First Edition

Oct 20, 2003

Final Revision

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LCD Module Technical Specification

Type No. **T-51638D084J-FW-A-AB**

T. Sato

Approved by (Quality Assurance Division)

K. Gondo

Checked by (ACI Engineering Division)

R. Wazuni

Prepared by (Module Coordination Group)

1. OVERVIEW

T-51638D084J-FW-A-AB is 8.4" 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 digital data, 640×480, 262,144-color images are displayed on the 8.4" diagonal screen. Input power voltage is single 3.3V for LCD driving.

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

ITEM	SPECIFICATION
Display Area (mm)	$170.9(H) \times 128.2$ (V) (8.4-inch diagonal)
Number of Dots	640×3 (H) $\times 480$ (V)
Pixel Pitch (mm)	0.267 (H) $\times 0.267$ (V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	normally white
Number of Colors	262,144
Contrast ratio	450
Optimum Viewing Angle(Contrast ratio)	6 o'clock
Brightness (cd/m²)	450
Module Size (mm)	199.5 (W) $\times 149.0$ (H) $\times 11.5$ (D)
Module Mass (g)	360(Typ)
Backlight Unit	CCFL, 2-tubes, edge-light, replaceable
Surface Treatment	Anti-glare and hard-coating 3H

Characteristic value without any note is typical value.

The LCD product described in this specification is designed and manufactured for the standard use in OA equipment and consumer products, such as computers, communication equipment, industrial robots, AV equipment and so on.

Do not use the LCD product for the equipment that require the extreme high level of reliability, such as aerospace applications, submarine cables, nuclear power control systems and medical or other equipment for life support.

OPTREX assumes no responsibility for any damage resulting from the use of the LCD product in disregard of the conditions and handling precautions in this specification.

If customers intend to use the LCD product for the above items or other no standard items, please contact our sales persons in advance.

2. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT
Power Supply Voltage for LCD	VCC	0	4.0	V
Logic Input Voltage	VI	0	6.0	V
Lamp Voltage	VL	0	1500	Vrms
Lamp Current	IL	0	8.0	mArms
Lamp Frequency	FL	--	80	kHz
Operation Temperature *1)	T_{op}	0	60	°C
Storage Temperature *1)	T_{stg}	-20	65	°C

[Note]

*1) 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.

3. 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	Note A) (See: Page 5,6)
Power Supply Currents for LCD		ICC	--	240	400	mA	Note B) (See: Page 6)
Permissive input ripple Voltage		VRP	--	--	100	mVp-p	VCC=+3.3V
Logic Input Voltage	High	VIH	2.4	--	5.5	V	VCC=MAX
	Low	VIL	0	--	0.8	V	VCC=MIN

(2) Backlight   Ta = 25°C

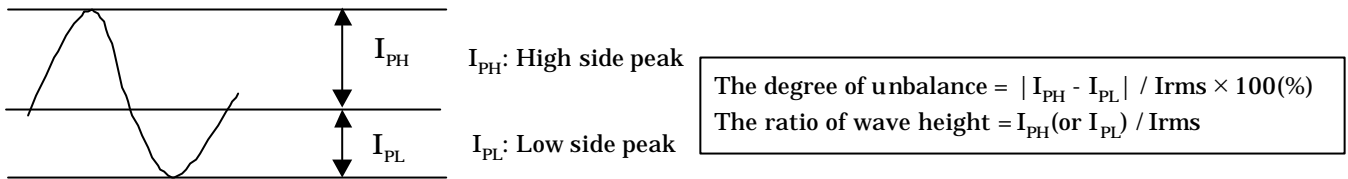| ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	Remarks
Lamp Voltage	VL	--	450	--	Vrms	IL = 6.5 mArms
Lamp Current	IL	3.0	6.5	7.0	mArms	*1),*5)
Lamp Frequency	FL	30	--	60	kHz	*2)
Starting Lamp Voltage	VS	670	--	--	Vrms	
Lamp Life Time	LT	50000	--	--	h	*3),*4) IL = 6.5 mArms

*1) Lamp Current measurement method (The current meter is inserted in low voltage line.)
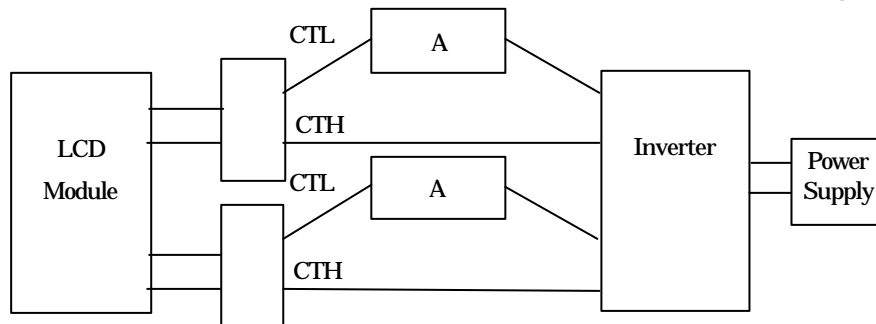
*2) Lamp frequency of inverter may produce interference with horizontal synchronous frequency, and this may cause horizontal beat on the display. Therefore, please adjust lamp frequency, and keep inverter as far from module as possible or use electronic shielding between inverter and module to avoid the interference.

*3) Lamp life time is defined as the time either when the brightness becomes 50% of the initial value, or when the starting lamp voltage does not meet the value specified in this table.

*4) The life time of the backlight depends on the ambient temperature. The life time will decrease under low/high temperature.

*5) Please use the inverter which has symmetrical current wave form as follows,

The degree of unbalance: less than 10%

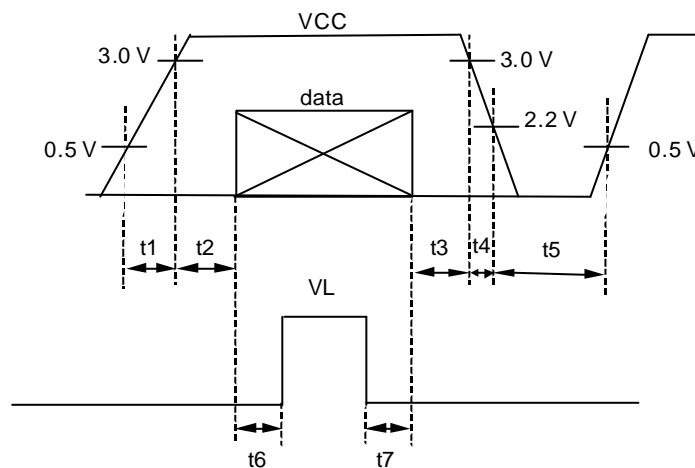The ratio of wave height: less than $\sqrt{2} \pm 10\%$

I_{PH}: High side peak

I_{PL}: Low side peak

The degree of unbalance $= |I_{PH} - I_{PL}| / I_{rms} \times 100(\%)$

The ratio of wave height $= I_{PH}(\text{or } I_{PL}) / I_{rms}$

CURRENT WAVE FORM

[Note]

A) Power and signals sequence:

$t1 \leq 10$ ms	400 ms $\leq t5$
$0 < t2 \leq 50$ ms	200 ms $\leq t6$
$0 < t3 \leq 50$ ms	$0 \leq t7$
$0 \leq t4 \leq 50$ ms	

VCC

3.0 V

data

3.0 V

2.2 V

0.5 V

0.5 V

t1 t2

t3 t4 t5

VL

t6   t7

Data: RGB DATA. DCLK. HD. VD. DENA

VCC-dip conditions:

1) When 2.6 V ≤ VCC < 3.0 V, td ≤ 10 ms

2) When VCC < 2.6 V

   VCC-dip conditions should also follow the power and signals sequence.
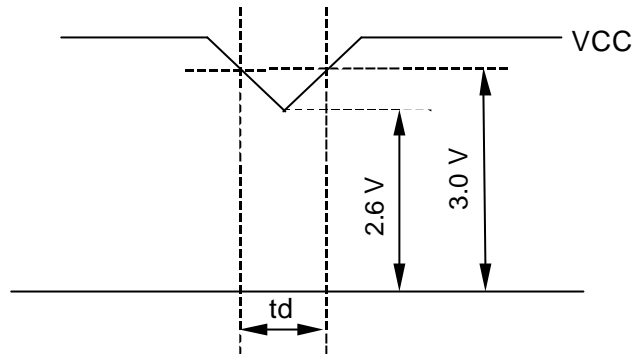
B) Typical current condition:

       64- gray- bar-pattern
       480 line mode
       VCC = +3.3 V, f_H=31.5 kHz, f_V=60 Hz, f_{CLK}= 25 MHz
       Normal value, not peak value

4. INTERFACE PIN CONNECTION

CN 1(INTERFACE SIGNAL)

Used connector: DF9B-31P-1V(Hirose)

Corresponding connector: DF9B-31S-1V(Hirose)

