Product Service Manual – Level II

Service Manual for BenQ:
XL2411T

P/N: 9H.L9SLB.xxx
Applicable for All Regions

Version: 001
Date:2012/09/06

Notice:
- For RO to input specific "Legal Requirement" in specific NS regarding to responsibility and liability statements.

- Please check BenQ's eSupport web site, http://esupport.benq.com, to ensure that you have the most recent version of this manual.

First Edition (Sep, 2012)

Content Index

Abbreviations & Acronyms

1 About This Manual

This manual contains information about maintenance and service of BenQ products. Use this manual to perform diagnostics tests, troubleshoot problems, and align the BenQ product.

1.1. Trademark

The following terms are trademarks of BenQ Corporation:

BenQ

Importance

Only trained service personnel who are familiar with this BenQ Product shall perform service or maintenance to it. Before performing any maintenance or service, the engineer MUST read the "Safety Note".

2 Introduction

This section contains general service information, please read through carefully. It should be stored for easy access place for quick reference.

2.1. RoHS (2002/95/EC) Requirements

– Applied to all countries require RoHS.

The RoHS (Restriction of Hazardous Substance in Electrical and Electronic Equipment Directive) is a legal requirement by EU (European Union) for the global electronics industry which sold in EU and some counties also require this requirement. Any electrical and electronics products launched in the market after June 2006 should meet this RoHS requirements. Products launched in the market before June 2006 are not required to compliant with RoHS parts. If the original parts are not RoHS complaints, the replacement parts can be non ROHS complaints, but if the original parts are RoHS compliant, the replacement parts MUST be RoHS complaints.
If the product service or maintenance require replacing any parts, please confirming the RoHS requirement before replace them.

2.2. Safety Notice

1. Make sure your working environment is dry and clean, and meets all government safety requirements.
2. Ensure that other persons are safe while you are servicing the product. DO NOT perform any action that may cause a hazard to the customer or make the product unsafe.
3. Use proper safety devices to ensure your personal safety.
4. Always use approved tools and test equipment for servicing.
5. Never assume the product's power is disconnected from the mains power supply. Check that it is disconnected before opening the product's cabinet.
6. Modules containing electrical components are sensitive to electrostatic discharge (ESD). Follow ESD safety procedures while handling these parts.
7. Some products contain more than one battery. Do not disassemble any battery, or expose it to high temperatures such as throwing into fire, or it may explode.
8. Refer to government requirements for battery recycling or disposal.

2.3. Compliance Statement

Caution: This Optical Storage Product contains a Laser device. Refer to the product specifications and your local Laser Safety Compliance Requirements.

2.4. General Descriptions

This Service Manual contains general information. There are 3 levels of service:
Level 1: Cosmetic / Appearance / Alignment Service
Level 2: Circuit Board or Standard Parts Replacement
Level 3: Component Repair to Circuit Boards

2.5. Related Service Information

BenQ Global Service Website: http://www.benq.com/support/
eSupport Website: http://esupport.benq.com/v2

3 Product Overview

3.1. Specification

3.1.1 Introduction

XL2411T is defined 24'W LCD Monitor supports WXGA (1920x1080) resolution with DPMS (Display Power Management System) and Senseye function. There are five different input types, D-sub, DVI-D Dual-Link, and HDMI ports of models. XL2411T adopts AUO panel, M240HW01-V8.

The features summary is shown as below,

* All spec. of monitor need to warm up at least 1hr.

* To test the "Contrast Ratio" and "Luminance" functions, the color status must be "User preset" mode.

* 1. "Contrast Ratio": Set "brightness" at 100, and "contrast" at 50.

* 2. "Luminance": Set "brightness" at 100, and "contrast" at 100.

Feature items	Specifications	Remark
Panel supplier & module name	AUO M240HW01 V8	TN
Screen diagonal	24"	531.36(H)x298.89(V)
Display Format	1920 (H) x 1080 (V)	Panel Display information
Pixel Pitch	0.27675 mm x 0.27675 mm	per one triad
Viewing Angle (@ Contrast Ratio >= 10)	R/L:170 degrees (typ) U/D: 160 degrees (typ)	
Analog interface with Scaling supported	Yes	With 15-pin D-sub connector
DVI interface with Scaling supported	Yes	DVI-D Dual-Link
DP interface with Scaling supported	NO	Display port 1.2
HDMI interface with Scaling supported	Yes	HDMI 1.4(1 port)
Video interface with Scaling supported	No	
Max resolution mode supported	1920x1080@60Hz	
Number of Display Colors supported	16.7 millions	RGB 6-bit + Hi_FRC
Luminance	350 cd/m^2 (typ.)	Test Condition: Contrast=100, Brightness=100, Color=User mode
Contrast Ratio	1000(typ.)	Test Condition: Contrast=50, Brightness=100, Color=User mode
Color Temperature	(1) Bluish mode: (x,y)= (0.283, 0.297)+/-(0.02, 0.02) (2) Reddish mode: (x,y)= (0.326, 0.342)+/-(0.02, 0.02)	

	(3) 6500K mode : (x,y)= (0.313, 0.329)+/-(0.02, 0.02) (4) sRGB: (x,y)= (0.313, 0.329)+/-(0.015, 0.015)	
AC power input	Yes	90-264 Volts, 47-63 Hz.
DC power input (with AC power adapter)	No	
DPMS supported(Power Saving)	Yes	≤0.5W
LED indicator for power status showed	Yes	White/Amber
OSD for control & information supported	Yes	ADC Key
Multi-language supported for OSD	Yes	17 languages
Buttons control supported	Yes	6 buttons including 1 monitor power on/off control button. (Touch sensor)
Flywheel control supported	No	
Scaling function supported	Yes	
Auto adjustment function supported	Yes	"OSD" function
DDC function supported (EDID ver. 1.3)	Yes	DDC2B
DDC-CI support version 1.1 or later	Yes	DDC-CI
Audio speakers supported	No	
Audio Jack (input connector) supported	NO	
Earphone Jack (input connector) supported	Yes	For HDMI port
Microphone function supported	No	
Mechanical Tilt base design	Yes	From -5 to +20 degree
VESA wall mounting design	Yes	
Mechanical Rotate design	No	
Mechanical Lift base design	No	
Kensington compatible lock design	Yes	

3.1.2 Operational Specification

3.1.2.1 Power supply

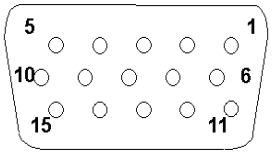
Item	Condition	Spec	OK	N.A	Remark
Input Voltage range	Universal input full range	90~264VAC /47~63Hz	√		
Input Current range	90 ~ 264VAC	≤ 1.5 Arms	√		
Power Consumption	Normal "On" operation	< 36W	√		LED: Green
	DPMS "Sleep" state	< 0.5 W	√		LED: Amber
	DPMS "Off" state	< 0.5 W	√		LED: Off
Inrush Current	110 VAC 220 VAC	<40 A (peak) <80 A (peak)	√		Cold-start
Earth Leakage Current	264 VAC/50Hz	< 3.5 mA	√		

Hi-Pot	1. 1500VAC, 1 sec 2. Ground test: 30A, 1sec	Without damage < 0.1 ohm	√		(on-line test) (in-lab test)
Power Line Transient	IEC1000-4-4	1KV	√		
	IEC1000-4-5 (Surge)	Common: 2KV, Differential: 1KV	√		
LED Operation Current (2D)	90V ~ 264VAC	110mA	√		Panel Spec
LED Operation Current (3D)	90V ~ 264VAC	200mA 215mA	√		Panel spec (duty 33%, 24%)
CCFL operation range	90V ~ 264VAC	7.5mA (Typ.)		√	Depends on panel source (Operation with fixed driving current)
CCFL Frequency	90V ~ 264VAC	40KHz ~ 80KHz		√	Depends on panel source
Power cord		Color: Black Length: 1800 +/- 50 mm	√		

3.1.2.2 Signal interface

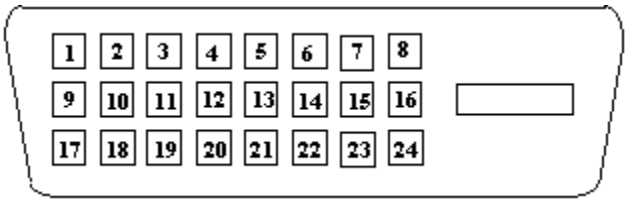
Item	Condition	Spec	OK	N.A	Remark
Signal Cable	15-pin D-Sub	Color: Black Length: 1800 +/- 30 mm	√		
	24-pin DVI-D Dual-Link	Color: White Length: 1800 +/- 50 mm	√		Dual-Link Cable
Pin assignment	15-pin D-sub connector	See Note-1	√		For 15-pin D-sub
	24-pin DVI-D connector	See Note-2	√		For 24-pin DVI-D Dual-Link
	19-pin HDMI connector	See Note-3	√		For 19-pin HDMI
Video input	Signal type	Separate analog R/G/B	√		For 15-pin D-sub
	Level	700 mV (peak to peak)	√		
	Impedance	75 Ohms +/- 1.5 Ohms	√		
Sync input	Signal type	Separate H/V-sync Composite H/V-sync (Positive/Negative)	√		For 15-pin D-sub
	Level	Logic High: 2.4V ~ 5.5V Logic Low: 0V ~ 0.5V (TTL level)	√		Refer to VESA VSIS Standard V1R1
	Impedance	Minimum 2.2KΩ(pull down)	√		10KΩ for application
	Sync Pulse Width (SPW)	0.7μs < H-SPW 1H < V-SPW	√		

Note-1: The pin assignment of 15-pin D-sub connector is as below,



Pin	Signal Assignment	Pin	Signal Assignment
1	Red video	9	PC5V (+5 volt power)
2	Green video	10	Sync Ground
3	Blue video	11	Ground
4	Ground	12	SDA
5	Cable Detected	13	H-Sync (or H+V)
6	Red Ground	14	V-sync
7	Green Ground	15	SCL
8	Blue Ground		

Note-2: The pin assignment of 24-pin DVI-D connector is as below,



Pin	Signal Assignment	Pin	Signal Assignment
1	TMDS RX2-	13	TMDS RX3+
2	TMDS RX2+	14	+5V Power
3	TMDS Ground	15	GROUND
4	TMDS RX4-	16	Hot Plug Detect
5	TMDS RX4+	17	TMDS RX0-
6	DDC CLOCK	18	TMDS RX0+
7	DDC DATA	19	TMDS Ground
8	Floating	20	TMDS RX5-
9	TMDS RX1-	21	TMDS RX5+
10	TMDS RX1+	22	TMDS Ground
11	TMDS Ground	23	TMDS CLOCK+
12	TMDS RX3-	24	TMDS CLOCK-

Note-3: The pin assignment of 19-pin HDMI connector is as below

Table 4-8 Type A-to-Type A Cable Wire Assignment

Type A pin	*Signal Name*	*Wire*	*Type A pin*
1	*TMDS Data2+*	*A*	*1*
2	*TMDS Data2 Shield*	*B*	*2*
3	*TMDS Data2–*	*A*	*3*
4	*TMDS Data1+*	*A*	*4*
5	*TMDS Data1 Shield*	*B*	*5*
6	*TMDS Data1–*	*A*	*6*
7	*TMDS Data0+*	*A*	*7*
8	*TMDS Data0 Shield*	*B*	*8*
9	*TMDS Data0–*	*A*	*9*
10	*TMDS Clock+*	*A*	*10*
11	*TMDS Clock Shield*	*B*	*11*
12	*TMDS Clock–*	*A*	*12*
13	*CEC*	*C*	*13*
14	*Reserved (in cable but N.C. on device)*	*C*	*14*
15	*SCL*	*C*	*15*
16	*SDA*	*C*	*16*
17	*DDC/CEC Ground*	*D*	*17*
18	*+5V Power*	*5V*	*18*
19	*Hot Plug Detect*	*C*	*19*

3.1.2.3 Video performance

Item	Condition	Spec	OK	N.A	Remark
Max. support Pixel rate		170 MHz	√		Both for analog and HDMI
		330 MHz	√		DVI-D Dual-link And DP
Max. Resolution		1920 x 1080	√		
Rise time + Fall time		5 ms(Typ.)	√		1920 x 1080 @ 60Hz (max. support timing)
Settling Time after overshoot /undershoot		< 5% final full-scale value	√		Refer to VESA VSIS Standard V1R1
Overshoot/Undershoot		< 12% of step function voltage level over the full voltage range	√		Refer to VESA VSIS Standard V1R1

3.1.2.4 Scan range

Item	Condition	Spec	OK	N.A	Remark
Horizontal		H-Freq VGA/HDMI:15K-135K H-Freq DVI:30K-140K	√		
Vertical		V-Freq VGA:24-120HZ V-Freq HDMI:56-120HZ	√		

3.1.2.5 Plug & Play DDC2B DDC-CI Support

Item	Condition	Spec	OK	N.A	Remark
DDC channel type		DDC2B	√		
EDID		Version 1.3	√		Refer to S/W spec. document to see the detailed EDID data definition.
DDC-CI		Version 1.1 or Later	√		Refer to S/W spec

3.1.2.6 Support Timings

	Resolution	Pixel clock	H-sync	V-sync
		(unit:MHz)	(unit:KHz)	(unit:Hz)
P	640x350	25.18	31.47	70.09
P	640x480	25.17	31.47	59.94
P	640x480	31.50	37.50	75.00
P	720x400	28.32	31.47	70.08
P	832x624	57.27	49.71	74.53
P	800x600	40.00	37.88	60.32
P	800x600	49.50	46.88	75.00
P	1024x576	46.966	35.82	60
P	1024x600	48.964	37.32	60
P	1024x768	65.00	48.36	60.00
P	1024x768	80.00	60.24	74.93
P	1024x768	78.75	60.02	75.03
P	1152x720	66.75	44.86	60
P	1152x864	108.00	67.50	75.00
P	1152x870	100.00	68.68	75.06
P	1152x900	92.94	61.80	65.95
P	1280x720	74.25	45.00	59.94
P	1280x720	74.50	44.77	59.86
P	1280x720	95.75	56.46	74.78
P	1280x768-R	68.25	47.40	60.00
P	1280x800	83.50	49.702	59.81
P	1280x800	106.6	62.795	74.934
P	1280x960	108.00	60.00	60.00
P	1280x1024	108.00	63.98	60.02
P	1280x1024	135.00	79.98	75.02
P	1360x768	85.50	47.71	60.01
P	1366x768	85.50	47.71	59.79
P	1440x900-R	88.75	55.496	59.901
P	1440x900	106.5	55.935	59.887
P	1440x900	136.75	70.6	75
P	1600X900-R	108	60	60
P	1600x1000-R	108.5	61.648	59.910
P	1600x1200	162.00	75.00	60.00
P	1680x1050	146.25	65.29	59.95
P	1680x1050	187	82.306	75
P	1920x1080-R	138.5	66.587	59.934
P	1920x1080	173	67.158	59.963
P	1920x1080	148.5	67.5	60

3.1.3 Operational & Functional Specification

3.1.3.1 Video performance

*All spec. of monitor need to warm up at least 1hr.

