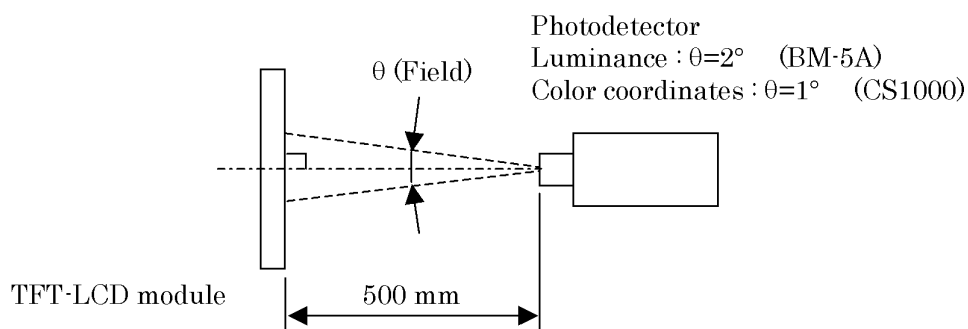
The luminance is measured according to FLAT PANEL DISPLAY MEASUREMENTS STANDARD (VESA Standard).

*1) Measurement Point

Contrast Ratio, Luminance, Response Time, Viewing Angle, Color Coordinates: Display Center
Luminance Uniformity: point 1~5 shown in a figure below
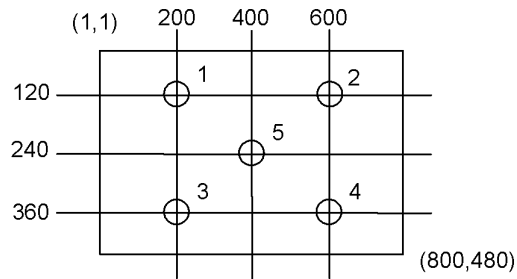
*2) Definition of Contrast Ratio

CR= Luminance with all white pixels / Luminance with all black pixels

*3) Definition of Luminance Uniformity

$\Delta Lw=[Lw(MAX)/Lw(MIN)-1] \times 100$

*4) Definition of Response Time
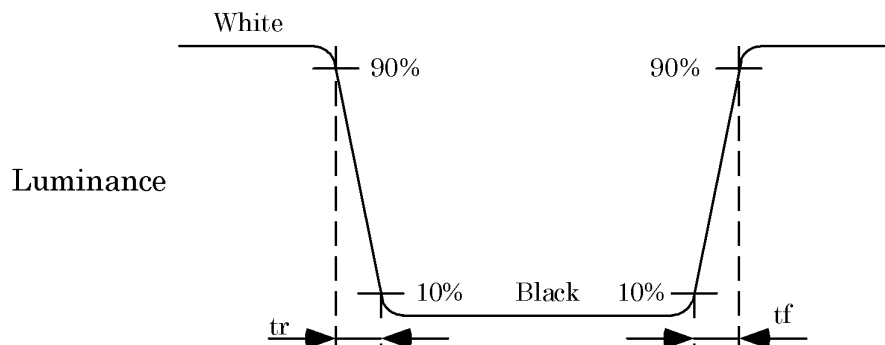
*5) Definition of Viewing Angle (θ_V, θ_H)
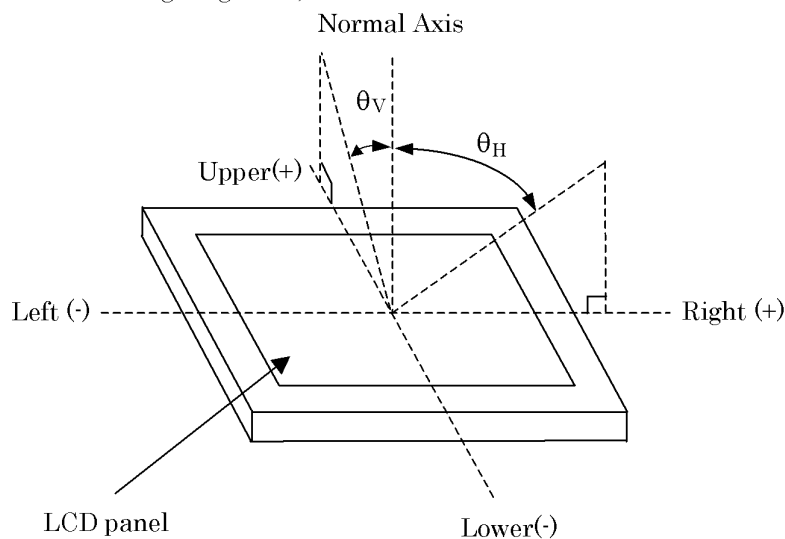
*6) Image sticking:

Continuously display the test pattern shown in the figure below for two-hours. Then display a completely white screen. The previous image shall not persist more than two seconds at 25°C.

