Products Specification

Products Name	Color TFT-LCD
Type Name	AA104VC02

Prepared	Hiroyuki Daikoku	
Approved	Kenichi Niki	

Products Specification

Products name   <u>COLOR TFT-LCD</u>

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This products specification includes d/d(documents and drawings) in the below table.

item	d/d No.	Rev. No	Title of d/d	Number of Pages	Remarks
01	AA104VC02 - 02 - 03	--	AA104VC02 TECHNICAL SPECIFICATION	22	
02	AA104 - 03	--	10.4"LCD Module(AA104 Series) PACKAGING SPECIFICATION	4	
03	PRODUCTLABELE	F	PRODUCTS NUMBER LABELING FORMS	2	
04	AA104VC01 - 06	--	LAMP UNIT for 10.4"VGA (AA104VC**)	9	

Authorization for submission, (Sep.17, 2003)			
	Name	**Title**	**Signature**
Prepared	T.Hatashita	Project Manager Products Design, Design Dept.	畑下 豊仁
Checked	Y.Numano	Manager Products Design, Design Dept.	沼野 容典
Approved	K.Kobayashi	Manager Design Dept.	小林和弘

(note 1) Three copies of this specification are submitted. Please return one copy with the receipt signature to us.

(note 2) When altering this specification, please consult us in advance and correct with red ink.

(note 3) In the case that we change applicable specifications, the revised specification shall be submitted for your receipt .

Specification Receipt			
Date	**Name**	**Title**	**Signature**

Products Specification	Rev. No.
MDPS – AA104VC02 - 01 - 03	--

Revision Status for Products Specification

Products name COLOR TFT-LCD
Type name   AA104VC02

Rev.	Description	Rev.Date	Prepared	Checked / Approved
First	First Revision	Sep. 17,'03	T.Hatashita	Y.Numano K.Kobayashi

Products Specification	Rev.No.
MDPS – AA104VC02 - 01 - 03	**--**

10.4"VGA

TECHNICAL SPECIFICATION

AA104VC02

MITSUBISHI / MDTI

Date: Sep.17,'03

CONTENTS

1. OVERVIEW

AA104VC02 is 10.4" 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, 260K-color images are displayed on the 10.4" diagonal screen. Input power voltage is single 3.3 / 5.0V for LCD driving. Both 3.3V-CMOS and 5.0V-CMOS level voltage are acceptable for logic input voltage.

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

ITEM	SPECIFICATION
Display Area (mm)	211.2(H) × 158.4 (V) (10.39-inch diagonal)
Number of Dots	640 × 3 (H) × 480 (V)
Pixel Pitch (mm)	0.33 (H) × 0.33 (V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	normally white
Number of Color	260K
Wide Viewing Angle Technology	Optical compensation film
Optimum Viewing Angle(Contrast ratio)	6 o'clock
Brightness (cd/m²)	380
Module Size (mm)	243.0 (W) × 181.6 (H) × 12.2 (D)
Module Mass (g)	540
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.

MDTI 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	-0.3	6.5	V
Logic Input Voltage	VI	0	6.5	V
Lamp Voltage	VL	0	1500	Vrms
Lamp Current	IL	0	10.0	mArms
Lamp Frequency	FL	30	80	kHz
Operation Temperature Note 1,2)	T_{op}	0	60	°C
Storage Temperature Note 2)	T_{stg}	-20	70	°C

[Note]

1) Display panel 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

3. ELECTRICAL CHARACTERISTICS

(1) TFT- LCD   Ambient Temperature : Ta = 25°C

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	Remarks
Power Supply Voltage for LCD	3.3V powered	VCC	3.0	3.3	3.6	V	A)
	5.0V powered	VCC	4.75	5.0	5.25	V	A)
Power Supply Current for LCD	3.3V powered	ICC	-	300	450	mA	VCC=3.3V B)
	5.0V powered	ICC	-	200	300	mA	VCC=5.0V B)
Permissive Input Ripple Voltage		VRP	-	-	100	mVp-p	VCC = +3.3V/5.0V
Logic Input Voltage	High	VIH	2.0	-	5.25	V	
	Low	VIL	0	-	0.8	V	

(2) Backlight   Ta=25°C

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	Remarks
Lamp Voltage		VL	--	480	--	Vrms	IL=6.0mArms
Lamp Current		IL	3.0	6.0	7.0	mArms	*1),*5)
Lamp Frequency		FL	40	--	80	kHz	*2)
Starting Lamp Voltage	Ta=25°C	VS	930	--	--	Vrms	
	Ta=0°C		1170	--	--	Vrms	
Lamp Life Time		LT	50000	--	--	h	*3),*4) IL=6.0mArms

*1) Lamp Current measurement method (The current meter is inserted in low voltage line.)
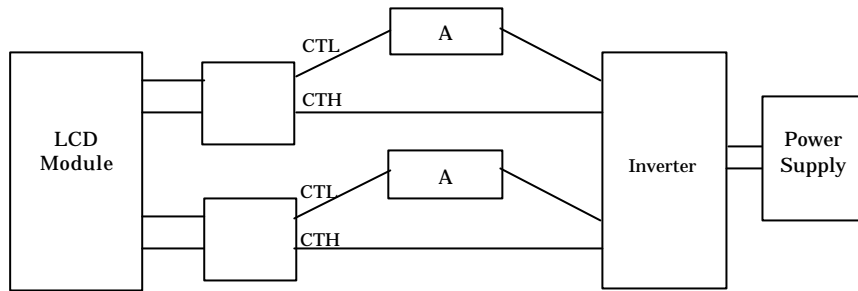
*2) Lamp frequency of inverter may produce interference with horizontal synchronous frequency, and this may cause horizontal beat on the display. Therefore, please adjust lamp frequency, and keep inverter as far from module as possible or use electronic shielding between inverter and module to avoid 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 $\sqrt{2}$ ±10%
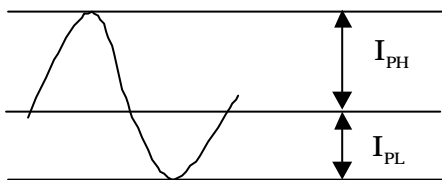
I_{PH}: High side peak

I_{PL}: Low side peak

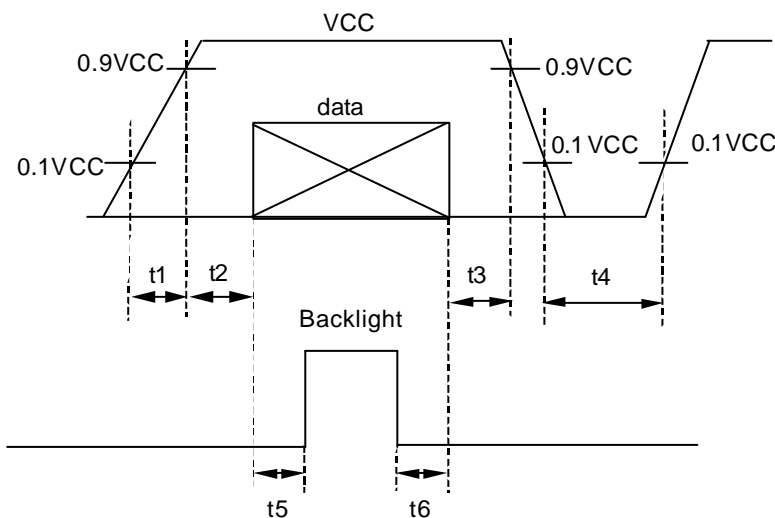The degree of unbalance = $|I_{PH} - I_{PL}| / Irms \times 100(\%)$

The ratio of wave height = I_{PH}(or I_{PL}) / Irms

     CURRENT WAVE FORM

[Note]