Item	Condition	Spec	OK	N.A	Remark
Resolution	Any input resolution modes which are under 1920x1080	1920 x 1080	√		
Contrast ratio		1000 (typ.)	√		Test Condition: Set Contrast at 50, Brightness at 100, and Color at User preset.
Brightness	At R/G/B saturated condition	350 cd/m^2 (Typ.)	√		Test Condition: Set contrast at 100, brightness at 100, and color at User preset.
Response time	Gray to Gray	1ms (typ.)	√		Test Equipment: Westar TRD 100 or equal level equipment ;
Viewing angle	At Contrast ratio = 10	R/L: 170 degrees (typ.)	√		
	At Contrast ratio = 10	U/D: 160 degrees (typ.)	√		
CIE coordinate of White		(1) Bluish mode: (x,y)= (0.283, 0.297)+/-(0.02, 0.02) (2) Reddish mode: (x,y)= (0.326, 0.342)+/-(0.02, 0.02) (3) 6500K mode : (x,y)= (0.313, 0.329)+/-(0.02, 0.02) (4) sRGB: (x,y)= (0.313, 0.329)+/-(0.015, 0.015)	√		
Display colors		16.7 Millions colors	√		RGB 6-bit + Hi_FRC

Color temperature specification:

Color mode	Color temperature	x	Y	
Normal	6500k	0.313±0.020	0.329±0.020	Min 250m^2
Bluish	9300k	0.283±0.020	0.297±0.020	Min 200/m^2
Reddish	5800k	0.326±0.020	0.342±0.020	Min 250/m^2
User Mode	Panel default color temp.			Min 250/m^2
sRGB	6500k (Gamma=2.2±0.2)	0.313±0.015	0.329±0.015	200+/-20 cd/m^2

3.1.3.2 Brightness Adjustable Range

Item	Condition	Spec	OK	N.A	Remark
Brightness adjustable range	At default contrast level (saturate point) & Full-white color pattern	(Max. brightness value – Min. brightness value) ≧ 100 cd/㎡	√		

3.1.3.3 Acoustical Noise

Item	Condition	Spec	OK	N.A	Remark
Acoustical Noise	At 4 cm distance & “Audio” function disabled	≦ 28 dB/A	√		

3.1.3.4 Environment

Item	Condition	Spec	OK	N.A	Remark
Temperature	Operating	0 ~ +40 ℃	√		
	Non-operating	-20 ~ +60 ℃	√		
Humidity	Operating	10 ~ 90%	√		Non-condensing
	Non-operating	10 ~ 70%	√		Non-condensing
Altitude	Operating	0~3048m (10,000ft)	√		Without packing
	Non-operating	0~12,192m (40,000ft)	√		With packing

3.1.3.5 Transportation

Item	Condition	Spec	OK	N.A	Remark
(1) Vibration	Package, Non-Operating	(1) Test Sweep Frequency (Hz) / PSD (G^2/Hz) 1 / 0.0001 4 / 0.01 100 / 0.01 200 / 0.001 * Acceleration: 1.15G; (1)The product should be packaged and non-operating. (2) The duration of endurance is 30 minutes per axis (X, Y and Z) (3) Procedure: Confirmed sample with appearance and function ready before testing then compare with after test record as brightness, uniformity and contrast ratio. Perform random vibration after sine-wave vibration test.	√		
(2) Unpackaged Vibration	Unpackaged, Non-Operating	Test Spectrum: 20 Hz 0.0185(g2/Hz) 200Hz 0.0185(g2/Hz) Duration : 5 Minutes Axis : 3 axis (Horizontal and Vertical axis ,Z axis)	√		

<table>
<tr><td>(3) Drop</td><td>Package, Non-Operating</td><td>91 cm Height (MP stage)
(1 corner, 3 edges, 6 faces)
<table><tr><th colspan="2">Drop test with packing gross weight and falling height relationship</th></tr><tr><th>Gross Weight (Kg)</th><th>FallingHeight (cm)</th></tr><tr><td>N/A</td><td>106</td></tr><tr><td>0.0≦W<4.5</td><td>91</td></tr><tr><td>4.5≦W<20.5</td><td>76</td></tr><tr><td>20.5≦W<34.0</td><td>61</td></tr><tr><td>34.0≦W<45.5</td><td>46</td></tr><tr><td>45.5≦W<79.4</td><td>31</td></tr></table></td><td>√</td><td></td><td></td></tr>
<tr><td>(4) Shock</td><td>Wooden package, Non-Operating</td><td>Waveform: half sine
Faces: 6 sides/ per orientation
3 shocks.
Duration: <3ms
Velocity accelerate: 75g</td><td>√</td><td></td><td></td></tr>
</table>

3.1.3.6 Electrostatic Discharge Requirements

Item	Condition	Spec	OK	N.A	Remark
Electrostatic Discharge	IEC801-2 standard	Contact: 8KV Air: 15KV	√		

3.1.3.7 EMC

Item	Condition	Spec	OK	N.A	Remark
TCO03	Electric	Band 1 < 10 V/m Band 2 < 1 V/m	√		
	Magnetic	Band 1 < 200nT Band 2 < 25nT	√		
EMI	FCC part 15J class B	After Mass production under 1dBuv for constant measure. Besides DNSF and VCCI class-2 are optional.	√		
	EN55022 class B				

3.1.3.8 Reliability

Item	Condition	Spec	OK	N.A	Remark
MTBF Prediction	Refer to Telcordia (Bellcore)	> 60,000 Hours	√		Excluding backlight
Backlight Life time	At 25±2℃	30,000 Hours (min)	√		See Note-A

Note-A: Backlight life time is defined as the time when brightness of backlight become 50% or less than its original value at the condition of typical backlight operation current (for CCFL backlight, it's CCFL operation current; for LED backlight, it's LED forward (/operation) current).

3.1.3.9 Audio performance

Item	Condition	Spec	OK	N.A	Remark
Speaker					
(1)Nominal impedance	@ 1KHz	4 ± 15% ohm			
(2)Rated input power		3W/CH			
(3)Frequency response	SPL-10dB	450~20KHz SPL-10dB			
(4)Output sound pressure level	1W 0.5M	>75 ± 3 dB			
Earphone out					
Signal Level	when 1Vrms sin wave input, tested under 32 ohm dummy load 1	<= 150 mVrms			
Line out					
Signal Level	when 1Vrms sin wave input	>=1.0 Vrms			

3.1.4 LCD Characteristics

3.1.4.1 The Physical definition & Technology summary of LCD panel

Item	Condition	Spec	OK	N.A	Remark
LCD Panel Supplier		AUO	√		
Panel type of Supplier		M240HW01V8	√		
Screen Diagonal		609.7(24")	√		
Display area	Unit=mm	531.36(H) x 298.89(V)	√		
Physical Size	Unit=mm	556(W) x323.2(H) x 14.4(D)	√		
Weight	Unit=gram	2200 (Typ.)	√		
Technology		TN type	√		
Pixel pitch	Unit=mm	0.27675(H) x 0.27675(W)	√		Per one triad
Pixel arrangement		R/G/B vertical stripe	√		
Display mode		Normally White	√		
Support color		16.7 Millions colors	√		RGB 6-bit + Hi_FRC

3.1.4.2 Optical characteristics of LCD panel

Item	Unit	Conditions	Min.	Typ.	Max.	Remark
Viewing Angle	[degree] [degree]	Horizontal (Right) CR = 10 (Left)	150	170	- -	
	[degree] [degree]	Vertical (Up) CR = 10 (Down)	140	160	- -	
Contrast ratio		Normal Direction	600	1000		
Response Time	[msec]	Rising Time	-	3.5	7.4	
	[msec]	Falling Time	-	1.5	2.6	
	[msec]	Rising + Falling	-	5	10	
Color / Chromaticity Coordinates (CIE)		Red x	Typ.-0.03	0.65	Typ.+0.03	
		Red y	Typ.-0.03	0.329	Typ.+0.03	
		Green x	Typ.-0.03	0.331	Typ.+0.03	

		Green y	Typ.-0.03	0.622	Typ.+0.03	
		Blue x	Typ.-0.03	0.151	Typ.+0.03	
		Blue y	Typ.-0.03	0.053	Typ.+0.03	
Color Coordinates (CIE) White		White x	Typ.-0.03	0.313	Typ.+0.03	
		White y	Typ.-0.03	0.329	Typ.+0.03	
Luminance Uniformity	[%]	9 points measurement	75	80		
White Luminance @ CCFL 6.0mA (center)	[cd/m2]		300	350	-	
Crosstalk (in 60Hz)	[%]				1.5	

3.1.5 User Controls

3.1.5.1 User's hardware control definition

Item	Condition	Spec	OK	N.A	Remark
Power button			√		
Enter button			√		
Right/Inc. button			√		
Left/Dec. button			√		
Menu button			√		
Mode button				√	
Input Select button				√	
iKey button			√		
Mute button				√	

3.1.5.2 OSD control function definition

Item	Condition	Spec	OK	N.A	Remark
Auto Adjust		Auto-Geometry	√		
Brightness			√		
Contrast			√		
Horizontal Position			√		
Vertical Position			√		
Pixel Clock			√		
Phase			√		
Color		Bluish Reddish Normal sRGB Senseye User: Separate R/G/B adjustment Reset Color	√		
OSD Position		OSD Horizontal position OSD Vertical position	√		
OSD Time		From 5 sec to 30 sec	√		
OSD Lock			√		

Language		17 languages	√		
Recall		Recall All	√		
Mode		Standard Movie Photo sRGB ECO FPS1 FPS2 RTS Gamer1 Gamer2 Gamer3	√		
Input Select			√		
Sharpness			√		
Display Information		For input timing	√		
Volume	Selection by Custom key		√		
Mute	Selection by Custom key		√		
Hot key for Brightness	Selection by Custom key		√		
Hot key for Contrast	Selection by Custom key		√		
Hot key for Volume	Selection by Custom key		√		
Hot key for Input Select	Selection by Custom key		√		
Hot key for Mode	Selection by Custom key		√		

3.1.6 Mechanical Characteristics

3.1.6.1 Dimension

Item	Condition	Spec	OK	N.A	Remark
Bezel opening		533.2*300.7	√		
Monitor without Stand	W x H x D mm	570*347*63	√		
Monitor with Stand	W x H x D mm	570*431*222.6	√		
Carton Box (outside)	L x W x H mm	652*420*251	√		
Tilt and Swivel range		Tilt: -5°~20° Swivel: ±45°	√		

3.1.6.2 Weight

Item	Condition	Spec	OK	N.A	Remark
Monitor (Net)		6.0Kg	√		
Monitor with packing (Gross)		8.5Kg	√		

3.1.6.3 Plastic

Item	Condition	Spec	OK	N.A	Remark
Flammability		>ABS<,94-HB	√		
Heat deflection To	ABS	65 ℃	√		
UV stability	ABS	Delta E < 8.0	√		
Resin		MPRII: ABS (SD0150/PA756/GP-35/HF-380/D-150)	√		
Texture		RC&CVR: MT-11020 Others: MT-11010	√		
Color		7015A(Black)	√		

3.1.6.4 Carton

Item	Condition	Spec	OK	N.A	Remark
Color		color	√		
Material		BE Flute	√		
Compression strength		250 Kgf	√		
Burst Strength		19.3 KGF/cm^2(general)	√		
Stacked quantity		WW 20':360 / 40':810 JP 20':320 / 40':720 EU 20':270 / 40':567	√		

3.1.7 Pallet & Shipment

3.1.7.1 Container Specification

Stowing Type	Container	Quantity of products (sets) (Every container)	Quantity of Products (sets) (Every Pallet)	Quantity of pallet (sets) (Every Container)
With pallet	20'	380(WW)	Pallet A:36 Pallet B: 54	Pallet A: 4 Pallet B: 4
		344(JP）	Pallet A:32 Pallet B: 48	Pallet A: 4 Pallet B: 4
		270(EU)	Pallet A:27	Pallet A: 10
	40'	810(WW)	Pallet A:36 Pallet B: 54	Pallet A: 9 Pallet B: 9
		720(JP)	Pallet A:32 Pallet B: 48	Pallet A: 9 Pallet B: 9
		567(EU)	Pallet A:27	Pallet A:21
Without pallet	20'	X	X	X
			X	X
	40'	X	X	X
			X	X

3.1.7.2 Carton Specification

Product:

Net Weight (Kg)	Gross Weight (Kg)	Dimension w/o Base W*H*D (mm)
6.0Kg	8.5Kg	570*348.4*63

Package:

Carton Interior Dimension (mm) L*W*H	Carton External Dimension (mm) L*W*H
640*408*231	652*420*251

3.1.8 Certification

Region	Country	Certification	Level	Apply by	Apply by Vendor	Sample Request	Document Type	Standard	BenQ Information
BQA	USA	FCC			Y		DOC;Reports	FCC CFR 47 Part 15 Subpart B	
BQC	China	CCC			Y		Certificate;Printing Permission;Reports	GB4943, GB9254, GB17625.1	製造商:明基電通有限公司
BQC	China	China Energy Label	1級		Y		Certificate	GB 21520-	
BQE	EU	CE			Y		DOC;DOI;Reports	EN55022; EN55024	
BQE	EU	ErP			Y		Reports	2005/32/EC, 2009/125/EC, EC No 1275-2008 and its implementation measurements	
BQE	EU	REACH			Y		Evidence	EC No. 1907/2006 & SVHC lists, No. 552/2009	
BQE	EU	WEEE			Y		Reports	2002/96/EC and its amendments	
BQE	Germany	Ergo			Y		Certificate	ISO9241-307; prEN 50279; EK1-ITB 2000	
BQE	Germany	GS			Y		Certificate	EN60950-1; EK1-ITB 2000; ZEK 01.2-08/12.8	
BQE	Russia	GOST		Y			Certificate	rOCT P MOK 60950-1, rOCT 26329-84, rOCT P 50948, rOCT P 51318.22, rOCT P 51317.3.26, rOCT P 51317.3	
BQE	Ukraine	EMC DoC			Y		Certificate	IEC 60950-1	
BQE	Ukraine	UkrSEPRO			Y		Certificate	CISPR22; CISPR24; IEC60950-1	
BQL	Mexico	Mexico Energy Label			Y		Certificate	Law for Sustainable Energy	Apply by SI directly
BQL	Mexico	NOM			Y		Certificate	IEC 60950-1	
BQP	Korea	e-Standby			Y		Reports	Ministry of Knowledge Economy Notification No. 2008-116	
BQP	Korea	KC			Y		Certificate	K60950-1	For safety approval
BQP	Korea	KCC			Y		Certificate	KN22, KN24, K00022 (CISPR22), K00024 (CISPR24)	
BQP	Saudi Arabia	SASO		Y			Certificate	IEC 60950-1	
BQP	Singapore	PSB			Y		Certificate	IEC 60950-1	
BQP	Turkey	CE			Y		DOC;DOI;Reports	EN55022; EN55024	
International	CB Scheme	CB			Y		Certificate;Reports	IEC 60950-1	Includes JP deviation
International	International	BenQ GP Guideline			Y		Evidence	SUP-QM-07-02	
International	International	RoHS (RoHS, China/Korea RoHS, J-MOSS)			Y		Evidence	2002/95/EC and its amendments	
International	International	TCO			Y		Certificate	TCO Certified Displays 6	

3.2. Customer Acceptance

3.2.1. SCOPE

This document establishes the general workmanship standards and functional Acceptance criteria for LCD color monitor model XL2411T Produced by BenQ.