Cols 398-402

Rows 238-242

White Area

Black Lines

TEST PATTERN FOR IMAGE STICKING TEST

10. RELIABILITY TEST CONDITION

(1) Temperature and Humidity

ITEM	CONDITIONS
HIGH TEMPERATURE HIGH HUMIDITY OPERATION	40°C, 90%RH, 240 h (No condensation)
HIGH TEMPERATURE OPERATION	80°C, 240 h
LOW TEMPERATURE OPERATION	−30°C, 240 h
HIGH TEMPERATURE STORAGE	80°C, 240 h
LOW TEMPERATURE STORAGE	−30°C, 240 h
THERMAL SHOCK (NON-OPERATION)	−30°C (1h) ~ 80°C(1h), 100 cycles

(2) Shock & Vibration

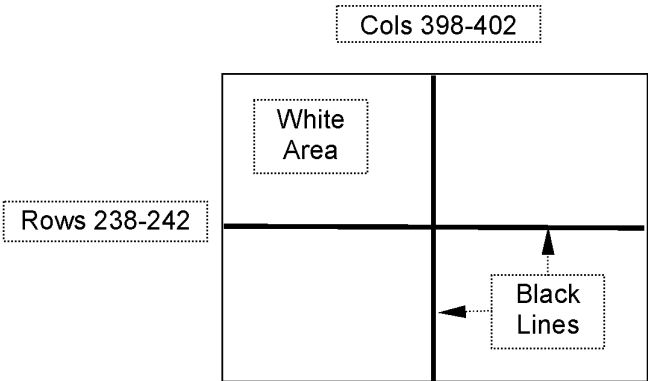| ITEM	CONDITIONS
SHOCK (NON-OPERATION)	Shock level: 1470 m/s^2 (150G) Waveform: half sinusoidal wave, 2 ms Number of shocks: one shock input in each direction of three mutually perpendicular axes for a total of six shock inputs
VIBRATION (NON-OPERATION)	Vibration level: 9.8 m/s^2 (1.0G) Waveform: sinusoidal Frequency range: 5 to 500 Hz Frequency sweep rate: 0.5 octave /min Duration: one sweep from 5 to 500 Hz in each of three mutually perpendicular axis(each x,y,z axis: 1 hour, total 3 hours)

(3) Judgment standard

    The judgment of the above tests should be made as follow:

        Pass: Normal display image, no damage of the display function. (ex. no line defect)

            Partial transformation of the module parts should be ignored.

        Fail: No display image, damage of the display function. (ex. line defect)

11. INSPECTION STANDARDS

Inspection condition is as follows:

- Inspection Area: active area
- Viewing distance: approximately 35 cm.
- Viewing angle: normal to the LCD panel ±10° horizontal and vertical.
- Ambient temperature: approximately 25°C.
- Ambient light: 300 - 500 lx.

Bright Dot is defined as follows:

Visible through 5% transmission ND filter under the condition that black image (color 0) is on the display.

DEFECT TYPE			LIMIT
VISUAL DEFECT	SCRATCH	$0.01 \text{ mm} < W \leq 0.05 \text{ mm}$ $L \leq 10 \text{ mm}$	$N \leq 4$
		$0.01 \text{ mm} < W$ $10 \text{ mm} < L$	$N = 0$
		$0.05 \text{ mm} < W$	$N = 0$
	DENT	$0.2 \text{ mm} < \phi \leq 0.4 \text{ mm}$	$N \leq 4$
		$0.4 \text{ mm} < \phi$	$N = 0$
	BLACK SPOT BUBBLE	$0.2 \text{ mm} < \phi \leq 0.4 \text{ mm}$	$N \leq 5$
		$0.4 \text{ mm} < \phi$	$N = 0$
	LINT	$L \leq 3 \text{ mm}$ $W \leq 0.1 \text{ mm}$	$N \leq 4$
		$3 \text{ mm} < L$ $W \leq 0.1 \text{ mm}$	$N = 0$
		$0.1 \text{ mm} < W$	ACCORDING TO BLACK SPOT
ELECTRICAL DEFECT	BRIGHT DOT		$N \leq 5$
	DARK DOT		$N \leq 5$
	TOTAL DOT		$N \leq 8$
	TWO ADJACENT DOT BRIGHT DOT DARK DOT		≤ 2 PAIRS ≤ 2 PAIRS
	THREE OR MORE ADJACENT DOT		NOT ALLOWED
	LINE DEFECT		NOT ALLOWED

*1) W: width, L: length, ϕ : diameter, N: number

*2) DEFINITION OF ADJACENT
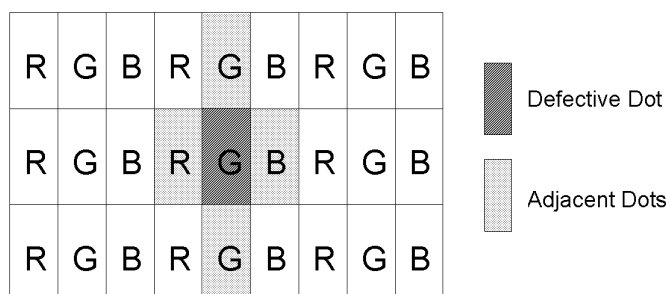
The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

12. OTHER FEATURE

This LCD module complies with RoHS[*] directive.

