Document Version: 1.2
Date:2008/12/24

Product Functional Specification

42” WXGA Color TFT-LCD Module
Model Name: T420XW01 VD

(*) Preliminary Specification
( ) Final Specification

Note : This specification is subject to change without notice.

Contents

Record of Revision

Version	Date	No	Old Description	New Description	Remark
1.0	08'/10/10		First release		
1.1	08'12/18		Updated HV cable Drawing		
1.2	08'/12/24		Updated Lamp Spec		

1. General Description

This specification applies to the 42 inch Color TFT-LCD Module T420XW01 VD. This LCD module has a TFT active matrix type liquid crystal panel 1366x768 pixels, and diagonal size of 42 inch. This module supports 1366x768 WXGA mode (Non-interlace).

Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 8-bit gray scale signal for each dot.

The T420XW01 VD has been designed to apply the 8-bit 1 channel LVDS interface method. It is intended to support displays where high brightness, wide viewing angle, high color saturation, and high color depth are very important.

* General Information

Items	Specification	Unit	Note
Active Screen Size	42.02	inches	
Display Area	930.25(H) x 523.01(V)	mm	
Outline Dimension	983.0(H) x 576.0(V) x 44.1(D)	mm	
Driver Element	a-Si TFT active matrix		
Display Colors	16.7M	Colors	
Number of Pixels	1366 x 768	Pixel	
Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally Black		
Lamp quantity, type	18pcs, Straight type	pcs	
Surface Treatment	AG, Haze=11		

2. Absolute Maximum Ratings

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Item	Symbol	Min	Max	Unit	Note
Logic/LCD Drive Voltage	V_{DD}	-0.3	14.0	[Volt]	1
Input Voltage of Signal	Vin	-0.3	3.6	[Volt]	1
BLU Brightness Control Voltage	BLON	-0.3	5.5	[Volt]	1
Operating Temperature	T_{OP}	0	+50	[°C]	2
Operating Humidity	H_{OP}	10	90	[%RH]	2
Storage Temperature	T_{ST}	-20	+60	[°C]	2
Storage Humidity	H_{ST}	10	90	[%RH]	2
Shock (non-operation)		-	50	G	3
Vibration (non-operation)		-	1.5	G	4
Thermal shock		-20	60	C	5
Altitude test	50000feet (12Kpa)				

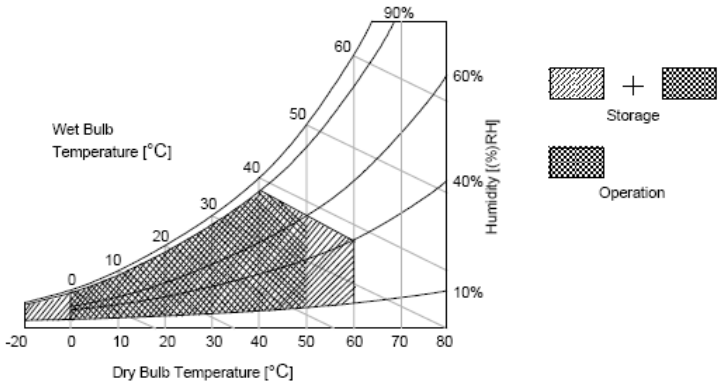
Note 1 : Duration = 50msec

Note 2 : Maximum Wet-Bulb should be 39℃ and No condensation.

Note 3 : Half sine wave, shock level : 50G(11ms), direction : ±x, ±y, ±z (one time each direction)

Note 4 : Wave form : random, vibration level : 1.5G RMS, Bandwidth : 10--300Hz
Duration : X,Y,Z 30min (one time each direction)

Note 5 : -20C/0.5hr ~ 60C/0.5hr, 10 cycles



3. Electrical Specification

The T420XW01 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input, which powers the CCFL, is typically generated by an inverter.

3-1 Electrical Characteristics

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
LCD:							
Power Supply Input Voltage		Vdd	11.4	12	12.6	Vdc	
Power Supply Input Current		Idd	-	0.45	0.6	A	1
Power Consumption		Pc	-	5.4	7.2	Watt	1
Inrush Current		I_{RUSH}	-	-	8	A	4
LVDS Interface	Differential Input High Threshold Voltage	V_{TH}			+100	mV	3
	Differential Input Low Threshold Voltage	V_{TL}	-100			mV	3
	Common Input Voltage	V_{CIM}	1.10	1.25	1.40	V	
CMOS Interface	Input High Threshold Voltage	V_{IH} (High)	2.4		3.3	Vdc	
	Input Low Threshold Voltage	V_{IL} (Low)	0		0.7	Vdc	
Life Time			50000	60000		Hours	2

The performance of the Lamp in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC Inverter. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter. When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter (no lighting, flicker, etc) never occurs. When you confirm it, the LCD Assembly should be operated in the same condition as installed in your

instrument.

Do not attach a conducting tape to lamp connecting wire. If the lamp wire attach to conducting tape, TFT-LCD Module have a low luminance and the inverter has abnormal action because leakage current occurs between lamp wire and conducting tape.

The relative humidity must not exceed 80% non-condensing at temperatures of 40℃ or less. At temperatures greater than 40℃, the wet bulb temperature must not exceed 39℃. When operate at low temperatures, the brightness of CCFL will drop and the lifetime of CCFL will be reduced.

Note :

1. Vdd=12.0V, fv=60Hz, f_{CLK}=81.5 Mhz , 25℃, Vdd Duration time= 400 μs , Test pattern : white pattern
2. The life is determined as the time at which luminance of the lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25±2℃.
3. VCIM = 1.2V

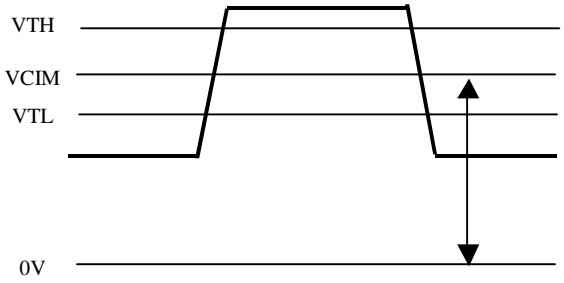
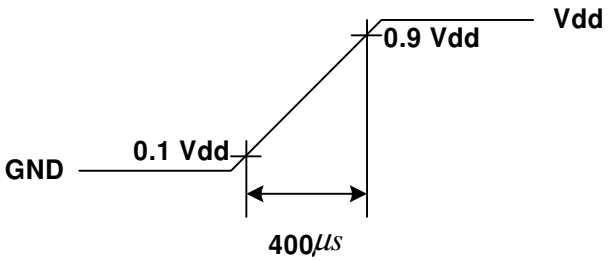