3.2.2. PURPOSE

The purpose of this publication is to define a procedure for inspection of the LCD monitor by means of a customer acceptance test, the method of evaluation of defects and rules for specifying acceptance levels.

3.2.3. APPLICATION

The "Customer Acceptance Criteria" is applicable to the inspection of the LCD monitor, completely packed and ready for dispatch to customers. Unless otherwise specified, the customer acceptance inspection should be conducted at manufacturer's site.

3.2.4. DEFINITION

The "Customer Acceptance Criteria" is the document defining the process of examining, testing or otherwise comparing the product with a given set of specified technical, esthetic and workmanship requirements leading to an evaluation of the "degree of fitness for use", including possible personal injury or property damage for the user of the product.

3.2.5. CLASSIFICATION OF DEFECTS

The defects are grouped into the following classes:

Critical defect

A critical defect is a defect that judgment and experience indicate is likely to result in hazardous or unsafe conditions for individuals using, maintaining or depending upon the product.

Major defect

A major defect is a defect, other than critical, that is likely to result in failure, or to reduce materially the usability of the product for its intended purpose.

Minor defect

A minor defect is a defect that is not likely to reduce materially the usability of the product for its intended purpose, or is a departure from established standards having little bearing on the effective use of operation of the product.

3.2.6. CLASSIFICATION OF DEFECTIVES

A defective is a product which contains one or more defects. The defective will be classified into following classes:

Critical defective

A critical defective contains one or more critical and may also contain major and/or minor defects.

Major defective

A major defective contains one or more defects and may also contain minor defects but contains no critical defect.

Minor defective

A minor defective contains one or more minor defects but contains no critical and major defects.

3.2.7. EXPRESSION OF DEFECTIVES

$$\text{Percent of defects} = \frac{\text{Number of defects}}{\text{Number of products inspected}} \times 100\%$$

3.2.8. INSPECTION STANDARD

Unless otherwise specified, the inspection standard will be defined by ANSI/ASQC Z1.4, SINGLE SAMPLING PLAN. Level II is in use all the time, inspection levels are normal, reduce and tighten.

Acceptance Quality Level

When a critical defect is found, this must be reported immediately upon detection, the lot or batch shall be rejected and further shipments shall be held up pending instructions from the responsible person in relevant organization.

Major Defective: 0.4 AQL
Minor Defective: 1.50 AQL

3.2.9. GENERAL RULES

The inspection must be carried out by trained inspectors having good knowledge of the meaning of "fitness for use". The inspection must be based upon the documents concerning the completely assembled and packed product when more defects appear with the same cause only the most serious defect must be taken into account. Defects found in accessories packed with the product as connecting cables, plugs, adapters and the like, and being inspected as a part of the complete product, must be included in the evaluation.

The evaluation must be within the limits of the product specification and, for not specified characteristics, be related to the design model, limit samples or judgment of a jury of experts.
Faults must be demonstrable.

3.2.10. TEST CONDITIONS

Unless otherwise prescribed, the test conditions are as follows:

. Nominal mains voltage

. Temperature: +5~+35℃

. Warm up time: 30minutes minimum.

. Visual inspection shall be down with the distance from eyes to the sample 35-50 cm.

. Display mode: Primary mode 1366*768

3.2.11. TEST EQUIPMENTS

1. PC with display adapter or other specific display adapter which is agreed upon by both parties
2. Test program by BenQ
3. Ruler
4. Power saving test tool
5. Minolta color analyzer (CA-110 or BM – 7)

3.2.12. VISUAL INSPECTION CRITERIA

1. PACKING
2. ACCESSORIES
3. APPEARANCE
4. AC POWER AND SIGNAL CABLE
5. INTERIOR OF THE PRODUCT

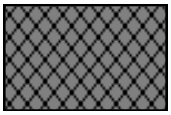
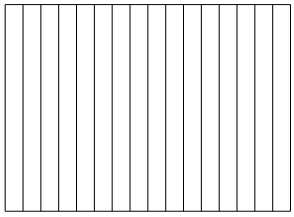
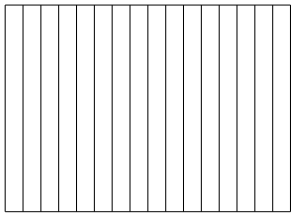
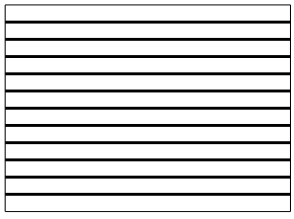
No	Description	Class
1	**Packing**	
1.1	Wrong packing material	Major
1.2	Carton damaged(over 6cm dia).wet, badly taped or stapled, product will not arrive in good condition at customer	Minor
1.3	Carton damaged(3cm to 6cm dia), badly taped or stapled , product will arrive in good condition at customer	Minor
1.4	Wrong marking of trade mark	Major
1.5	Wrong marking of model number	Major
1.6	Wrong serial # marking on carton	Major
1.7	Product wrongly placed in box (upside down)	Major
1.8	Broken polyfoam or PU foam	Major
1.9	Broken packing bag	Major
1.10	Wrong size or poor printing for artwork/character	Major
1.11	Bar-code wrong, missing, or damaged	Major
1.12	Label on box missing or damaged	Major
1.13	Strange object in the box	Major
1.14	Unit not corresponding to model stated on external label	Major
1.15	Superficial breaking 5 ~ 10 cm dia	Minor
2	**Accessories**	
2.1	Missing accessory parts	Major
2.2	Wrong Accessory parts	Major
3	**Appearance of product**	
3.1	Incorrect color of cabinet	Major
3.2	Incorrect color of tilt/swivel base	Major
3.3	Wrong logo or name plate	Major
3.4	Poor print of logo or name plate	Major
3.5	Label on product Wrong or missing	Major
3.6	Scratched or dirty but legible spec. label	Minor
3.7	GAP between LCD and front bezel is over 2.0 mm	Major
3.8	Dot/area discolor over 1mm dia. in front or over 2mm dia. in other areas	Major
3.9	Cabinet warped, sagged or bulging ＞0.5% of surface length	Major
3.10	Cabinet warped, sagged or bulging noticeable but ＜0.5% of surface length	Minor
3.11	Sharp stud or edge, which can cause damage not safe	Major
3.12	Finishing of piece parts will not arrived in good condition at the customer	Major
3.13	Cabinet step (between housing and bezel) ＞1.0mm , < 1.5mm	Minor
3.14	Cabinet step (between housing and bezel) ＞1.5mm	Major
3.15	Wiring or fixing cord comes out of cabinet or jammed	Major
3.16	Auxiliary material used during production not removed	Major
3.17	Cabinet parts come loose during normal handling, not safe	Critical
3.18	Cabinet parts come loose during normal handling, but safe	Major
3.19	Tilt/swivel too flexible/not working	Major
3.20	Tilt/swivel stiff	Minor
3.21	Dirty front bezel and housing can’t remove	Major

3.22	Dirty front bezel and housing removable easily	Minor
3.23	Sticker or loose user control switch which will not function correctly	Major
3.24	Missing knob or switch, not safe	Critical
3.25	Missing knob or switch, but safe	Major
3.26	Poor functional user controls in mechanical	Major
3.27	Unreadable printing of user controls label	Major
3.28	Rubber foot missing	Major
3.29	LED wrong material or missing	Major
3.30	LED sagged >1.0mm or bulging>0.5mm	Minor
3.31	Wrong S/N between spec. label and monitor display	Major
4	**AC power and signal cable**	
4.1	AC power or connector not correct or damaged, not safe	Critical
4.2	AC power or connector not correct or damaged, but safe	Major
4.3	Signal cable contact pin dirty	Minor
4.4	Signal cable plug dirty or surface damaged, but safe	Minor
4.5	Cable crack	Major
4.6	Cable scratch (wire not exposed), or dirty	Major
4.7	AC-DC adapter no function	Minor
4.8	Signal cable contact pin dirty	Major
5	**Interior of the product**	
5.1	Use Non-QVL (Qualify vendor list)component	Major
5.2	Wrong parts, broken component, but safe	Major
5.3	Foreign material	
	Conductive (Has potential to short circuit)	Major
	Non-conductive (Moveable)	Minor
5.4	Missing hardware, component or screw, stripped screw	Major
5.5	Loose hardware/screw or insufficient torque	Major
5.6	Poor wire routing, which is no concerned on EMI	Minor
5.7	Cold soldering/loose connections (Electrical)	Major
5.8	Wires and mechanical structure do not meet UL/CSA or TUV	Critical
5.9	Wrong parts, broken component, not safe	Critical
5.10	Component burn	Critical

3.2.13. OPERATIONAL INSPECTION CRITERIA

1. TEST PATTERN
2. SPECIFICATIONS
3. OPERATIONAL INSPECTION CRITERIA

3.2.13.1. List of test pattern

KEY	PATTERN	TEST ITEM
A	FULL WHITE 	H - Size , V – Size Viewing Angle Light Output Impurity, Spot check Contrast Ratio Brightness adjust Range
E	DARK 	Background, Spot check
F	FULL W , R , G , B 	Impurity, Spot check CIE Coordinate check
G	256 COLORS 	Color Check
H	16 GREY 	Gray Check
H	Black/White stripe pattern 	Electric characteristics

3.2.14. PANEL INSPECTION CRITERIA

Panel	Description	M240HW01 V8
Model Name		XL2411T
Bright Dot	Single	3 Dots
Dark Dot	Single	5 Dots
Density	Bright Dot (Distance between two Bright Dots)	15mm
	Dark Dot (Distance between two Dark Dots)	15mm
	Bright to Dark Dot (Distance between Bright and Dark Dot)	15mm
Total Dots	Bright and Dark Dot	5Dots

4. Level 1 Cosmetic / Appearance / Alignment Service

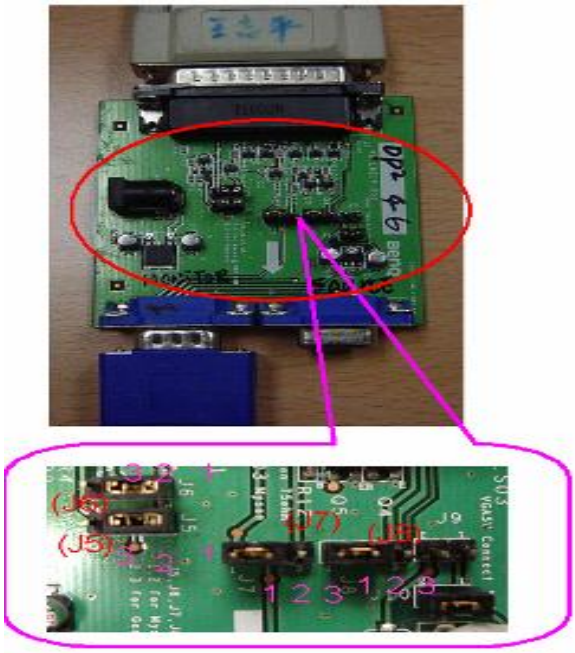
4.1. Software / Firmware Upgrade Process

4.1.1 Hardware Requirement:

Step 1: Prepare PC with 2K or XP system, printer port cable x1 and D-sub cable x1

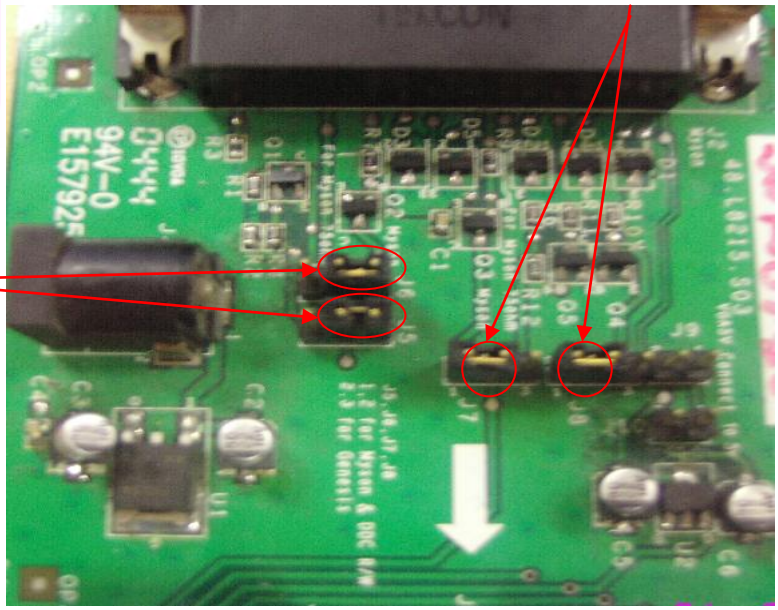
Step 2: Prepare ISP board and setup jumper as below. Pin 1 &2 of J5,J6,J7,J8 are for Firmware Upgrading. Please Setup the Jumper as below photo shows.

Short pin1 and pin2 at J5,J6,J7,J8.