[*] RoHS: Restriction of the use of certain hazardous substances in electrical and electronic equipment

13. HANDLING PRECAUTIONS FOR TFT-LCD MODULE

Please pay attention to the followings in handling TFT-LCD products;

(1) ASSEMBLY PRECAUTION

  a. Please mount the LCD module by using mounting hole with a screw clamping torque less than 0.2 Nm. Please do not bend or wrench the LCD module in assembling. Please do not drop, bend or twist the LCD module in handling.

  b. Please design display housing in accordance with the following guide lines.

    (a) Housing case must be designed carefully so as not to put stresses on LCD and not to wrench module.

    (b) Under high temperature environment, performance and life time of LED may heavily shorten. When you design with our LCD product, please consider radiating heat and ventilation for good heat management.

    (c) Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. Approximately 1.0mm of the clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.

    (d) When some parts, such as, FPC cable and ferrite plate, are installed underneath the LCD module, still sufficient clearance is required, such as 0.5mm. This clearance is, especially, to be reconsidered when the additional parts are implemented for EMI countermeasure.

    (e) Design the LED driver location and connector position carefully so as not to give stress to LED backlight cable.

    (f) Keep sufficient clearance between LCD module and the others parts, such as inverter and speaker so as not to interfere the LCD module. Approximately 1.0 mm of the clearance in the design is recommended.

    (g) To avoid local elevation/decrease of temperature, considering location of heating element, heat release, thermal design should be done.

  c. Please do not push or scratch LCD panel surface with anything hard. And do not soil LCD panel surface by touching with bare hands. (Polarizer film, surface of LCD panel is easy to be flawed.)

  d. Please wipe off LCD panel surface with absorbent cotton or soft cloth in case of it being soiled.

  e. Please wipe off drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change.

  f. Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.

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g. Please do not touch metal frames with bare hands and soiled gloves. A color change of the metal frames can happen during a long preservation of soiled LCD modules.

h. Please handle metal frame carefully because edge of metal frame is very sharp.

i. Please connect the metal frame of LCD module to GND in order to minimize the effect of external noise and EMI.

j. Be sure to connect the cables and the connecters correctly.

(2) OPERATING PRECAUTIONS

a. Please be sure to turn off the power supply before connecting and disconnecting signal input cable.

b. Please do not change variable resistance settings in LCD module. They are adjusted to the most suitable value. If they are changed, it might happen LCD does not satisfy the characteristics specification.

c. The interface signal speed is very high. Please pay attention to transmission line design and other high speed signal precautions to satisfy signal specification.

d. The condensation might happen on the surface and inside of LCD module in case of sudden change of ambient temperature. Please take care so as not to cause any damage mentioned on (1)-d.

e. Please pay attention not to display the same pattern for very long time. Image might stick on LCD. Even if image sticking happens, it may disappear as the operation time proceeds.

f. Please obey the same safe instructions as ones being prepared for ordinary electronic products.

(3) PRECAUTIONS WITH ELECTROSTATICS

a. This LCD module use CMOS-IC on circuit board and TFT-LCD panel, and so it is easy to be affected by electrostatics. Please be careful with electrostatics by the way of your body connecting to the ground and so on.

b. Please remove protection film very slowly from the surface of LCD module to prevent from electrostatics occurrence.

(4) STORAGE PRECAUTIONS

LCD should be stored in the room temperature environment with normal humidity. The LCD inventory should be processed by first-in first-out method.

(5) SAFETY PRECAUTIONS

a. When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

b. If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

c. Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.

d. LED driver should be designed carefully to limit or stop its function when over current is detected on the LED.

(6) OTHERS

a. A strong incident light into LCD panel may cause deterioration to polarizer film, color filter, and other materials, which will degrade the quality of display characteristics. Please do not expose LCD module under strong Ultraviolet rays for a long time.

b. Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.

c. For the packaging box handling, please see and obey with the packaging specification datasheet.

d. Please do not reuse the LED unit which is once removed.