Pin No.	Symbol	Function
1	GND	
2	DCLK	Clock signal for sampling catch data signal
3	HD	Horizontal sync signal
4	VD	Vertical sync signal
5	GND	
6	R0	Red data signal(LSB)
7	R1	Red data signal
8	R2	Red data signal
9	R3	Red data signal
10	R4	Red data signal
11	R5	Red data signal(MSB)
12	GND	
13	G0	Green data signal(LSB)
14	G1	Green data signal
15	G2	Green data signal
16	G3	Green data signal
17	G4	Green data signal
18	G5	Green data signal(MSB)
19	GND	
20	B0	Blue data signal(LSB)
21	B1	Blue data signal
22	B2	Blue data signal
23	B3	Blue data signal
24	B4	Blue data signal
25	B5	Blue data signal(MSB)
26	GND	
27	DENA	Data enable signal(to settle the viewing area)
28	VCC	3.3 V Power Supply
29	VCC	3.3 V Power Supply
30	TEST	This pin should be open. Test signal output for only internal test use.
31	REV	Reverse scan control. L = Normal, H = Reverse

*) The shielding case is connected with GND

CN 2 , CN 3 (BACKLIGHT)

Backlight-side connector: BHR-02(8.0)VS-1N(JST)

Inverter-side connector: SM02(8.0)B-BHS(JST)

Pin No.	Symbol	Function
1	CTH	VBLH High Voltage
3	CTL	VBLL Low Voltage

[Note]VBLH-VBLL = VL

5. INTERFACE TIMING

(1) Timing Specifications

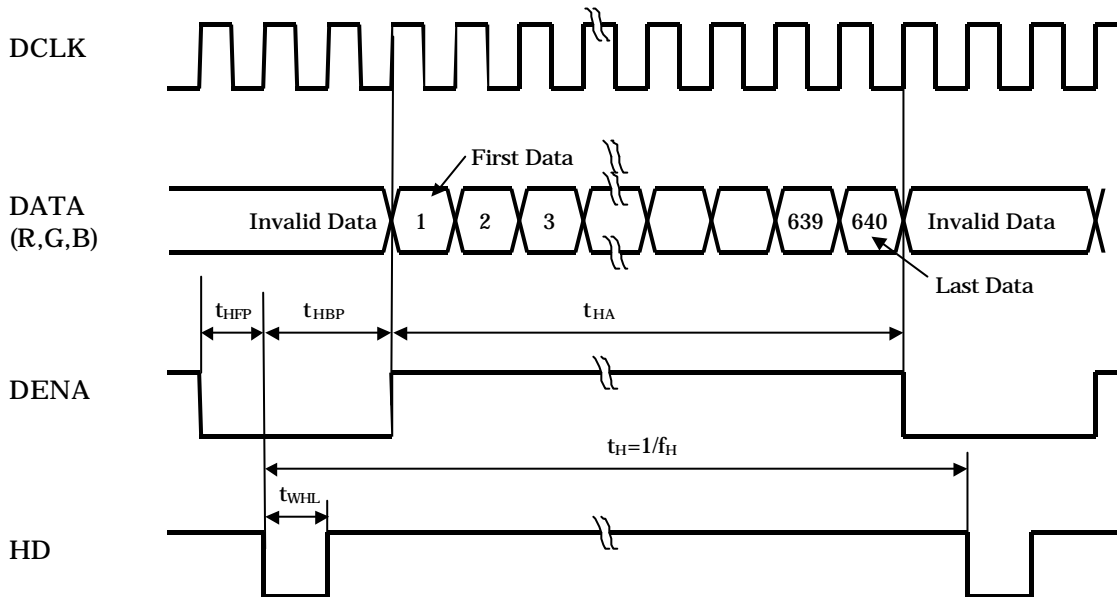| ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT
DCLK *1), *4)	Frequency	f_{CLK}	20	25	30	MHz
	Period	t_{CLK}	33.3	40	50	ns
	Low Width	t_{WCL}	10	--	--	ns
	High Width	t_{WCH}	10	--	--	ns
DATA (R,G,B,DENA, HD, VD) *1)	Set up time	t_{DS}	5	--	--	ns
	Hold time	t_{DH}	5	--	--	ns
DENA *3)	Horizontal Active Time	t_{HA}	640	640	640	t_{CLK}
	Horizontal Front Porch	t_{HFP}	0	16	--	t_{CLK}
	Horizontal Back Porch	t_{HBP}	19	144	--	t_{CLK}
	Vertical Active Time	t_{VA}	480	480	480	t_H
	Vertical Front Porch	t_{VFP}	1	10	--	t_H
	Vertical Back Porch	t_{VBP}	8	35	--	t_H
HD *2), *4)	Frequency	f_H	27	31.5	38	kHz
	Period	t_H	26.3	31.7	37.0	μs
	Low Width	t_{WHL}	5	96	--	t_{CLK}
VD *2)	Frequency	f_V	55	60	70	Hz
	Period	t_V	14.2	16.7	18.2	ms
	Low Width	t_{WVL}	2	2	--	t_H

[Note]

*1) DATA is latched at fall edge of DCLK in this timing specification.

*2) Polarities of HD and VD are negative in this specification.

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

*4) DCLK should appear during all invalid period, and HD should appear during invalid period of frame cycle.
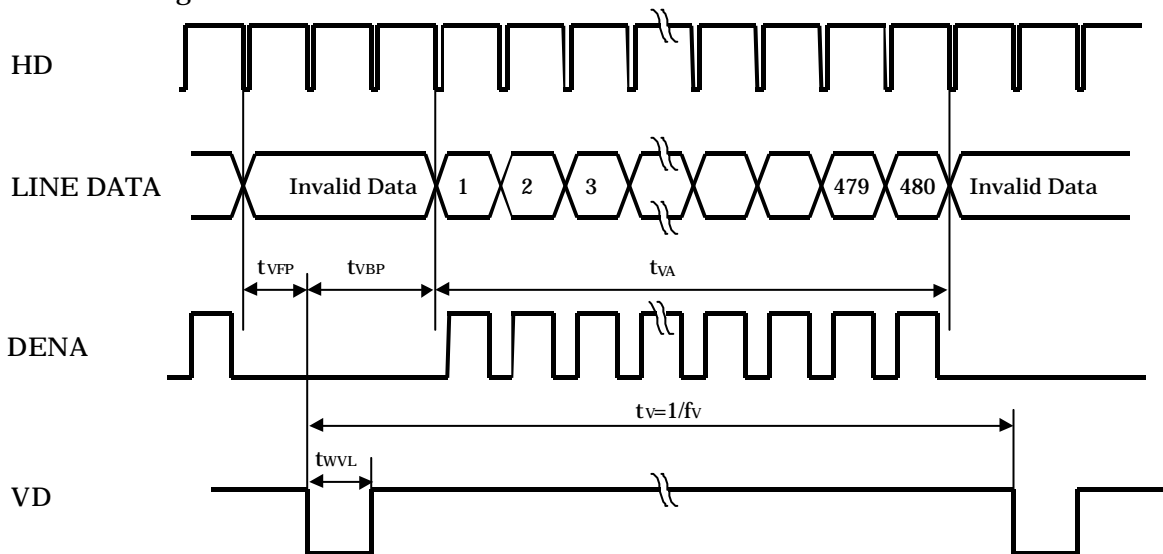
(2) Timing Chart

a. Pixel Timing Chart

DCLK

t_{CLK}

t_{WCH} t_{WCL}

2.0V
0.8V

DATA(R,G,B),
DENA, HD, VD

t_D t_D

2.0V
0.8V
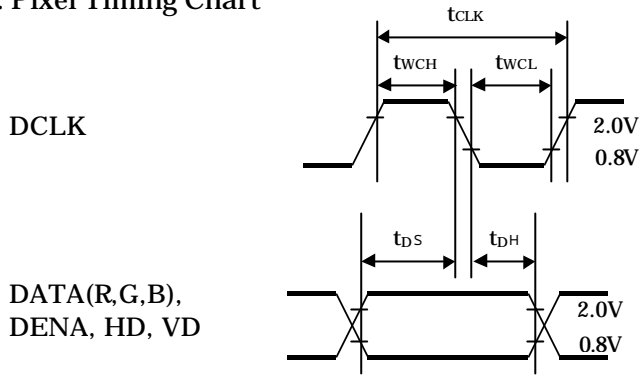
b. Horizontal Timing Chart

DCLK

DATA
(R,G,B)

First Data

Invalid Data | 1 | 2 | 3 | ... | 639 | 640 | Invalid Data

Last Data

DENA

t_{HFP} t_{HBP} t_{HA}

$t_H = 1/f_H$

t_{WHL}

HD

c. Vertical Timing Chart

HD

LINE DATA

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

DENA

t_{VFP} t_{VBP} t_{VA}

$t_V = 1/f_V$

t_{WVL}

VD

(3) Color Data Assignment

COLOR	INPUT DATA	R DATA						G DATA						B DATA					
		R5 MSB	R4	R3	R2	R1	R0 LSB	G5 MSB	G4	G3	G2	G1	G0 LSB	B5 MSB	B4	B3	B2	B1	B0 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(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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

