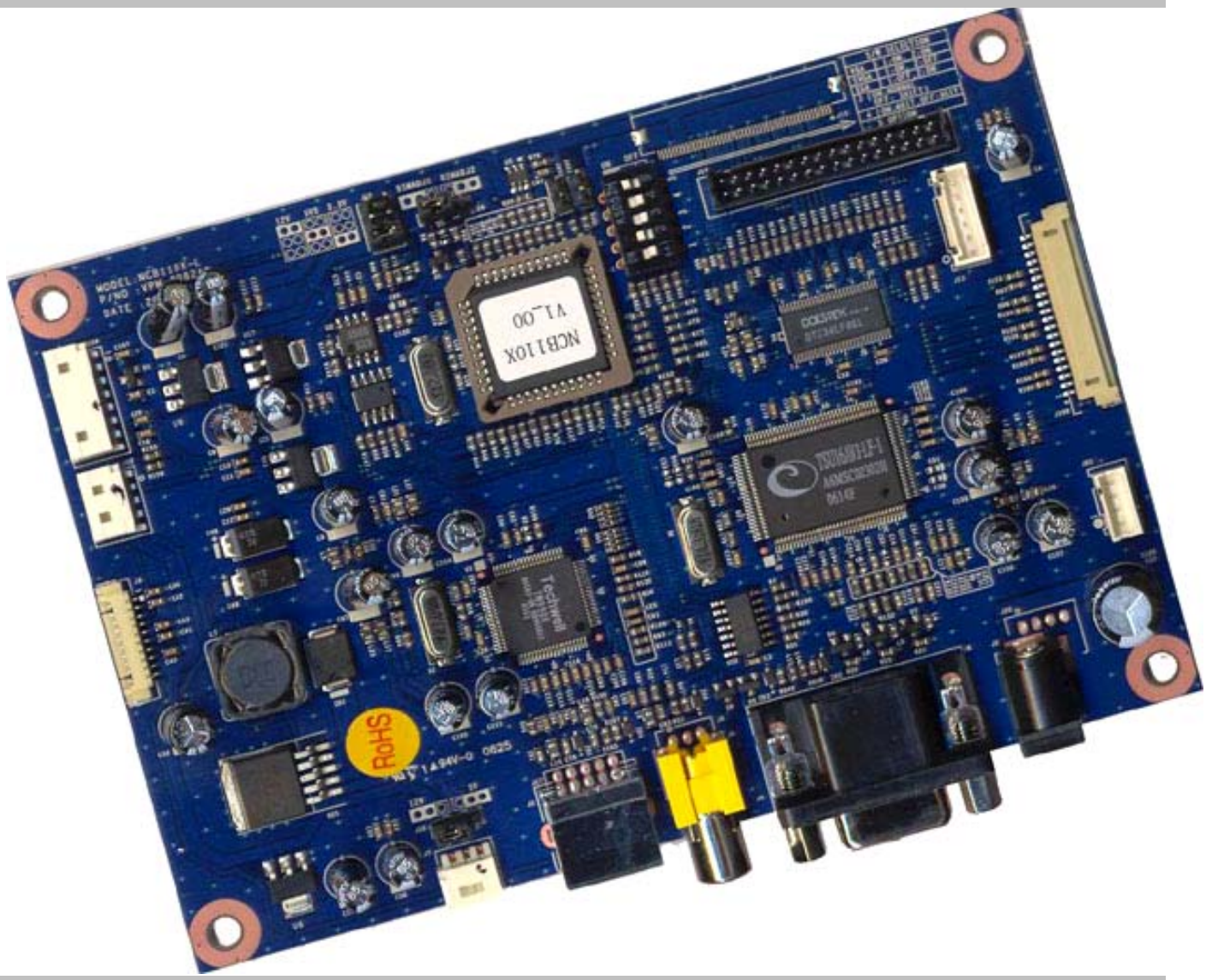
For LCD Monitor (PC + Video) Interface Controller

For 640X480, 800X600 & 1024X768 Resolutions TFT LCD

DATA SHEET



TFT LCD Monitor Control Board

NCB110X3-DS-AB(RoHS Compliant)

July 2006

Kordis Media Co., ltd.
3F, 1006-9, Sadang-Dong,
Dongjak-Ku, Seoul
156-090, Korea
TEL : 82-2-585-8347
FAX : 82-2-585-8391

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History (revision date)

No	Description	Revision	Page
1	E/S	AA	
2	Connecter Changed	AB	

INTRODUCTION

Designed for LCD monitor and other flat panel display application the NCB110X3 controller provides an auto-input synchronization and easy to sue interface controller for:

- TFT (active matrix) LCD panels of 1024x768, 800x600 and 640x480 resolutions
- Computer video signals of VGA, SVGA, XGA standard.
- Video signals of NTSC, PAL standard
- Input Signal Support
  - All VESA standard
  - In case of VGA option (VGA /NTSC/PAL Input support)
  - In case of SVGA option (VGA/SVGA/NTSC/PAL Input support)
  - In case of XGA option (VGA/SVGA/XGA/NTSC/PAL Input support)

HOW TO PROCEED

- Ensure that you have all parts & they are correct, refer to:
  - Connection diagram
  - Connector reference
  - Assembly notes
- Check controller switch & jumper settings (errors may damage the panel)
- Prepare the PC & Video
- Connect the parts
- Understand the operation & functions

IMPORTANT USAGE NOTE

This equipment is for use by developers and integrators. The manufacturer accepts no liability for damage or injury caused by the use of this product. It is the responsibility of the developer, integrators or other users of this product to:

- Ensure that all necessary and appropriate safety measures are taken.
- Obtain suitable regulatory approvals as may be required.
- Check power settings to all component parts before connection.

DISCLAIMER

There is no implied or expressed warranty regarding this material.

GENERAL SPECIFICATION

No.	Item	Description			
1	Controller name	For VGA panel	NCB110V3		
		For SVGA panel	NCB110S3		
		For XGA Panel	NCB110X3		
2	LCD Module	VGA~XGA TFT LCD (TTL/LVDS Interface)			
3	Signal Input	Analog RGB Input. NTSC/PAL			
4	Resolution Support	H: 31 ~ 61kHz			
		V: 55 ~ 76Hz			
5	OSD Control	Menu, Select (AUTO), Down, Up(Source change), Power			5 keys
	Plug & Play	VESA DDC 1/2B Ver1.3			
6	Power Connector	Input	Type: IEC320 MALE 3Line Connector		
7.	Power Consumption	Supply Voltage	12Vdc		cf) Back Light Inverter
		Max Power	30W (including Back Light Inverter)		
8	Signal Connector	Analog	15Pin D-SUB Connector		
		Video	MINIDIN	SVHS	
			RCA	CVBS	

ELECTRICAL SPECIFICATION

Input characteristic

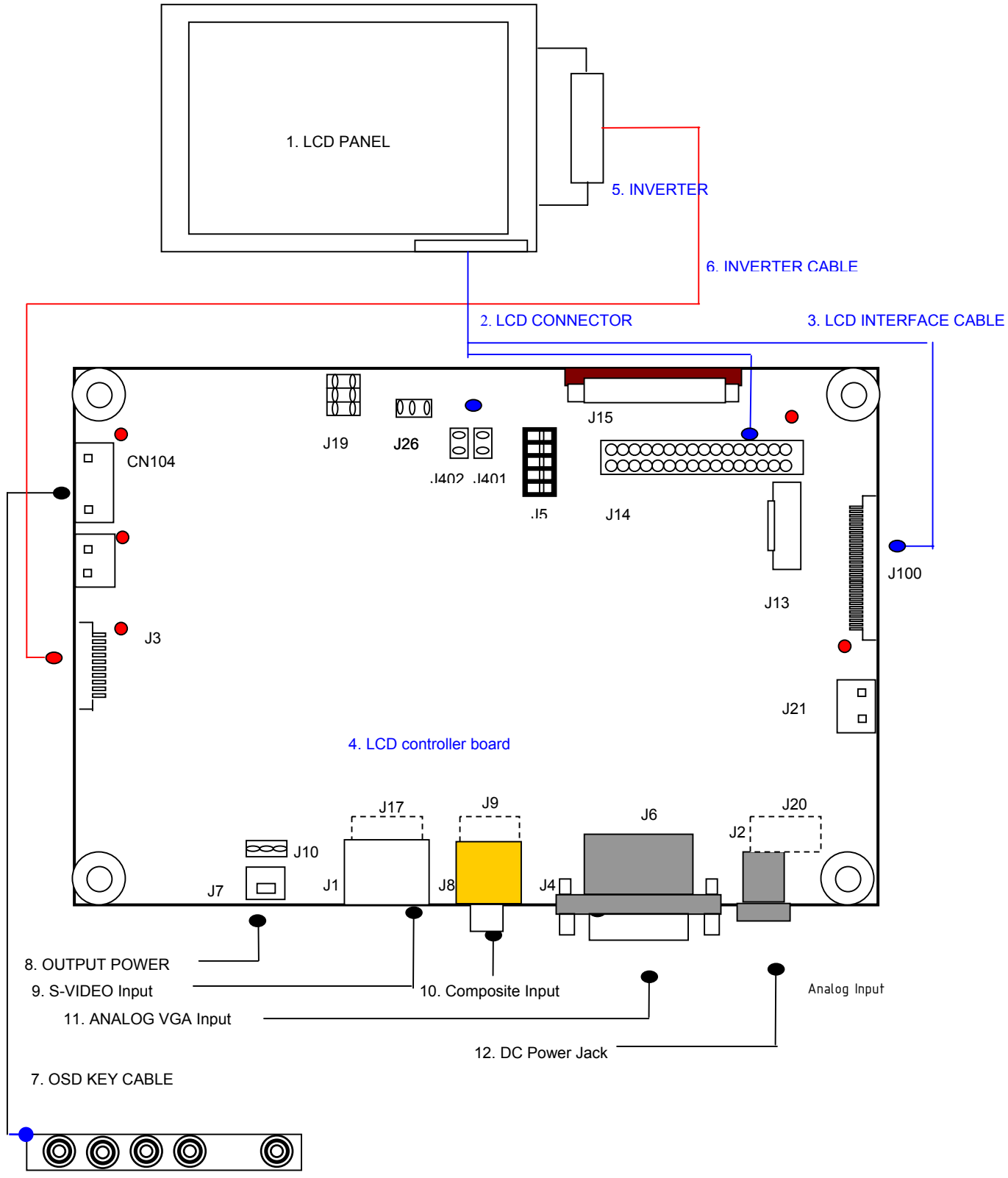
Description	Signal	Unit	Min	Typical	Max	Remarks
Power In (12Vdc)						
	Input	Vdc	11.4	12	12.6	
	Consumption	Watt		5		Board only
RGB Input						
	Analog RGB	Vp-p	0		0.7	
	Sync	Vdc	0		5.5	
	H Frequency	KHz	31		61	Depends on Mode
	V Frequency	Hz	55	60	75	
NTSC/PAL	Y/CVBS	Vp-p	0.6	1.0	1.4	
	C	Vp-p	0.6	0.8	1.2	