Figure : LVDS Differential Voltage

4. Measurement Condition: Rising time = 400 μs

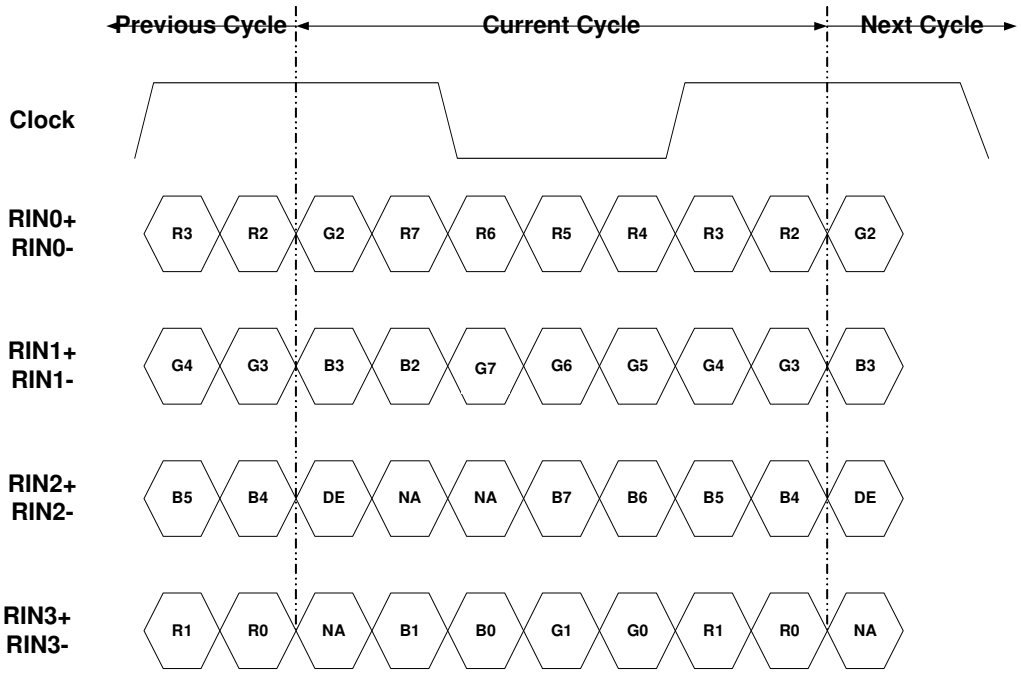


3-2 Interface Connections

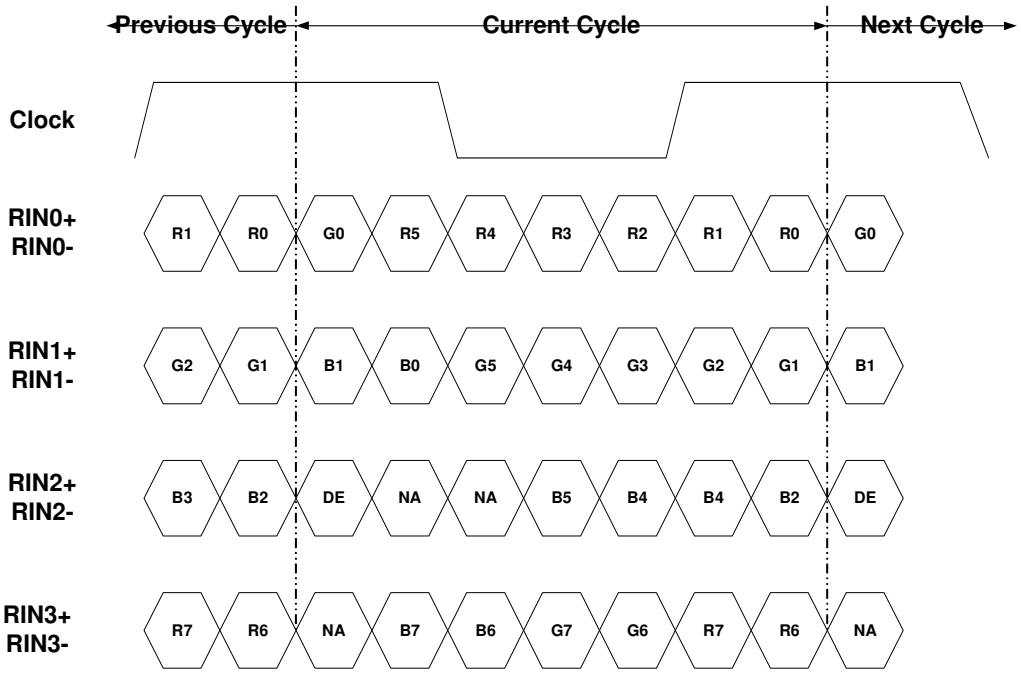
- LCD connector: 093G30-B0001A-1 (Starconn)

Pin No	Symbol	Description	Note
1	VCC	+12V, DC, Regulated	
2	VCC	+12V, DC, Regulated	
3	VCC	+12V, DC, Regulated	
4	VCC	+12V, DC, Regulated	
5	GND	Ground and Signal Return	
6	GND	Ground and Signal Return	
7	GND	Ground and Signal Return	
8	GND	Ground and Signal Return	
9	LVDS Option	Low/Open for Normal (NS), High for JEIDA	Default : NS mode
10	Reserved	Open or High	AUO internal test
11	GND	Ground and Signal Return for LVDS	
12	RXIN0-	LVDS Channel 0 negative	
13	RXIN0+	LVDS Channel 0 positive	
14	GND	Ground and Signal Return for LVDS	
15	RXIN1-	LVDS Channel 1 negative	
16	RXIN1+	LVDS Channel 1 positive	
17	GND	Ground and Signal Return for LVDS	
18	RXIN2-	LVDS Channel 2 negative	
19	RXIN2+	LVDS Channel 2 positive	
20	GND	Ground and Signal Return for LVDS	
21	RXCLKIN-	LVDS Clock negative	
22	RXCLKIN+	LVDS Clock positive	
23	GND	Ground and Signal Return for LVDS	
24	RXIN3-	LVDS Channel 3 negative	
25	RXIN3+	LVDS Channel 3 positive	
26	GND	Ground and Signal Return for LVDS	
27	Reserved	Open or High	AUO internal test
28	Reserved	Open or High	AUO internal test
29	GND	Ground and Signal Return	
30	GND	Ground and Signal Return	

LVDS Option = High➔JEIDA



LVDS Option = Low/OPEN➔NS



Backlight Specification

1. Electrical specification

	Description			Min	Typ	Max	Unit	Condition
1	BL Operating Voltage		VBL	**964**	**1164**	**1364**	Vrms	1. BL one side operating voltage at dimming ratio 100% 2. Calculation method: (notes 1) 3. fo=58KHz, IBL= 144mArms
2	BL Operating Current		IBL		144		mArms	1. BL one side operating current at dimming ratio 100%
3	Starting Voltage	0℃	Vs	**2070**	**2270**	-	Vrms	Starting Voltage
		25℃		**1890**	**2090**	-		
4	Operating frequency		fo	56	58	60	kHz	
5	Striking time		St	1000	1500	2000	msec	
6	Power Consumption		PBL	162	170	178	Watt	
7	PWM Operating Frequency		F_PWM	140	-	240	Hz	95~140Hz might cause waterfall noise but not influence panel function
8	PWM Dimming Duty ratio		D_PWM	20	-	100	%	1. luminance is from 20% to 100% 2. note 2
9	Lamp type			Straight type				
10	Number of lamps			16			pcs	
11	Type of current balance			Capacitor				
12	C ballast		Cb	14.25	15	15.75	pF	