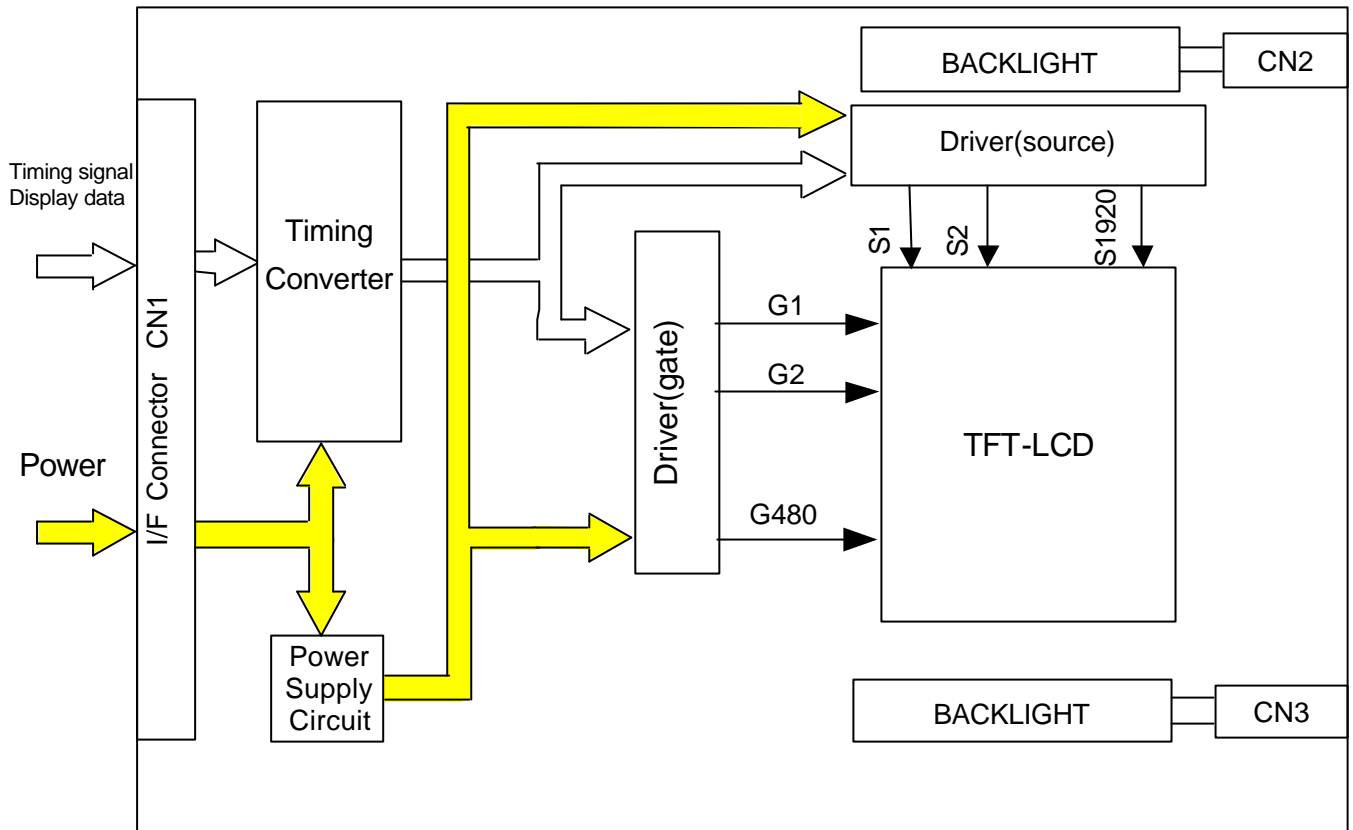[Note]
　　1) Definition of gray scale
　　　　Color (n) --- 　n indicates gray scale level.
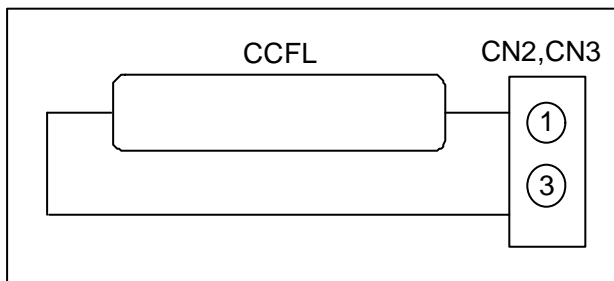　　　　Higher n means brighter level.
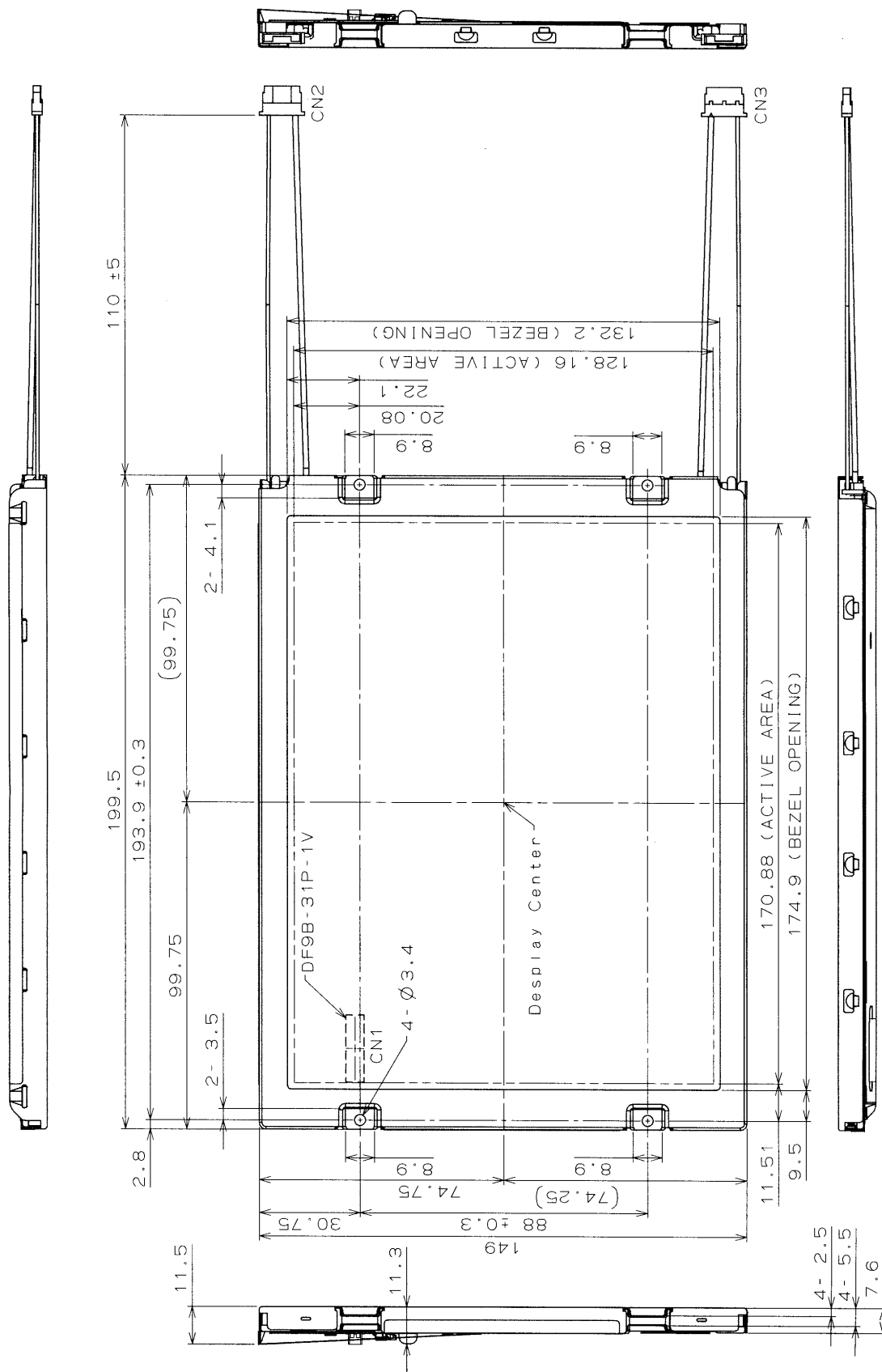　　2) Data
　　　　1:High, 0: Low