Output Characteristics

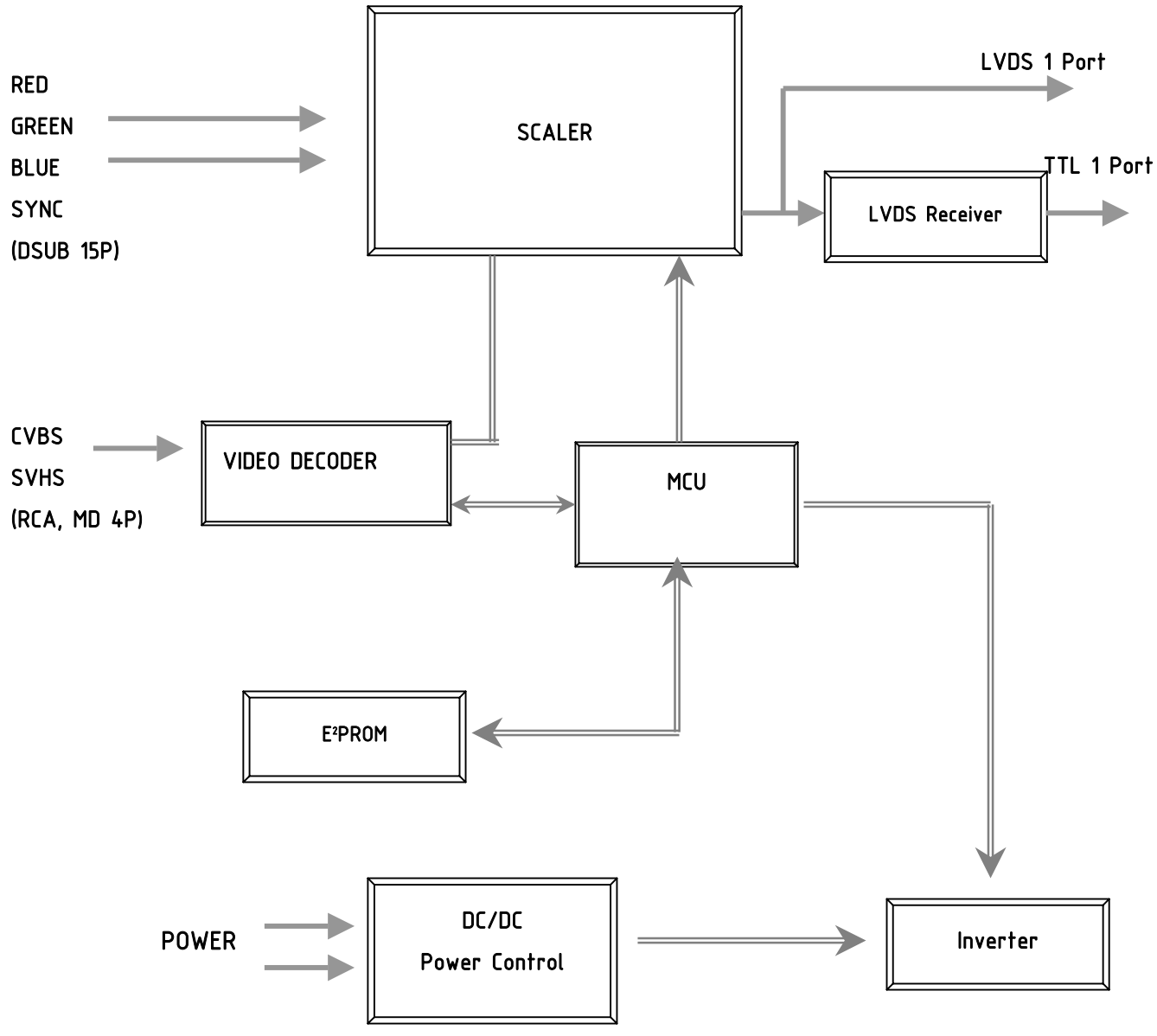
Description	Signal	Unit	Min	Typical	Max	Remarks
TTL LCD Interface						
	RGB Data	Vp-p		3.3		
	DE, Sync, Clock	Vp-p		3.3		
	Clock Freq.	MHZ	25		80	Depends on Mode
	LCD Power (5v)	Vdc	4.5	5	5.5	Jumper option
	LCD Power (3.3v)	Vdc	3.16	3.3	3.5	Jumper option
LVDS Interface						
	Differential output	MVp-p	250	350	450	
	LCD Power (5v)	Vp-p	4.5	5	5.5	
	LCD Power (3.3v)	Vp-p	3.16	3.3	3.5	
Inverter Interface						
	Power out	Vdc	11.5	12	12.5	
	On/Off control	Vp-p	0		5.25	L=off, H=on
	Bright control	Vp-p	0		4.0	

SYSTEM DESIGN (T.B.D)

A typical LCD based display system utilizing this controller is likely to comprise the following.



BLOCK DIAGRAM



ASSEMBLY NOTES

This controller is designed for monitors and custom display projects using 1024x768, resolution TFT LCD panels with a VGA, SVGA, XGA signal input. The following provides some guidelines for installation and preparation of a finished display solution.

Preparation: Before preceding it is important to familiarize yourself with the parts making up the system and the various connectors, mounting holes and general layout of the controller. As much as possible connectors have been labeled. Guides to connectors and mounting holes are shown in the following relevant sections.

1. **LCD Panel:** This controller has 12V, 5V or 3.3V TTL and LVDS interface logic on the Board for different kind of TFT LCD panel. For the other type of LCD interface like Panel Link interface and etc, this board can accommodate a daughter board instead of on-board LCD interface. Due to the different signal timing and electrical characteristics from each LCD panel manufacturer, for selecting LCD interface type and resolution, put jumper marked J5 on the right position following LCD panel specification. For selecting DC power level, put jumper marked J19 on the right position. Supplied power level depends on LCD panel specification.

2. **Controller:** Handle the controller with care as static charge may damage electronic components, Make sure correct jumper and switches settings to match the target LCD panel

3. **LCD connector board**: Different makers and models of LCD panel require different panel signal connectors and different pin assignments.

4. **LCD signal cables:** In order provide a clean signal it is recommended that LCD signal cables should not longer than 30cm. If loose wire cabling is utilized these can be a made into a harness with cable ties. Care should be taken when you place the cables to avoid signal interface. Additionally it may necessary in some systems to add ferrite cores to the cables to minimize signal noise.

5. **Inverter**: This will be required for the backlight of an LCD, some LCD panel have an inverter built in. As LCD panels may have 1 or more backlight tubes and the power requirements for different panel backlights may vary it is important to match the inverter in order to obtain optimum performance. See application notes for more information on connection.

6. **Inverter cable:** Different inverter models require different cables and different pin assignment. Make sure the correct cable pin out to match the inverter. Unsuitable cable pins out may damage the inverter.

7. **AV cable:** Standard composite or S-video cables can be used. Reasonable quality cables should be used to avoid image quality degradation.

8. **OSD Button:** See Operational Function section.

9. **3 Color LED:** This LED shows the state of controller.