Jump Setting for J7&J8

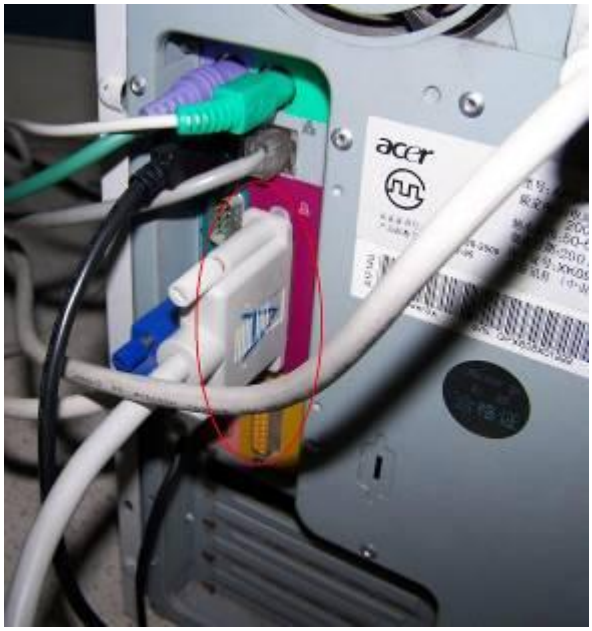
Jump Setting for J5&J6



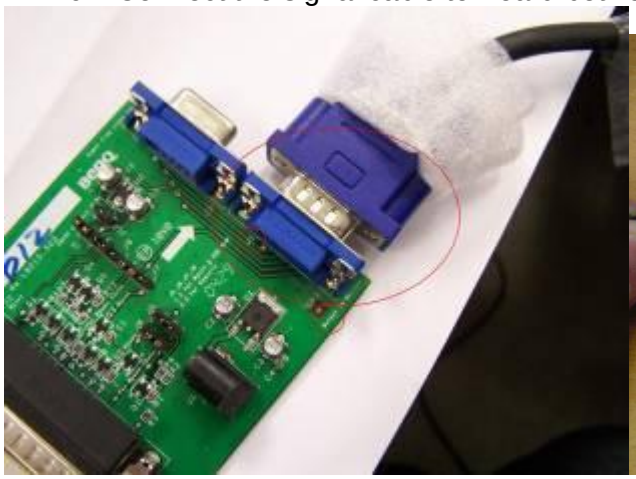
Step 3:

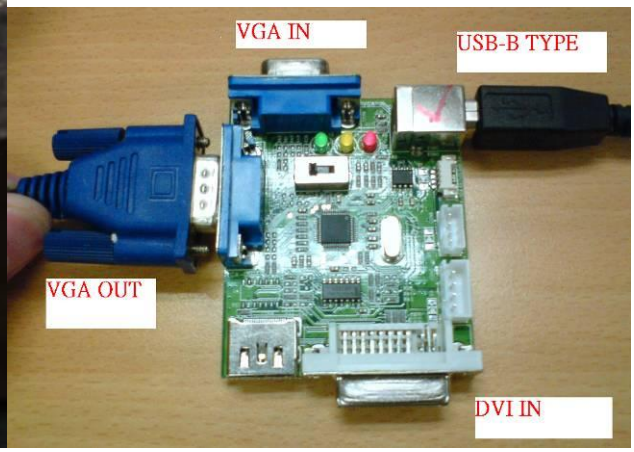
1. Connect printer port cable between PC LPT1 and ISP board
   Then connect signal cable between ISP board (position 1) and monitor.
2. Power on the monitor.

Connection:



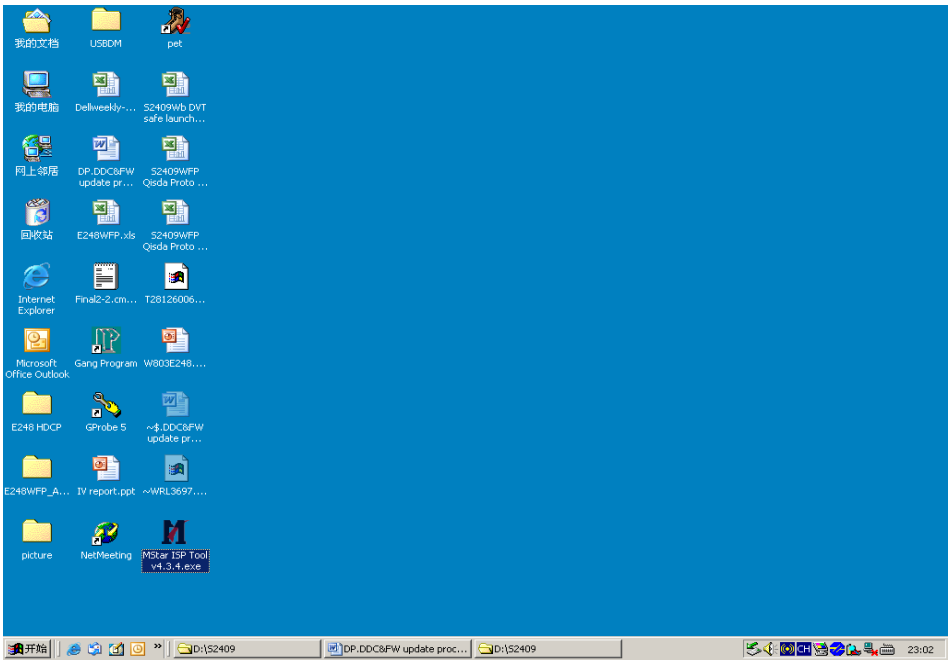
a. Connect the Printer Cable to the Printer Connector.
b. Connect the other side to the Board
c. Connect the signal cable to Board between ISP board (position 1) and monitor.



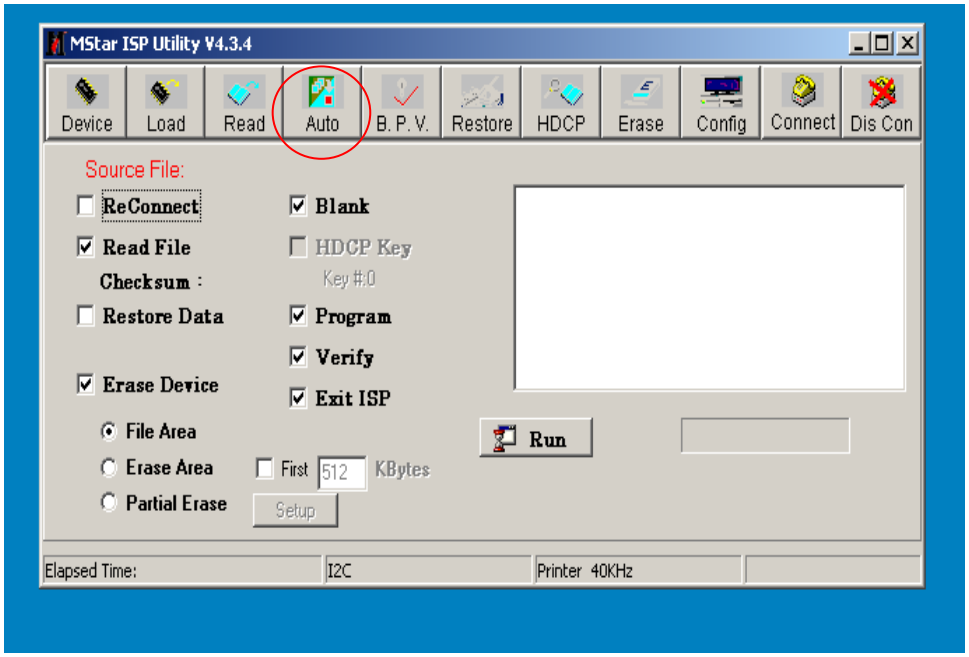


4.1.2 Firmware Upgrade Prepare for XL2411T

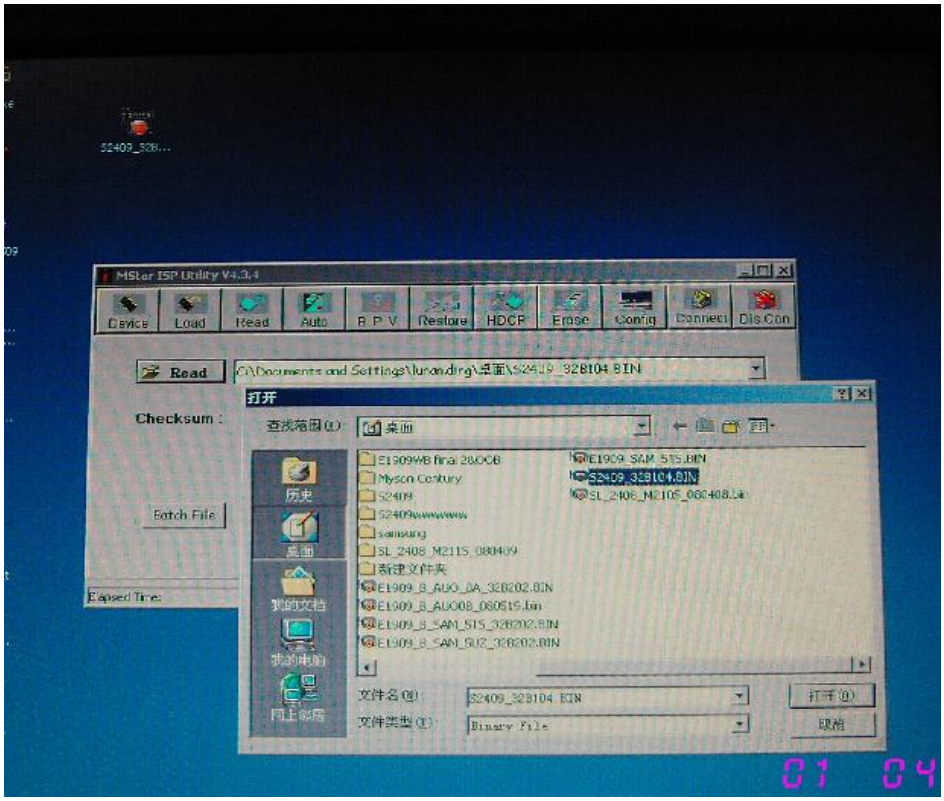
Step1: Run Program MStarISPToolv4.3.4.exe (refer to below Picture)



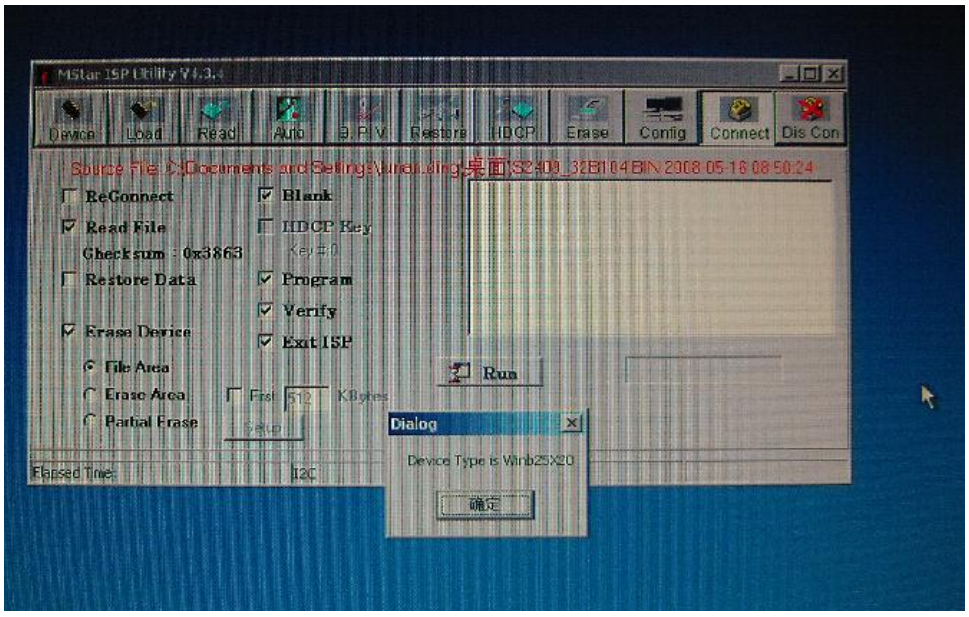
Step2: Program Setting
Click the button 'Auto', to set the ISP tool as bellow:



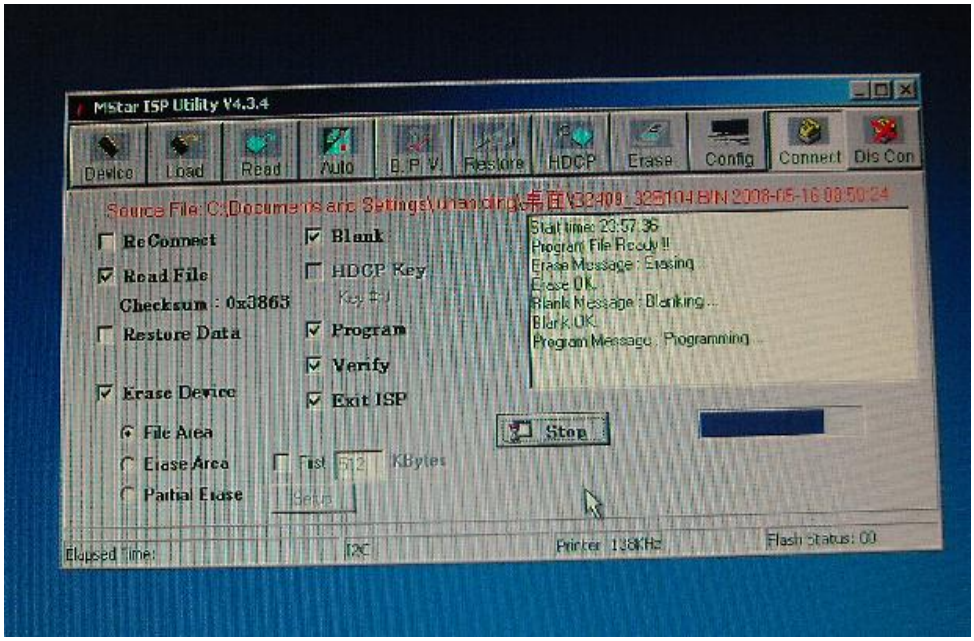
Step3: Click the button “Read” to open the firmware that will be ISP