A) Power and signals sequence:

    $t1 \leq 10$ ms 400 ms $\leq t4$

    $0 < t2 \leq 50$ ms 200 ms $\leq t5$

    $0 < t3 \leq 50$ ms $0 \leq t6$

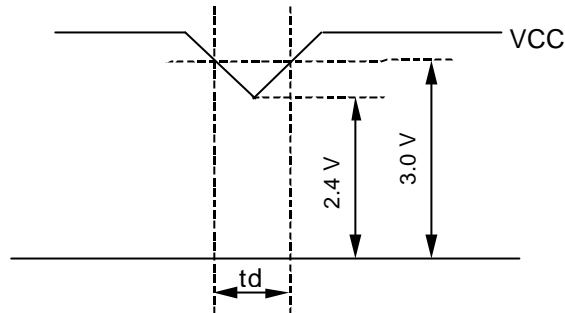

data : RGB DATA, DCLK, HD, VD, DENA

VCC-dip conditions:

    (a) 3.3 V powered

        1) When 2.4 V $\leq$ VCC < 3.0 V, td $\leq$ 10 ms

        2) When VCC < 2.4 V

          VCC-dip conditions should also follow the power and signals sequence.

VCC

2.4 V   3.0 V

td

    (b) 5.0V powered

        1) When 3.6 V $\leq$ VCC < 4.5 V, td $\leq$ 10 ms

        2) When VCC < 3.6 V

          VCC-dip conditions should also follow the power and signals sequence.

VCC

3.6 V   4.5 V

td
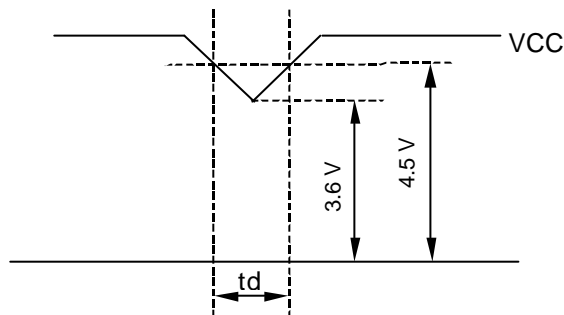
B) Typical current condition:

      64- gray- bar-pattern
      480 line mode
      VCC = + 3.3 / 5.0 V, f_H=31.5kHz, f_V=60Hz, f_{CLK}= 25MHz

4. INTERFACE PIN CONNECTION

CN 1(INTERFACE SIGNAL)

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

Corresponding connector: DF9-31S-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 / 5.0 V Power Supply
29	VCC	3.3 / 5.0 V Power Supply
30	TEST	This pin should be open. Test signal output for only internal test use.
31	SC	Scan direction Control.(GND or Open:Normal, High:Reverse)

*1) The shielding case is connected with GND

*2) See; Timing Chart(P9)

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

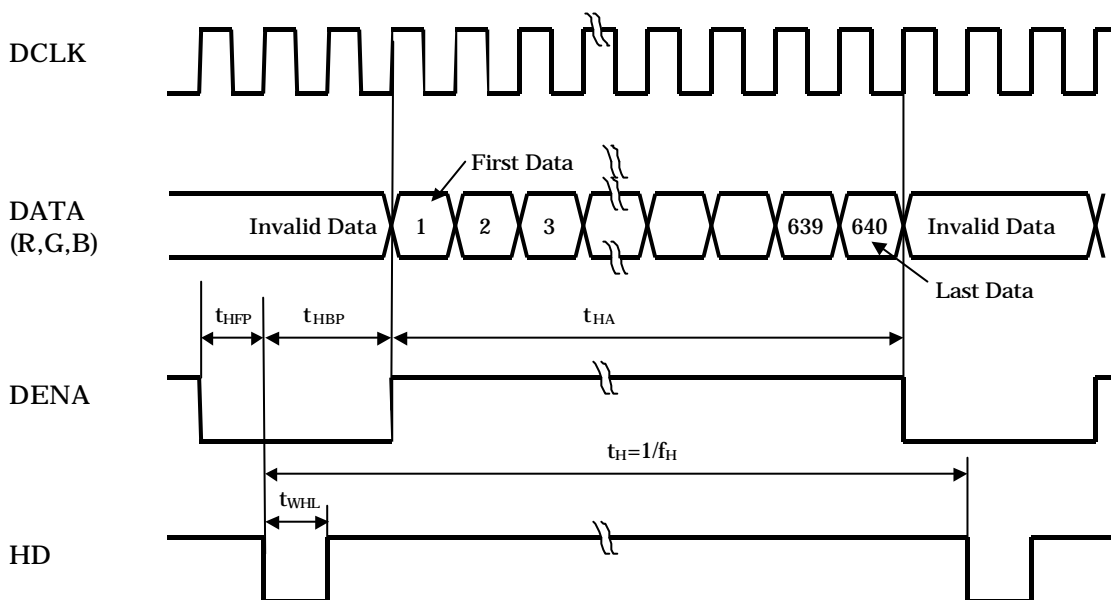| ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT
DCLK *1) *4)	Frequency	f_{CLK}	--	25	29	MHz
	Period	t_{CLK}	34.5	40	--	ns
	Low Width	t_{WCL}	12	--	--	ns
	High Width	t_{WCH}	12	--	--	ns
DATA *1) (R,G,B,DENA HD, VD)	Set up time	t_{DS}	5	--	--	ns
	Hold time	t_{DH}	5	--	--	ns
DENA *3)	Horizontal Active Time	t_{HA}	640	640	640	t_{CLK}
	Horizontal Front Porch	t_{HFP}	10	16	--	t_{CLK}
	Horizontal Back Porch	t_{HBP}	2	138	--	t_{CLK}
	Vertical Active Time	t_{VA}	480	480	480	t_H
	Vertical Front Porch	t_{VFP}	1	13	--	t_H
	Vertical Back Porch	t_{VBP}	2	33	--	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	14.3	16.7	18.2	ms
	Low Width	t_{WVL}	3	--	--	t_H

[Note]

*1) DATA is latched at fall edge of DCLK in this 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.
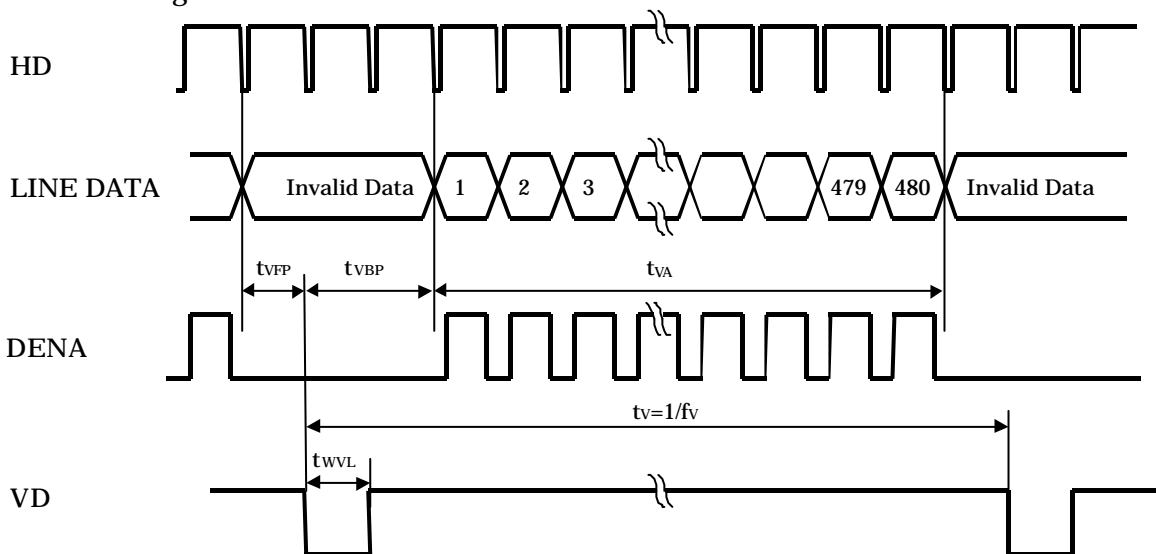
(2) Timing Chart