   - Green – Normal state
   - Off – Off mode (Can't find video signals)

- Amber – DPMS mode

10. Power switch: This switch is located on OSD button board.

11. Power input: +12Vdc is required to supply power for the controller, the Inverter and the LCD panel

12. VGA Input Cable: As this may affect regulatory emission test result, a suitably shielded cable should be utilized.

EMI: Shielding will be required for passing certain regulatory emissions tests. Also the choice of video board and power supply can affect the test result.

Consideration should be given to:

- Electrical insulation.
- Grounding.
- EMI shielding.
- Heat & ventilation

Caution: Ensure that the equated insulation is provided for all areas of the PCB with special attention to high voltage parts such as the inverter.

13. Setup for operation

Once the circuit has been connected, a setup procedure for optimal is requires a few minutes The following instructions are likely to form the basis of the finished product operation manual.

PC Settings

The PC needs to be set to an appropriate graphics mode that has the same resolution with the LCD panel to have clear screen image. And the vertical refresh rate should be set to one of 56~75Hz, non – interlaced signal.

LCD display System Settings

The OSD (On Screen Display) provides certain functions to have clear image and others. This board supports 4 buttons OSD operation as a standard, but 6 – button operation can be supported with a different firmware if it is required. The control functions defined on OSD operation are as below.

Pc Graphics Output: A few guidelines:

- Signal quality is very important, if there is noise or instability in the PC graphics output this may result in visible noise on the display
- Refer to the graphic modes table in specification section for supported modes.
- Non-interlaced & interlaced video input is acceptable.

Important: please read the application notes section for more information.

CONNECTION & OPERATION

CAUTION: Never connect or disconnect parts of the display system when the system is powered up as this may cause serious damage.

CONNECTION

1. **LCD panel & inverter**: Connect the inverter (if it is not built- in the panel) to the CCFT lead connector of the LCD panel.
2. **TTL type panels**: Plug the signal cables direct to J14 (for Single 6bits, or Single (Dual first) higher 6bit, J13 (8bit dual (J13) and 8bits single lower 2bit) on the controller board. Plug the other end of cables to the LCD connector board (if connector board is required, otherwise the signal can be directly plugged to the LCD panel connector).

   LVDS type panels: Plug the signal cables direct to J100 of the controller board. Plug the other end of cables to the LCD connector board (if connector board is required, otherwise the signal can be directly plugged to the LCD panel connector).
3. **Inverter & Controller:** Plug the inverter cable to J8 of the controller board and another end to the connector on the inverter.
4. **Function switch & Controller:** Plug the OSD switch mount cable to J2 of the controller board and another end to the OSD board.
5. **Jumpers & Switch:** Check all jumpers {J19 (External power Setting), J17 (Target panel power is setting)} and switches (J14, Target panel selection) are set correctly. Details referring the jumpers and switches setting table (in the following section)
6. **VGA cable & Controller:** Plug the VGA cable to the connector J3 of the controller board.
7. **Power supply & Controller:** Plug the DC 12V power in to the connector J7.
8. **Power on:** Switch on the controller board and panel by using the OSD switch mount.

General:

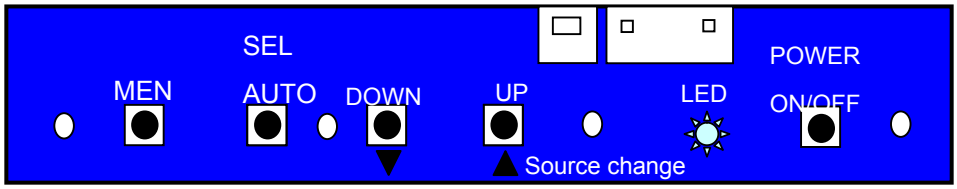
- If you use supplied cables & accessories, ensure that they are correct for the model of the panel and the controller.
- If you make your own cables & connectors, refer carefully to both the panel & inverter specifications and the section in this manual, "Connectors, Pin outs & Jumpers" to ensure the correct pin to pin wiring.

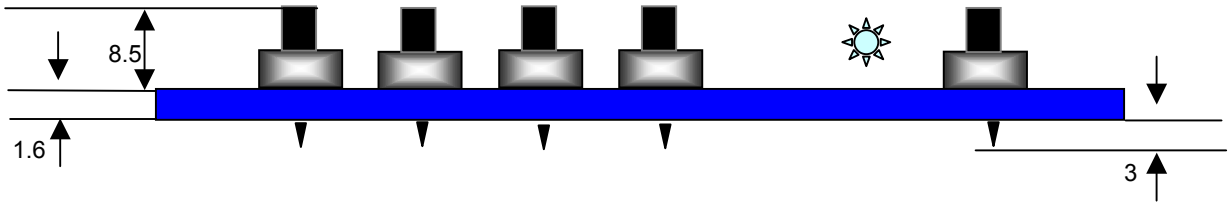
PC Setting:

The controller has been designed to take a very wide range of input signals however to optimize the PC's graphic performance we recommend choosing 60Hz vertical refresh rate – this will not cause screen flicker.

OSD

The OSD (On Screen Display) provides certain functions to have clear image and others. This board supports 4 buttons OSD operation as a standard. The control functions defined on OSD operation are as below. (unit: mm)





Button	Function	Status	HOT Key
Power	Power on/off	On/Off	
Menu	Activate menu		
Select	Menu Select		Auto setting
LED	Indicates operation status	Green/ Off/ Amber	
DOWN, UP ▼ ▲	Cursor control Increment / Decrement value		Source change

The chosen OSD settings will be stored in memory. The OSD menu can be cleared from the screen from the screen by moving the selection bar to the **EXIT MENU** icon pressing the **SEL** button otherwise it will be automatically cleared after a few second of non-use

OSD Function (MAIN MENU)