（Ta=25±5℃, Turn on for 45minutes）

2. Lamp specification (Recommendation)

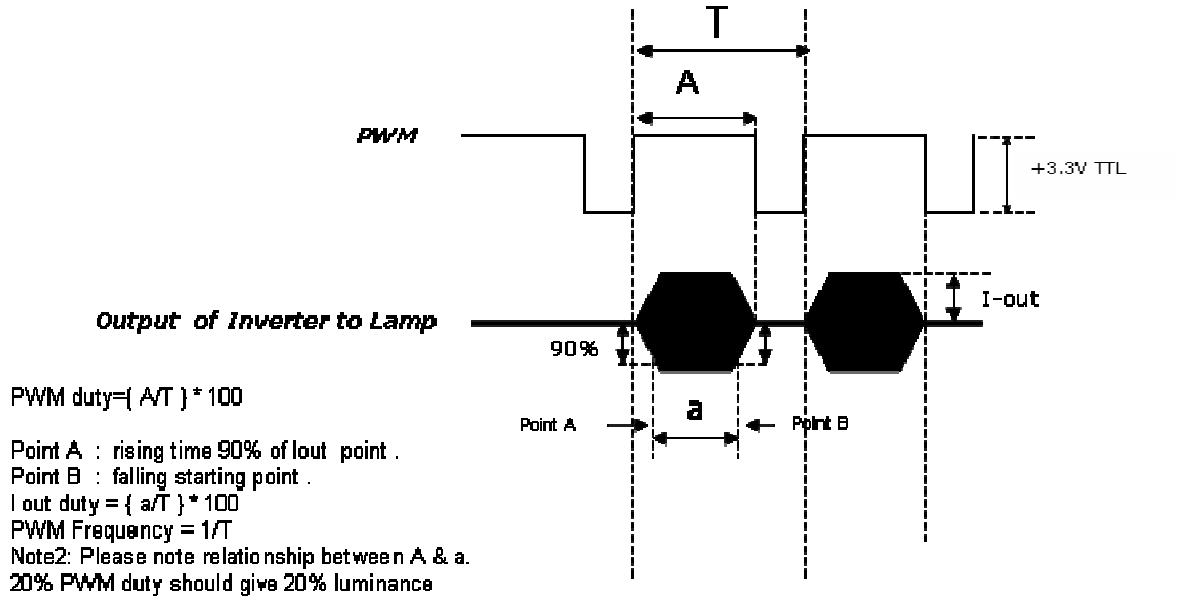
	Description		Min	Typ	Max	Unit
1	Lamp Voltage	Vlamp		1192		Vrms
2	Lamp Current	Ilamp	-	9		mArms
3	Lamp frequency	flamp	40	-	80	KHz
4	Starting Voltage	0℃		-	2140	Vrms
		25℃			1780	Vrms
5	Striking time	St	1000	-	-	msec
6	Discharge Stabilization Time		-	-	3	Min
7	Life time		50K	-	-	hr

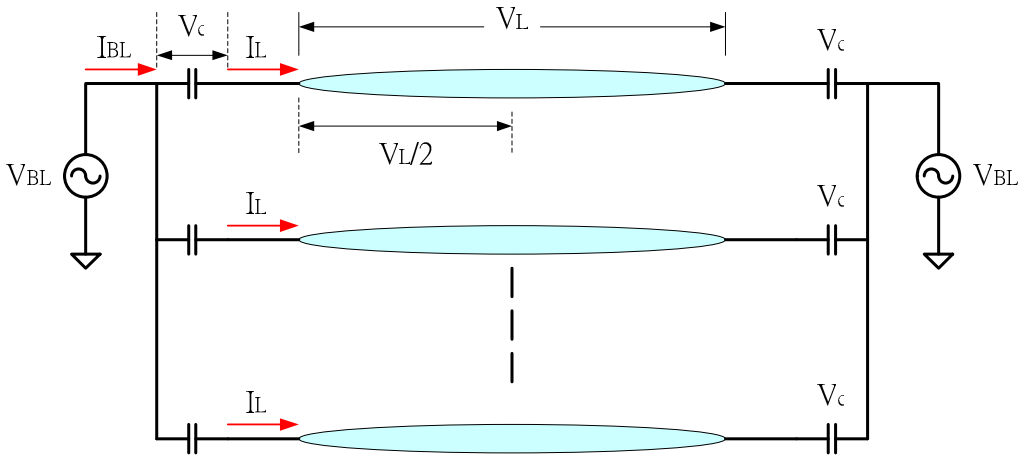
2. Lamp specification (Recommendation)

Notes 1:

$$V_{BL} = \sqrt{\left(\frac{V_L}{2}\right)^2 + (V_C)^2}$$

Notes 2:





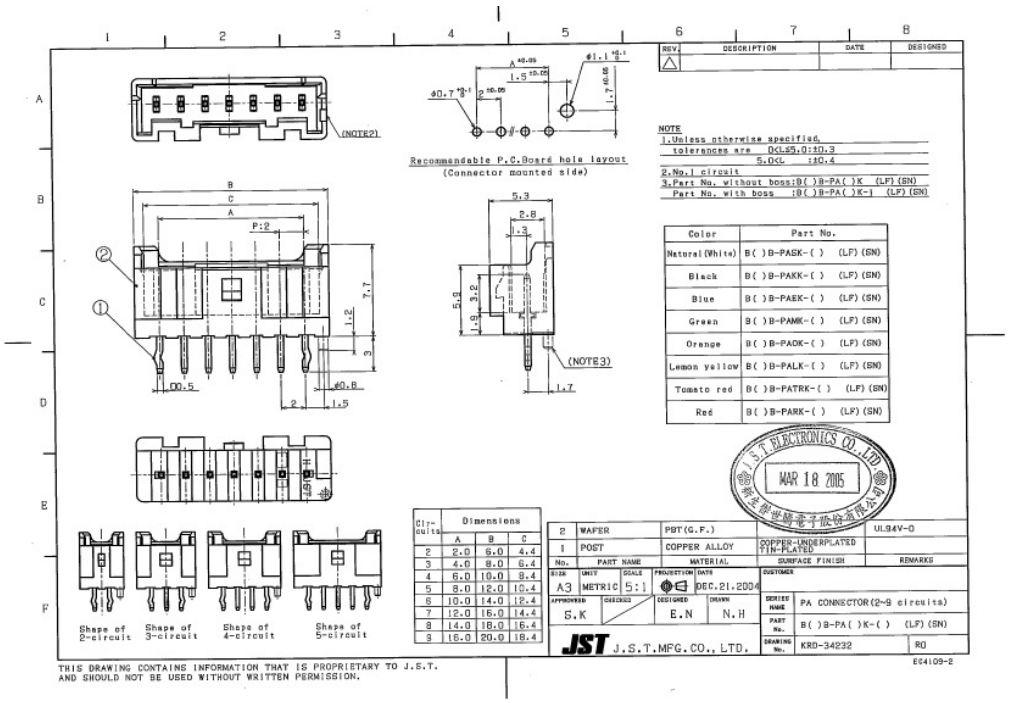
3. Pin assignment, connector drawing and connection configuration