a. Pixel Timing Chart

t_{CLK}

t_{WCH} t_{WCL}

DCLK

2.0V
0.8V

t_D t_D

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

2.0V
0.8V
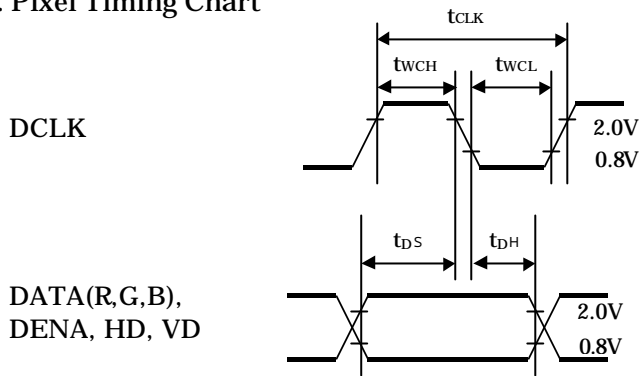
b. Horizontal Timing Chart

DCLK

First Data

DATA
(R,G,B)

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

Last Data

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

DENA

$t_H = 1/f_H$

t_{WHL}

HD

c. Vertical Timing Chart

HD

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

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

DENA

$t_V = 1/f_V$

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

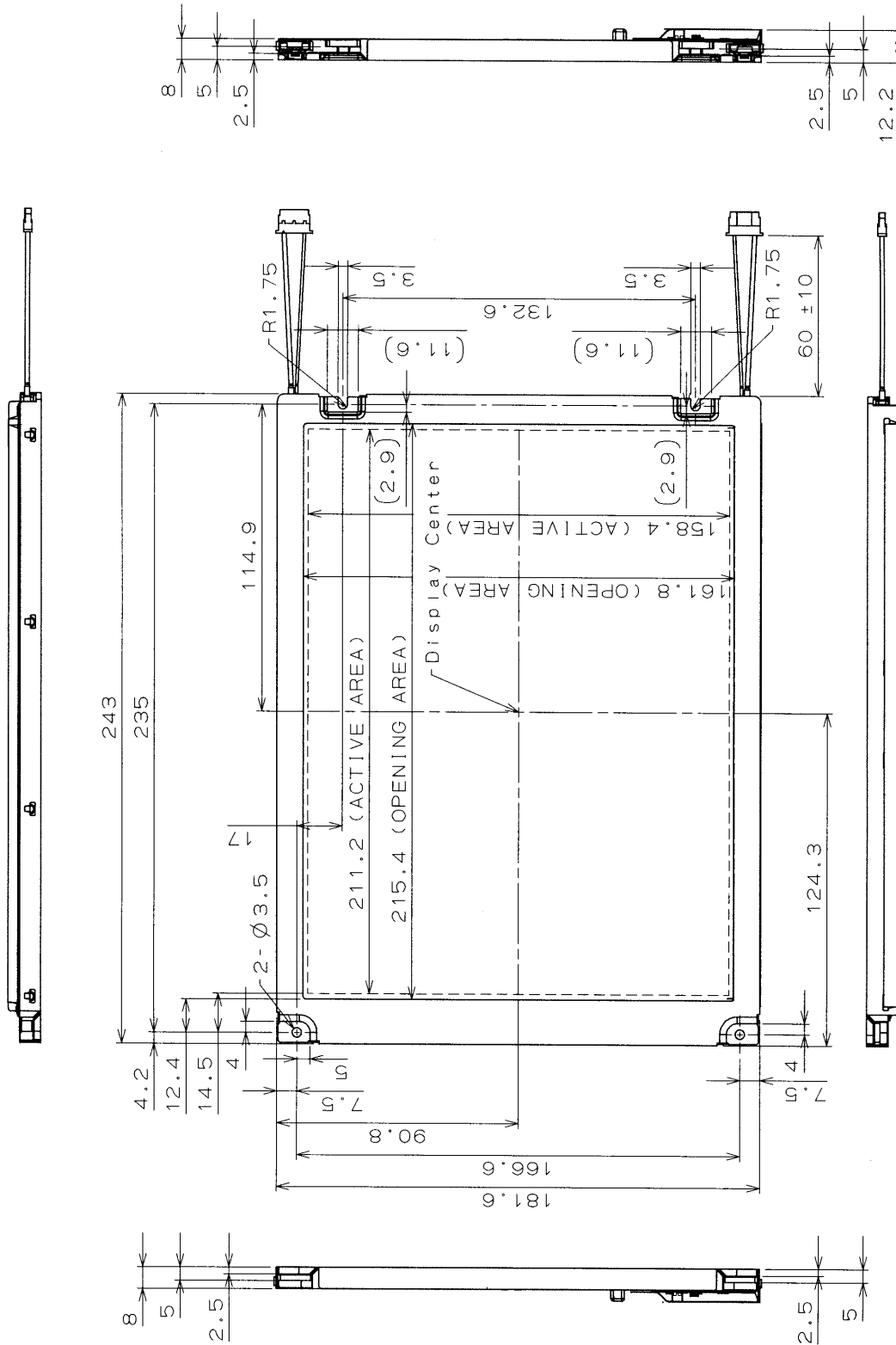   1:High, 0: Low

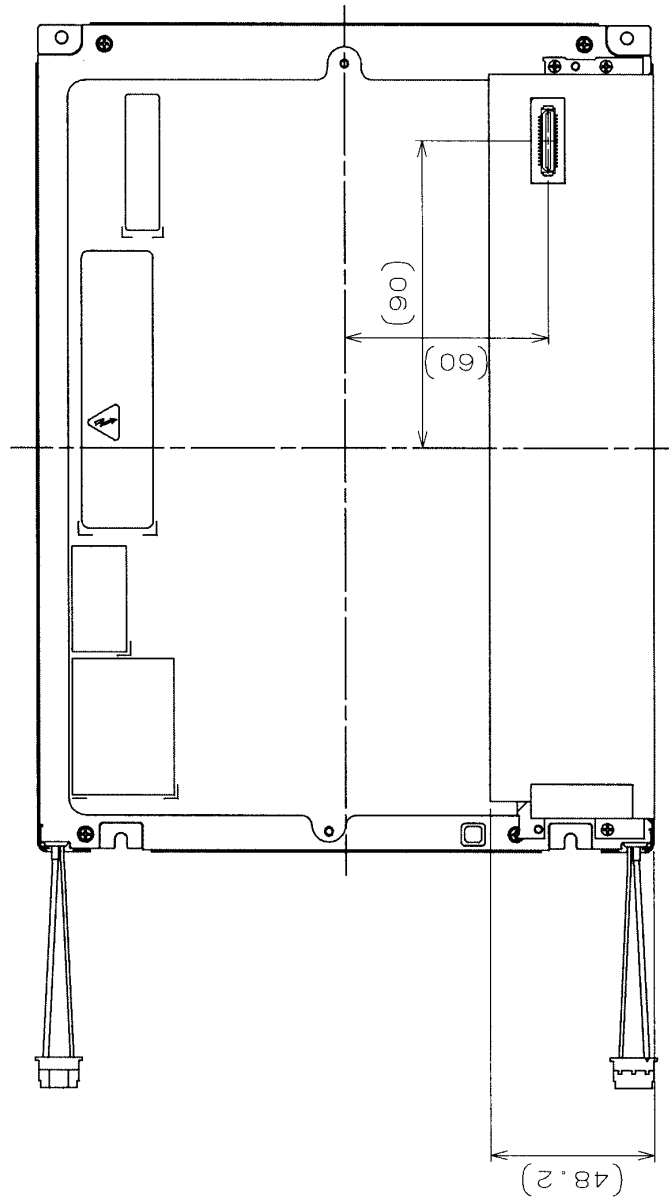# 6. BLOCK DIAGRAM
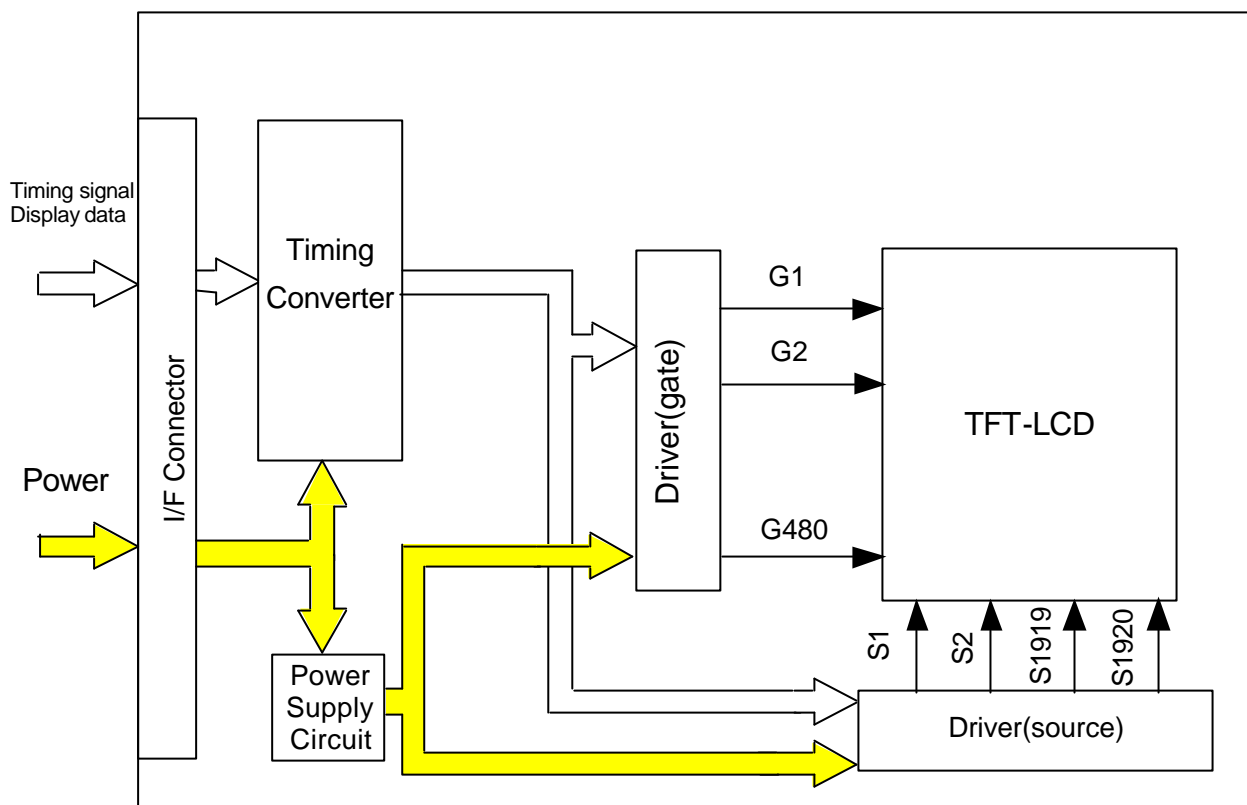
BACKLIGHT
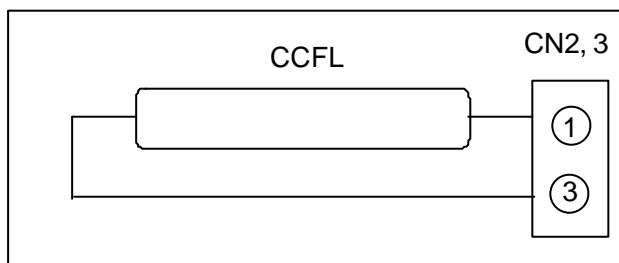
7. MECHANICAL SPECIFICATIONS

(1) Front Side

1)Tolerance is ±0.5mm unless noted
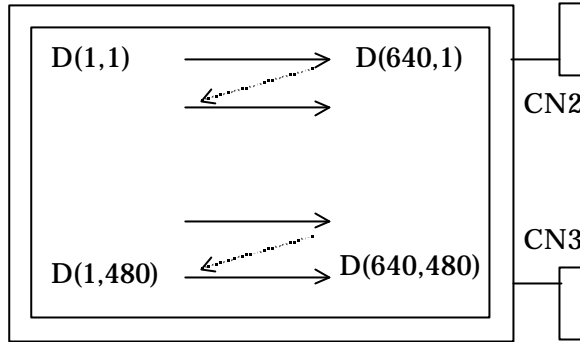2)Except for thickness of PET film

(Unit:mm)