6. BLOCK DIAGRAM

BACKLIGHT
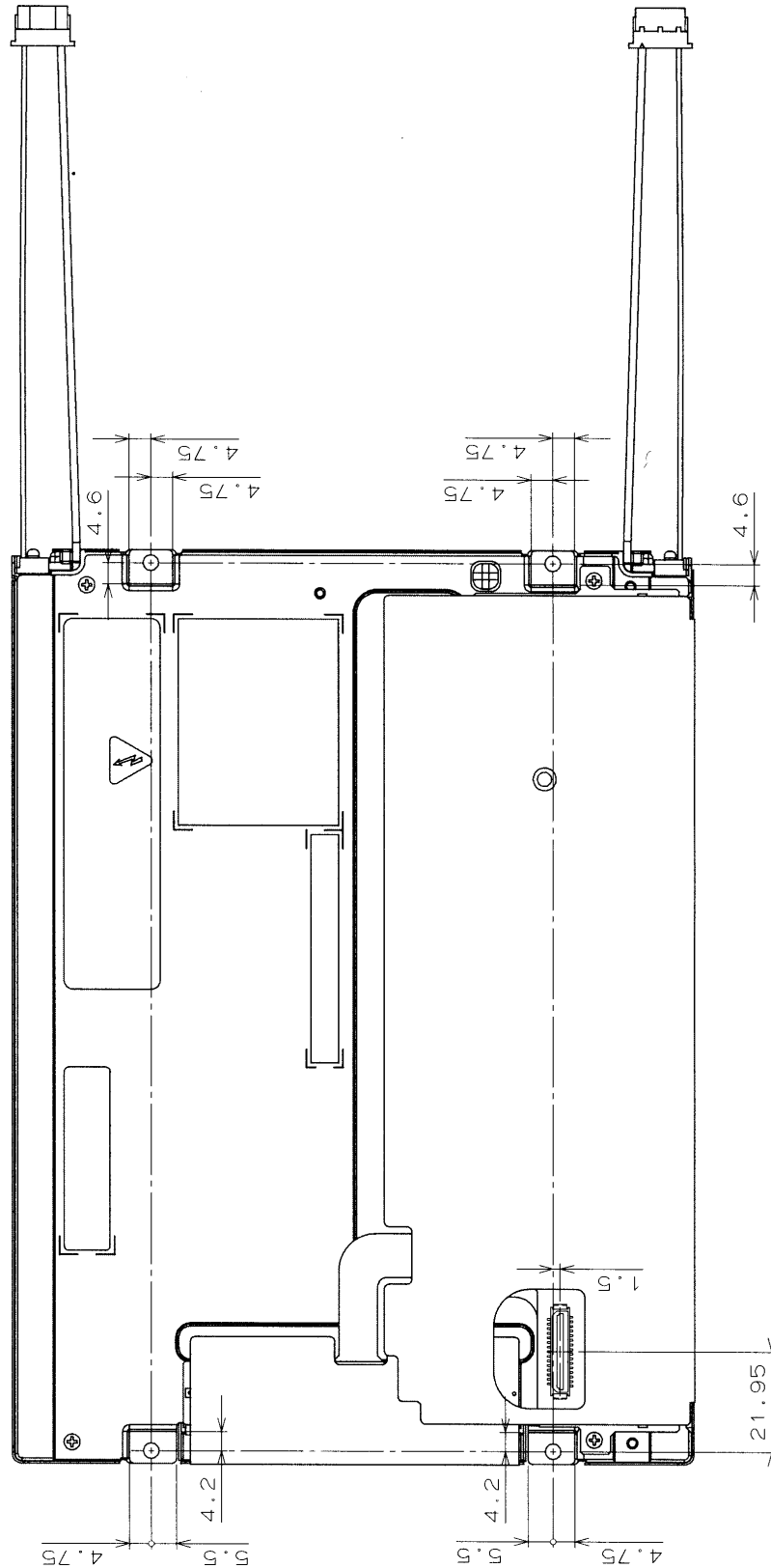
7. MECHANICAL SPECIFICATIONS

(1) Front Side

Unit: mm

(2) Rear Side

Unit: mm

[Note]
　　　We recommend you referring to the detailed drawing for your design.
　　　Please contact our company sales representative when you need the detailed drawing.

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8. OPTICAL CHARACTERISTICS

Ta = 25°C, VCC = 3.3 V, Input Signals: Typ. Values shown in Section 5

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	Remarks
Contrast Ratio		CR	θ = φ = 0°	--	450	--	--	*1)*3)
Luminance		Lw	θ = φ = 0°	300	400	--	cd/m²	IL=5.5mArms *2)*3)
				350	450	--	cd/m²	IL=6.5mArms *2)*3)
Response Time		tr	θ = φ = 0°	--	8	--	ms	*3)*4)
		tf	θ = φ = 0°	--	27	--	ms	*3)*4)
Viewing Angle	Horizontal	φ	CR ≥ 10	--	-65~65	--	°	*3)
	Vertical	θ		--	-60~50	--	°	*3)
Image Sticking		tis	2 h	--	--	2	s	*5)
Color Coordinates	Red	Rx	θ = φ = 0°	0.528	0.558	0.588	--	*3)
		Ry		0.297	0.327	0.357		
	Green	Gx		0.288	0.318	0.348		
		Gy		0.494	0.524	0.554		
	Blue	Bx		0.125	0.155	0.185		
		By		0.108	0.138	0.168		
	White	Wx		0.281	0.311	0.341		
		Wy		0.297	0.327	0.357		

[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 lamp unless noted.

Condition: FL = 60 kHz

*1) Definition of Contrast Ratio
    CR=ON (White) Luminance / OFF(Black) Luminance: average of 5 points shown in a figure below
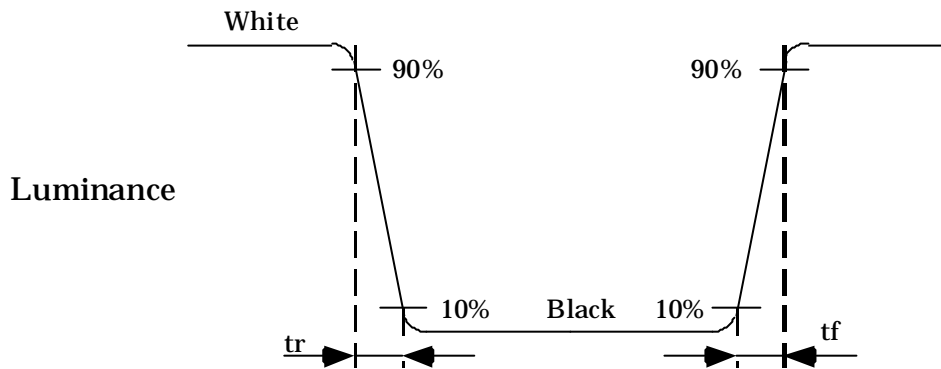
*2) Definition of Luminance
    Lw= ON (White) Luminance: average of 5 points shown in a figure below

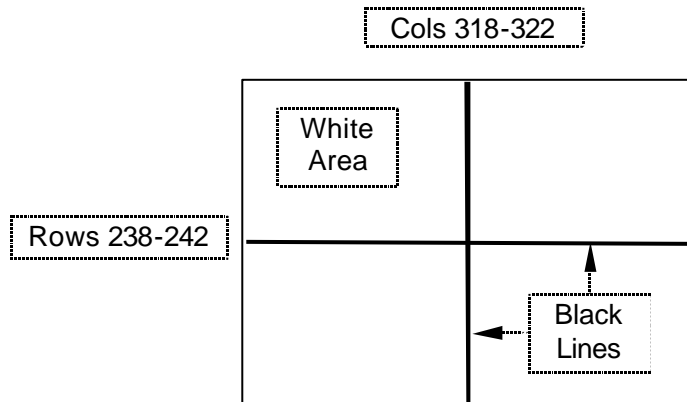MEASUREMENT POINT
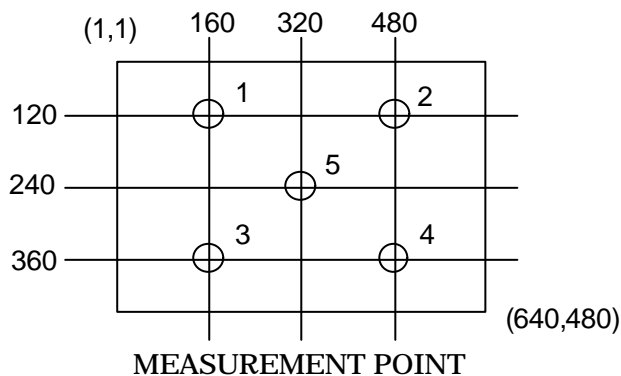
*3) Definition of Viewing Angle(θ , φ)
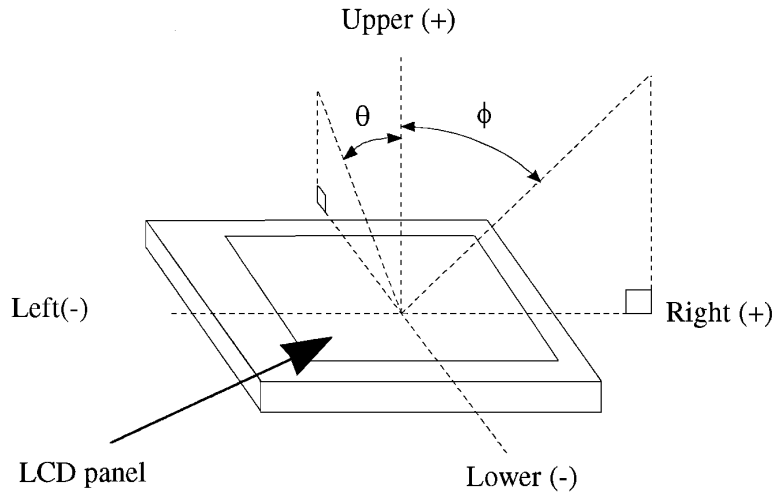
*4) Definition of Response Time

*5) 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.