CN1: B03B PASK-1 (JST) or equivalent

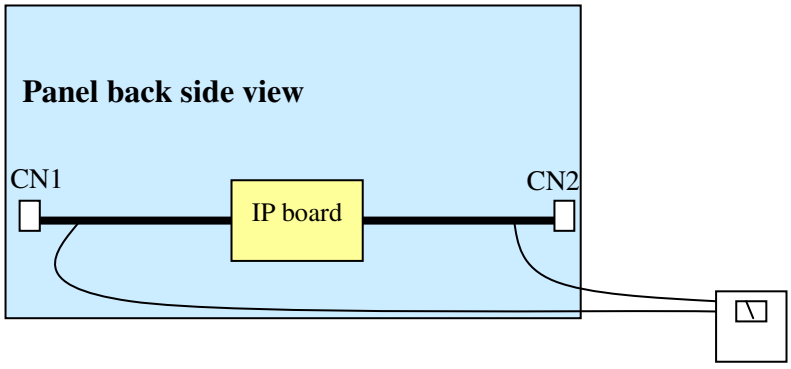
PIN #	Symbol	Description
1	High	I/P board high voltage supply
2	N.C.	No connection
3	High	I/P board high voltage supply

CN2: B03B PASK-1 (JST) or equivalent

PIN #	Symbol	Description
1	High	I/P board high voltage supply
2	N.C.	No connection
3	High	I/P board high voltage supply



4. Measurement method



Measurement equipment

Model: Tektronix P6022

3-3 Signal Timing Specifications

This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications for it's proper operation.

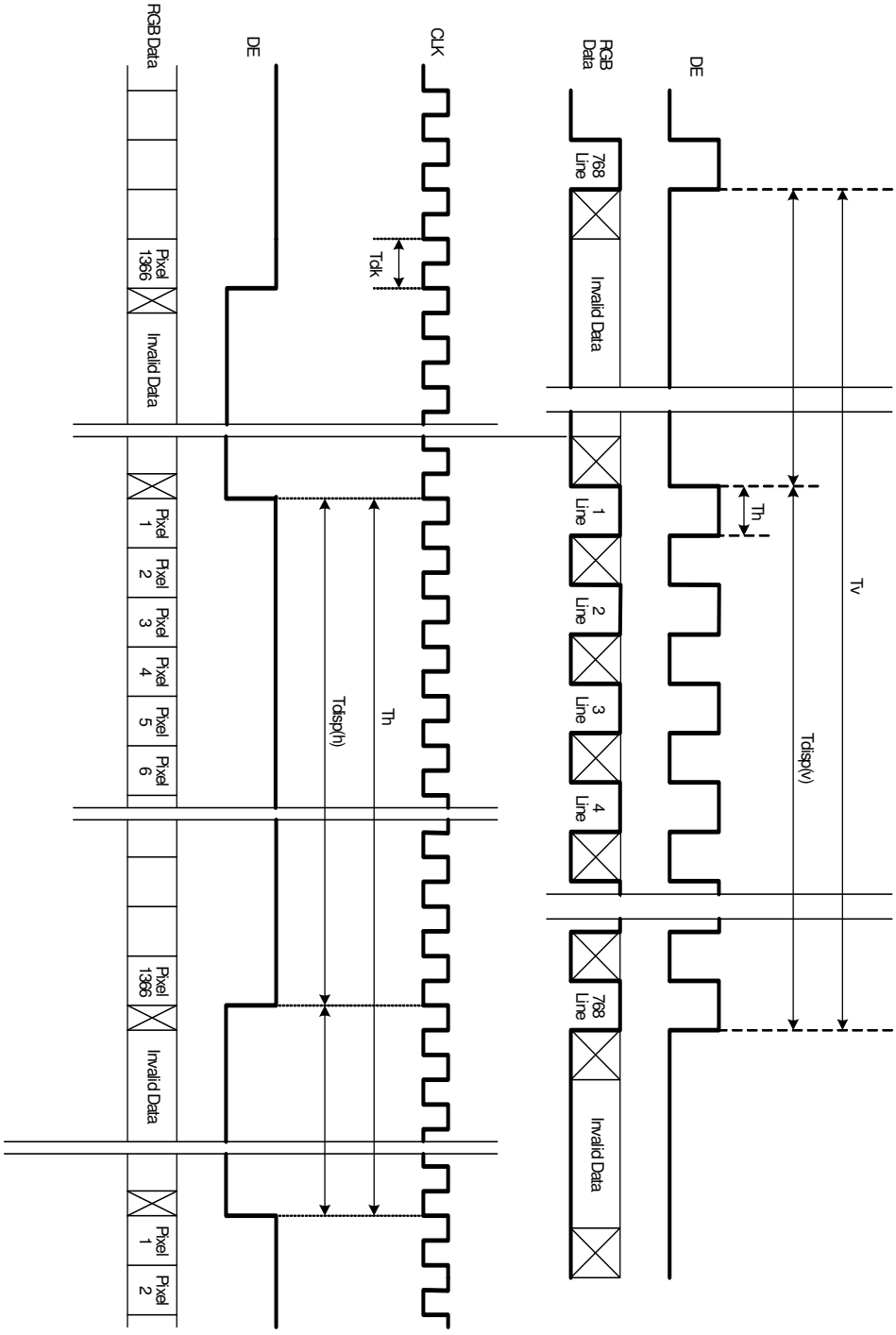
Timing Table (DE only Mode)

Vertical Frequency Range A (60Hz)

Signal	Item	Symbol	Min	Type	Max	Unit
Vertical Section	Period	Tv	776	810	1015	Th
	Active	Tdisp (v)	768			Th
	Blanking	Tblk (v)	8	42	247	Th
Horizontal Section	Period	Th	1414	1648	2000	Tclk
	Active	Tdisp (h)	1366			Tclk
	Blanking	Tblk (h)	48	282	634	Tclk
LVDS Clock	Frequency	1/Tclk	50	80	86	MHz
Vertical Frequency	Frequency	Freq	47	60	63	Hz
Horizontal Frequency	Frequency	Freq	43	48	53	KHz

1.) Display position is specific by the rise of DE signal only.
Horizontal display position is specified by the falling edge of 1st DCLK right after the rise of 1st DE, is displayed on the left edge of the screen.
Vertical display position is specified by the rise of DE after a "Low" level period equivalent to eight times of horizontal period. The 1st data corresponding to one horizontal line after the rise the of DE is displayed at the top line of screen.
2.) If a period of DE "High" is less than 1366 DCLK or less than 768 lines, the rest of the screen displays black.
3.) The display position does not fit to the screen if a period of DE "High" and the effective data period do not synchronize with each other.