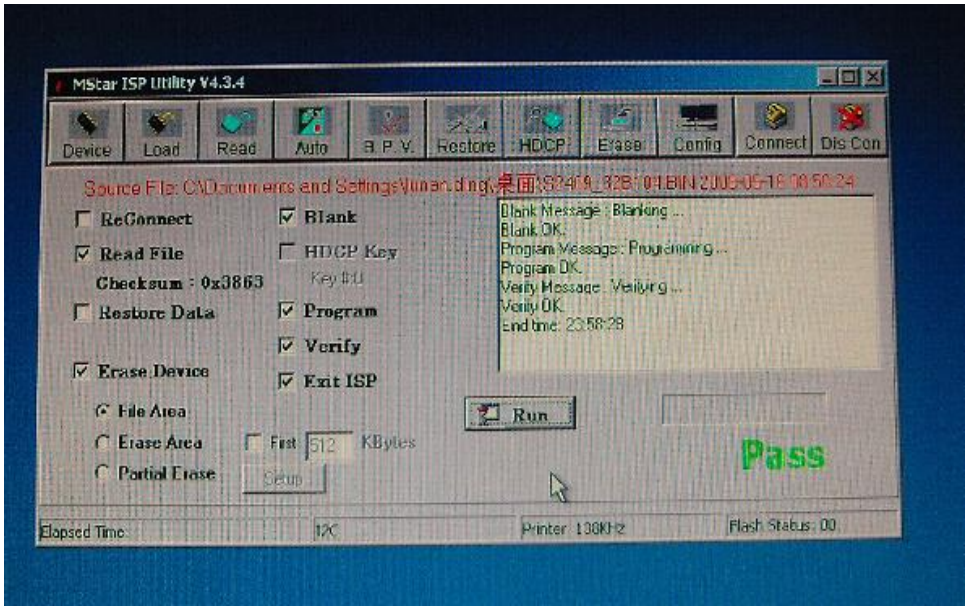


Step4: Click the button “Connect” ,one cue “Device Type is xxxx” will show as bellow. If not, check connects again:



Step5: Click the button “Run” to continue the programming. If the ISP process is successful, it will show “Pass”





Step6: AC off/on, and turn on Factory Menu, and check F/W version

4.1.3 EDID Upgrade Process

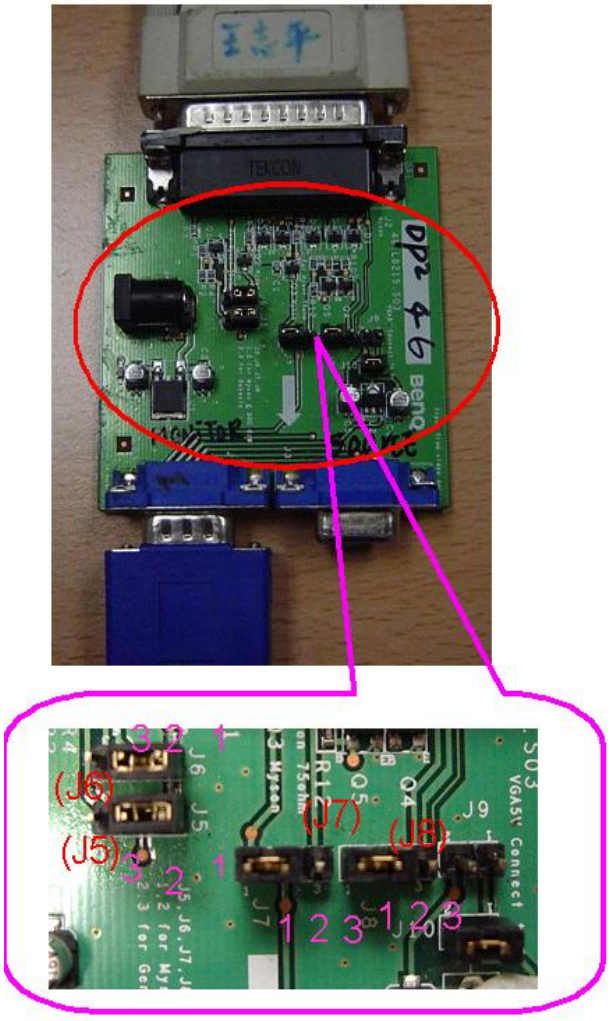
4.1.3.1 Software configuration:

Step 1: Un-zip Port95nt and install into your computer.
Step 2: Un-zip QEDIDV016.rar

4.1.3.2. Hardware configuration:

Step 1: Prepare following items
a. PC with 2K or XP system*1
b. printer port cable *1
c. D-Sub cable *2

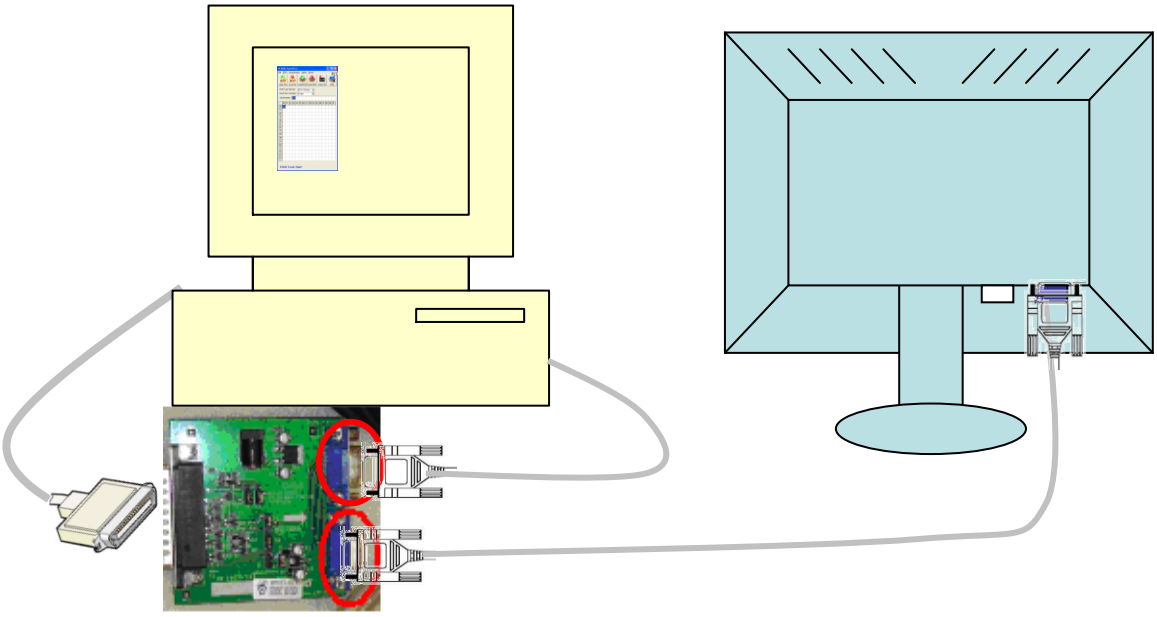
Step 2: Prepare ISP board and setup jumper as below
Short pin1 and pin2 at J5,J6,J7,J8.



Step 3: Connect printer port cable between ISP board and PC LPT1

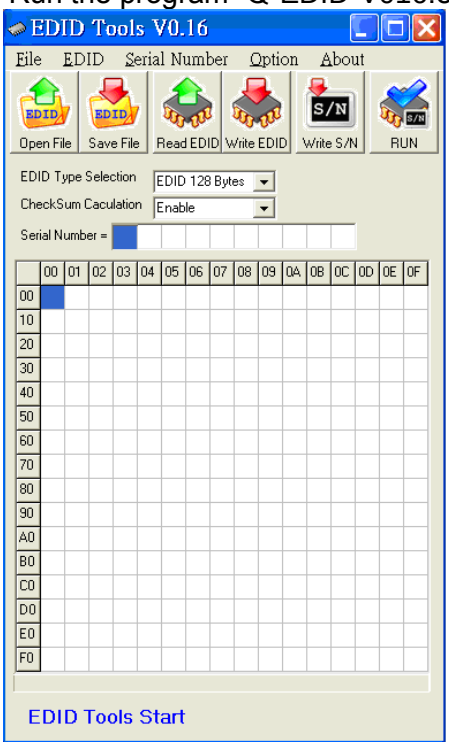
Connect one D-Sub cable between ISP board (position 1) and monitor

Connect another D-Sub cable between ISP board and PC

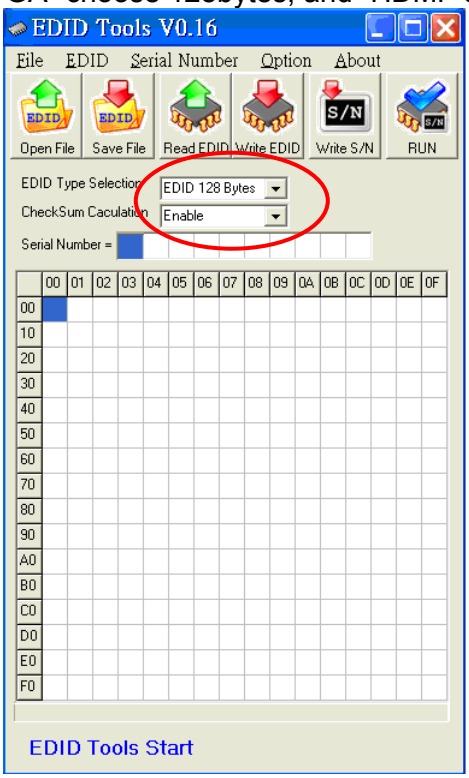


4.1.3.3 EDID Upgrade Procedure

Step 1: Run the program “Q-EDID-V016.exe”, when the UI popped up

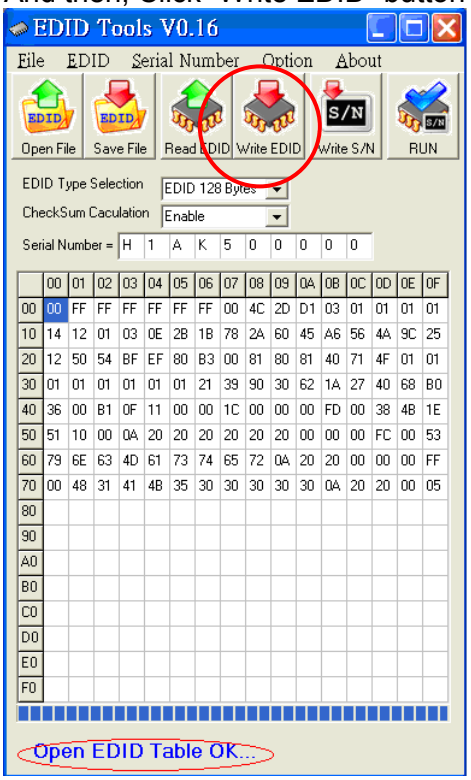


Note: If “VGA” choose 128bytes, and “HDMI” choose 256bytes

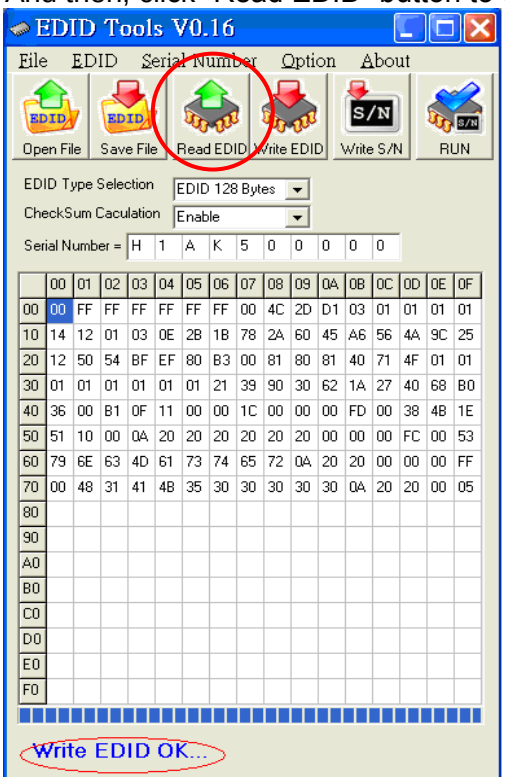


Step 2: Click “Open File” and select “VGA” or “HDMI” EDID file

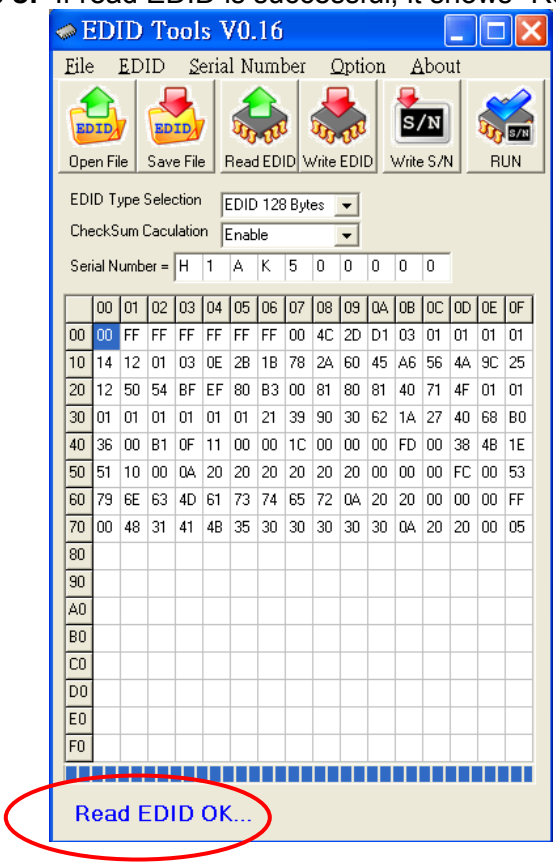
Step 3: If load file is successful, it shows “Open EDID Table OK.”
And then, Click “Write EDID” button to update EDID



Step 4: If write EDID is successful, it shows"Write EDID OK …"
And then, click "Read EDID" button to check if successful or not.



Step 5: If read EDID is successful, it shows" Read EDID OK …"



4.2. Alignment procedure (for function adjustment)

A. Preparation:

1. Setup input timing ICL-605(800x600@60Hz), Pattern: 5-Mosaic.
2. Setup unit and keep it warm up at least 30 minutes.

B. Timing adjustment:

1. Enter factory setting area (press “ENTER”, “MENU” and then press “SOFTPOWER”).
2. Check the settings to following values:

   Contrast = 50
   Brightness = 90
   Color = User Mode
   Senseye mode = Standard
   Language = English
   Burn In =ON

   Then, turn off the monitor power.
3. Turn on power enter user area.

C. Color balance adjustment:

1. Enter factory setting area (press “ENTER”, “MENU” and then press “SOFTPOWER”).
2. Setup input timings (800x600@60Hz), Pattern: 5-Mosaic.
3. Setup Color mode “User Mode”.
4. Open Factory page then select “White Balance” item and press “ENTER” button to do auto color.