TEST PATTERN FOR IMAGE STICKING TEST

9. RELIABILITY TEST CONDITION

(1) Temperature and Humidity

TEST ITEM	CONDITIONS
HIGH TEMPERATURE HIGH HUMIDITY OPERATION	40°C, 90%RH, 240 h
HIGH TEMPERATURE STORAGE	65°C, 96 h
LOW TEMPERATURE STORAGE	-20°C, 96 h
THERMAL SHOCK(NON-OPERATION)	BETWEEN -20°C (1h) and 65°C(1h), 5 CYCLES

(2) Shock & Vibration

ITEM	CONDITIONS
SHOCK (NON-OPERATION)	Shock level: $1470 m/s^2$ (150G) Waveform: half sinusoidal wave, 2ms Number of shocks: one shock input in each direction of three mutually perpendicular axis for a total of six shock inputs
VIBRATION (NON-OPERATION)	Vibration level: $9.8 m/s^2$ (1.0G)(Zero to Peak) Waveform: sinusoidal Frequency range: 5 to 500Hz 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 with no obvious non-uniformity and no line defect.
Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

10. INSPECTION STANDARDS

Inspection condition is as follows:

      Viewing distance is approximately 35 cm.

      Viewing angle is normal to the LCD panel.

      Ambient temperature is approximately 25°C.

   Ambient light is from 300 to 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	
	DISTANCE BETWEEN DEFECTS BRIGHT DOT DARK DOT	$\geq 15 \text{ mm}$ $\geq 15 \text{ mm}$	
	LINE DEFECT	NOT ALLOWED	

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

*2) DEFINITION OF ADJACENT

R	G	B	R	G	B	R	G	B
R	G	B	R	G	B	R	G	B
R	G	B	R	G	B	R	G	B

■ Defective Dot

■ Adjacent Dots
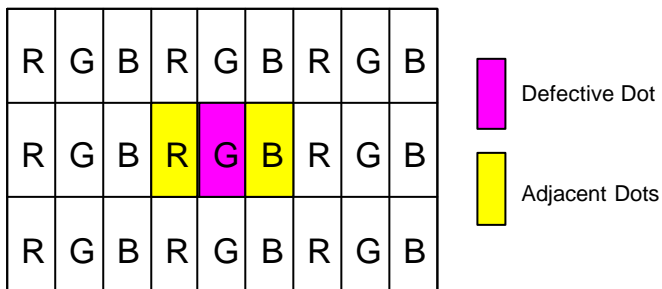
The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

11. HANDLING PRECAUTIONS FOR TFT-LCD MODULE

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

(1) ASSEMBLY PRECAUTION

a. Please use the mounting hole on the module in installing and do not bending or wrenching LCD in assembling. And please do not drop, bend or twist 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 all sides and not to wrench module. The stresses may cause non-uniformity even if there is no non-uniformity statically.

  (b) 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.

  (c) 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.

  (d) Design the inverter location and connector position carefully so as not to give stress to lamp cable, or not to interface the LCD module by the lamp cable.

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

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 do not press any parts on the rear side such as source TCP, gate TCP, control circuit board and FPCs during handling LCD module. If pressing rear part is unavoidable, handle the LCD module with care not to damage them.

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

f. 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.

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

h. 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.

i. Please pay attention to handling lead wire of backlight so that it is not tugged in connecting with inverter.

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

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

(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. LCD backlight takes longer time to become stable of radiation characteristics in low temperature than in room temperature.

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

e. A condensation might happen on the surface and inside of LCD module in case of sudden change of ambient temperature.

f. 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.

g. 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

a. Please do not leave the LCDs in the environment of high humidity and high temperature such as 60°C90%RH.

b. Please do not leave the LCDs in the environment of low temperature; below -20°C.

(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 cable.

d. Inverter should be designed carefully so as not to keep working in case of detecting over current or

open circuit on the lamp.

(6) OTHERS

a. A strong incident light into LCD panel might cause display characteristics changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight and strong UV rays.

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, please pay attention to the followings;

   (a) 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.

   (b) Please do not pile them up more than 6 boxes. (They are not designed so.) And please do not turn over.

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

   (d) 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.)

Packaging specification

1. packaging box

material: cardboard, polyethylene form
construction: See Fig 1
max. packaging number: 10 pcs.
dimension: 593(W) $\times$ 255(D) $\times$ 325(H)
mass(including 10 modules): 5.8kg
label: Labels are put on the box.(See Fig 2,3,4)
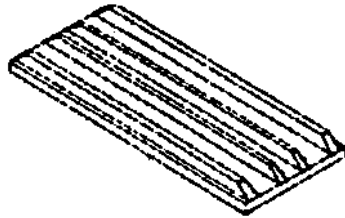
Upper Protector
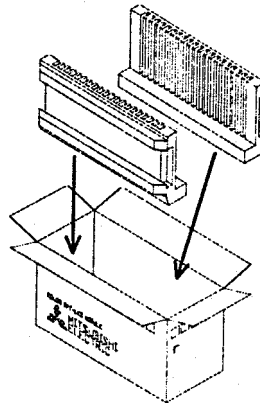
Side Protector

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

Fig.2. Label1

Shipper	Box No.
	Mass
Shipping No.	
Bar-code	
Products name	
Bar-code	
Packaging No.	
Bar-code	
Order No.	
Bar-code	
Product name	
Bar-code	

Fig.3. Label 2

Consignee

Product name

Product name of consignee

Order No.

Box No.

Place of production

Bar-code

Shipping date

Fig. 4. Label 3

OPTREX

TFT - LCD   AA084VC05

T-5638D084J-FW-A-AB

P / O NO.   123456789

C / S   001 OF 005

MADE IN JAPAN

001   JA1BK4144

2001/11/15

Fig. 5 Sample of Label3

Label 1
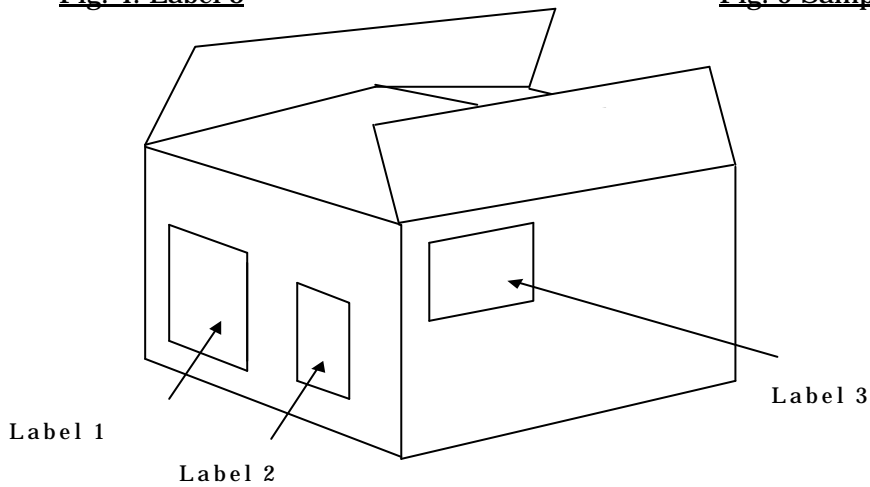
Label 2

Label 3

Fig. 6. Location of Labels

2. Location of label on the packaging box

Labels are put on the box.(See. Fig 6)

3. Packaging form of product

(1) Each of LCD modules is packed in anti-electrostatic bag.(Fig 7)
(2) The packaging box contains 10 modules.(Fig 8,9)
(3) Upper protector is put on the products, and shut the box.(A→B→C→D) (Fig 10)

Tape(temporary)

Lamp lead

Product in
Anti-electrostatic bag
(Surface)

(Rear)
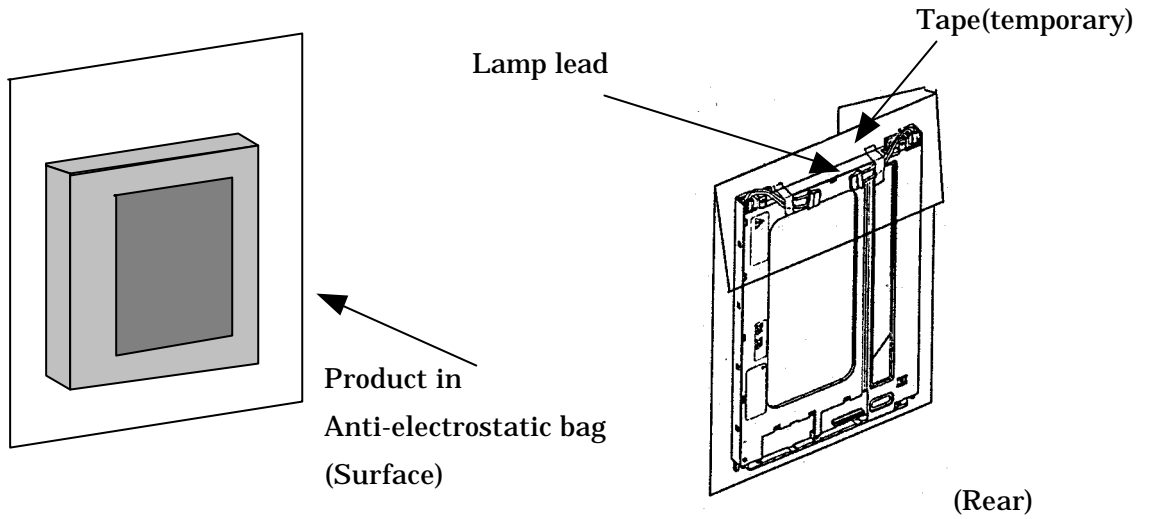
Fig. 7
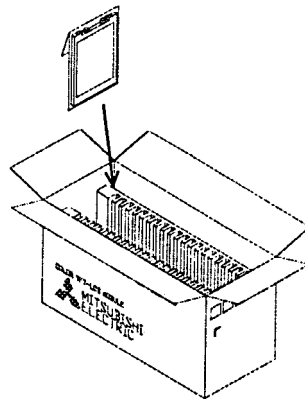
Fig. 8