Picture

In case of AV (Video & S-Video) mode

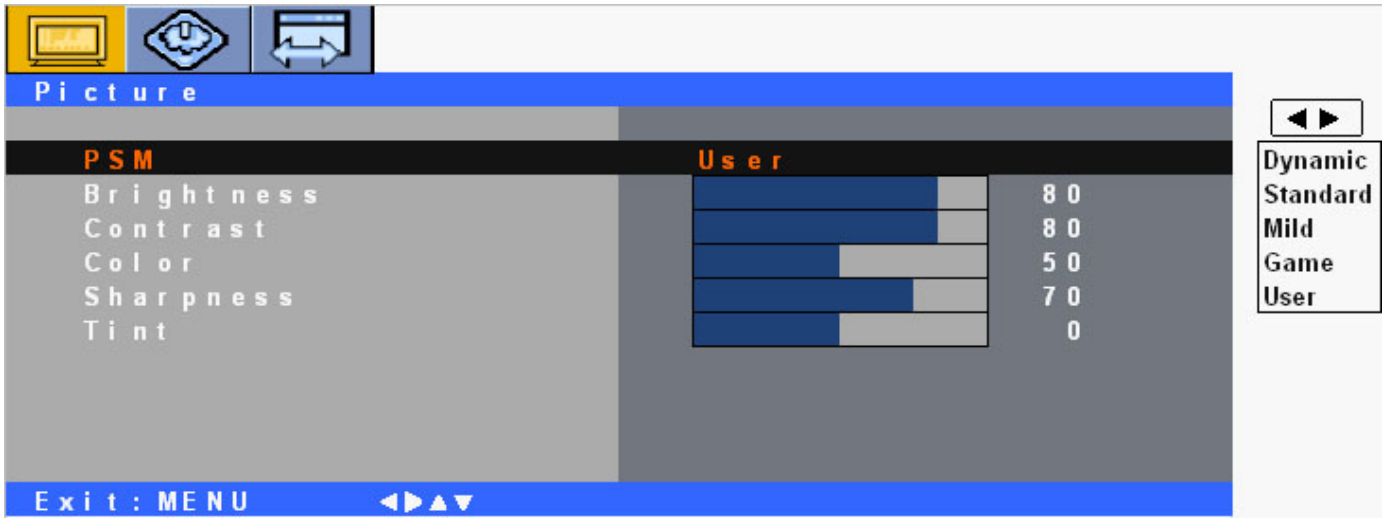
In case of PC mode

Setup

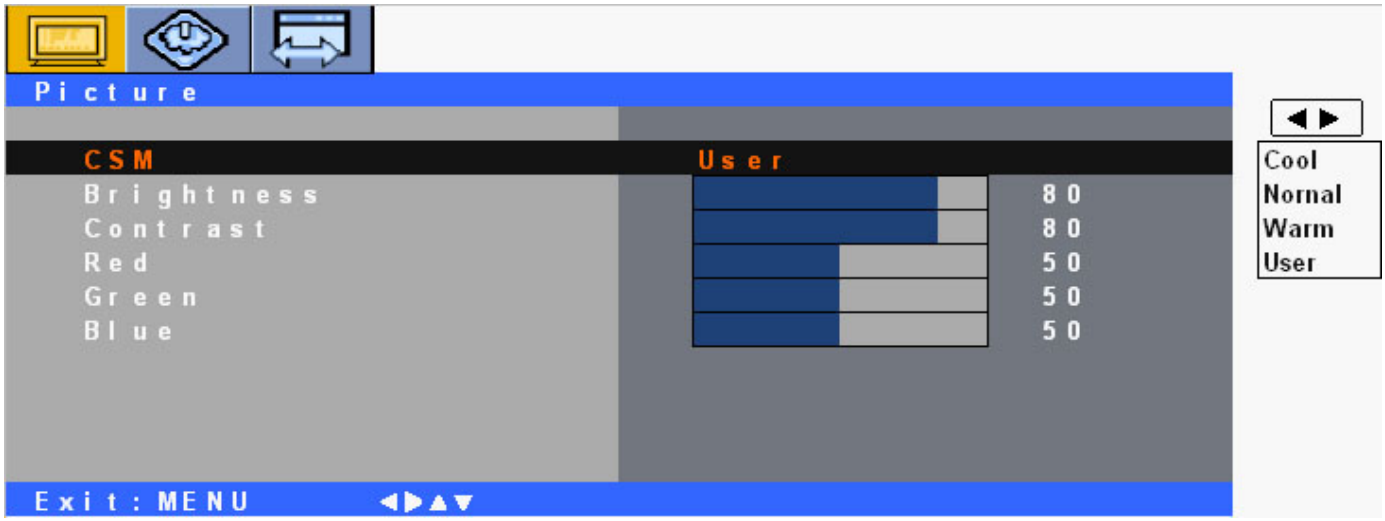
Screen

Picture Icon

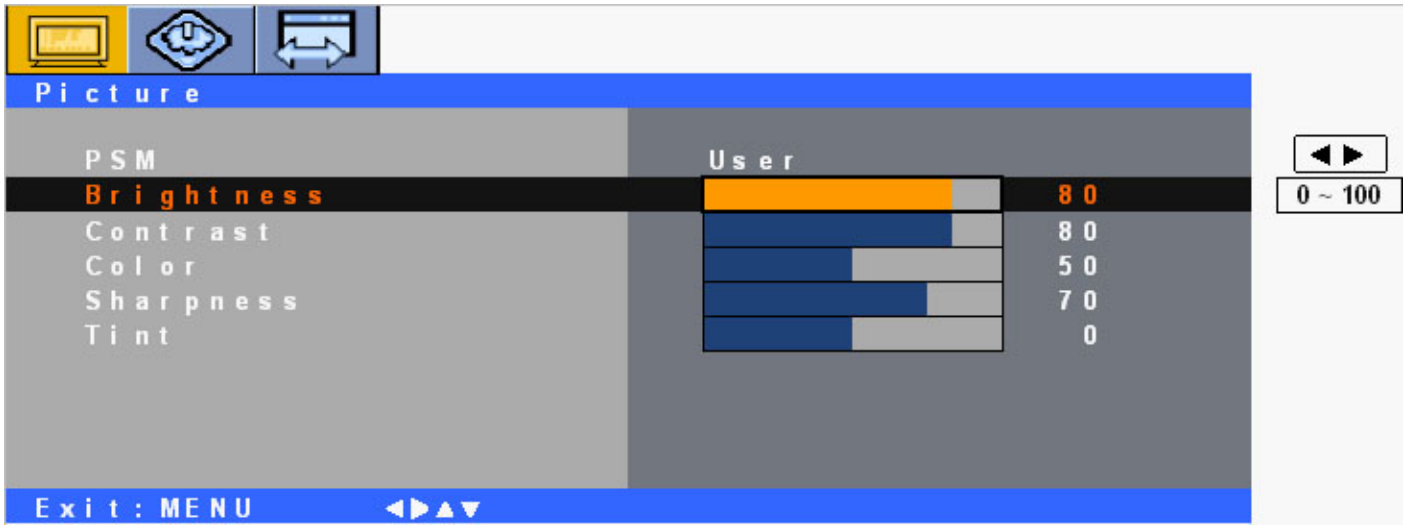
PSM (AV)



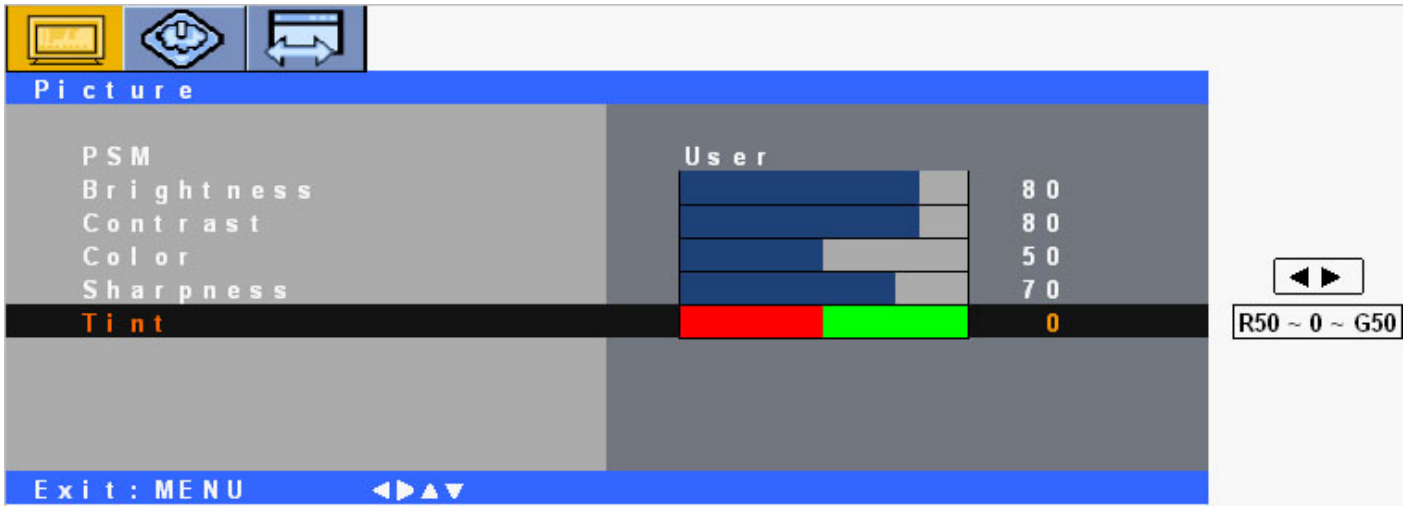
CSM (PC)