3-4 Signal Timing Waveforms



3-5 Color Input Data Reference

The brightness of each primary color (red, green and blue) is based on the 8 bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

COLOR DATA REFERENCE

Color		Input Color Data																							
		RED								GREEN								BLUE							
		MSB							LSB	MSB							LSB	MSB							LSB
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
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(000)	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(001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

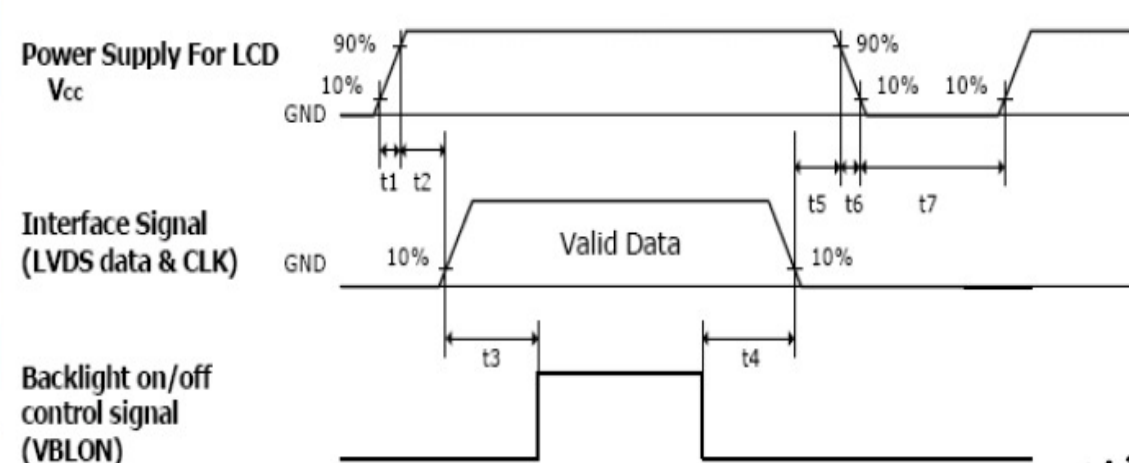
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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(000)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(001)	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(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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

3-6 Power Sequence

1. Power sequence of panel

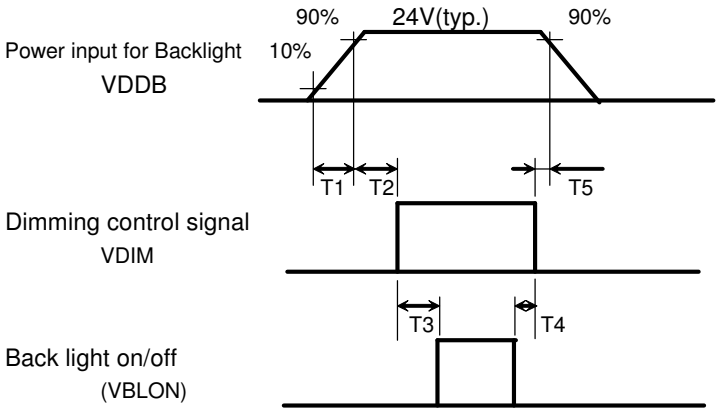


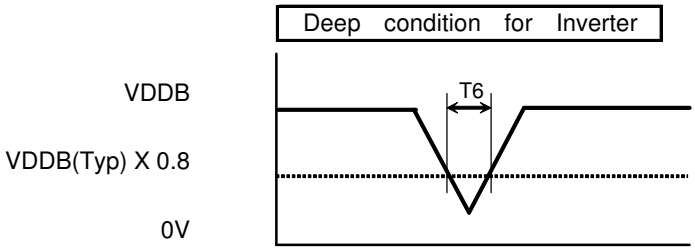
Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.4	---	30	ms
T2	0.1	---	50	ms
T3	200	---	---	ms
T4	10	---	---	ms
T5	0.1	---	50	ms
T6	---	---	300	ms
T7	300	---	---	ms

Apply the lamp voltage within the LCD operating range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal.

Caution : The above on/off sequence should be applied to avoid abnormal function in the display. In case of handling, make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

2. Power sequence of inverter





Parameter	Values			Units
	Min.	Typ.	Max.	
T1	20	-	-	ms
T2	50	-	-	ms
T3	0	-	-	ms
T4	0	-	-	ms
T5	0	-	-	ms
T6	-	-	10	ms

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 45 minutes in a dark environment at 25℃. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

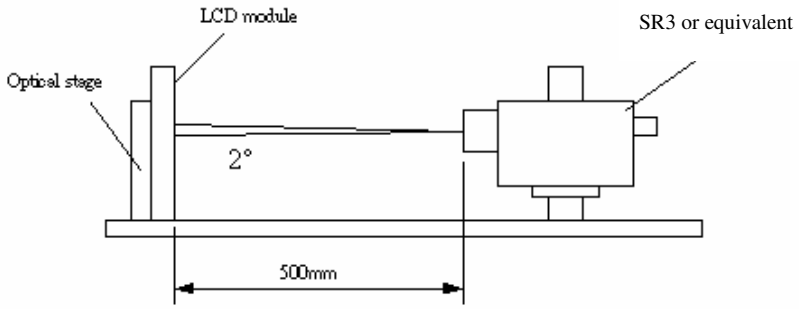


Fig.4-1 Optical measurement equipment and method

Parameter		Symbol	Values			Units	Notes
			Min.	Typ.	Max.		
Contrast Ratio		CR		3000			1
Surface Luminance, white		LWH	360	450		cd/m²	2
Luminance Variation		δ_{WHITE} 9 p			1.3		3
Response Time (G to G)		Tγ		6.5		ms	4
Color Coordinates							
	RED	R_X	Typ.-0.03	0.640	Typ.+0.03		
		R_Y		0.330			
	GREEN	G_X		0.290			
		G_Y		0.600			
	BLUE	B_X		0.150			
		B_Y		0.060			
	WHITE	W_X		0.280			
		W_Y		0.290			
Viewing Angle							
	x axis, right(φ=0°)	θ_r		89		Degree	5
	x axis, left(φ=180°)	θ_l		89			
	y axis, up(φ=90°)	θ_u		89			
	y axis, down (φ=0°)	θ_d		89			

Note:

1. Contrast Ratio (CR) is defined mathematically as:

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

2. Surface luminance is luminance value at point 1 across the LCD surface 50cm from the surface with all pixels displaying white. From more information see Fig. 4-2. When V_{DDB} = 24V, I_{DDB} = (TBD). $L_{WH}=L_{on1}$, Where L_{on1} is the luminance with all pixels displaying white at center 1 location.