D. Color adjustment:

1. Setup input timing ICL-605, white pattern.
2. Confirm auto color adjustment had already done.
3. Measure color temperature by Minolta CA-110 (or equivalent equipment).
4. Check the color temperature Bluish, Reddish & Normal. The color temperature specification as follows:

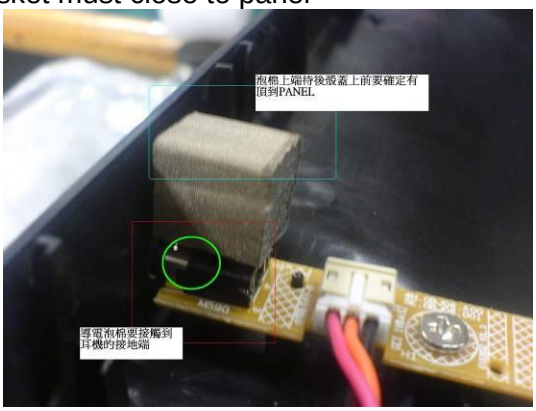
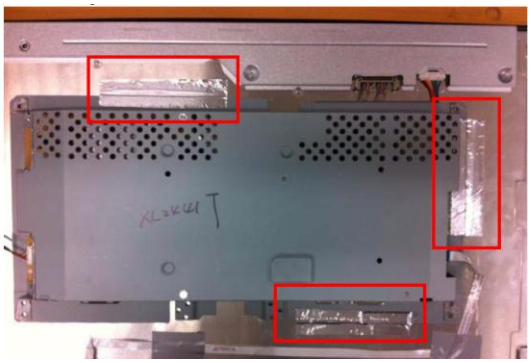
Color mode	Color temperature	x	Y	
Normal	6500k	0.313±0.020	0.329±0.020	Min 250m^2
Bluish	9300k	0.283±0.020	0.297±0.020	Min 200/m^2
Reddish	5800k	0.326±0.020	0.342±0.020	Min 250/m^2
User Mode	Panel default color temp.			Min 250/m^2
sRGB	6500k (Gamma=2.2±0.2)	0.313±0.015	0.329±0.015	200 ± 20 cd/m^2

5. Setup input timing, 32 -Gray pattern.

   To check if there are any abnormal display problems of preset timing modes.
6. Checking if the picture is no good, reject this monitor.
7. To check the power consumption by disabling “burn-in mode” setting
8. To clear user data and program complete DDC data to monitor by IIC bus communication.

E. Wire Dressing - Assembly note

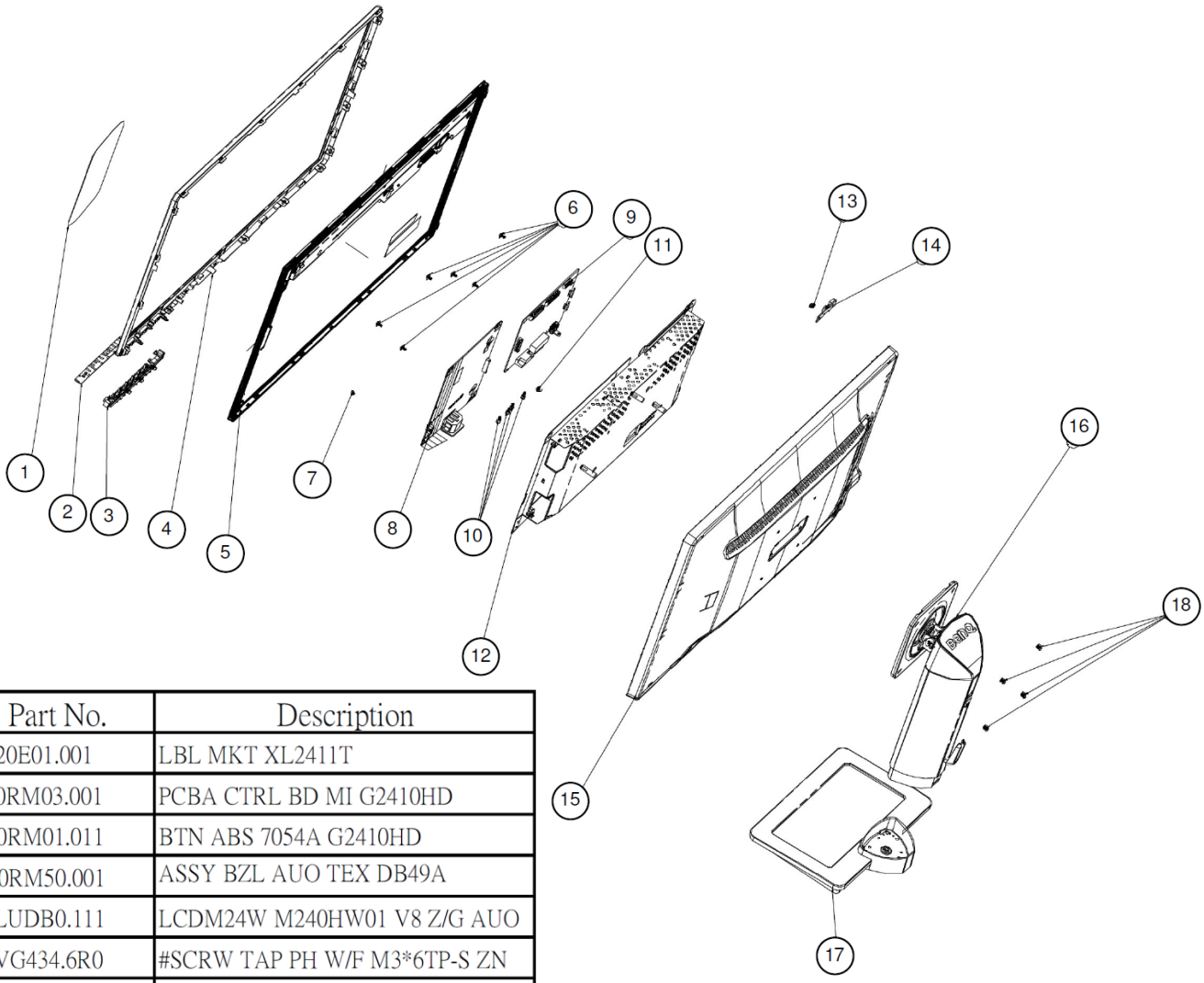
Connect the IF BD with power BD. 	Put power BD and I/F BD into shielding and fix the screw. 
Assembly LVDS cable with panel. 	Assembly the Ctrl board set. 
Add skew on D-sub, DVI and HDMI. 	Connect the backlight wire. 

Add gasket on connector of Ear-Jack board and gasket must close to panel 	Add AL-tape on shielding, total 3 pcs and assemble control board then fix it. 
Connect earphone wire to IF BD 	Assembly RC with stand. 
	

5. Level 2 Disassembly /Assembly Circuit Board and Standard Parts

Replacement

5.1. Exploded View



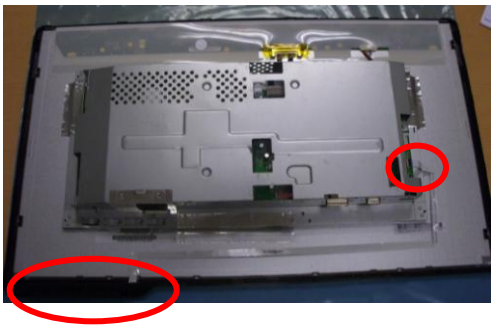
Item	Part No.	Description
1	4E.20E01.001	LBL MKT XL2411T
2	5E.0RM03.001	PCBA CTRL BD MI G2410HD
3	4B.0RM01.011	BTN ABS 7054A G2410HD
4	6K.0RM50.001	ASSY BZL AUO TEX DB49A
5	5F.LUDB0.111	LCDM24W M240HW01 V8 Z/G AUO
6	8F.VG434.6R0	#SCRW TAP PH W/F M3*6TP-S ZN
7	8F.AG224.6R0	#SCRW TAP PH W/FL M3*6L W-ZN
8	5E.20E02.001	PCBA SPS BD MI XL2411T
9	5E.20E01.001	PCBA IF BD MI XL2411T
10	8F.205B4.019	#SCRW MACH STEEL HEX #4-40 NI
11	8F.5A224.6R0	#SCRW MACH FLAT M3*0.5P*6L
12	6K.20E01.001	ASSY SHD 3D XL2411T
13	8F.00551.3R0	SCRW M FPH M2*3L (6/1.4) NI
14	5E.0BJ06.001	PCBA JACK BD MI G2400W
15	6K.0RM51.001	ASSY RC AUO 3D DB49A XL2411T
16	6E.20E01.001	ASSY HAC 130MM DB49A XL2410T
17	6E.19102.011	ASSY BASE DB49A XL2410T
18	8F.8A356.100	#SCRW MACH FPH M4*10L B-ZN

5.2. Disassembly /Assembly

5.2.1 Disassembly SOP

Preparation before disassemble
1. Clean the room for disassemble
2. Identify the area for monitor
3. Check the position that the monitors be placed and the quantity of the monitor ;prepare the area for material flow; according to the actual condition plan the disassemble layout
4. Prepare the implement, equipments, materials as bellow:
   1) Press-fixture
   2) Working table
   3) Screw-driver
   4) Knife*1
   5) Glove
   6) Cleaning cloth
   7) ESD protection

item	picture	Operation	Tool	Notes
1		Disassemble the stand → 4 screws. Take off the stand .	Screw -driver	
2		Disassembly the BZL from the monitor, notice the disassembly order : 1.Left (1) parts of BZL 2.Top (2) parts of bezel 3.Bottom (3) parts of BZL 4. Right (4) parts of BZL Don't draw the BZL		When disassembly the BZL ,notice don't bend the C/B .man must wear glove The purpose is loose the BZL
3		Turn over the monitor，Unlock the wires, Dismantle the Rear cover from the monitor.		

4		Tear down Al foils		
5		Take out the light-wires from the panel.		
6		Disassemble the C/B		
7		Disassembled the SHD shielding : 2/4 screw，and HDMI screw(the monitor with DVI have four)	Screw -driver	

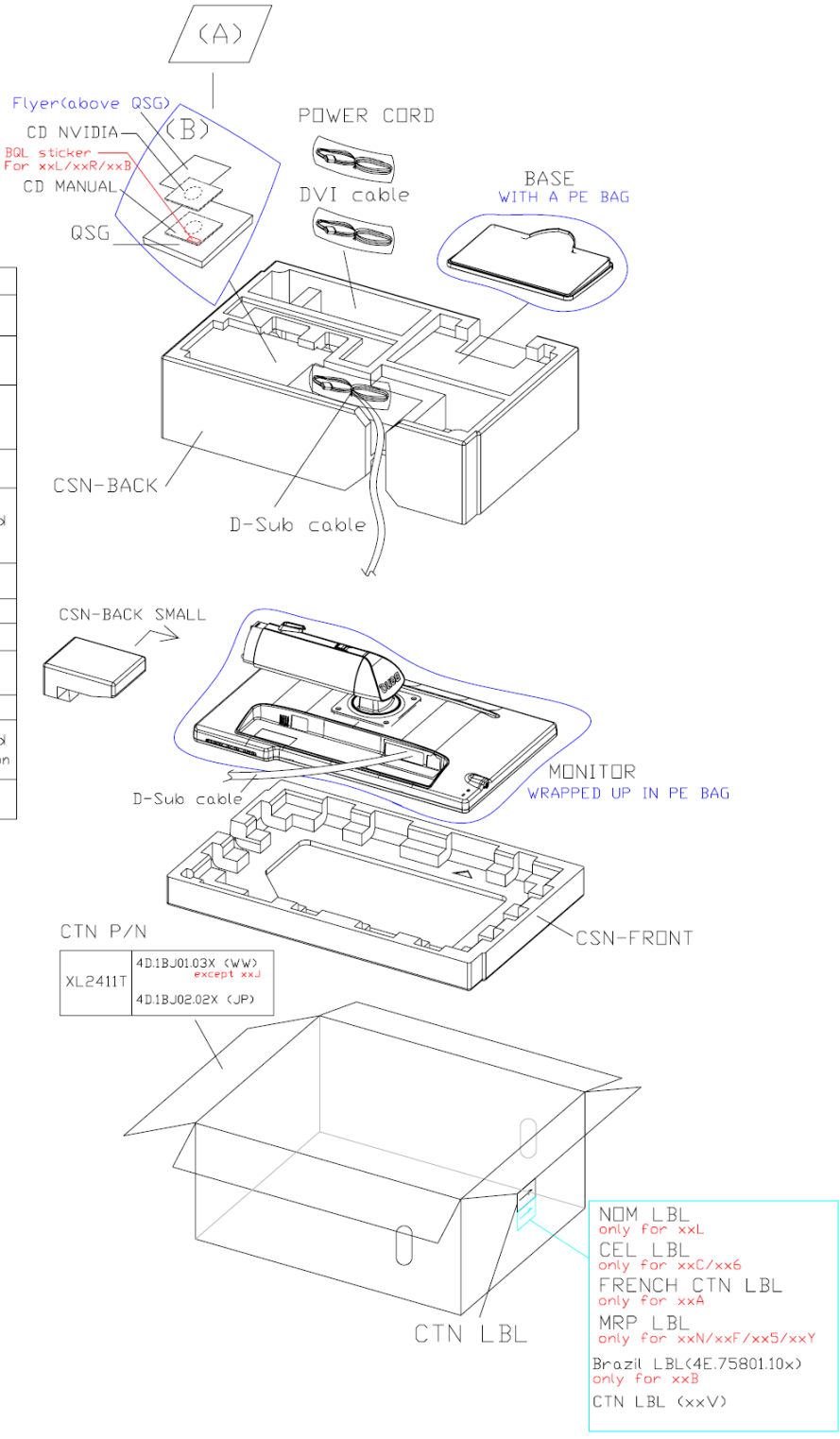
8		Tear down all Al foils		
9		Disassembled the AC-soc shielding .		
10		Unlock the LVDS wire and panel wire.		
11		Disassembled the PCBA shielding : 9 screws	Screw -driver	
12		Disassemble the PCBA from Main-SHD and disassemble the wire from I/F BD		

5.3. Packing

The sequence of the accessory decided by factory

Accessory Requirements v15

P/N	Region	(A) Outside	(B) Inside
xxC,xx6	China	3 guarantee card with LBL	×
xxE,xxU, xx3	EU	×	Service Information Safety Instructions
xxA	US,CA	×	US warranty card
xxR	Argentina	×	BQL warranty card
xxK, xxV, xxD, xxM, xxN, xxS, xxI, xxF, xx5, xxY	BQP	×	BQP online warranty card
xxW	Australia	×	BQau warranty card
xxJ	Japan	×	JP warranty card
xxT	Taiwan	×	TW warranty card
xxL	Mexico	×	BQL warranty card
xxH	HK	×	BQhk warranty card
xxP	BQP		BQP online warranty card Turkey distributor information
xxB	Brazil	×	BQL warranty card