Brightness / Contrast / Color / Sharpness



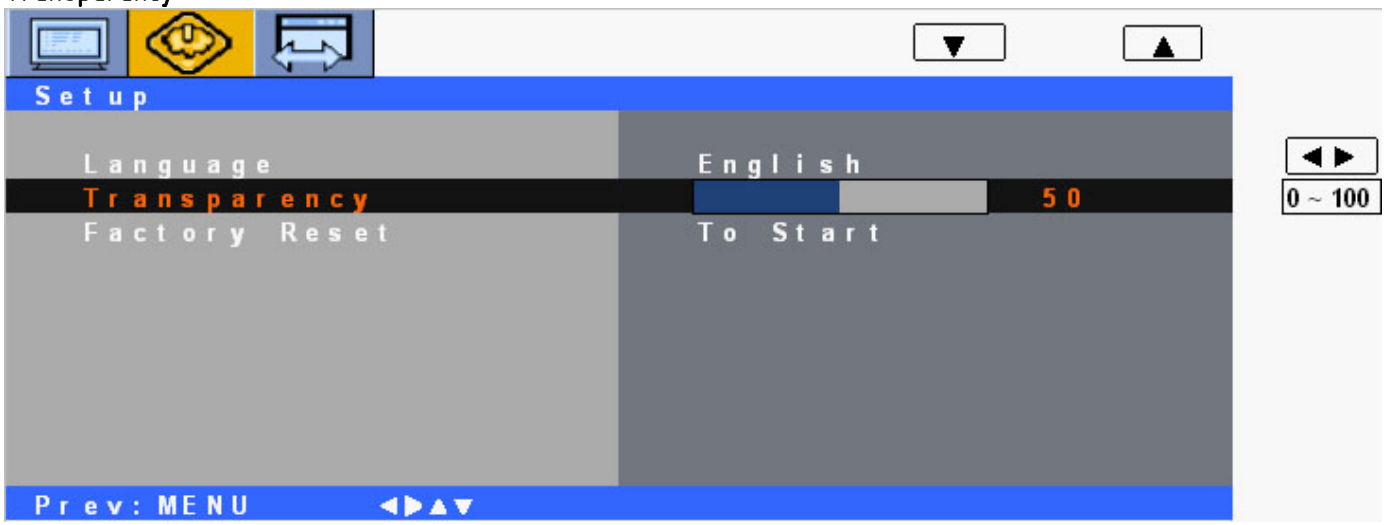
Tint



Setup

Language

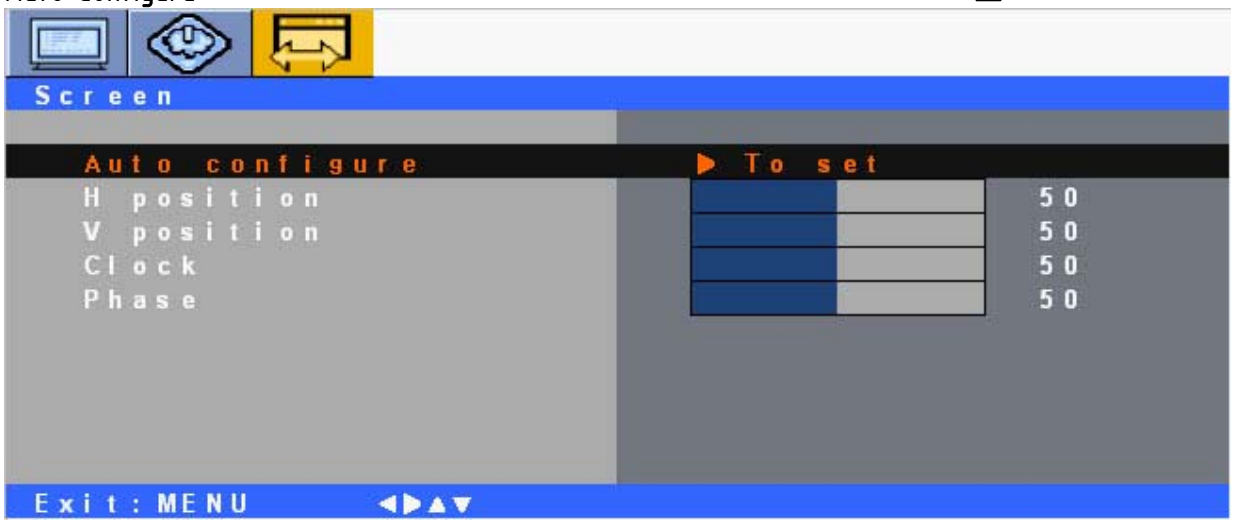
Transparency



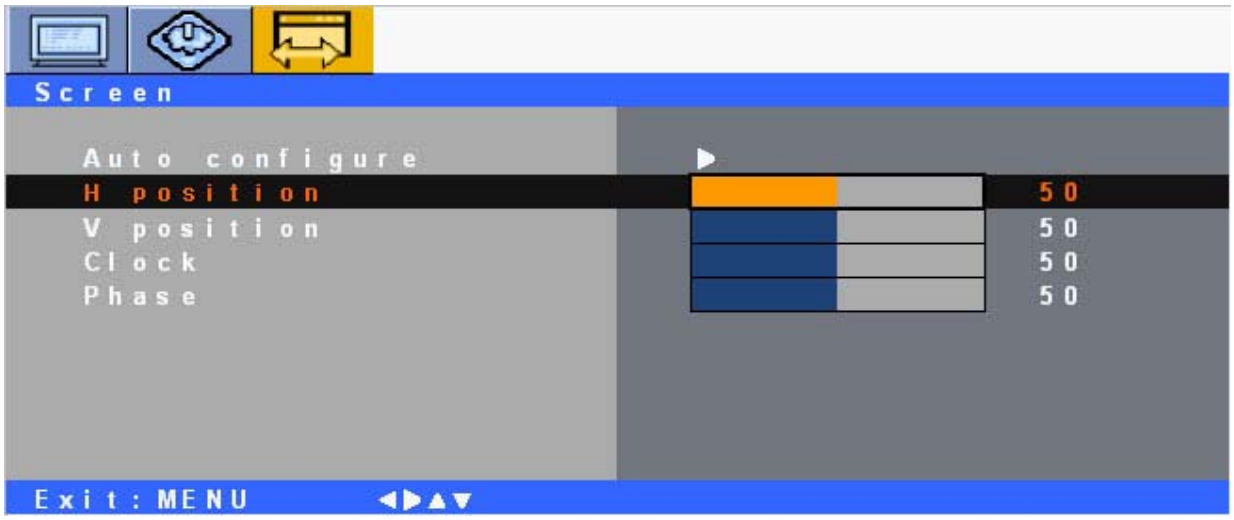
Factory Reset

Screen

Auto Configure



H Position / V Position / Clock / Phase



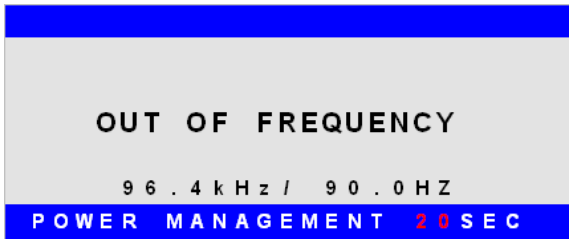
OSD GUI Control Table

MAIN MENU	SUB MENU	CONTROL		
PICTURE	PSM	Dynamic/Standard/Mild/Game/User		VIDEO
		USER	Brightness, Contrast, Color, Sharpness	
	CSM	CSM/Brightness/Contrast		PC
		CSM	Normal/Warm/User	
		User	Red/Green/Blue	
SETUP	Language	English/Deutsch/François/Italiano/Espanol		
	Transparency	50 (1 ~100)		
	Factory Reset	On/Off		
SCREEN	Auto Configure	On/Off		RGB PC
	H Position	50(0 ~ 100)		
	V Position	50(0 ~ 100)		
	Clock	50(0 ~ 100)		
	Phase	50(0 ~ 100)		

Operation Message

OUT OF FREQUENCY

Input Signal is over the supporting range



POWER SAVER MODE

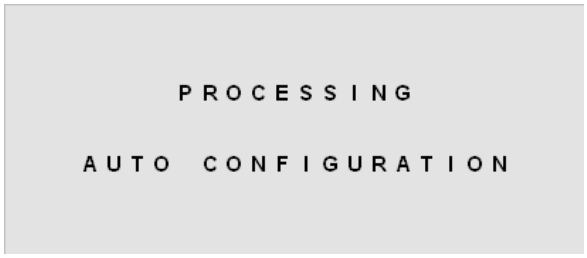
Input Signal is not present. This message is disappeared after 5 seconds.

SELF DIAGNOSTICS

Input Signal is not present after power on with power switch. This message is not disappeared before power off or activity of input signal.

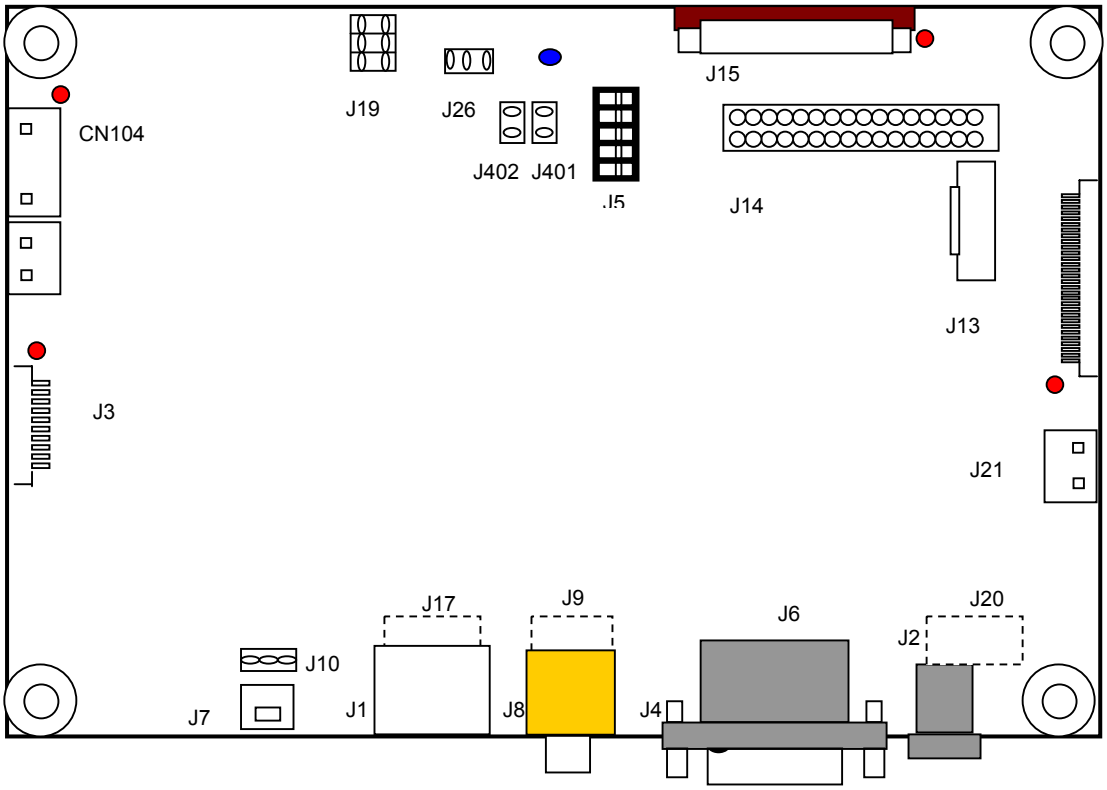
AUTO CONFIGURATION

Execute AUTO Function.