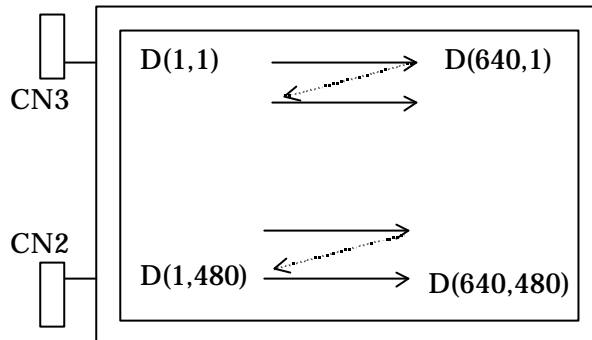
(2) Rear Side

(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.

(3) Scanning direction

SC　GND or Open

D(1,1) $\longrightarrow$ D(640,1)

CN2

D(1,480) D(640,480)

CN3

SC : High

CN3

D(1,1) $\longrightarrow$ D(640,1)

CN2

D(1,480) D(640,480)

8. OPTICAL CHARACTERISTICS

Ta=25°C, VCC=3.3 / 5.0 V, Input Signals: Typ. Values shown in Section 5

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	Remarks
Contrast Ratio		CR	θ = φ = 0°	350	500	--	--	*1)*3)
Luminance		Lw	θ = φ = 0°	300	380	--	cd/m²	*2)*3)
Response Time		tr	θ = φ = 0°	--	10	--	ms	*3)*4)
		tf	θ = φ = 0°	--	30	--	ms	*3)*4)
Viewing Angle	Horizontal	φ	CR ≥ 10	--	-60~60	--	°	*3)
	Vertical	θ		--	-55~45	--	°	*3)
Image Sticking		tis	2 h	--	--	2	s	*5)
Color Coordinates	Red	Rx	θ = φ = 0°	0.555	0.585	0.615	--	*3)
		Ry		0.304	0.334	0.364		
	Green	Gx		0.300	0.330	0.360		
		Gy		0.506	0.536	0.566		
	Blue	Bx		0.138	0.168	0.198		
		By		0.143	0.173	0.203		
	White	Wx		0.300	0.330	0.360		
		Wy		0.312	0.342	0.372		