If the number of modules is smaller than 10pcs, modules are put in order　　,　　,　　…

⑨　⑦　⑤　③　①　②　④　⑥　⑧　⑩

1 piece in each space, total 10 pieces.(max)　　　Center mark 凹

Fig
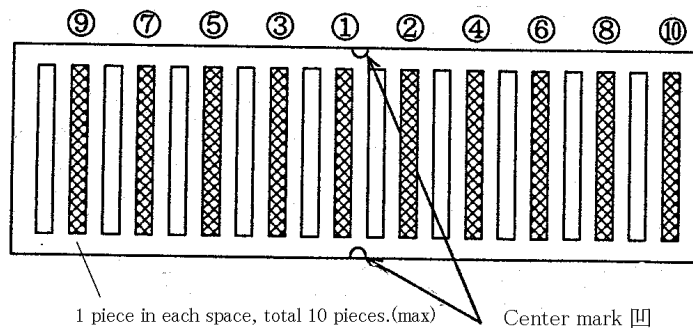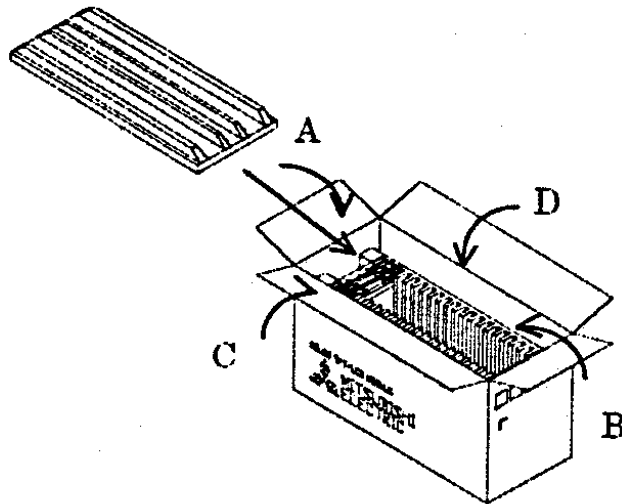
Fig. 10

4. 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) Handle with care. Keep off from rain & dew.
(3) Keep off from direct sunlight exposure. Please store under room temperature & low humidity in original packaging condition when they were shipped.
(4) Keep other cautions described in handling manual.

Products Number Labeling Forms

Products number label is constructed as below;

Brand Name, Symbol

T-51512D121-FW-A-AA

AA121SK26

ABC1234567890

60100001L

Bar-code

⚠ WARNING LAMP HIGH VOLTAGE

c🆄us E158720   Made in Japan
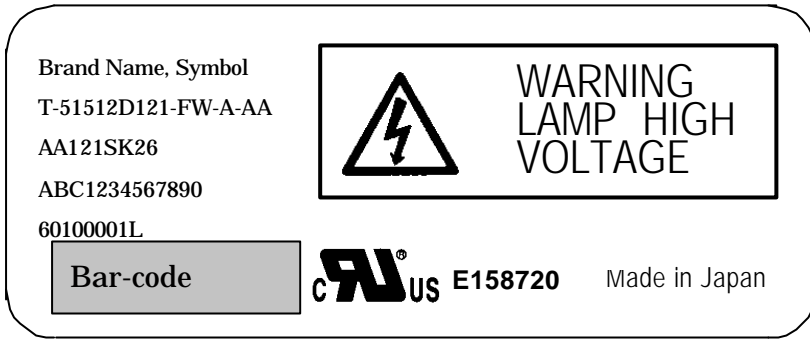
Brand Name, Symbol
Products Name of Optrex
Products Name
Production Key Number(13Digits)
Date Code
(Serial Number, Factory Sign)
Bar-code of Date Code
UL File No.
Production Country

Brand Name, Symbol
OPTREX

Products Name of Optrex

ex. T51512D121-FW-A-AA

Products Name

ex.1: AA121SK26   ex.2: AA150XA03   B

Production Key Number(13Digits)

(ID Number for Production Control)

Date Code   Serial Number, Factory Sign

```
1  2  3  4  5  6  7  8  9
         └─────────────── Factory Sign
         └──────────────Serial Number on Every Production Week
                          (00001     99999)
         └──────────────Production Week Number(01    53)
         └──────────────Production Year Number
                          Last 1 Digit of AD Year Number
```
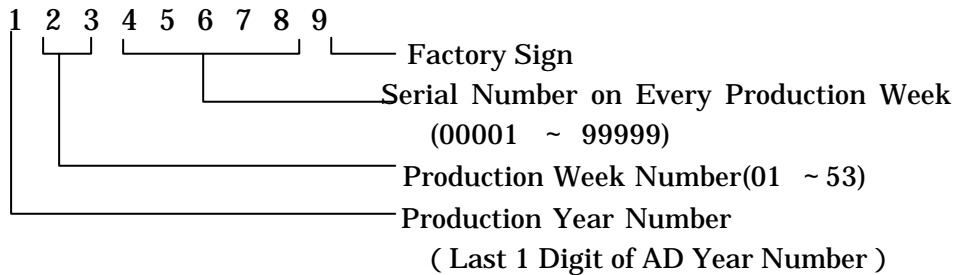
Date Code is constructed by 9 Digits as below;
   1st Digit   Production Year Number   Last 1 Figure of AD Year
   2nd 3rd Digit   Production Week Number in a Year
                       A Year is divided to 53 weeks from Monday to Saturday
   4th 8th Digit   Serial Number on Every Production Weeks.
              00001   99999
                       These are numbered in order according to Production Name.
   9th Digit   Factory Sign (on the Module Test Process)
                (L: Shisui Factory Line,   Y: YACHIYO SANYO Industries Line,
           W: CPT Fab-1, R: CPT Fab-2 , U: CPT Wujiang-LCM

Bar-code(Date Code)

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

UL File No.

ADI: E158720, CPT: E194548

Production Country

ADI: Made in Japan, CPT: Made in Taiwan

LAMP UNIT for 8.4"VGA

APPLICATION

This technical literature applies to the replaceable lamp unit that is the maintenance parts for 8.4"VGA TFT-LCD module industrial use(model name:T-51638D084J-FW-A-AB).
(AA-L5903361(Top), AA-L5903362(Bottom))

MECHANICAL CHARACTERISTICS

Item	Specification	Remarks
Outline Dimension of Reflector	$196^{+0.4}_{-0.6} \times 3.9 \pm 0.1 \times 6.23 \pm 0.1$ (mm)	Except wire
Mass	8 (g) (MAX)	
Lamp Diameter	ϕ 2.4-1.8$\pm$ 0.1 (mm)	

See DRAWING OF OUTLINE DIMENTIONS

ENVIRONMENTAL CONDITIONS

Item	Operation		Non Operation		Remarks
	MIN	MAX	MIN	MAX	
Ambient Temperature	-10°C	65°C	-20°C	70°C	No Condensation

Top,Tstg $\leq$ 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

Item	Symbol	Condition	MIN	TYP	MAX	Unit	Remarks
Lamp Current	IL	Ta = 25°C	3.0	6.5	7.0	mArm	
Lamp Voltage	VL	Ta = 25°C	-	450	-	Vrms	
Starting Lamp Voltage	VS	Ta = 25°C	670	-	-	Vrms	
Lamp Frequency	FL	Ta = 25	30	-	60	kHz	

*1) These values are shown by Elevam using S-12324A-00 inverter.