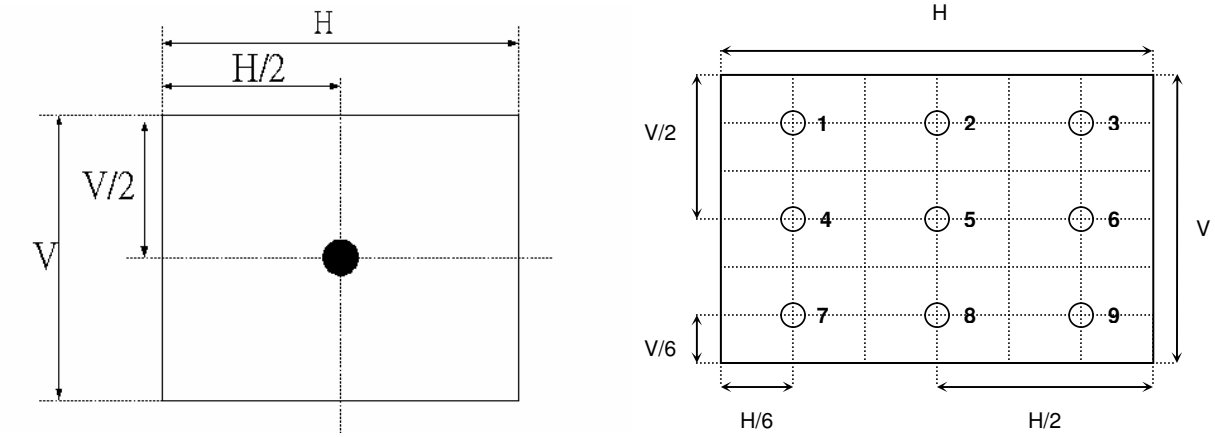


Fig.4-2 Optical measurement point

3. The variation in surface luminance, δ_{WHITE} is defined under 100% brightness as:

$$\delta_{WHITE(9P)} = \text{Maximum}(L_{on1}, L_{on2},\ldots,L_{on9}) / \text{Minimum}(L_{on1}, L_{on2},\ldots L_{on9})$$

4. Response time Tγ is the average time required for display transition by switching the input signal for five luminance ratio (0%,25%,50%,75%,100% brightness matrix) and is based on f_v=60Hz to optimize.

	0%	25%	50%	75%	100%
0%		t0%-25%	t0%-50%	t0%-75%	t0%-100%
25%	t25%-0%		t25%-50%	t25%-75%	t25%-100%
50%	t50%-0%	t50%-25%		t50%-75%	t50%-100%
75%	t75%-0%	t75%-25%	t75%-50%		t50%-100%
100%	t100%-0%	t100%-25%	t100%-50%	t100%-75%	

5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see Fig. 4-5.