PACKING SPECIFICATION

PACKAGING BOX

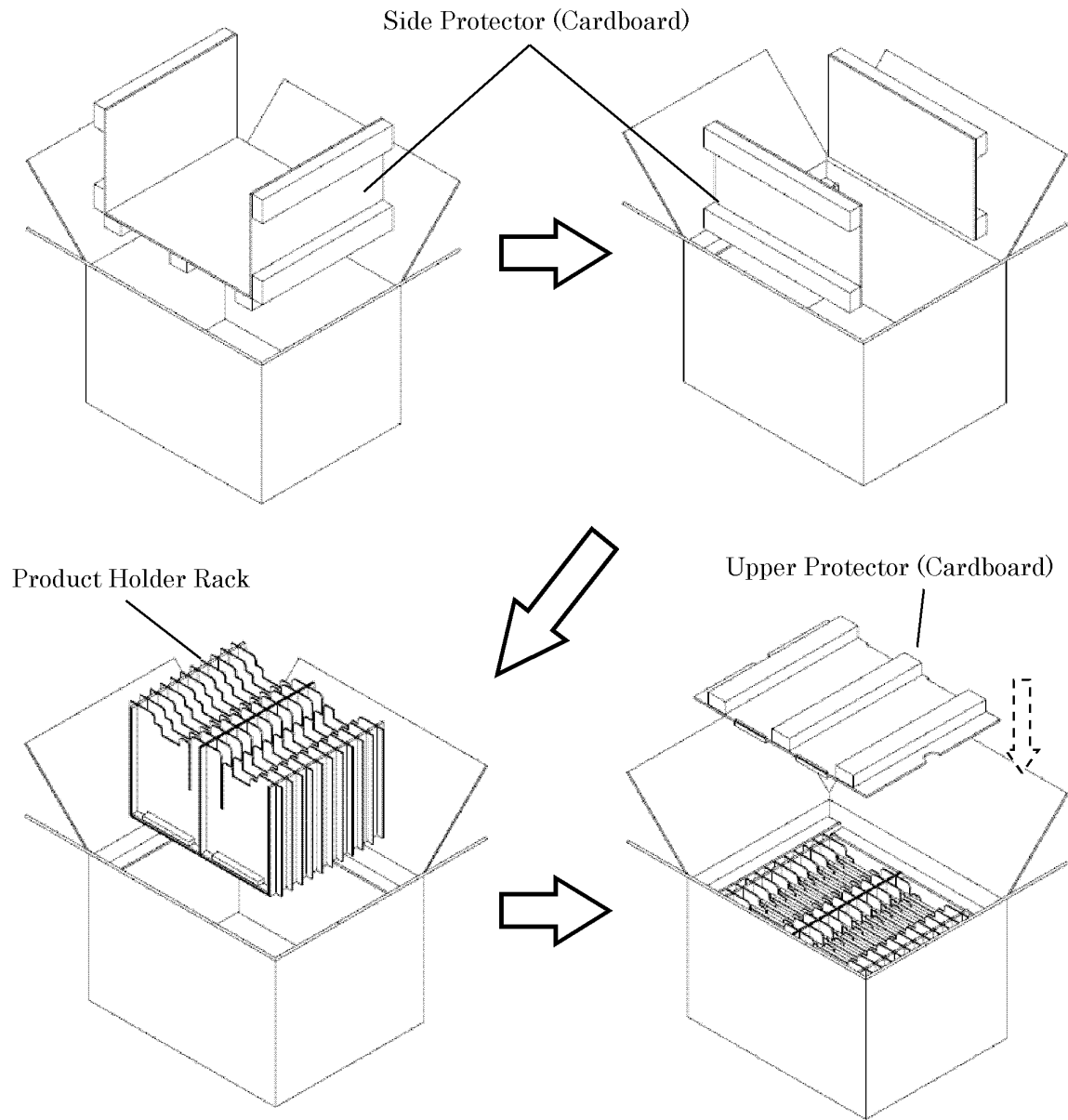|	
material:	cardboard
construction:	See Fig.1
max. packaging number:	20 pcs.
dimension:	520 (W) × 420 (D) × 370 (H) (mm) (Tolerance is ±15mm)
mass(including 20 modules):	12.0 kg
label:	Labels are put on the box.(See Fig.2, 3, 4)

Side Protector (Cardboard)

Product Holder Rack

Upper Protector (Cardboard)

Fig.1   Illustration of packaging box structure

Product name	Packaging number
Bar-code	Bar-code
Serial No.	Serial No.
Bar-code	Bar-code
Serial No.	Serial No.
Bar-code	Bar-code
Serial No.	Serial No.
Bar-code	Bar-code
Serial No.	Serial No.
Bar-code	Bar-code
Serial No.	Serial No.
Bar-code	Bar-code
Serial No.	Serial No.
Bar-code	Bar-code

Fig.2   Label 1

	Box No.
	Mass
PKG ID Bar-code	
Special Bar-code	
Quantity Bar-code	
Trans ID Bar-code	
Special Bar-code	

Fig.3   Label 2

Consignee

Product name of consignee

Product name

Order No.

Box No.

Place of production

Bar-code

Shipping date

Fig.4   Label 3

OPTREX

TFT-LCD:

T-55562D090J-LW-A-AAN

AA090ME**

P / O NO.   123456789

C / S   001 OF 005

MADE IN JAPAN

001   JA1BK4144

2001/11/15

Fig.5   Sample of Label 3
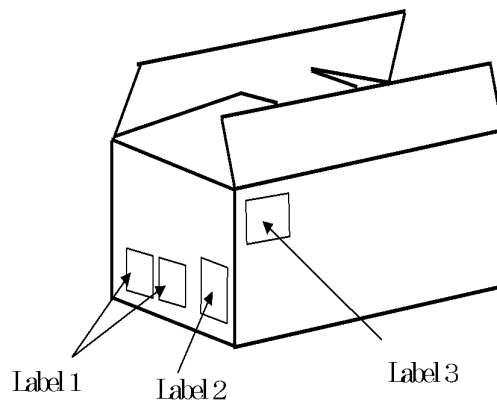
Label 1   Label 2   Label 3

Fig 6.   Location of labels

LOCATION OF LABEL ON THE PACKAGING BOX
Labels are put on the box.(See. Fig 6)

PACKAGING FORM OF PRODUCT
(1) Each of LCD modules is packed in anti-electrostatic bag(Fig 7).
(2) The packaging box accumulates maximum 20 modules.
(3) Upper protector is put on the products, and shut the box.