*2) Lamp Current measurement method (The current meter is inserted in low voltage line.)
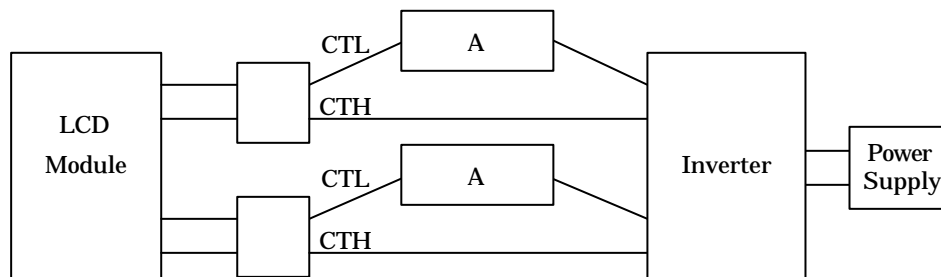
OPTICAL CHARACTERISTICS

Ta=25°C, 60±10%RH

Item	Symbol	MIN	TYP	MAX	Unit	Remarks
Luminance	Lw	300	400	--	cd/m²	IL=5.5 mArms Average of below 5 points
		350	450	--	cd/m²	IL=6.5 mArms Average of below 5 points
Color Coordinates (White)	Wx	0.281	0.311	0.341	-	Value of center point(5)
	Wy	0.297	0.327	0.357	-	Value of center point(5)

[Conditions]
　　　Inverter frequency: 60kHz
[Measurement Point]
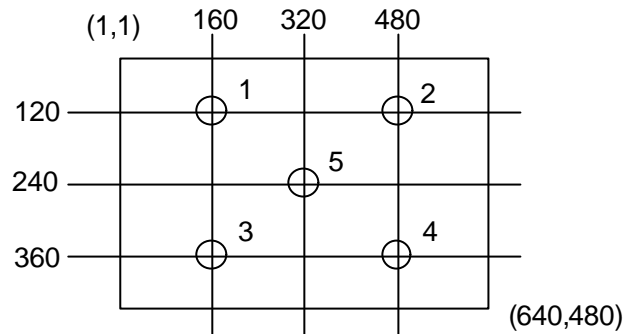
These items are measured when lamp units are assembled intot T-51638D084J-FW-A-AB, and using CS1000(MINOLTA) for color coordinates, and CS1000 or BM-5A(TOPCON) for others under the dark room condition (no ambient light) after more than 30 minutes from turning on the lamp unless noted.

LIFE TIME OF THE LAMP UNIT

　　　Environmental Conditions are as follows:
　　　Ambient temperature is 25±5°C.
　　　Lamp Current is 6.5 mArms.

Continuous Operation	50,000 h
Number of turning on and off	100,000 times (30 sec ON-OFF)

(1) Lamp life time is defined as the time either when the brightness becomes 50% of the initial value, or when the starting lamp voltage does not meet the value specified in the table of section 4.
(2) The life time of the backlight depends on the ambient temperature. The life time will decrease under low/high temperature.

INTERFACE PIN CONNECTION

　　　Backlight-side connector: BHR-02(8.0)VS-1N(JST)
　　　Inverter-side connector: SM02(8.0)B-BHS(JST)

Pin No.	Symbol	Function
1	CTH	VBLH(High voltage)
3	CTL	VBLL(Low voltage

[Note]　　VBLH-VBLL=VL

DRAWING OF OUTLINE DIMENTIONS

(1) <u>AA-L5903361</u>(Top)

3.9 ± 0.1

$196 \begin{smallmatrix} +0.4 \\ -0.6 \end{smallmatrix}$

112 ± 5

6.23 ± 0.1

(2) <u>AA-L5903362</u>(Bottom)

6.23 ± 0.1

3.9 ± 0.1

$196 \begin{smallmatrix} +0.4 \\ -0.6 \end{smallmatrix}$

112 ± 5
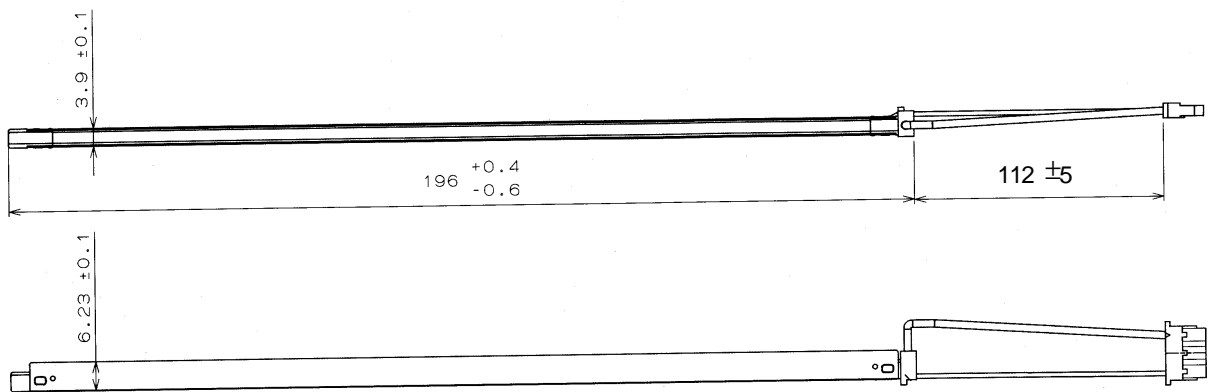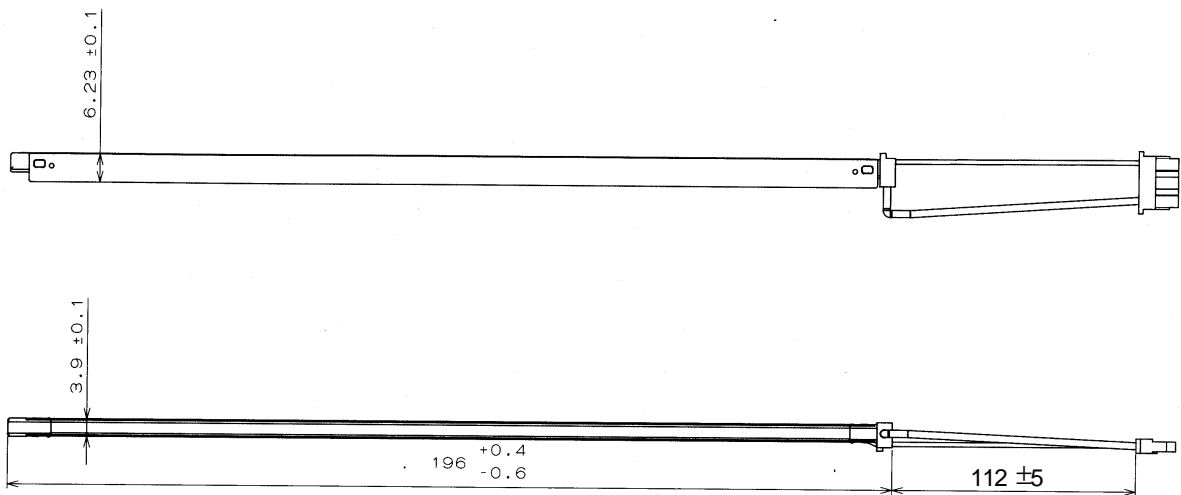
METHOD OF REPLACING THE LAMP UNIT

(1) Precautions
      Please pay attention to the following items while replacing the Lamp 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 matters that will cause bad display image.
       (Using clean bench or similar environment is recommended.)
   c. Please be careful of the edge of the frame metal.

(2) Method of replacing the Lamp Unit
   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 matters.

Top

Bottom
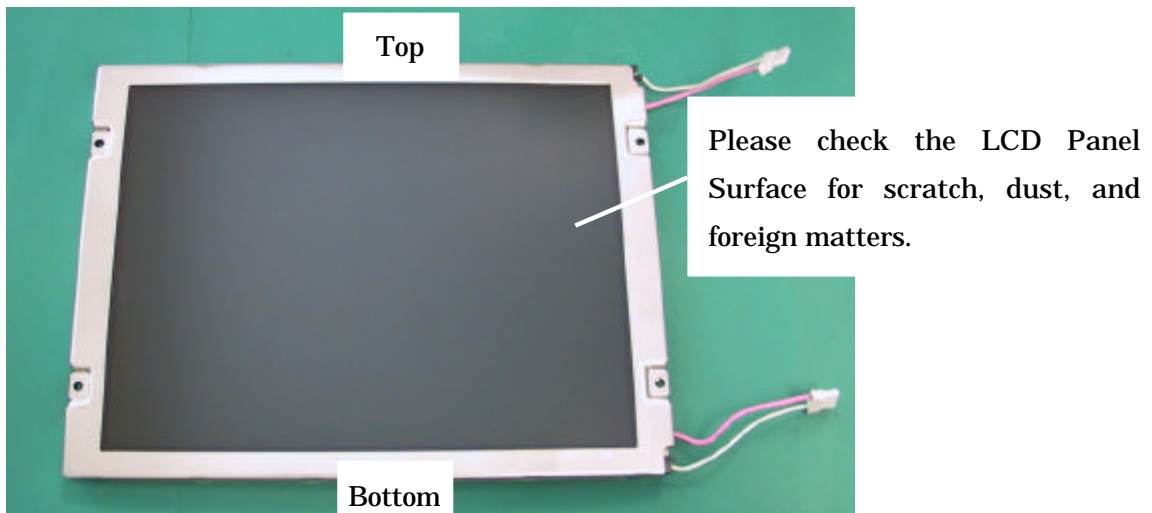
Picture 1

   2)   Turn the TFT-LCD Module upside down and unfasten the cable.