[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.
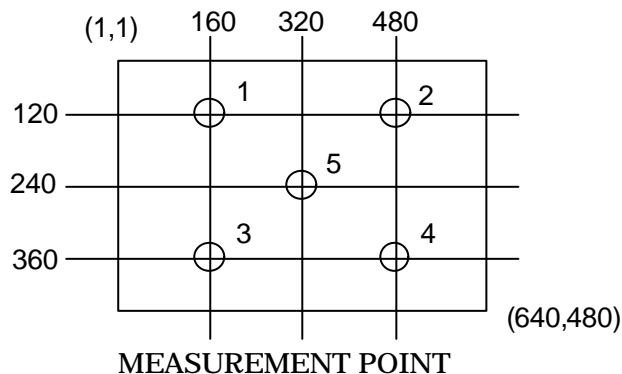
Condition: IL=6.0 mArms, FL=55 kHz

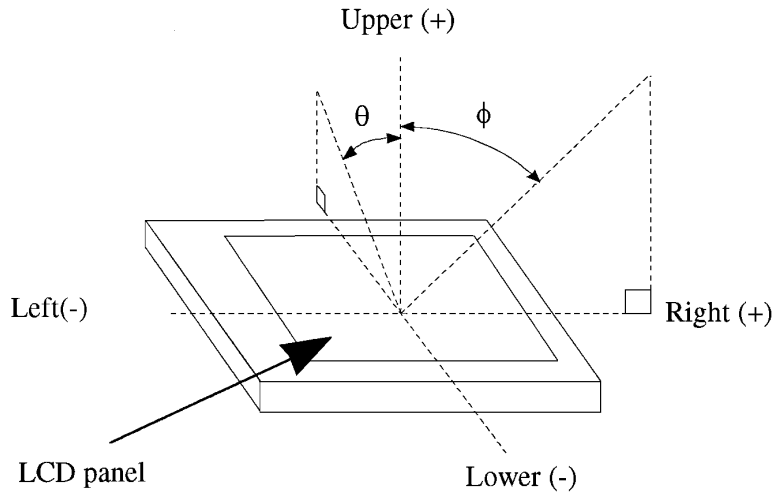*1) Definition of Contrast Ratio
     CR=ON(White) Luminance / OFF(Black) Luminance: average of 5 points shown in a figure below
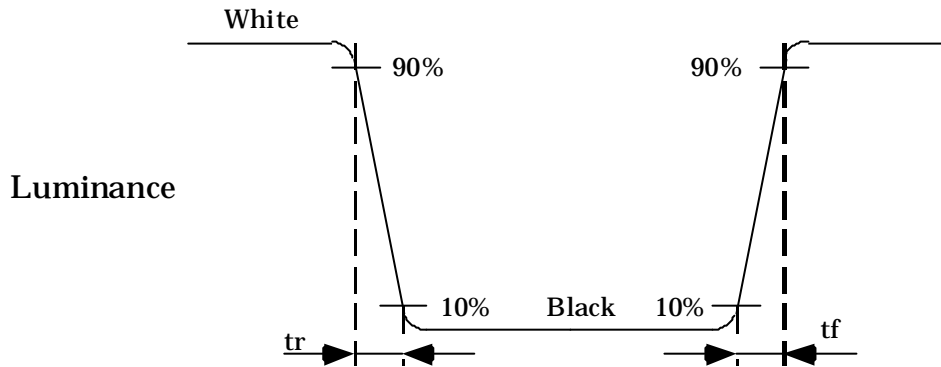
*2) Definition of Luminance
     Lw= ON (White) Luminance: average of 5 points shown in a figure below

MEASUREMENT POINT

*3) Definition of Viewing Angle(θ , φ)

Upper (+)

θ   φ

Left(-)   Right (+)

LCD panel   Lower (-)

*4) Definition of Response Time

White

90%   90%

Luminance

10%   Black   10%

tr   tf

*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

Cols 318-322

White Area

Rows 238-242

Black Lines
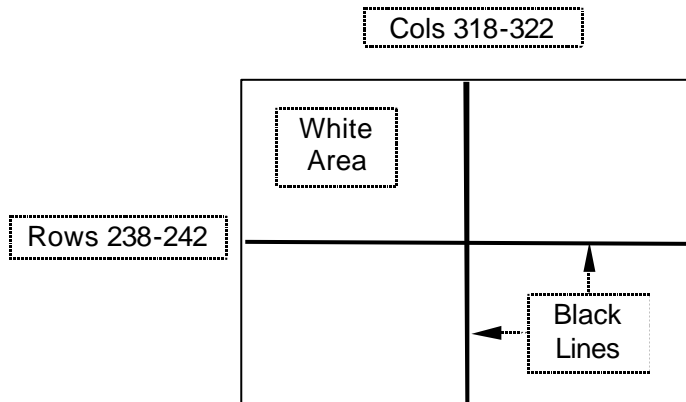
9. RELIABILITY TEST CONDITION

(1) Temperature and Humidity

TEST ITEM	CONDITIONS
HIGH TEMPERATURE HIGH HUMIDITY OPERATION	40°C, 90%RH, 240 h
HIGH TEMPERATURE STORAGE	70°C, 96 h
LOW TEMPERATURE STORAGE	-20°C, 96 h
THERMAL SHOCK(NON-OPERATION)	BETWEEN -20°C (1h) and 70°C(1h), 5 CYCLES

(2) Shock & Vibration

ITEM	CONDITIONS
SHOCK (NON-OPERATION)	Shock level: 1470m/s² (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: 9.8m/s² (1.0G) 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(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 mm < W ≤ 0.05 mm L ≤ 10 mm	N ≤ 4
		0.01 mm < W 10 mm < L	N = 0
		0.05 mm < W	N = 0
	DENT	0.2 mm < φ ≤ 0.4 mm	N ≤ 4
		0.4 mm < φ	N = 0
	BLACK SPOT BUBBLE	0.2 mm < φ ≤ 0.4 mm	N ≤ 5
		0.4 mm < φ	N = 0
	LINT	L ≤ 3 mm W ≤ 0.1 mm	N ≤ 4
		3 mm < L W ≤ 0.1 mm	N = 0
		0.1 mm < W	ACCORDING TO BLACK SPOT
ELECTRICAL DEFECT	BRIGHT DOT	N ≤ 5	
	DARK DOT	N ≤ 5	
	TOTAL DOT	N ≤ 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

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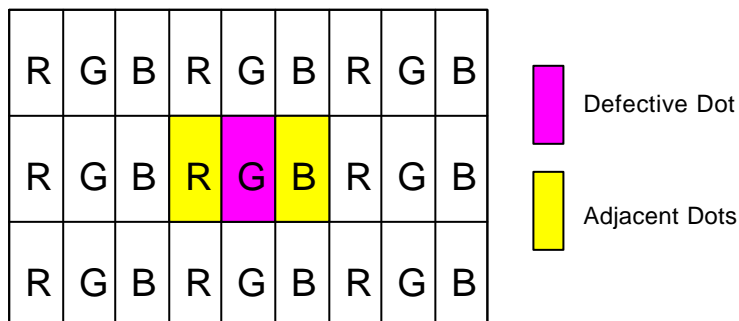
The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

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 handle metal frame carefully to avoid getting hurt because edge of metal frame is very sharp.

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

inverter.

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

l. 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 5 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.)