LED Backlight connector

LED Backlight connector side

Product(Rear)

Product in
Anti-electrostatic bag

(Surface)

Fig 7

Rear side

LED Backlight connector side

(*)Product in Anti-electrostatic bag.
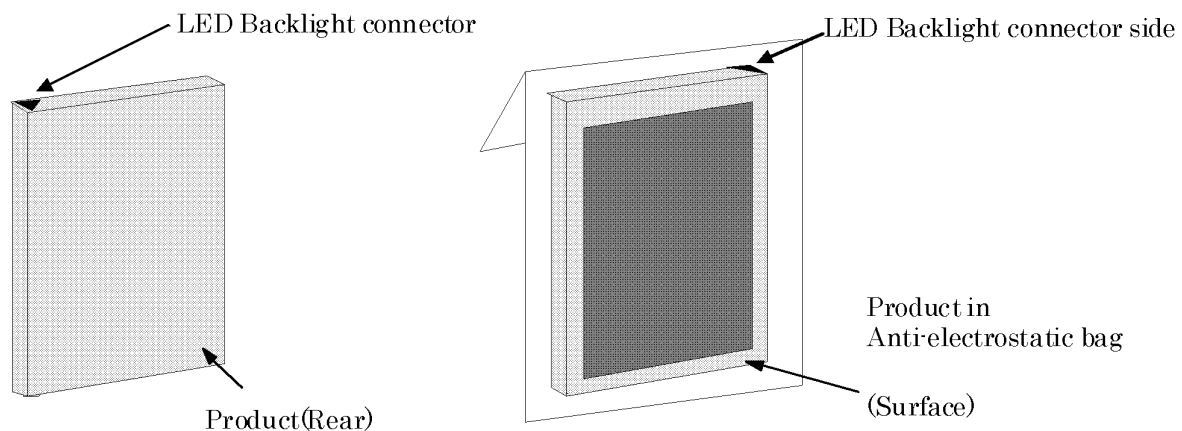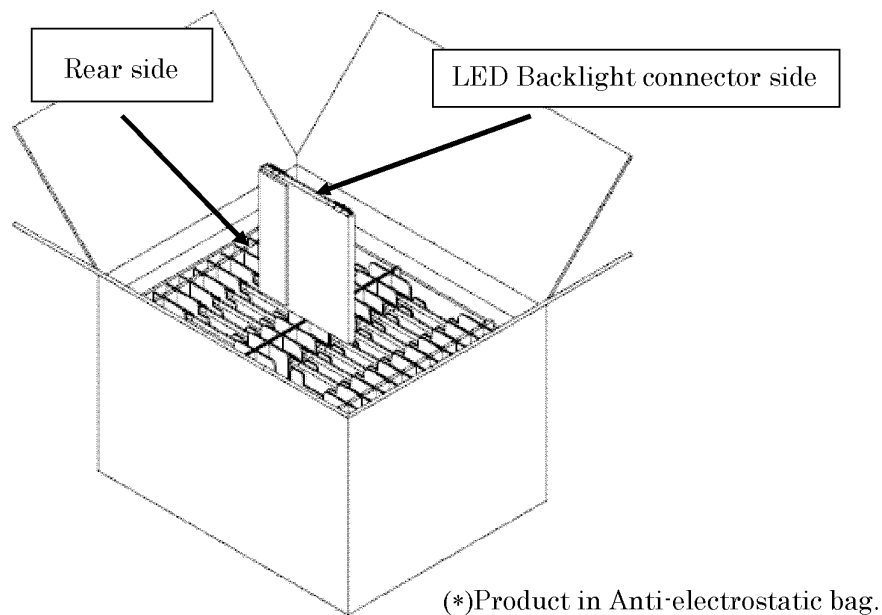
CAUTIONS OF SHIPPING & STORAGE

(1) Do not turn the packaging upside down while storage and transportation. The boxes should not be piled up more than 6.

(2) Packaging box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)

(3) Keep off from direct sunlight exposure. Please store under room temperature & low humidity in original packaging condition when they were shipped.

(4) Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching during transportation. Please do not open except picking LCDs up from the box.

(5) Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.

(6) Keep other cautions described in handling manual.