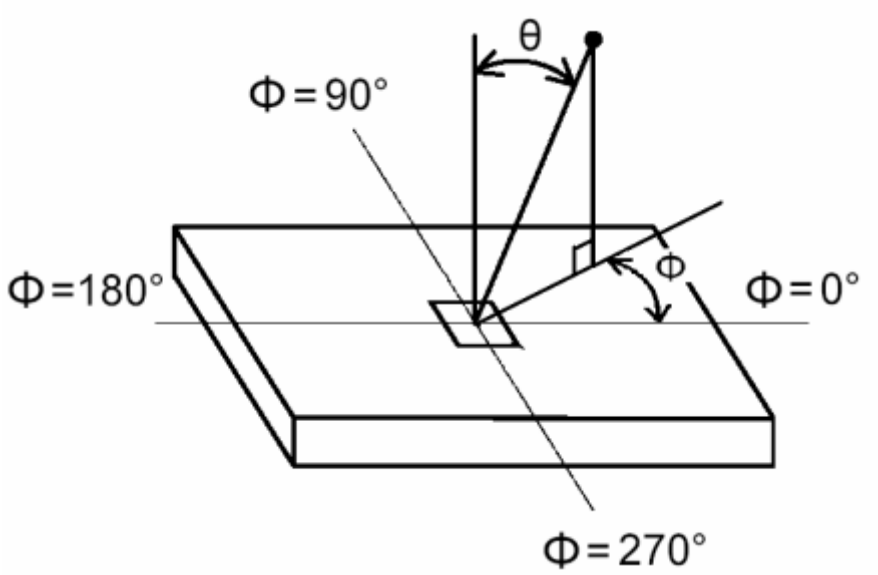


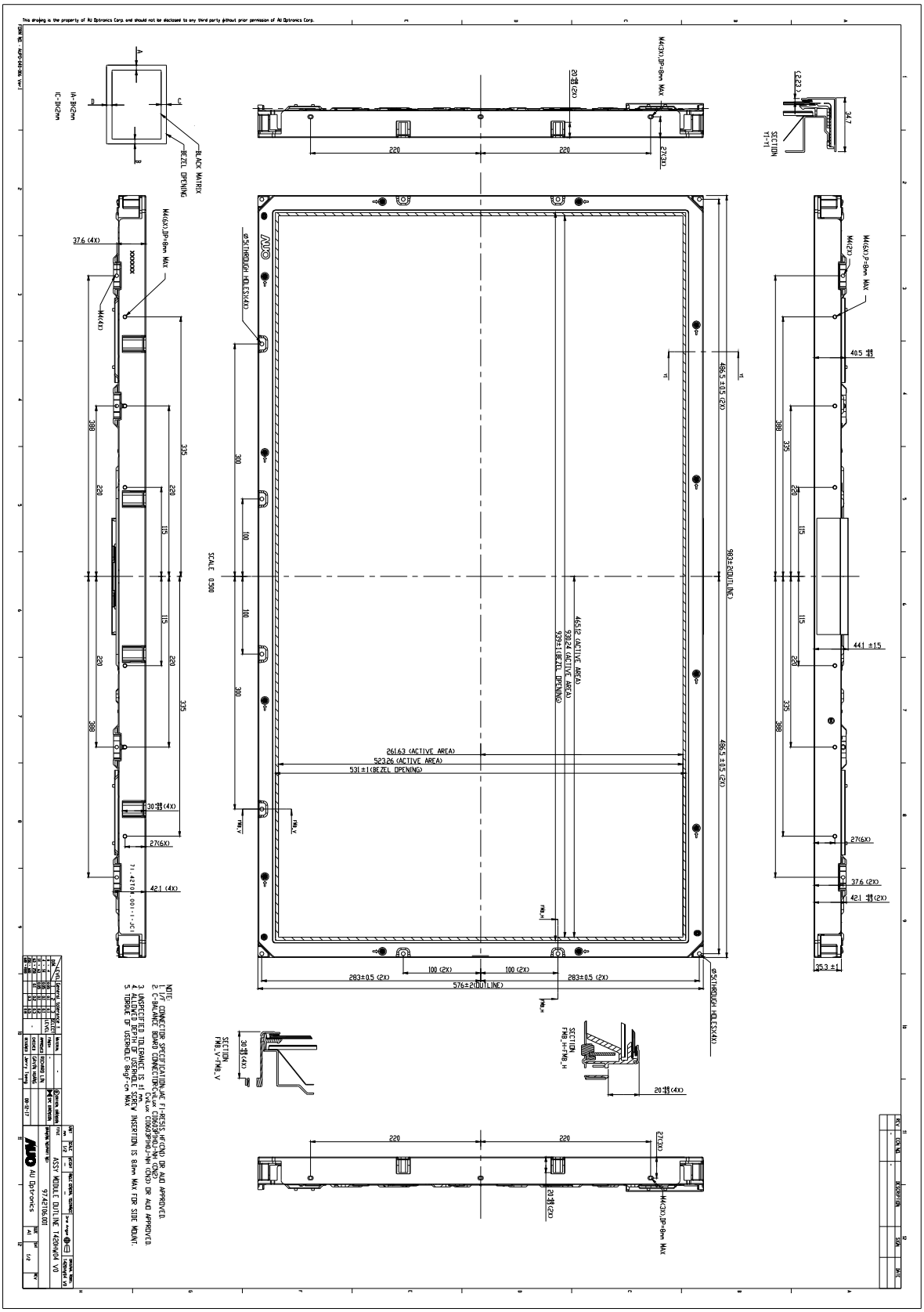
Fig.4-5 Viewing Angle Definition

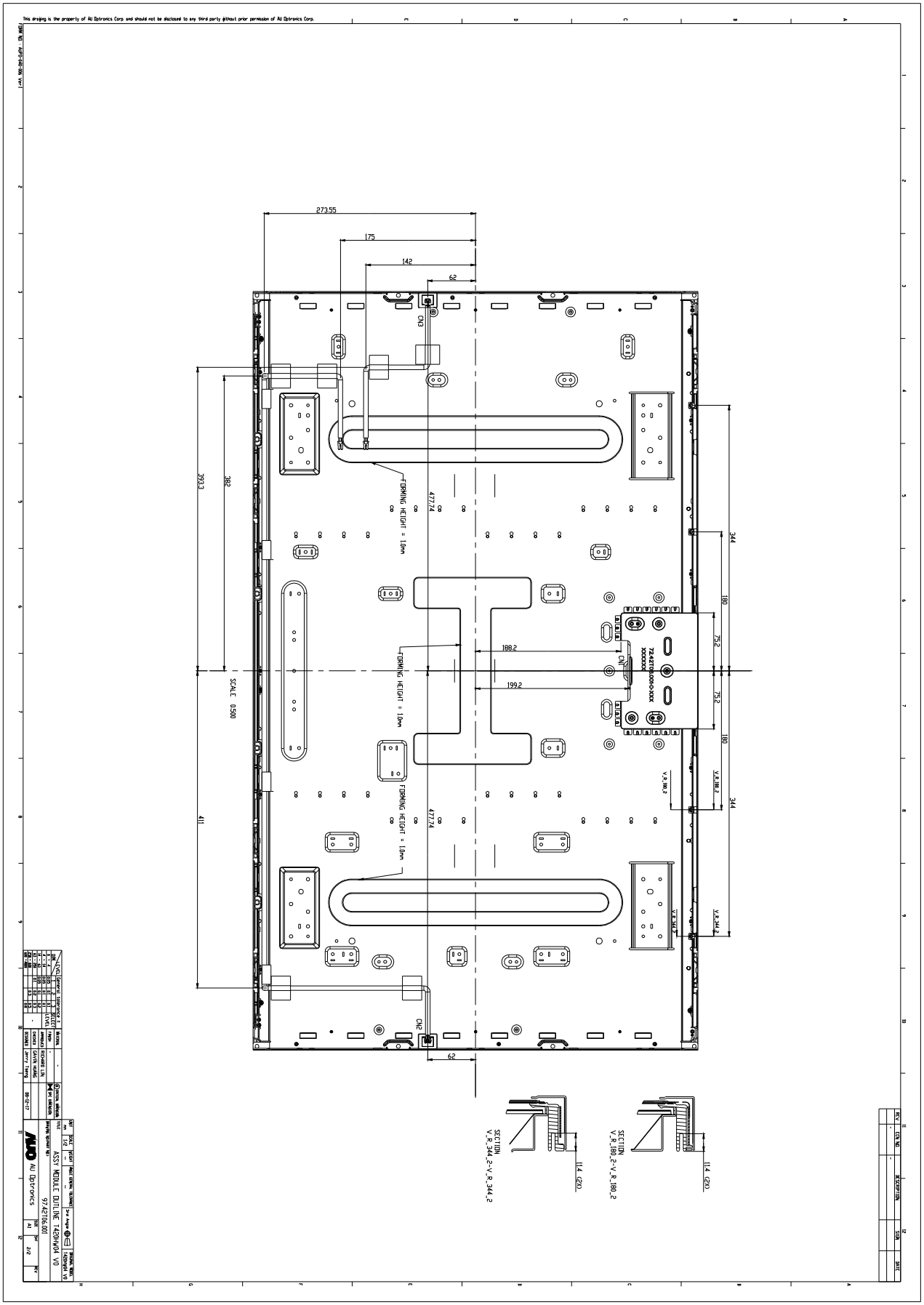
5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model T420XW01. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal (typ.)	983.0mm
	Vertical (typ.)	576.0mm
	Depth (typ.)	44.1mm
Bezel Area	Horizontal (typ.)	939.0mm
	Vertical (typ.)	531.3mm
Active Display Area	Horizontal	930.246mm
	Vertical	523.008mm
Weight	15000g (Max)	
Surface Treatment	**AG, Haze=11**	

2D drawing





6. International Standard

6-1. Safety

(1) UL6500, UL 60065 Underwriters Laboratories, Inc. (AUO file number : E204356)
Standard for Safety of Information Technology Equipment Including electrical Business Equipment.