12. REVISION STATUS

Rev.	Description	Date	Prepared	Checked
				Approved
First	First Revision	Sep.17,'03	T.Hatashita	Y.Numano
				K.Kobayashi

AA104 Series Packaging specification

Packaging specification

1．Packaging box

material:	cardboard, polyethylene form　Anti-electrostatic spec.
construction:	See fig. 1
max. packaging number:	10 pcs.
dimension:	457(W) × 302(D) × 422(H) [mm]
mass(including 10 modules):	7.0 kg
label:	Labels are put on the box.(See fig. 2, 3, 4,)

Upper
Protector

Side
Protector

Anti-electrostatic bag

LCD

Outside box
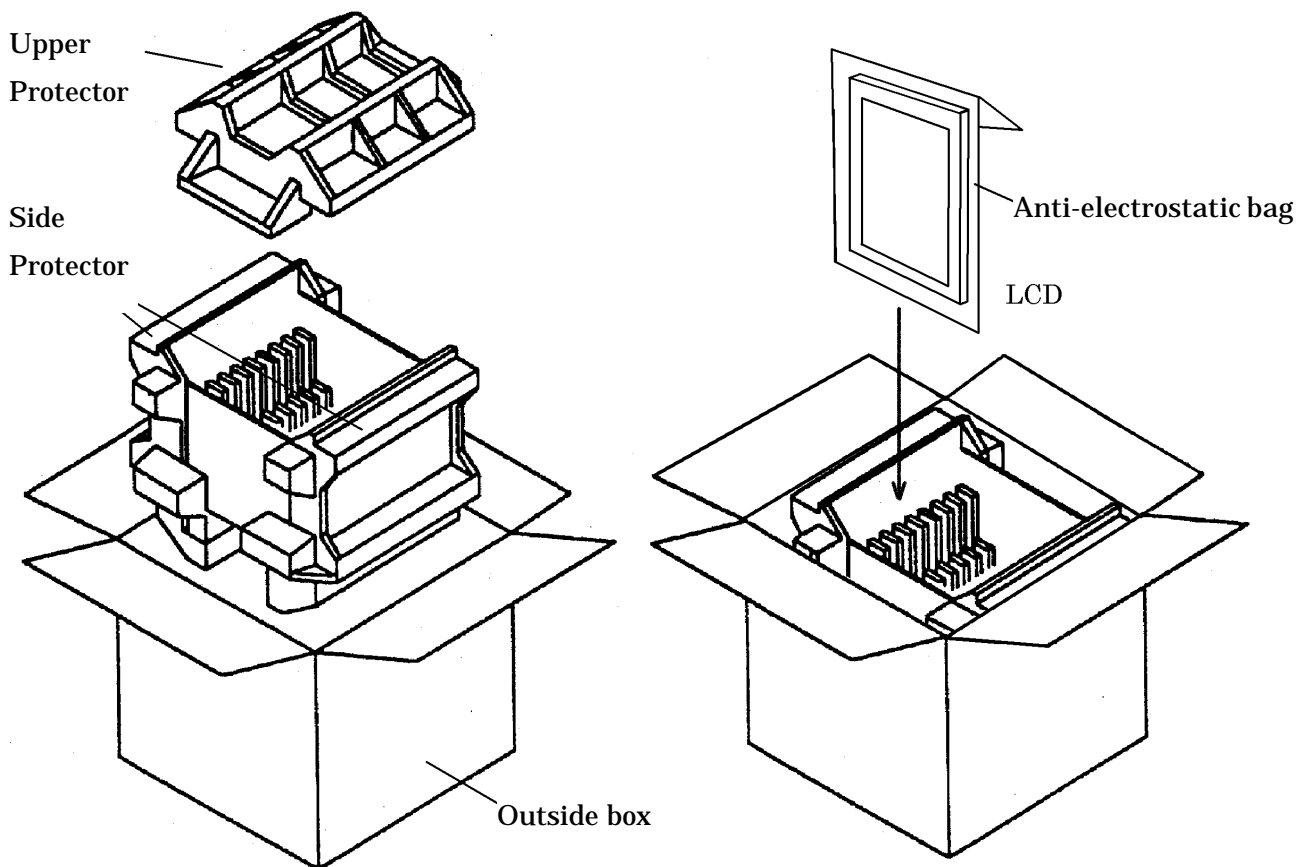
Fig 1.　Illustration of packaging box structure

Fig 2. Label 1

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. Label 1

Fig 3. Label 2

Box No.

Mass

Shipping No.
Bar-code

Shipping No.
Bar-code

Packaging No.
Bar-code

Shipping No.
Bar-code

Products name
Bar-code

Fig 3. Label 2

Fig 4. Label 3

Overseas sales office

Product name

Shipping No.

Box No.

MADE IN _____

Bar-code

Shipping date

Fig 4. Label 3

Fig 5. Sample of Label 3

ABC

TFT - LCD   AA104****

P / O NO.   NDF JZ55188

C / S   No.   049 OF 400

MADE IN JAPAN

049   JA8261074

1999/03/06

Fig 5. Sample of Label 3

Label 1
Label 2
Label 3
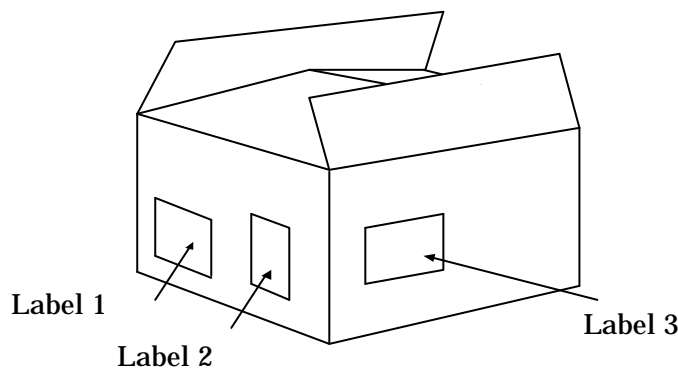
Fig 6.   Location of labels

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 accumulates maximum 10 modules.
(3) Upper protector is put on the products, and shut the box.

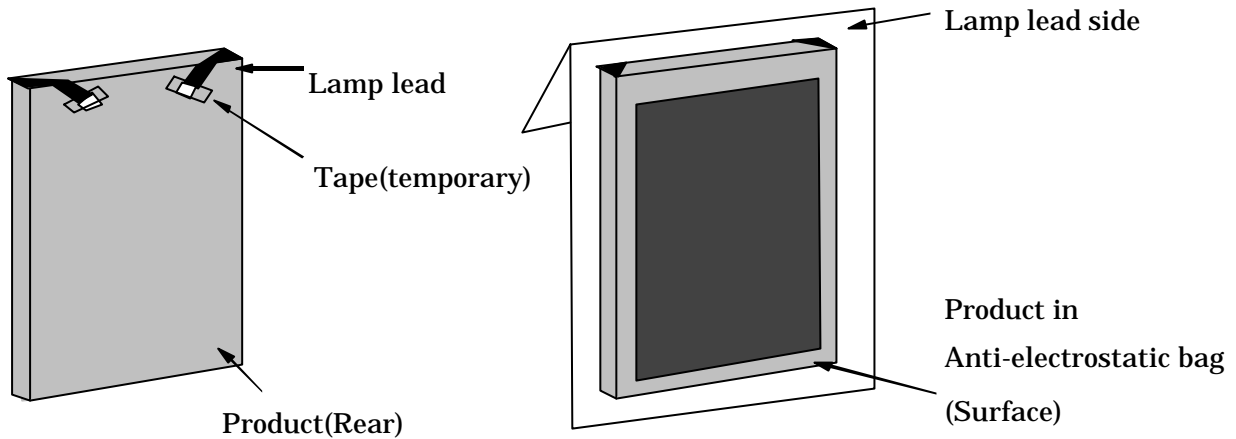Lamp lead

Tape(temporary)

Product(Rear)

Lamp lead side

Product in
Anti-electrostatic bag
(Surface)

Fig 7

4. Cautions of shipping & storage
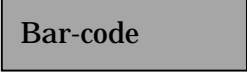
(1) Do not turn the packaging upside down while storage and transportation. The boxes should not be piled up more than 5.
(2) Handle with care. Keep off from rain & dew.
(3) Keep off from direct sunlight exposure. Please store under room temperature & low humidity in original packaging condition when they were shipped.
(4) Keep other cautions described in handling manual.