CONNECTOR, PINOUT & JUMPERS

The various connectors are:



Summary

Reference	Description	Connector Type
CN104	OSD control Connector	MOLEX 53015-0710 2.0mm RIGHT ANGLE
J1	S-video Jack	MJ373-4-BASE (MINIDIN 3PIN)
J2	Input Dc power Jack	DC-001 2.5Ø
J3	Inverter Connector	YEON-HO 12505WR-10A00 10P 1.25MM
J4	D-SUB Connector	53015-1210 MOLEX 2.0mm RIGHT ANGLE
J5	Panel Type Select Switch	HDR5X2, 14pin
J6	D-SUB Jack	15P D-SUB 2.29MM RIGHT ANGLE
J7	Out Power Connector	MOLEX 53015-0310 2.0mm RIGHT ANGLE
J8	C-video Jack	VIDEO 3P JACK (RCA 3PIN)
J9	C-video Connector	53015-0310 MOLEX 2.0mm RIGHT ANGLE
J10	Out Power Jumper	HDR3X1 CON3P-BASE
J13	LCD Interface TTL - Single lower 2 bit	YEON-HO SMW200-06P
J14	LCD interface board Connector for TTL 6bit	16*2 HEADER PIN
J15	LCD Interface TTL 8bit FPC Connecter	YEON-HO 05002HR-50A01
J17	S-video Connecter	MOLEX 53015-0510 2.0mm RIGHT ANGLE
J19	Panel Power Out Jumper	3*2 Header
J20	DC power Connector	MOLEX 53015-0410 2.0mm RIGHT ANGLE

J401	F/W Jumper Setting (Optional)	2*2 Header
J402	F/W Jumper Setting (Optional)	2*2 Header

CN104 : OSD control connector

Pin No.	Symbol	Description
1	VCC	+5V power for IR sensor
2	IRQ	Infrared rays signal line.
3	LED2	RED LED
4	LED1	GREEN LED
5	GND	Ground
6	KEY1	Up, Power
7	KEY0	Menu, Select, Down

J1: S-Video Input Jack

Pin No.	Symbol	Description
1	GND	Ground
2	GND	Ground
3	C-in	CROMA signal input
4	Y-in	LUMA signal input
5	GND	Ground
6	GND	Ground
7	GND	Ground

J2: 12V DC power supply

Pin No.	Symbol	Description
1	Vcc	12V
2	GND	Ground
3	GND	Ground

J3: Backlight Inverter connector

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	DIM-adj	DIM-adjustment	6	GND	Ground
2	GND	Ground	7	GND	Ground
3	GND	Ground	8	GND	Ground
4	GND	Ground	9	Vcc	12V
5	ON/OFF	Inverter ON/OFF	10	Vcc	12V

J4: Analog RGB Input Connector

Pin No.	Symbol	Description
1	SCL	Serial Clock Line for DDC
2	SDA	Serial Data Line for DDC
3	NC	No Connection
4	VSYNC	Vertical Sync
5	HSYNC	Horizontal Sync
6	GND	Ground for HSYNC, VSNC, SCL, SDA
7	BLUE	BLUE analog input
8	BLUE GND	Ground for BLUE Input Signal
9	GREEN	GREEN analog input
10	GREEN GND	Ground for GREEN Input Signal
11	RED	RED analog input
12	RED GND	Ground for RED Input Signal

J5: Panel Type Select Switch

* Refer to Appendix for setting

J6 : ANALOG VGA INPUT

Pin No.	Symbol	Description
1	Red1	Red analog input
2	Green1	Green analog input
3	Blue1	Blue analog input
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	NC	Not connected
10	GND	Ground
11	GND	Ground
12	DSDA	DDC-SDA
13	HSYNC	Horizontal Sync
14	VSYNC	Vertical Sync
15	DSCL	Serial Clock Input

J7: Power out connector

Pin No.	Symbol	Description
1	Vcc	12V/5V
2	GND	Ground
3	GND	Ground

J8: C-video jack

Pin No.	Symbol	Description
1,2	Composite	Composite-video input
3	GND	Ground

J9: C-video Connecter

Pin No.	Symbol	Description
1,2	Composite	Composite-video input
3	GND	Ground

J10: On board +12V/+5V logic power enable select jumper

Pin No.	Symbol	Description
1	12V	12V
2	Vcc	On board power enable
3	5V	5V

J13 : LCD Interface connector for TTL type - Single lower 2 bit

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	R0	. Red output data	4	G1	Green output data
2	R1	. Red output data	5	B0	Blue output data
3	G0	Green output data	6	B1	Blue output data

J14: LCD Interface connector for TTL type- 6bit For Single 6bits, or Single (Dual first) higher 6bit

Pin No.	Symbol	Description
1	ROA (7)	Red output data
2	ROA (6)	Red output data
3	ROA (5)	Red output data
4	ROA (4)	Red output data
5	ROA (3)	Red output data
6	ROA (2)	Red output data
7	GND	Ground
8	GND	Ground
9	GOA (7)	Green output data
10	GOA (6)	Green output data
11	GOA (5)	Green output data
12	GOA (4)	Green output data
13	GOA (3)	Green output data
14	GOA (2)	Green output data
15	GND	Ground
16	GND	Ground
17	BOA (7)	Blue output data
18	BOA (6)	Blue output data
19	BOA (5)	Blue output data
20	BOA (4)	Blue output data
21	BOA (3)	Blue output data
22	BOA (2)	Blue output data
23	GND	Ground
24	GND	Ground
25	DVS	Display Vertical Sync
26	DHS	Display Horizontal Sync
27	DCLK	Display Clock
28	GND	Ground
29	DEN	Display Enable
30	MOD_PWR	VDD For LCD Module
31	MOD_PWR	VDD For LCD Module
32	MOD_PWR	VDD For LCD Module

J15: LCD Interface connector for 8bit TTL type

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	NC	.	26	R1	Red output data
2	NC	.	27	R2	Red output data
3	GND	Ground	28	R3	Red output data
4	GND	Ground	29	GND	Ground
5	B0	Blue output data	30	R4	Red output data
6	B1	Blue output data	31	R5	Red output data
7	B2	Blue output data	32	R6	Red output data
8	B3	Blue output data	33	R7	Red output data
9	GND	Ground	34	GND	Ground
10	B4	Blue output data	35	CLK	Display Clock
11	B5	Blue output data	36	GND	Ground
12	B6	Blue output data	37	DE	Display Enable
13	B7	Blue output data	38	GND	Ground
14	GND	Ground	39	VSYNC	Display Vertical Sync
15	G0	Green output data	40	HSYNC	Display Horizontal Sync
16	G1	Green output data	41	GND	Ground
17	G2	Green output data	42	VCC	VDD For LCD Module
18	G3	Green output data	43	VCC	VDD For LCD Module
19	GND	Ground	44	VCC	VDD For LCD Module
20	G4	Green output data	45	VCC	VDD For LCD Module
21	G5	Green output data	46	GND	Ground
22	G6	Green output data	47	GND	Ground
23	G7	Green output data	48	NC	.
24	GND	Ground	49	NC	.
25	R0	Red output data	50	NC	.

* Optional connector for LC201V01 (LG) & A201SN01/2 (AU)

J17: S-Video Input Connector

Pin No.	Symbol	Description
1,2	C-in	CROMA signal input
3	GND	Ground
4,5	Y-in	LUMA signal input

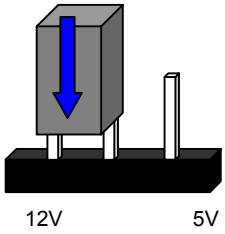
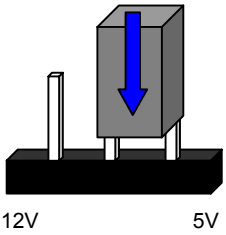
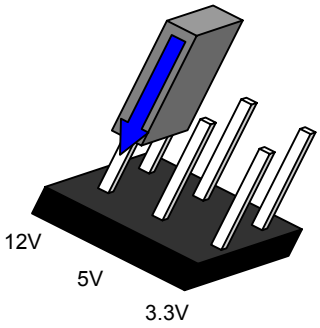
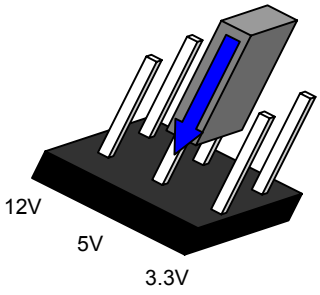
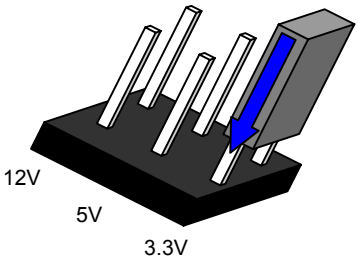
J19: LCD Panel power select jumper

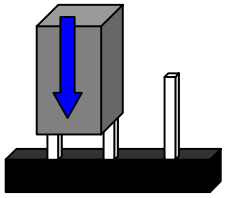
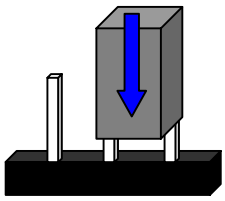
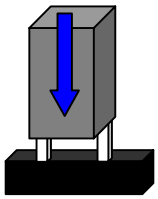
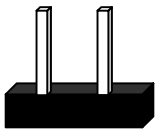
Pin No.	Symbol	Description
1	3.3V	3.3V
2	12V	12V
3	5V	5V