PRODUCTS NUMBER LABELING FORMS

Products number label is constructed as below:

```
            (1) OPTREX
  (2) T-55562D090J-LW-A-AAN
  (3) AA050AA01
  (4) 601000011L        (5) ABC1234567890
  (6)
                     Bar-code

        (7)           (8)
  cᴿᵁᵁˢ E158720   MADE IN JAPAN
```

Example of Products Number Label
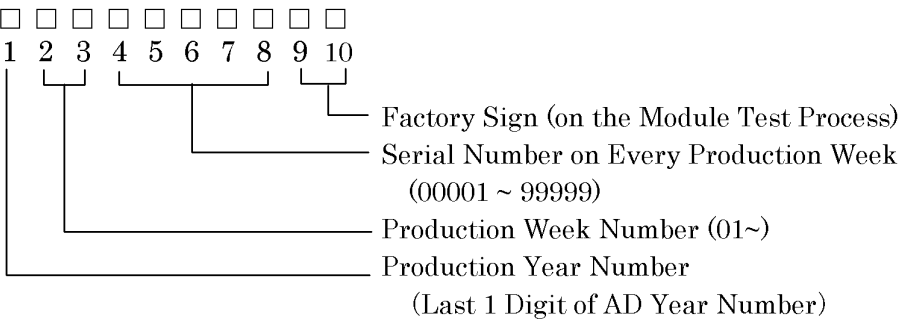
(1) Brand Name

(2) Products Name of Optrex

(3) Products Name
   ex.1: AA050AA01   ex.2: AA050AA01   B

(4) Date Code (Serial Number, Factory Sign)

```
 □ □ □ □ □ □ □ □ □ □
 1 2 3 4 5 6 7 8 9 10
```

—— Factory Sign (on the Module Test Process)
—— Serial Number on Every Production Week
       (00001 ~ 99999)
—— Production Week Number (01~)
—— Production Year Number
       (Last 1 Digit of AD Year Number)

(5) Production Key Number (13 Digits)
   (ID Number for Production Control)

(6) Bar-code(Date Code)
   Bar-code Line for computer reading Date Code mentioned as above.

(7) UL File No.

(8) Production Country

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LED UNIT for 9.0"WVGA

APPLICATION

This technical specification applies to the replaceable LED unit that is for 9.0" WVGA TFT-LCD module industrial use(model name: T-55562D090J-LW-A-AAN) maintenance parts.

MECHANICAL SPECIFICATION

Item	Specification	Remarks
Outline Dimension	212.7 × 5.7 × 12.6 (mm)	
Mass	8.0(g) (MAX)	

See DRAWING OF OUTLINE DIMENTIONS

ENVIRONMENTAL CONDITIONS

Item	Operation		Non Operation		Remarks
	MIN	MAX	MIN	MAX	
Ambient Temperature	–30°C	80°C	–30°C	80°C	No Condensation

Top, Tstg ≤ 40°C : 90%RH max. without condensation
Top, Tstg > 40°C : Absolute humidity shall be less than the value of 90%RH at 40°C without condensation.

ELECTRICAL CHARACTERISTICS

The values follow the corresponding LCD specification.

OPTICAL CHARACTERISTICS

The values follow the corresponding LCD specification.

LIFE TIME OF THE LED UNIT
Environmental Conditions are as follows:
Ambient temperature is 25±5°C.
LED Current is 80 mA

Continuous Operation	60,000 h

(1) LED life time is defined as the time when the brightness becomes 50% of the initial value.

(2) The life time of the backlight depends on the ambient temperature. The life time will decrease under high temperature.
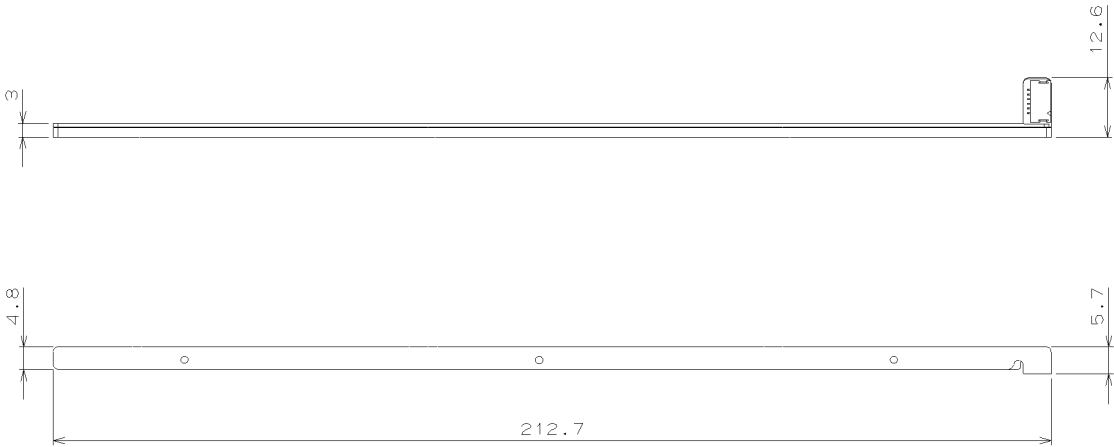
INTERFACE PIN CONNECTION