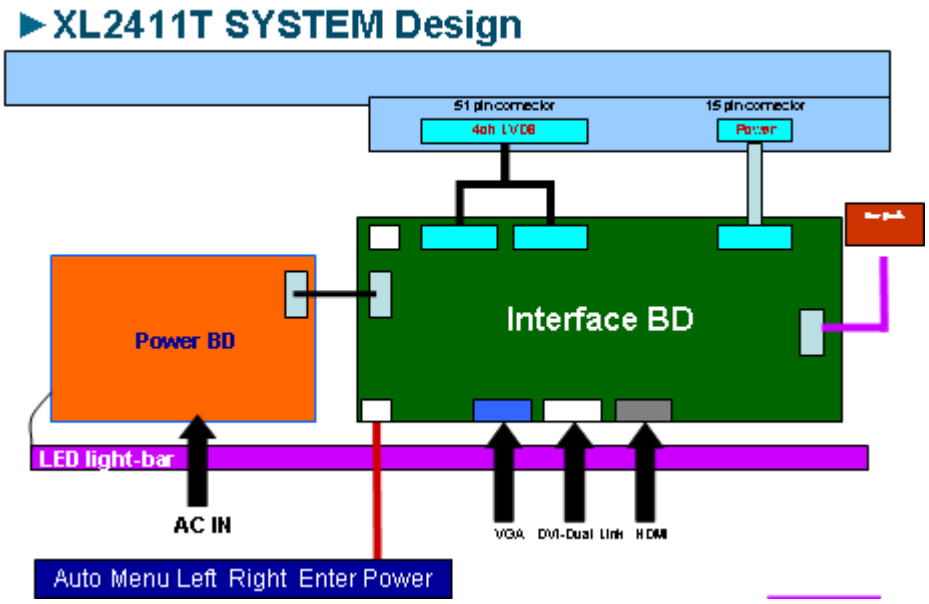


5.4. Block diagram

The XL2411T is a 24” (1920x1080) Model; LCD type is TN+Film and Normally White, 16.7M colors(R, G, B 6-bit data+FRC data) TFT LCD monitor. There are D-SUB, DVI, and HDMI interface LCD monitor. It’s compliant with VESA specification to offer a smart power management and power saving function. It also offers OSD menu for users to control the adjustable items and get some information about this monitor. The best function is to offer users an easy method to do DDC/CI Enable and Auto Adjustment items well done just by pressing hot key, we called it “DDC/CI” and “Auto” which can manual controlled items.

XL2411T also offer DDC2/CI function to meet VESA standard.

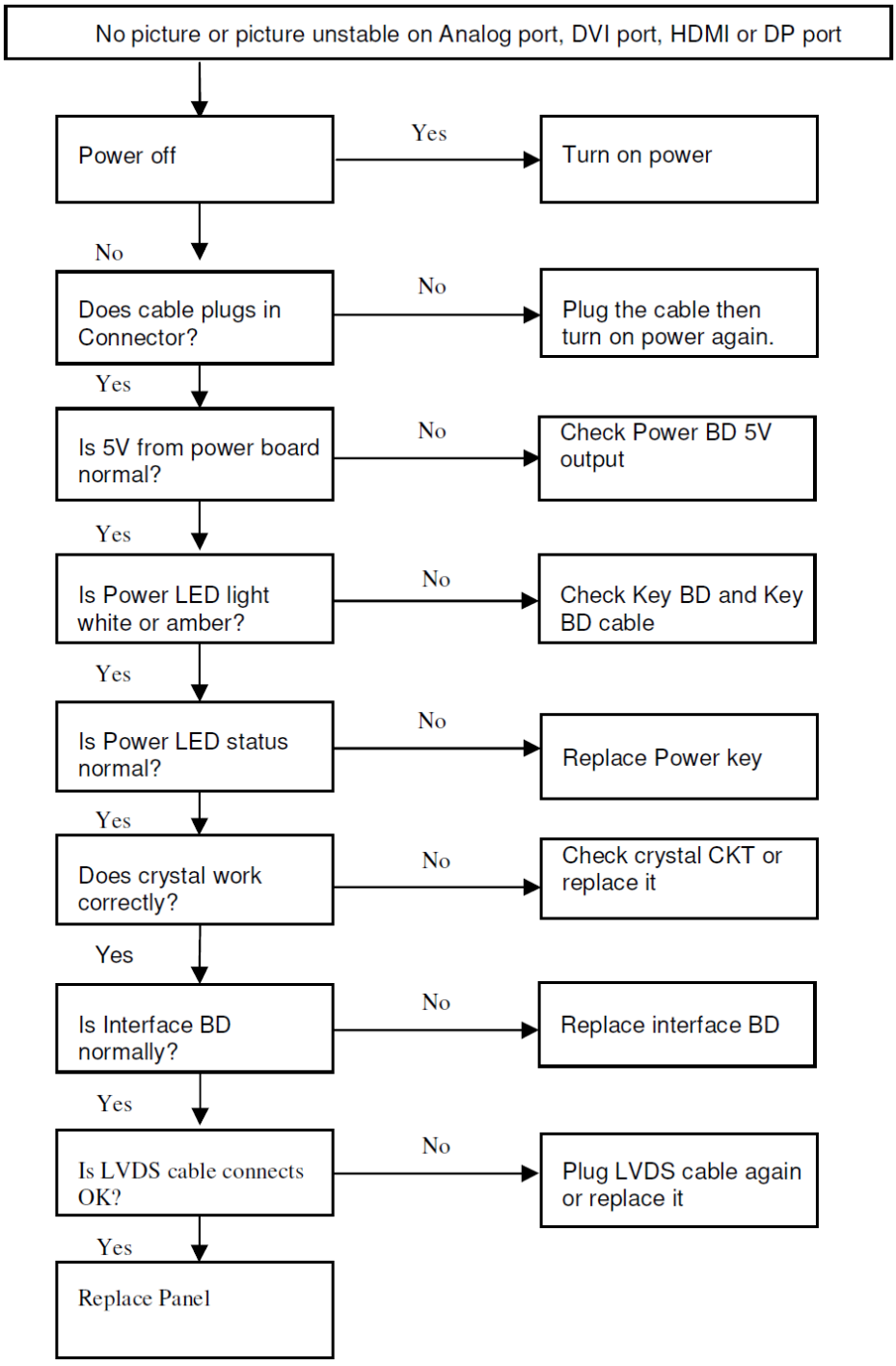
The block diagram is shown as below.



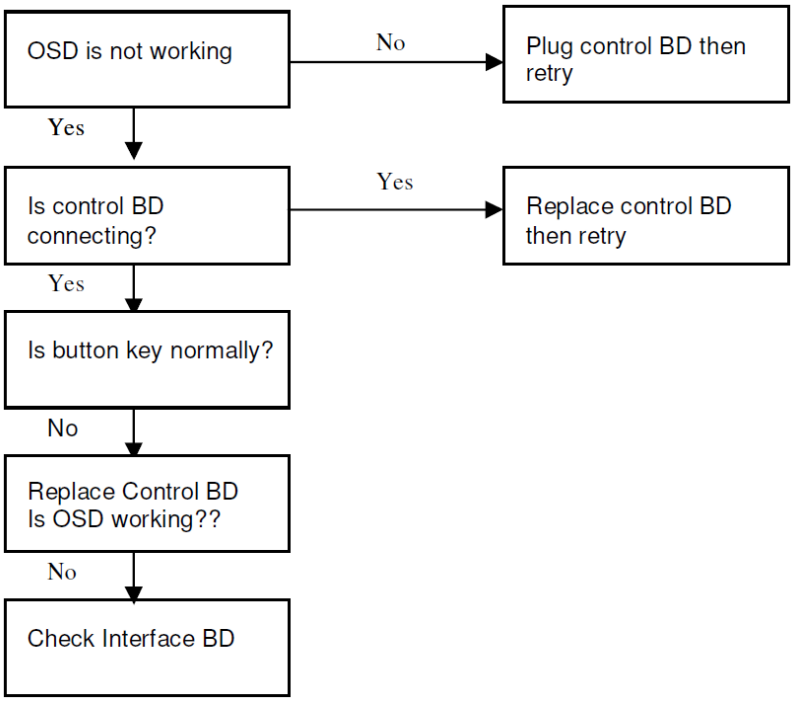
5.5. Trouble Shooting Guide

5.6.1 No Display or display is unstable on analog or digital port:

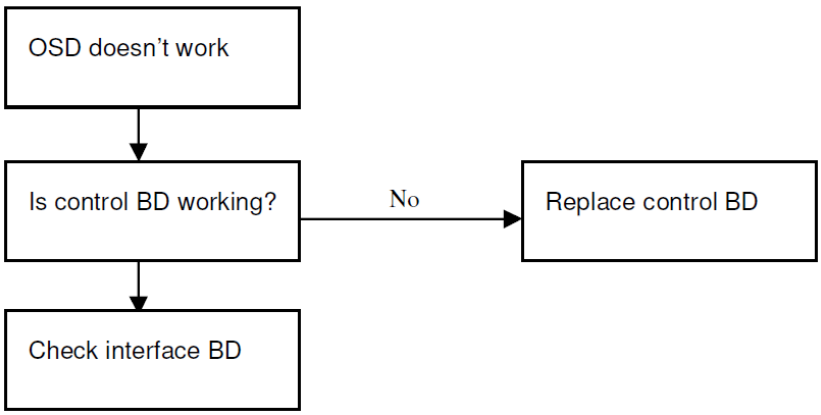
5.6.1.1 Interface Board:



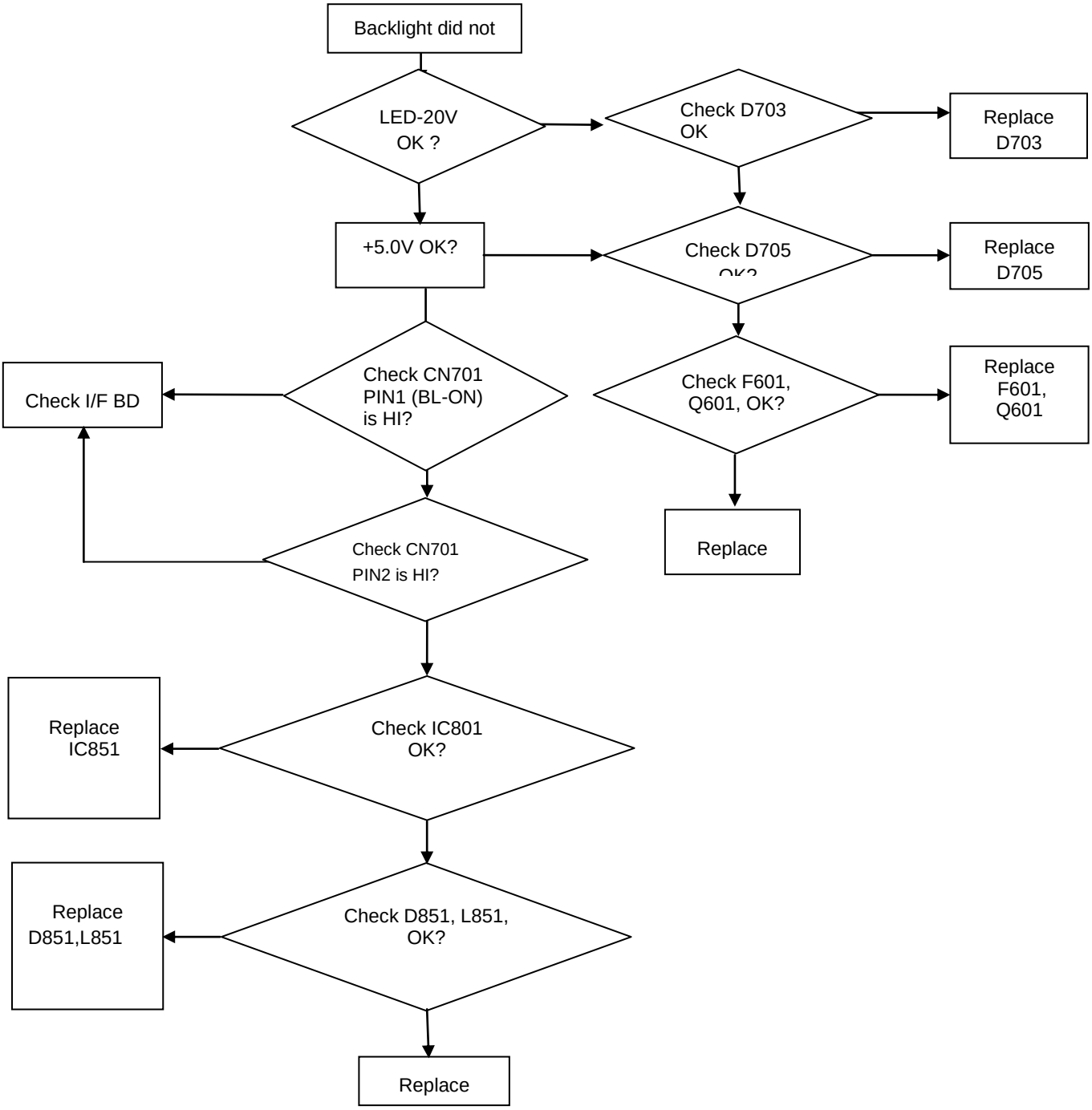
5.1.1 BUTTON Function:



5.5.2 OSD Function



5.5.3 Power no work troubleshooting

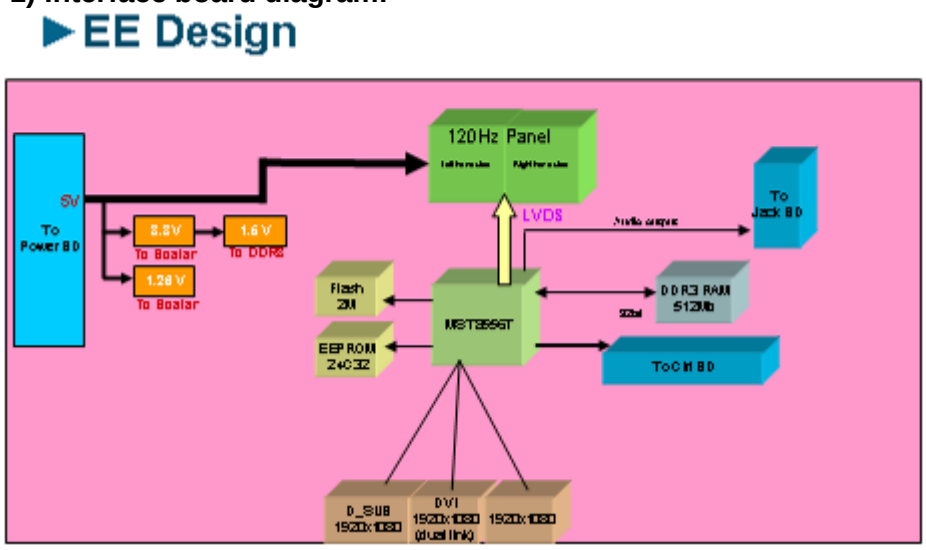


5.6. Circuit Operation Theory

Block diagram

The XL2411T consists of a LCD module with LED BLU (1 light bar), a power board (with driver board), a control board (ADC key), and an Ear Jack board. The block diagram is shown as below.