J100: LCD Interface connector for LVDS type

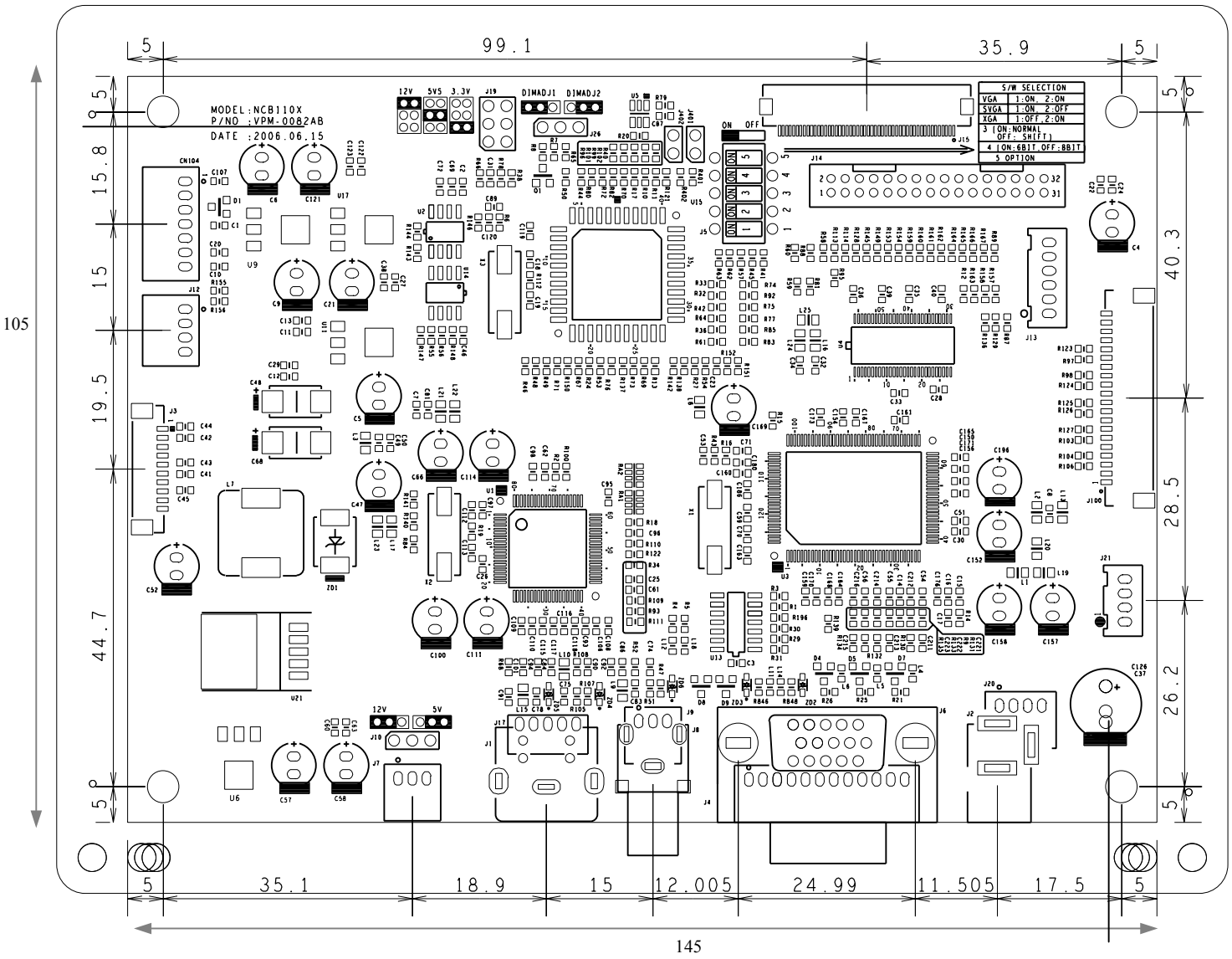
Pin No.	Symbol	Description
1	GND	Ground
2	GND	Ground
3	Y3P	LVDS 3 Channel Positive Signal for LCD Module (6Bit Unused)
4	Y3M	LVDS 3 Channel Negative Signal for LCD Module (6Bit Unused)
5	GND	Ground
6	CLKOUTP	LVDS Clock Positive Signal of Channel for LCD Module
7	CLKOUTM	LVDS Clock Negative Signal of Channel for LCD Module
8	GND	Ground
9	Y2P	LVDS 2 Channel Positive Signal for LCD Module
10	Y2M	LVDS 2 Channel Negative Signal for LCD Module
11	GND	Ground
12	Y1P	LVDS 1 Channel Positive Signal for LCD Module
13	Y1M	LVDS 1 Channel Negative Signal for LCD Module
14	GND	Ground
15	Y0P	LVDS 0 Channel Positive Signal for LCD Module
16	Y0M	LVDS 0 Channel Negative Signal for LCD Module
17	GND	Ground
18	GND	Ground
19	MOD_PWR	VDD For LCD Module
20	MOD_PWR	VDD For LCD Module

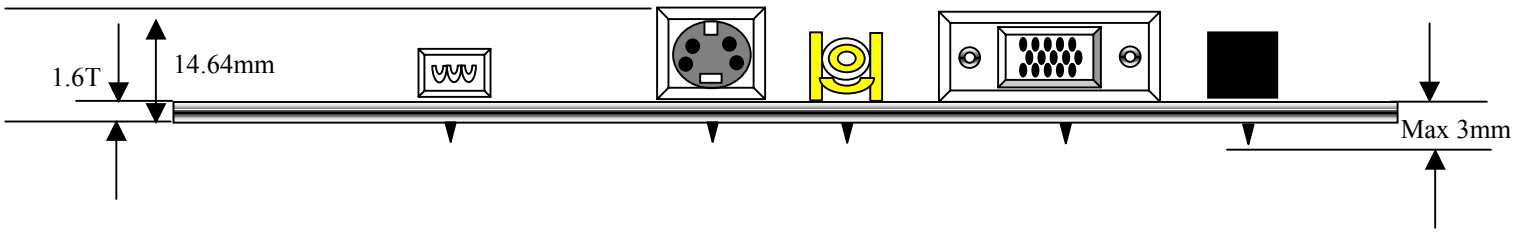
Summary: jumpers setting

Reference	Description	Connector Type
J10	On board +12V logic power enable	
	On board +5V logic power enable	
J19	12V panel power **CAUTION**: Incorrect setting can damage panel	
	5V panel power **CAUTION**: Incorrect setting can damage panel	
	3.3V panel power **CAUTION**: Incorrect setting can damage panel	

J26	Inverter Dimming Setting 0V (For Monitor LCD)	 DIMADJ1 DIMADJ2
	Inverter Dimming Setting 3.3V (For LCD TV)	 DIMADJ1 DIMADJ2
J401	Composite Video only Setting	
	Normal F/W Setting	

CONTROLLER DIMENSIONS





APPLICATION NOTES

USING THE CONTROLLER WITHOUT BOTTONS ATTACHED

This is very straightforward:

- Firstly setup the controller/display system with the buttons. With the attached controllers and display system active make any settings for color, contrast and image position as required then switch everything off.
- Remove the control switches, the 7-way (J2) cable.
- Refer to inverter specifications for details as to fixing brightness to a desired level, this may require a resistor, an open circuit or closed circuit depending on inverter

INVERTER CONNECTION

There are 3 potential issues to consider with inverter connection:

- Power
- ON/OFF
- Brightness (DIM-ADJ)

Inverter power: This should be matched with the inverter specification.

Inverter ON/OFF: This is a pin provided on some inverter for ON/OFF function and is used by this panel controller for VESA DPMS compliance. If the inverter does not have on/off pin or the on/off pin is not used DPMS will not operate. Pin 5 should be matched to the inverter specification for the ON/OFF pin.

Brightness Dimming control: NCB110 controller boards are analog dimming control method. And it is important to consider the specifications for the inverter to be used.

TROUBLESHOOTING

General

A general guide to troubleshooting of a flat panel display system it worth considering the system as separate elements, such as:

- Controller (jumpers, PC settings)
- Panel (controller, cabling, connection, panel, PC settings)
- Backlight (inverter, cabling, connection, panel, Pc settings)
- Cabling
- Computer system (display settings, operating system)

Through checking the system step by step cross with instruction manuals and a process of elimination to isolate the problem it is usually possible to clearly identify the problem area.

No image:

- If the panel backlight is not working it may still be possible to see just some image.
- A lack of image is most likely to be caused by incorrect connection, lack of power, failure to provide a signal or incorrect graphic card settings.

Image position:

If it is impossible to position the image correctly, ie the image adjustment controls will not move the image far enough, then test using another graphics card. This situation can occur when a graphic card is not close to standard timing or when something is in the graphics line that may affect the signal such as a signal splitter (please note that normally a signal splitter will not have any adverse effect).

Image appearance:

- A faulty panel can have blank lines, failed sections, flickering or flashing display.
- Incorrect graphic card refresh rate, resolution or interlaced mode will probably cause the image to be the wrong size, to scroll to, flicker badly or possibly even no image.
- Incorrect jumper settings on the controller may cause everything from incorrect image viewing to total failure.

CAUTION: Do not set the panel power input incorrectly.