Backlight-side connector: SM06B-SHLS-TF(LF)(SN) (JST)
Corresponding connector: SHLP-06V-S-B (JST)

Pin No.	Symbol	Function
1	NC	This pin should be open.
2	NC	This pin should be open.
3	LED C 1	LED cathode 1
4	LED A 1	LED anode 1
5	LED A 2	LED anode 2
6	LED C 2	LED cathode 2

DRAWING OF OUTLINE DIMENTIONS

METHOD OF REPLACING THE LED UNIT

(1) <u>Precautions</u>

   Please pay attention to the following items while replacing the LED unit.

  a. Please do not damage the LCD Panel Surface, and do not touch it with bare hands.
    (Wearing gloves is recommended.)

  b. Please be careful with electrostatics, and work in clean environment to prevent entering dust
    and/or foreign materials that may cause bad display image.
    (Using clean booth or similar environment is recommended.)

  c. Please be careful of the metal frame edge.

  d. Please do not reuse the LED unit which is once removed.
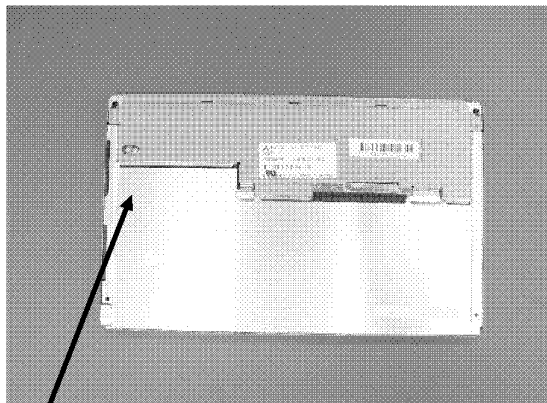
(2) <u>Method of replacing the LED unit</u>

  1) Put the TFT-LCD Module on the table.(LCD Panel Surface is upside.)
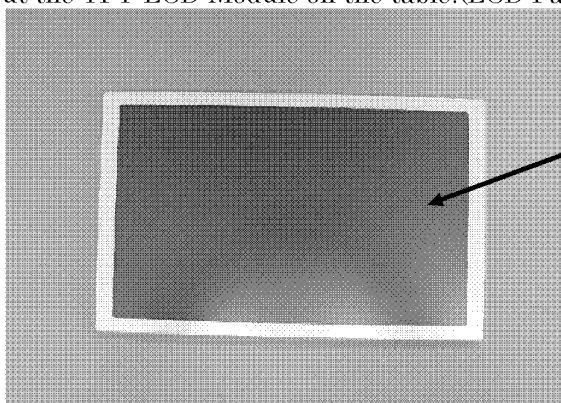
Please check the LCD Panel Surface for scratch, dust, and foreign materials.

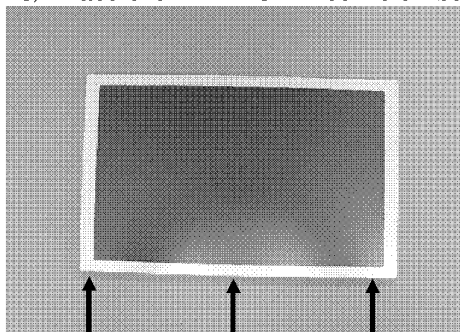<u>Picture 1</u>

  2) Turn the TFT-LCD Module to the back side.

<u>Picture 2</u>

Please check dust and foreign materials.

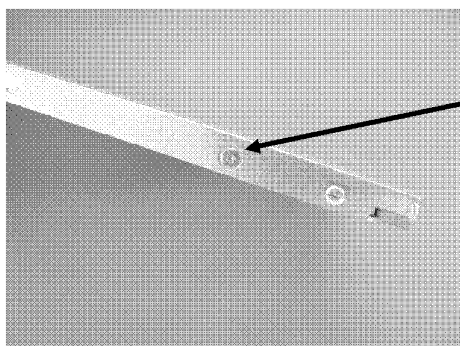| T-55562D090J-LW-A-AAN	OPTREX CORPORATION	Page 32/35

3) Place the TFT-LCD Module on bottom side and remove all three screws which fixes the LED unit.
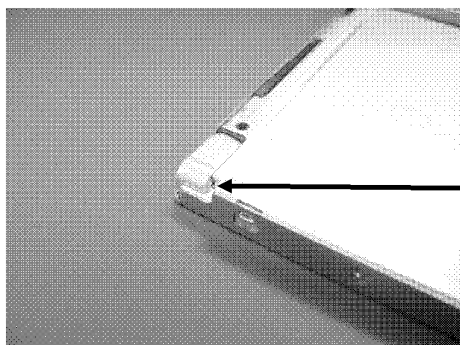