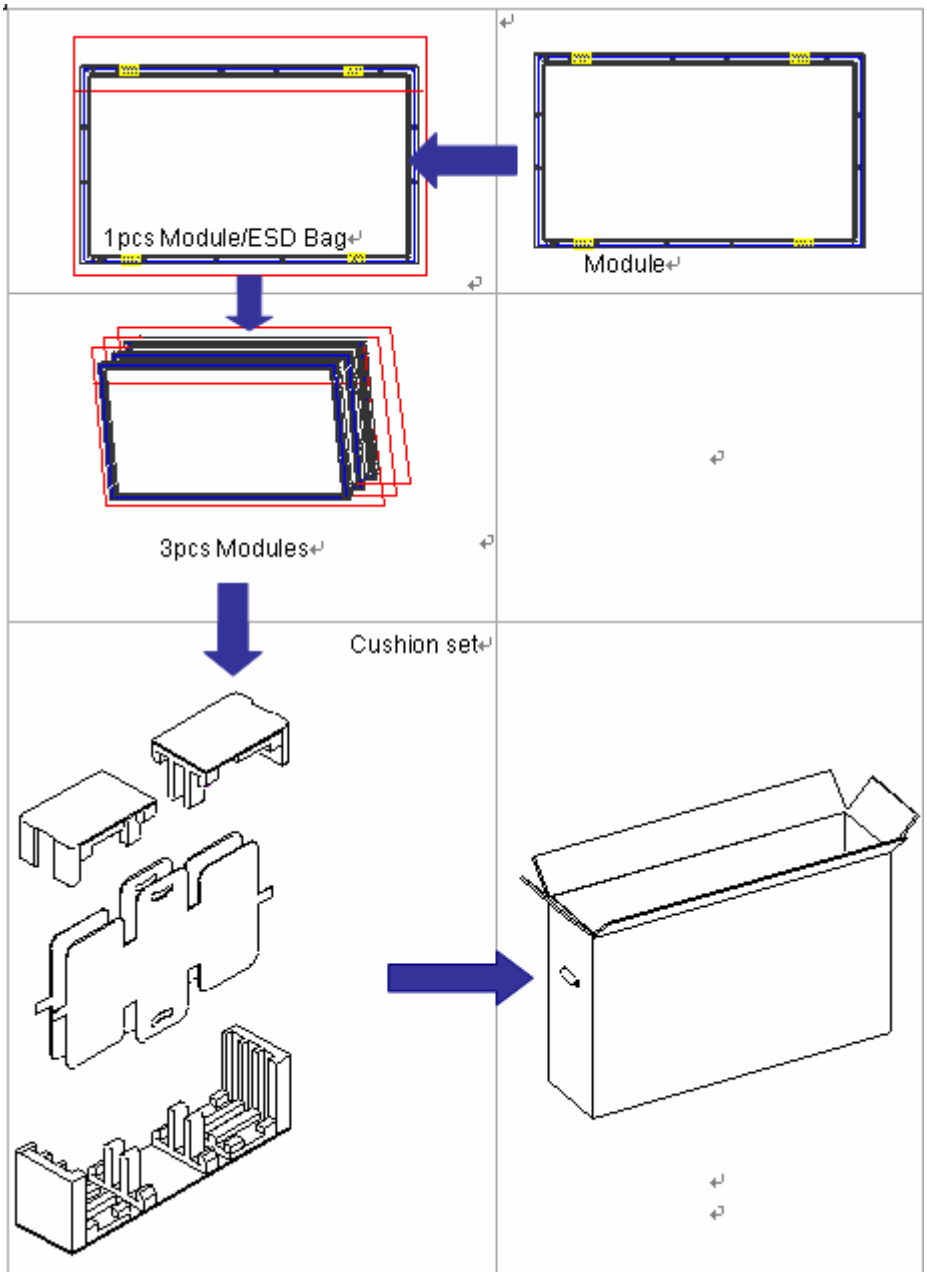
(2) CAN/CSA C22.2 No. 950-95 Third Edition, Canadian Standards Association, Jan. 28, 1995
Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.

(3) EN60950: 1992+A2: 1993+A2: 1993+C3: 1995+A4: 1997+A11: 1997
IEC 950: 1991+A1: 1992+A2: 1993+C3: 1995+A4:1996
IEC 60065: version 7th
European Committee for Electro technical Standardization (CENELEC)
EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

6-2. EMC

a) C.I.S.P.R "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment." International Special committee on Radio Interference.
Criteria: CISPR22

Packing



Package information:

Carton outside dimension : 1087x285x716mm

Carton/Package weight : 3kg

Gross weight(per Box) : 48kg

Shipping label

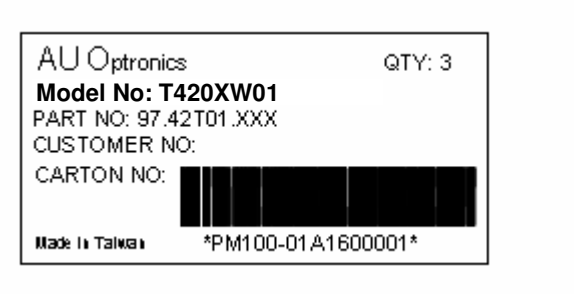
Green Mark Description:

For Pb Free products, AUO will add for identification.

For RoHS compatible products, AUO will add for identification.

Note. The Green Mark will be present only when the green documents have been ready by AUO Internal Green Team. (The definition of green design follows the AUO green design checklist.)

Carton label



Pallet information

By air cargo : : (4x1) x2 layers, one pallet put 8 boxes, total 24 pcs module.

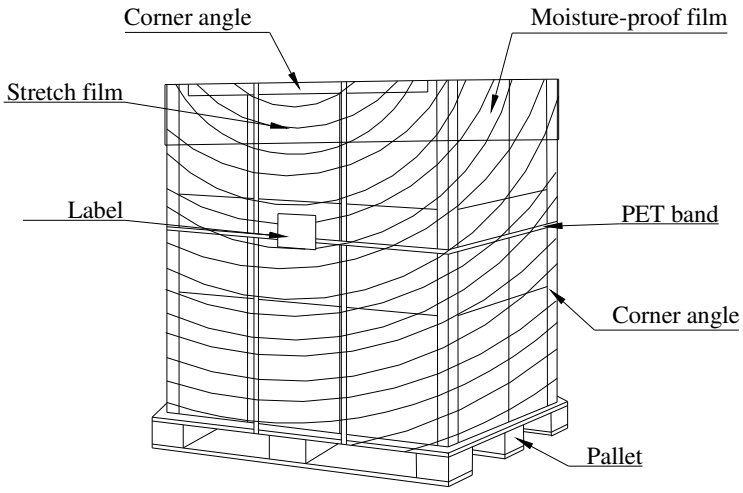
By sea : (4x1) x3 layers, one pallet put 12 boxes, total 24 pcs module.

Pallet dimension : 1150x1100x120mm

Pallet weight : 10kg

By air total weight : 48 kg/box X 8 boxes=384 kg (with pallet weight 394kg)

By sea total weight : 48 kg/box X 12 boxes=576 kg (with pallet weight 586kg)



7. PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD module.

8-1 MOUNTING PRECAUTIONS

(1) You must mount a module using holes arranged on back side of panel

(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.

(3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.

(4) You should adopt radiation structure to satisfy the temperature specification.

(5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.

(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)

(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front/ rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.

(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.

(9) Do not open the case because inside circuits do not have sufficient strength.

8-2 OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage: V=±200mV(Over and under shoot voltage)

(2) Response time depends on the temperature. (In lower temperature, it becomes longer..)

(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.

(4) Be careful for condensation at sudden temperature change. Condensation makes damage to

polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.

(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.

(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interface.

8-3 ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

8-4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

8-5 STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

8-6 HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) The protection film is attached to the bezel with a small masking tape. When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.

(2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of flue still on the Bezel after the protection film is peeled off.

(3) You can remove the glue easily. When the glue remains on the Bezel or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.