Please unfasten the wire from the latch of plastic frame.
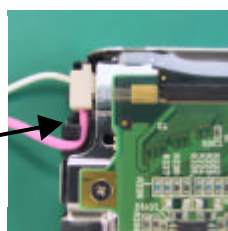
Picture 2

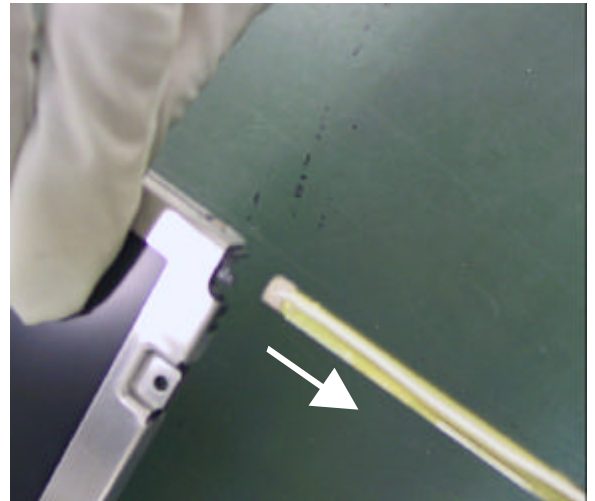3) Stand the TFT-LCD Module up and push down the latch with that the Lamp Unit fastens.

Latch

Push down the latch.
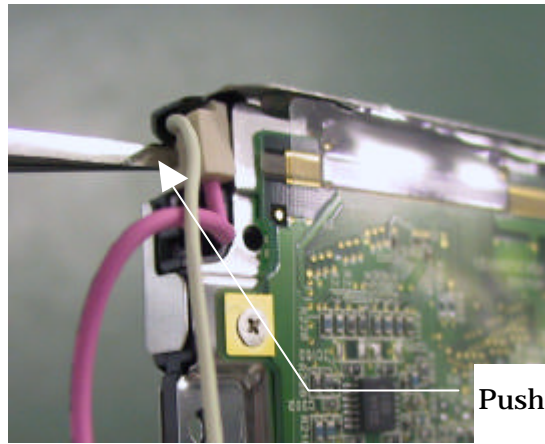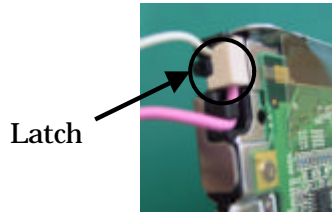
Picture 3

4) Pull the cable slowly and remove the Lamp Unit.
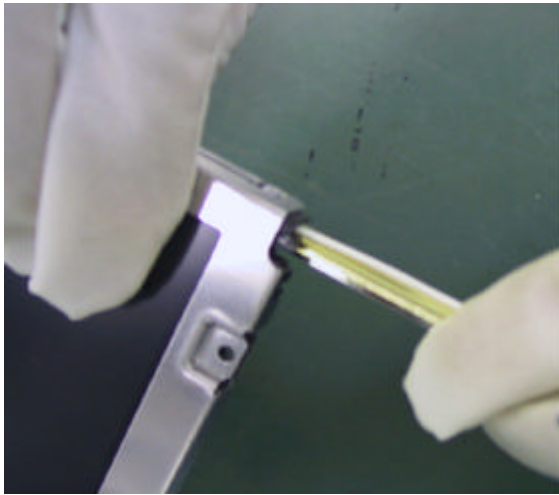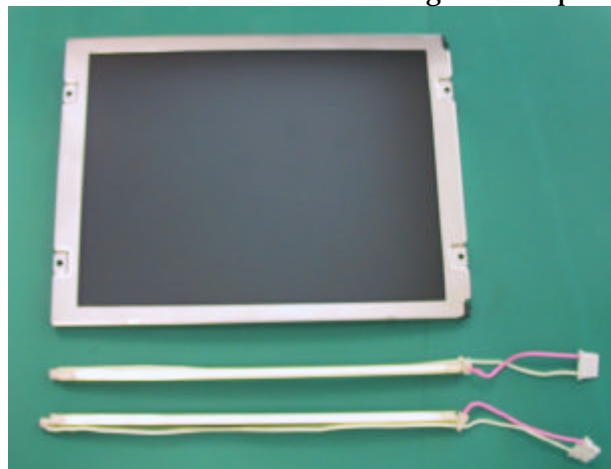
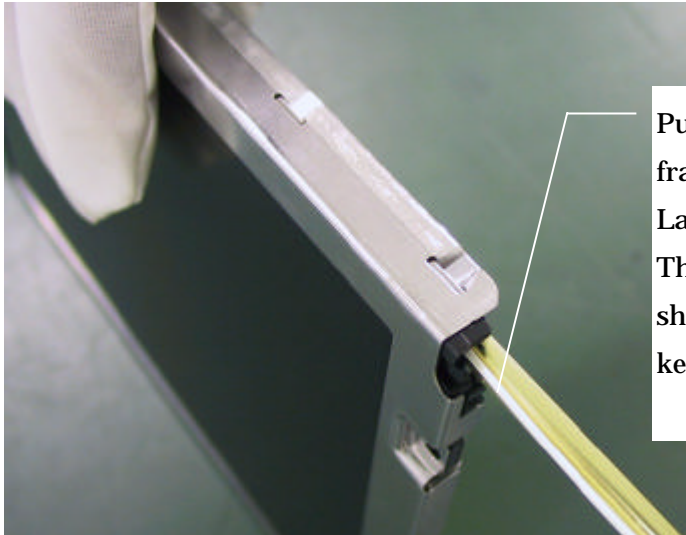Picture 4   Picture 5

5) Remove the other Lamp Unit at the opposite(bottom) side of LCD Module in the same way. See.3) and 4)

6) Picture 6 shows the TFT-LCD Module after removing the Lamp Units.

Picture 6

7)   Prepare to insert the new Lamp Units.
     • Open the package and take the new Lamp Units out.
     • Check the new Lamp Units for dust and foreign matters.

8)   Stand the TFT-LCD module and insert the new Lamp Unit.
     The light guide and reflector sheet should be inside of the Lamp Unit.
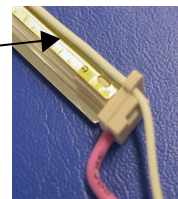   Please pay attention to insert direction.

Push down the latch of the plastic frame (black) and insert the new Lamp Unit.
The light guide and reflector sheet should be inside of the Lamp Unit keeping the white cable straight.
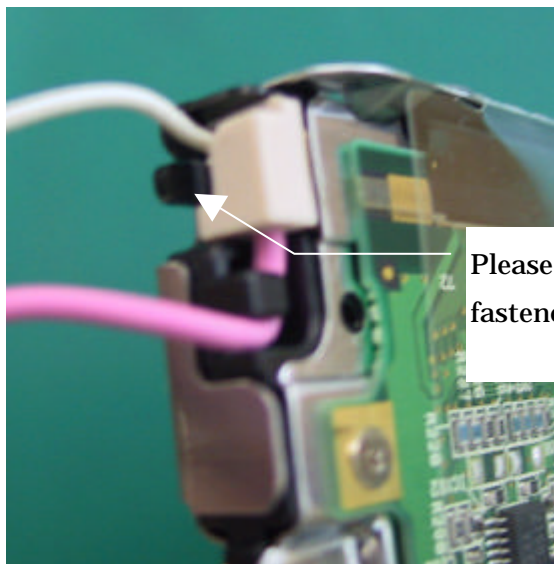
Picture 7
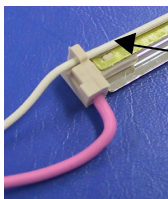
The white cable should be on the side of LCD Panel Surface.

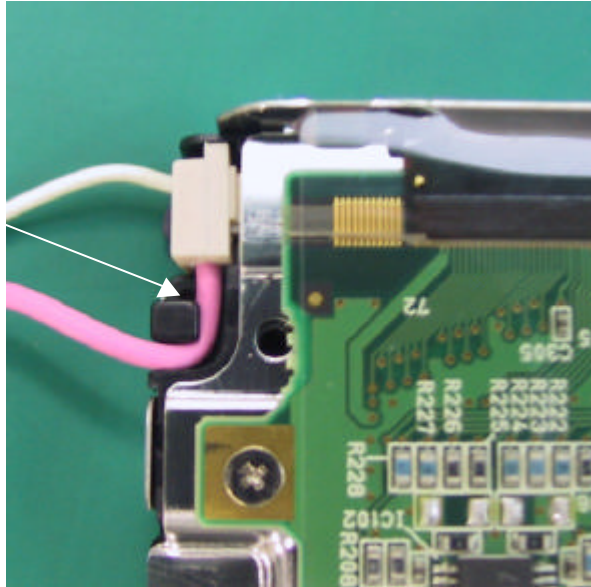9)   After inserting, please check the Lamp Unit is fastened with the latch.

Please check the Lamp Unit is fastened with the latch.

Picture 8

| T-51638D084J-FW-A-AB (AB) No. 2003-0193 | OPTREX CORPORATION | Page 31/32 |

10) Fasten the wires to the latch of the plastic frame.

Fasten the Pink and white wires to the latch of the plastic frame.

Picture 9

11) Insert the other Lamp Unit to the opposite(bottom) side of the LCD module in the same way. See. 8) to 10)

12) After replacing the Lamp Units, please check the following items.
   - Appearance of TFT-LCD Module is not changed after replacing Lamp Units. (See. Picture 1 and Picture 2)
   - There is no damage, dust, or foreign matters on the LCD Panel Surface.
   - Install the TFT-LCD Module then check turning on the lamps.