Screws
Picture 3

Screw which fixes LED unit
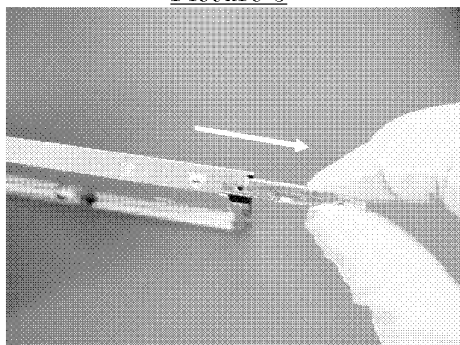
Picture 4

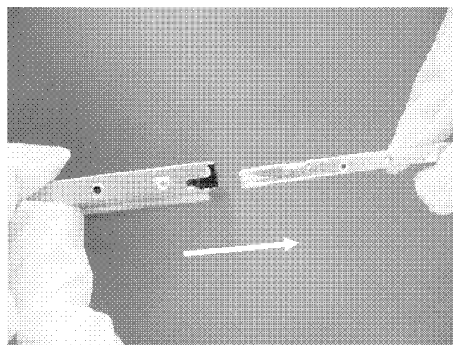4) Pull the latch of LED unit slowly to remove the LED unit.

Latch of LED unit

Picture 5
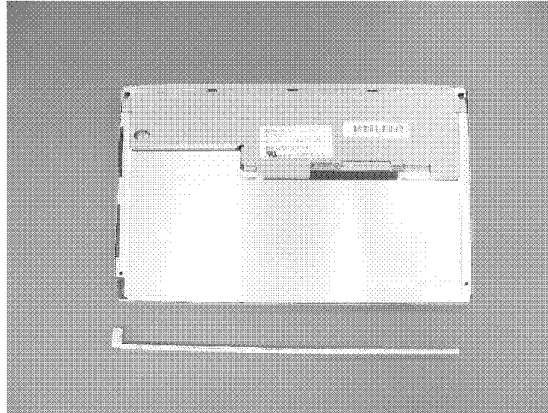

Picture 6

Picture 7

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5) <u>Picture 8</u> shows the TFT-LCD Module after removing the LED unit.
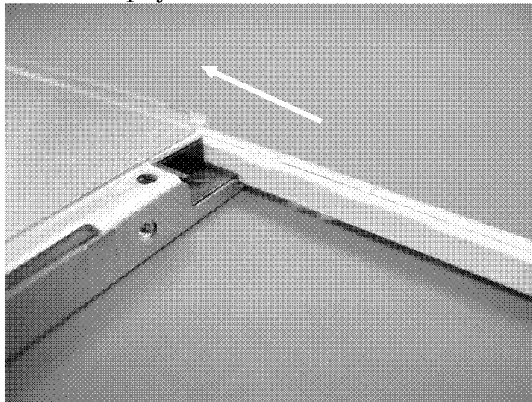

<u>Picture 8</u>

• Please do not reuse the LED unit which is once removed.
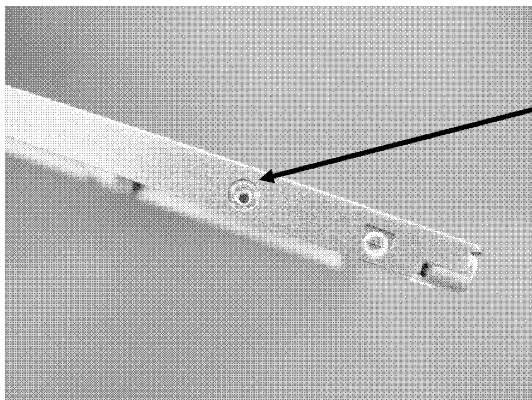

6) Prepare to insert the new LED unit.
    • Open the package and take the new LED unit out.
    • Check the new LED unit for dust and foreign materials.

7) Insert the new LED unit to TFT-LCD Module.
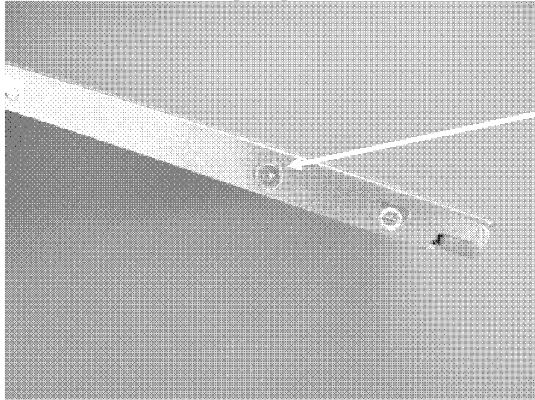   Please pay attention to insert direction.

<u>Picture 9</u>

Insert the LED unit until the holes are aligned with the screw holes.

<u>Picture 10</u>

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8) After inserting, tighten all three screws and check if the LED unit is fixed.

Please confirm that all three screws are tightened firmly.

Picture 11

9) After replacing the LED unit, please check the following items.
- Appearance of TFT-LCD Module is not changed after replacing LED unit.
  (See Picture 1 and Picture 2)
- There is no damage, dust, or foreign materials on the LCD Panel Surface.
- Install the TFT-LCD Module back to the system then check if backlight operates properly.