- Sparkling on the display: faulty panel signal cable.

Backlight:

Items to check include: Power input, controls, inverter and Tubes generally in this order.

If half the screen is dimmer than the other half:

- Check cabling for the inverter.

Also:

- If system does not power down when there is a loss of signal.

APPLICABLE GRAPHIC MODE

The microprocessor measures the, H – sync V – sync and polarity for RGB Inputs, and uses this timing information to control all of the display operation to get the proper image on a screen. This board can detect all VESA standard Graphic modes shown on the table below and Provide mare clear and stable image on a screen

Table 6.1) RGB input format

Spec / Mode	Pixel Freq.	Horizontal Timing				Vertical Timing			
		Sync	Freq.	Total	Active	Sync	Freq.	Total	Active
	MHz	Polar	KHz	Pixel	Pixel	Polar	Hz	Line	Lind
640*350@70Hz	25.144	P	31.430	800	640	N	70.000	449	350
640*400@70Hz	28.287	N	31.430	800	640	P	70.000	449	400
720*400@ 70Hz	28.287	N	31.430	900	720	P	70.000	449	400
640*480@60Hz	28.175	N	31.469	800	640	N	59.940	525	480
640*480@72Hz	31.500	N	37.861	832	640	N	72.809	520	480
640*480@75Hz	31.500	N	37.500	840	640	N	75.000	500	480
800*600@56 Hz	36.000	P	35.156	1024	800	P	56.250	625	600
800*600@60Hz	40.000	P	37.879	1056	800	P	60.317	628	600
800*600@72Hz	50.000	P	48.077	1040	800	P	72.188	666	600
800*600@75Hz	49.500	P	46.875	1056	800	P	75.000	625	600
1024*768@60Hz	65.000	N	48.363	1344	1024	N	60.005	806	768
1024*768@ 70Hz	75.000	N	56.476	1328	1024	P	70.070	806	768
1024*768@75Hz	78.750	P	60.023	1312	1024	P	75.030	800	768

ACCESSORY

This board requires several accessories to build a complete display unit. KORDIS can provide standard accessory for this board as below.

No.	Items	Part No.	Ex) LG. Philips LB064V2
1	LCD signal cable	SC-Panel Part No.-mm	SC-LB064V2-20
2	Inverter	Part no. of Manufacturer	GH006
3	Inverter cable	IC-Panel Part No.-mm	IC-GH006-20
4	OSD Board	NLX05-OSD	NLX05-OSD
5	OSD Cable	OC-NID01-mm	OC-NID01-20

* **SC**: LCD Signal Cable
  IC: Inverter Interface cable
  OC: OSD Board cable
  mm: Cable length(unit: mm)

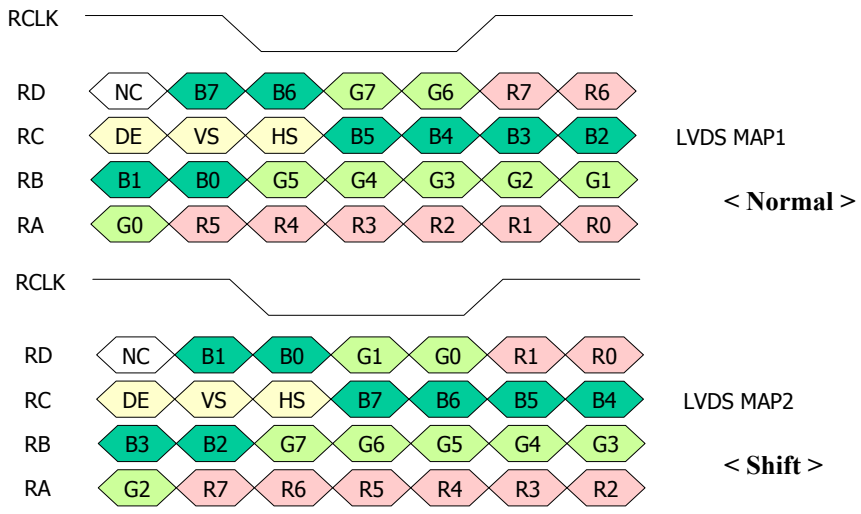
APPENDIX

* 1 ~ 2 : Output Resolution

1	2	Resolution
ON	ON	640x480
ON	OFF	800x600
OFF	ON	1024x760
OFF	OFF	*

* 3 : LVDS MAP

ON : LVDS MAP2 (Shift) OFF :LVDS MAP1 (Normal)



* 4 : Panel 6bit or 8bit

ON: 6bit OFF : 8bit

* 5 : LVDS Channel Selection (*)

ON : Normal Panel OFF: SHARP / Hydis Panel
(VGA / SVGA: Sharp)

A. Tested panel

This board can support various LCD panels, which have VGA, SVGA and XGA resolution.

The table below shows the model names of LCD panel, Jumper setting for LCD power, LCD panel selection and the dedicated inverter for each LCD panel. All of the LCD Panels listed can work without changing the control program of the NCB110 board. And KORDIS will try continuously to the model names of the LCD panels that have been tested.

No.	LCD Model Name	LCD vendor	LCD VCC	Resolution	Option (note1)	SW1	SW2	SW3	SW4	SW5	Dim
1	LB064V02	LG	+3.3V	VGA	VS6S	ON	ON	ON	ON	ON	Dim1
2	LB104V3	LG	+3.3V	VGA	VS6S	ON	ON	ON	ON	ON	Dim1
3	LP104S5	LG	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	ON	Dim1
4	LP104S6	LG	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	ON	Dim1
5	LB121S1	LG	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	ON	Dim1
6	LB121S02	LG	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	ON	Dim1
7	LC121S1	LG	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	ON	Dim1
8	LC150X01-C3	LG	+12V	XGA	XS8N	OFF	ON	OFF	OFF	ON	Dim1
9	LM150X08-A4	LG	+3.3V	XGA	XS8N	OFF	ON	OFF	OFF	ON	Dim1
10	LC151X01-C3	LG	+5.0	XGA	XS8N	OFF	ON	OFF	OFF	ON	Dim1
11	LC201V01	LG	+5V	VGA	VS8N	ON	ON	ON	ON	ON	Dim1
12	LC201V02	LG	+12V	VGA	VS8N	ON	ON	ON	ON	ON	Dim1
13	HLT15X15	HYDIS	+3.3V	XGA	XS8N	OFF	ON	OFF	OFF	ON	Dim1
14	B104SN02	AU	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	ON	Dim1
15	G121SN01	AU	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	ON	Dim1
16	B150XG05	AU	+3.3V	XGA	XS6S	OFF	ON	ON	ON	ON	Dim1
17	M150XN07	AU	+3.3V	XGA	XS6S	OFF	ON	ON	ON	ON	Dim1
18	G150XG01	AU	+3.3V	XGA	XS6S	OFF	ON	ON	ON	ON	Dim1
19	A201SN01	AU	+5.0V	SVGA	SS8N	ON	OFF	ON	ON	ON	Dim1
20	T-51750GD065J-FW-AA	Optrex	+3.3V	VGA	VS6S	ON	ON	ON	ON	ON	Dim1
21	T-51638D084J-FW-A-AC	Optrex	+3.3V	VGA	VS6S	ON	ON	ON	ON	ON	Dim1
22	T-51639D084JU-FW-A-AB	Optrex	+3.3V	XGA	XS6S	OFF	ON	ON	ON	ON	Dim1
23	T-51513D104JU-FW-A-AC	Optrex	+3.3V	VGA	VS6S	ON	ON	ON	ON	ON	Dim1
24	T-51944D104J-FW-A-AA	Optrex	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	ON	Dim1
25	T-51512D121J-FW-A-AB	Optrex	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	OFF	Dim1
26	T-51866D121J-FW-A-AA	Optrex	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	ON	Dim1
27	T-51756D121J-FW-A-AA	Optrex	+3.3V	XGA	XS6S	OFF	ON	ON	ON	ON	Dim1
28	T-51863D150J-FW-A-AB	Optrex	+3.3V	XGA	XS6S	OFF	ON	ON	ON	OFF	Dim1
29	LQ064V3DG01	Sharp	+3.3V	VGA	VS6S	ON	ON	ON	ON	OFF	Dim1

30	LQ104V1DG51	Sharp	+3.3V	VGA	VS6S	ON	ON	ON	ON	OFF	Dim1
31	LQ104S1DG21	Sharp	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	OFF	Dim1
32	LQ121S1DG41	Sharp	+3.3V	SVGA	SS6S	ON	OFF	ON	ON	OFF	Dim1
33	NL10276BC12-02	NEC	+3.3V	XGA	XS6N	OFF	ON	ON	ON	ON	Dim1
34	**LQ084S3DG01**	Sharp	+3.3V	VGA	VS6S	ON	ON	ON	ON	**ON**	Dim1

Note1 : Abbreviated word : S ⓐ S ⓑ 6 ⓒ S ⓓ

ⓐ V/S/X : V VGA, S SVGA, X XGA ⓑ S/D : SINGLE PORT, D DUAL PORT

ⓒ 6/8 : 6 6BITS 8 8BITS ⓓ S/N : (SFT) SHIFT, N(NOR) NORMAL