5. Revision status

Rev.	Description	Date	Prepared	Checked
				Approved
First	First Revision	Jun.5,'03	T.Hatashita	Y.Numano
				K.Kobayashi

Products Number Labeling Forms

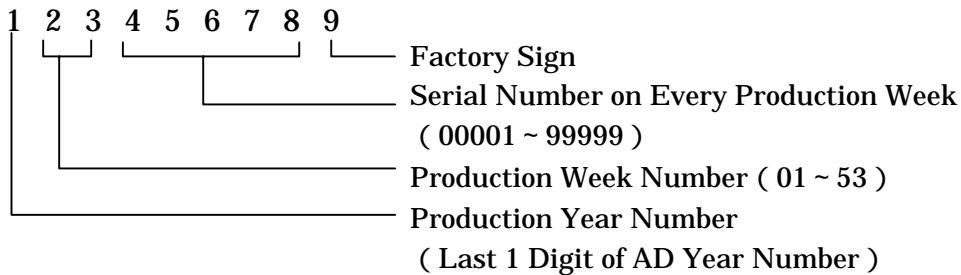Products number label is constructed as below;

① Brand Name, Symbol

②AA150XA03　　B

③ABC1234567890

④60100001L

⑤　Bar-code

WARNING
LAMP HIGH
VOLTAGE

c(UL)us E158720　　Made in Japan

Brand Name, Symbol
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

MITSUBISHI ELECTRIC

Products Name

ex.1: AA121SJ23　　　ex.2: AA150XA03　B

Production Key Number

(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 10.4"VGA (AA104VC**)

TECHNICAL SPECIFICATION

AA-L5903326

MITSUBISHI / MDTI

Date: Jun.5,'03

CONTENTS

1. APPLICATION

This technical literature applies to the replaceable lamp unit that is the maintenance parts for 10.4"VGA TFT-LCD module industrial use(model name: AA104VC**).

2. MECHANICAL CHARACTERISTICS

Item	Specification	Remarks
Outline Dimension of Reflector	228.5 ±0.2 ×5.4 ±0.1 ×4.6±0.1 (mm)	Except Wire and Lamp Rubber Cushion
Mass	12 (g)(MAX)	
Lamp Diameter	ϕ2.6 - 2.0 ±0.1 (mm)	

See 8. DRAWING OF OUTLINE DIMENTIONS (Page5)

3. ENVIRONMENTAL CONDITIONS

Item	Operation		Non Operation		Remarks
	MIN	MAX	MIN	MAX	
Ambient Temperature	0°C	60°C	-20°C	70°C	No Condensation

Ta ≤ 40°C : 90% RH max. without condensation

Ta > 40°C : Absolute humidity shall be less than the value of 90% RH at 40°C.

4. ELECTRICAL CHARACTERISTICS

Operation conditions

Item	Symbol	Condition	MIN	TYP	MAX	Unit	Remarks
Lamp Current	IL	Ta = 25°C	3.0	6.0	7.0	mArms	
Lamp Voltage	VL	Ta = 25°C	-	480	-	Vrms	
Starting Lamp Voltage	VS	Ta = 25°C	930	-	-	Vrms	
		Ta = 0°C	1170	-	-	Vrms	
Lamp Frequency	FL	Ta = 25 , IL = 6.0 mArms	40	-	80	kHz	

*1) These values are shown by Elevam using E-12324B inverter.

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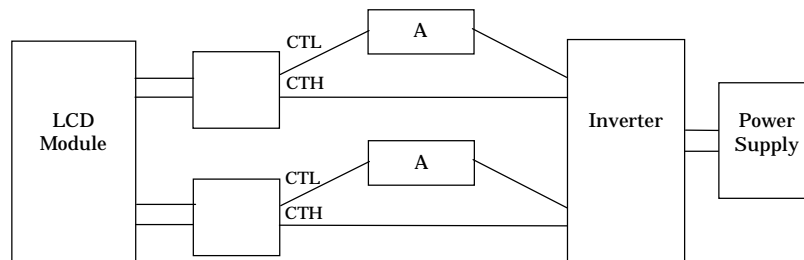
5. OPTICAL CHARACTERISTICS

Item	Symbol	MIN	TYP	MAX	Unit	Remarks
Luminance	Lw	300	380	-	cd/m^2	Average of below 5 points
Color Coodinates (White)	Wx	0.300	0.330	0.360	-	Value of center point(5)
	Wy	0.312	0.342	0.372	-	Value of center point(5)

[Conditions]
    IL = 6.0mArms, Inverter frequency: 55 kHz
[Measurement Point]
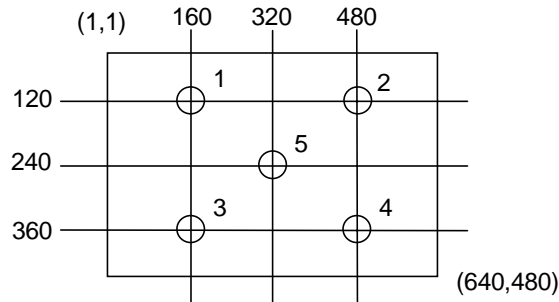
These items are measured when lamp units are assembled into AA104VC**, and using CS1000(MINOLTA) for color coordinates, and CS1000 or BM-5A(TOPCON) for others under the dark room condition (no ambient light) after more than 30 minutes from turning on the lamp unless noted.

6. LIFE TIME OF THE LAMP UNIT

Environmental Conditions are as follows:
    Ambient temperature is 25±2°C.
    Lamp Current is 6.0 mArms.

Continuous Operation	50,000 hours
Number of turning on and off	100,000 times (30sec 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.

7. INTERFACE PIN CONNECTION
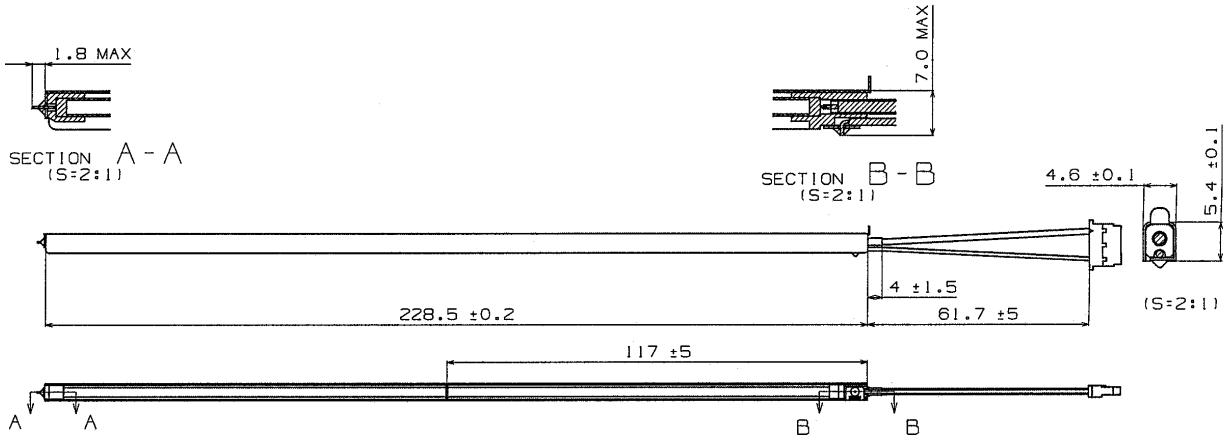   Backlight-side connector: BHR-02(8.0)VS-1N(JST)
    Inverter-side connector: SM02(8.0)B-BHS(JST)

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

[Note]
VBLH - VBLL = VL

8. DRAWING OF OUTLINE DIMENTIONS

1.8 MAX

SECTION A - A
(S=2:1)

7.0 MAX

SECTION B - B
(S=2:1)

4.6 ±0.1

5.4 ±0.1

(S=2:1)

228.5 ±0.2

4 ±1.5

61.7 ±5

117 ±5

A   A

B   B

9. 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.)