A-1) Interface board diagram:



(a) Circuit operation theory:

A basic operation theory for this interface board is to convert analog signals of Red, Green and Blue to digital signals of Red, Green and Blue. The scaling IC has internal A/D converter, internal OSD, built in RSDS transmitter and auto-detect input timing functions. A/D converter is convert analog signal to digital data. OSD is offering adjustable functions to end-user. Detect timing is for detect change mode. RSDS transmitter is used to compress the digital RGB data, the Hsync, Vsync and pixel clock generated by Scaling then output to LCD module. Flash-ROM stores source code and MCU (embedded in Scalar) offers H/W DDC2Bi function & controls system processing. EEPROM is stored DDC data, OSD common data and user mode data.

(b) IC introduction:

1. DDC (Display Data Channel) function: We use DDC IC to support DDC2Bi function. DDC data is store in 24C02 (EEPROM). Those data related to LCD monitor specification. PC can read them by “SDA” and “SCL” serial communication for I²C communication for DDC2Bi.
2. Scalar IC: There are A/D, TMDS receiver, Scaling, OSD and LVDS transmitter functions built-in two MST8556T ICs. Scaling IC is revolutionary scaling and color engine, capable of expanding any source resolution to a highly uniform and sharp image or down scaling

from 1920x1080, combined with the critically proven integrated 8 bit triple-ADC and patented Rapid-lock digital clock recovery system. It also support detect mode and DPMS control.

3. MCU embedded in Scalar: Control unit, it controls all the functions of this interface board, just like the OSD display setting, the adjustable items, adjusted data storage, the external IIC communication, support DDC2Bi. .
4. EEPROM: We use 24C32 to store all the adjustable data, user settings and uses four 24C02 to store D-SUB, DVI and HDMIx2 data.
5. Flash-rom stores source code.

A-2) Control board introduction:

There are 6 keys for user's control which includes “Power”, “Menu”, “Up/Plus”, “Down/Minus”, “Exit”, and “Enter”. The following descriptions are the introduction of these keys.

(1) Power key: to turn/off power of monitor
(2) “Menu” key: to enter OSD main menu.
(3) “ENTER” key: to enter sub-menus or select items.
(4) “EXIT” key: Exit OSD.
(5) “UP/Plus key: to select previous and to increase adjustment.
(6) “Down/Minus” key: to select next and to decrease adjustment.
(7) LED: It indicates the DPMS status of this LCD monitor; white light means DPMS on (Normal operating condition). Amber light means DPMS off (Power Saving).

A-3) LED Driver Circuit Operation Theory

An high power DC-DC boost converter controller—MPS3397

MPS3397 is a high efficiency DC-DC controller that drives up to eight strings connected in parallel configuration with multiple LEDs in each string connected in series.

MPS3397 provides four (4) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that a string(s) is damaged during normal operation

The IC provides an integrated circuit to balance the current flow through each LED string. It also features a low standby current or the LED backlight system.

Appendix 1 – Screw List / Torque

STANDARD SCREW TORQUE SPEC.

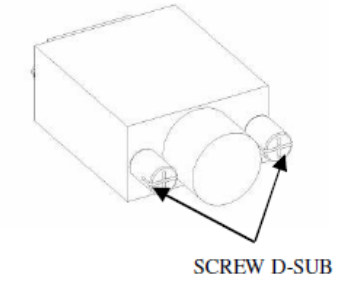
ITEM	P/N	DESCRIPTION	MOUNTING MATERIAL	TORQUE (KG-CM)	HOLE SIZE (MM)	Screw Head
1	8F.205B4.019	SCRW MACH HEX #4-40*0.3" N	Metal; D-SUB;DVI Connector	5.0±0.6	5.0±0.6	#4-40
2	8F.5A224.6R0	SCRW MACH FLATM3*0.5P*6L ZN	Metal Metal to metal Plastic to metal	Side mount: 3±0.6 Other: 4±0.6	M3*0.5	#2
3	8F.EA324.6R0	SCRW TAP FH M3*6L ZN	Metal	None tread : 8～10 Have tread: 6～8	Φ2.68±0.03	#2
4	8F.5A356.8R0 8F.5A356.100	SCRW MACH FH M4*8L B-ZN NYL	Metal Metal to metal Plastic to metal	9.0±1.0	M4*0.7	#2
5	6K.L8810.001	ASSY SCREW M4*8L FP726A NLK ISU (8F.5A456.8R0+4B.L7212.001)	Metal Metal to metal Plastic to metal	9.0±1.0	M4*0.7	#2
6	8F.00273.6R0	SCRW TAP PH F/10WSH M3*6L C-ZN	Metal Metal to metal Plastic to metal PCB to metal	None tread : 8～10 Have tread: 6～8 Aluminum: 4~5	Æ2.68±0.03	#2
7	8F.VZ524.6R0	SCRW TAP FLAT+EXT M3*6L C-ZN	Metal Metal to metal	None tread : 8～10 Have tread: 6～8 Aluminum: 4~5	Æ2.68±0.03	#2
8	8F.00518.100	SCRW TAP W/FL M3*10L(S3.8)ZN	Metal Metal to metal Plastic to metal SPEAKER to metal	None tread : 8～10 Have tread: 6～8 Aluminum: 4~5	Æ2.68±0.03	#2
9	8F.00003.143	SCRW TAP PAN #4-40*3/8	Aluminum (Heatsink)	3.3±0.3	Φ2.6±0.03	#2
10	8F.VG234.6R0	SCRW TAP PH W/F M3*6 TP-S ZN	Aluminum (Heatsink)	None tread : 8～10 Have tread: 6～8 Aluminum: 4~5	Φ2.68±0.03	#2
11	8F.VZ526.6R0	SCRW TAP FLAT+EXT M4*6L ZN-W	Metal Metal to metal	10±1.0	M4*0.7	#2
12	8F.HA334.8R0	SCRW TAP FPHM3*6(6/1)TP-S B-ZN	Metal Metal to metal Plastic to metal	6~8	Φ2.68±0.03	#2
13	8F.5A456.8R0	SCRW MACH FLAT M4*8L C-ZN NYLO	Metal Metal to metal Plastic to metal	9.0±1.0	M4*0.7	#2
14	8F.WA324.6R0	SCRW TAP CAP M3*1.34P*6L B-NI	Metal Metal to metal Plastic to metal	5.0±1.0	Φ2.35±0.05	#2
15	8F.XA324.5R0	SCRW TAP M3*5L B-ZB	Metal Metal to Plastic	6~8	2.85~2.95	#2

16	8F.1A526.5R0	SCRW MACH PAN M4*5L NI	Metal Metal to metal Plastic to metal	8~10	M4*0.7P	#2
17	8F.1B524.3R0	SCRW MACH PAN W/SPG M3*3L NI	Metal Metal to metal Plastic to metal	6~8	M3*0.5P	#2
18	8F.5A524.4R0	SCRW MACH FLAT M3*4L NI(W2407 lift	Metal Metal to metal Plastic to metal	6~8	M3*0.5P	#2
19	8F.00573.5R0	SCRW TAP FPHM3*5 B-ZN	Metal Metal to Plastic	6~8	M3*0.5P	#1
20	8F.5A456.7R0	SCRW MACH FLAT M4*7L B-ZN NYL	Metal Metal to Metal Plastic to Metal	8~10	M4*0.7P	#2
21	8F.XA326.150	SCRW TAP FLAT M4*15L B-ZN	Metal Metal to metal Plastic to metal	8~10	M4*0.7P	#2
22	8F.00608.6R0	SCRW TAP PH F/10WSH M3*6L B-ZN	PLASTIC	4.5±0.5	Φ2.35±0.05	#2
23	8F.XA313.8R0	SCRW TAP FLAT/PT M2.5*8L B-ZN	Plastic Metal to plastic Plastic to plastic PCB to plastic	4.0±0.5	Φ2.0±0.05	#1
24	8F.WA314.8R0	SCRW TAP CAP M3*1.34P*8L B-ZN	Plastic Metal to plastic Plastic to plastic	5.0±1.0	Φ2.35±0.05	#2
25	8F.XA224.8R0	SCRW TAP FH M3*8L NI	PLASTIC	4.5±0.5	Φ2.35±0.05	#2
26	8F.XA314.8R0	SCRW TAP FLAT M3*1.34P*8L B-ZN	Plastic Metal to plastic Plastic to plastic	4.5±0.5	Φ2.35±0.05	#2
27	8F.00607.8R0	SCRW TAP FPH M3*8L(5/0.8) B-ZN	Plastic Metal to plastic Plastic to plastic PCB to plastic	4.0±0.5	Φ2.68±0.03	#2
28	8F.5A322.2R4	SCRW MACH FLAT-P M2*2.4L B-ZN	Plastic Metal to plastic Plastic to plastic PCB to plastic	2.0±0.5	Φ1.75±0.05	#1
29	8F.00551.3R0	SCRW M FPH M2*3L (6/1.4) NI	Plastic Metal to plastic Plastic to plastic PCB to plastic	2.0±0.5	Φ1.75±0.05	#1
30	8F.3A356.8R0	SCRW MACH TRU M4*8L B-ZN NYL	Metal Metal to metal Plastic to metal	10.5±1.0	M4*0.7P	#2
31	8F.1A524.5R0	SCRW MACH PAN M3*5L NI	Metal Metal to metal	7.0±1.0	M3*0.5	#2
32	8F.00010.161	SCRW TAPTILE TRS W/EXT M4*8L	Metal Metal to metal	9.0±1.0	M4*0.7	#2
33	8F.XA326.100	SCRW TAP FLAT M4*10L B-ZN	Plastic Metal to plastic	6~8	M4*0.7	#1
34	8F.XA524.6R0	SCRW TAP FLT M3*6L NI	PLASTIC	4.5±0.5	∅2.35±0.05	#2
35	8F.XA213.6R0	SCRW TAP FLT M3*6L NI	PLASTIC	9.0±1.0	M2.5*6	#1
36	8F.00691.001	SCRW FPH M2.5*6 (2.5/1.45) B-ZN	PLASTIC	3±0.5	M2.5*6	#1

37	8F.00680.001	SCRW TAP FPH M3*8L(5/1.2)NI	Metal Metal to metal Plastic to metal	6~8	Φ2.68±0.03	#2
38	8F.VG434.6R0	SCRW TAP PH W/F M3*6TP-S ZN SO	Metal Metal to meta	No thread:8.5±1.0 Thread:6.5±1.0	M3	#2

*SCREW Q'TYPE AND POSITION REFERRED TO C328.
*NOTES:
1. (A)STANDARD SCREW TORQUE SPEC.
2. (B)SPECIAL SCREW TORQUE SPEC.
3. T: TAPPING SCREW.
4. M: MACHING SCREW.

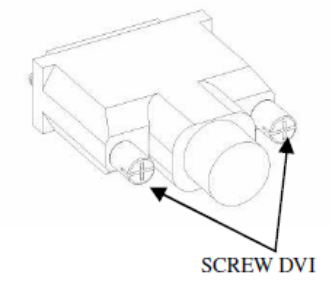
D-SUB Connector
SCREW TORQUE SPEC.



SCREW D-SUB

SCREW TORQUE: 1.0±0.2 (KG-CM)

DVI Connector
SCREW TORQUE SPEC.



SCREW DVI

SCREW TORQUE : 1.0±0.2(KG-CM)

Appendix 2-Physical Dimension Front View and Side view

Fig. 1 Physical Dimension Front View and Side view

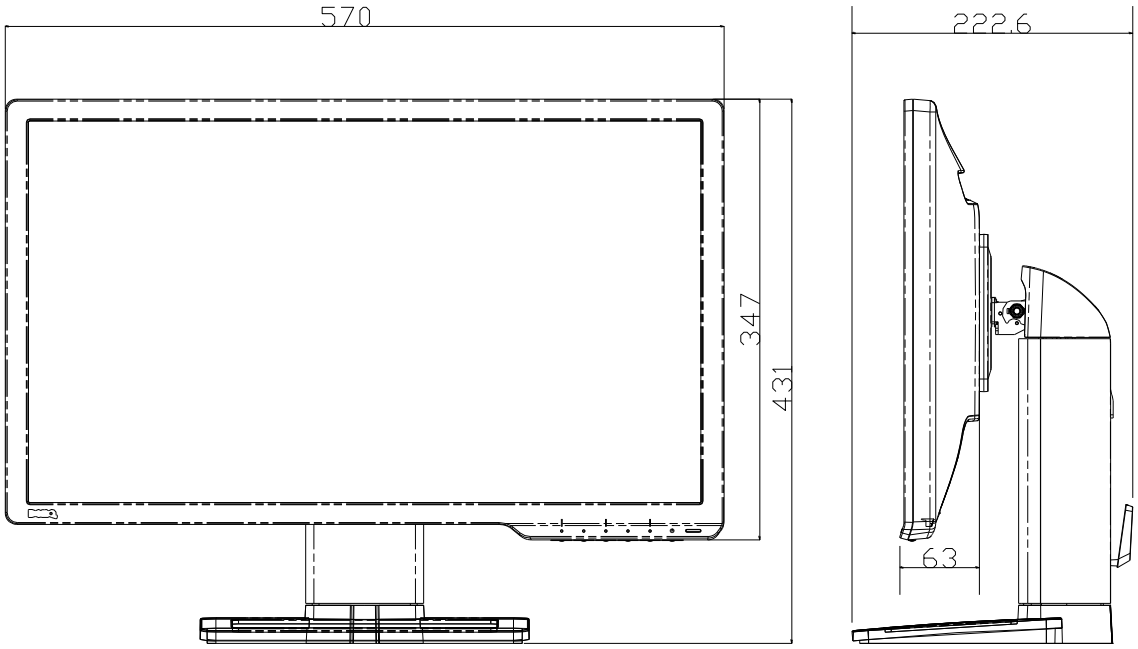


Fig. 2 Appearance Description