Top

Please check the LCD Panel Surface for scratch, dust, and foreign matters.

Bottom
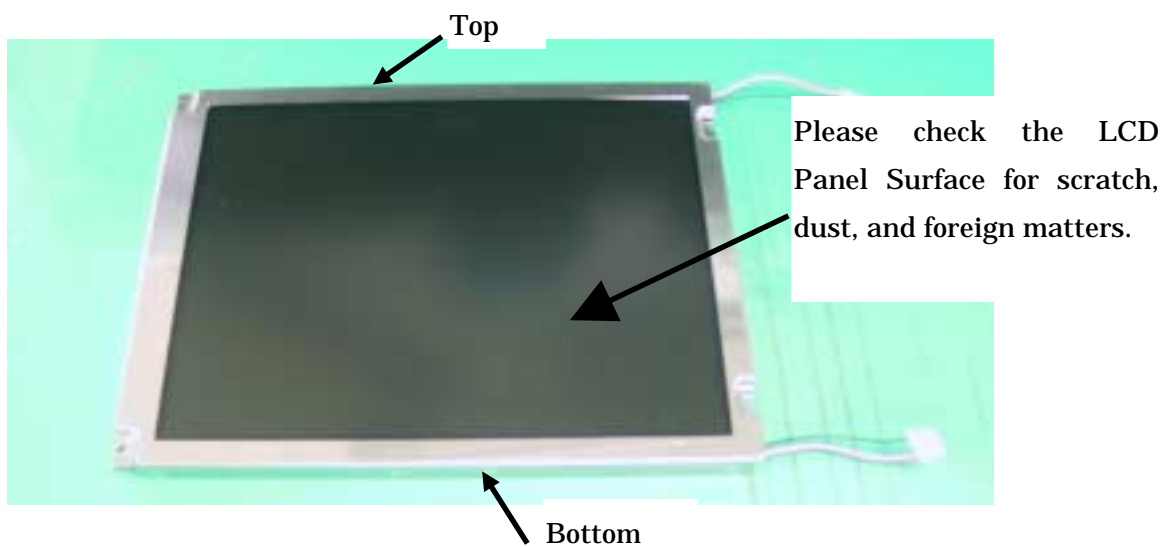
Picture 1

2) Turn the TFT-LCD Module upside down.

Please check the cable for dust and foreign matters.

Picture 2

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

Top

Please push out the black latch.
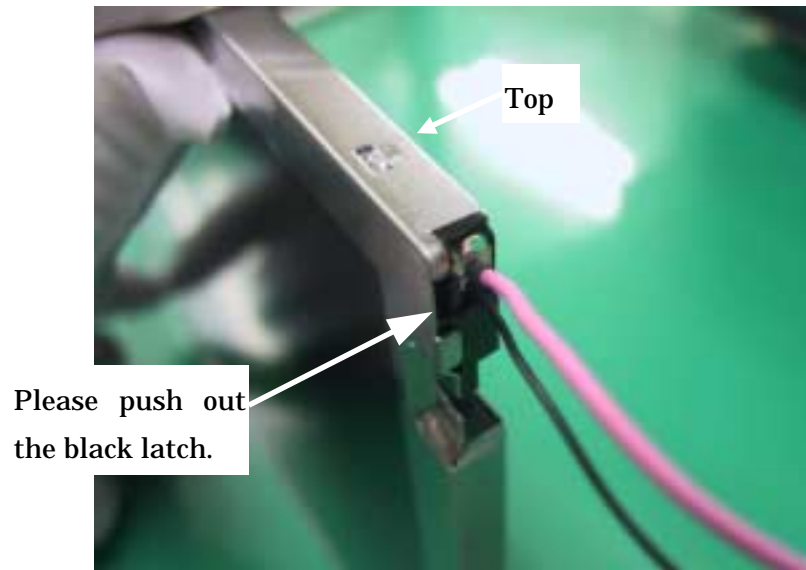
Picture 3

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 Unit.
   • Open the package and take the new Lamp Unit out.
   • Check the new Lamp Unit for dust and foreign matters.

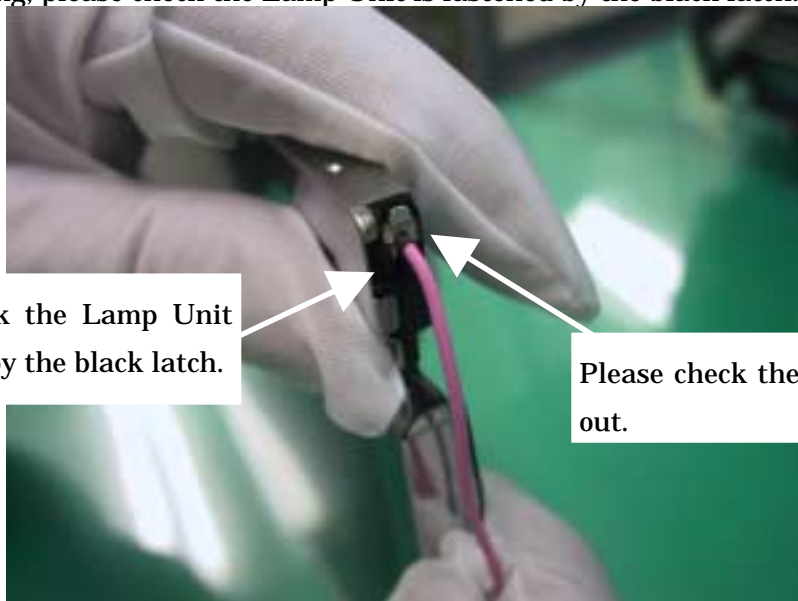8) Stand the TFT-LCD Module up and insert the new Lamp Unit.
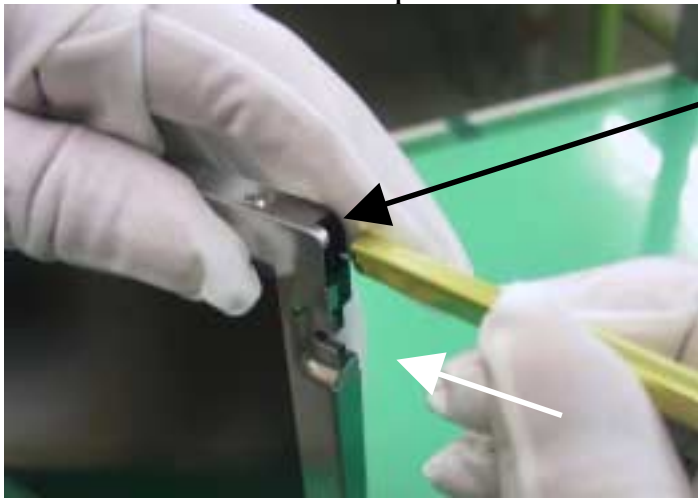
Fold down the black film to keep the end of the black film out.
Push the black latch out, and insert the new Lamp Unit.
(Set the Lamp opening face down.)

Picture 7
Please do not insert it in the wrong position.

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

Please check the Lamp Unit is fastened by the black latch.

Please check the black film is out.

Picture 8

10) Insert the other Lamp Unit to the opposite(bottom) side of the LCD module in the same way.
    See. 8) to 9)

11) After replacing the Lamp Unit, please check the following items.
    • Appearance of TFT-LCD Module is not changed after replacing Lamp Unit.
      (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.

10. REVISION STATUS

Rev. Notice	Description	Rev. Date	Prepared	Checked / Approved
First	First Revision	Jun.5,'03	T.Hatashita	Y.Numano
				K.Kobayashi