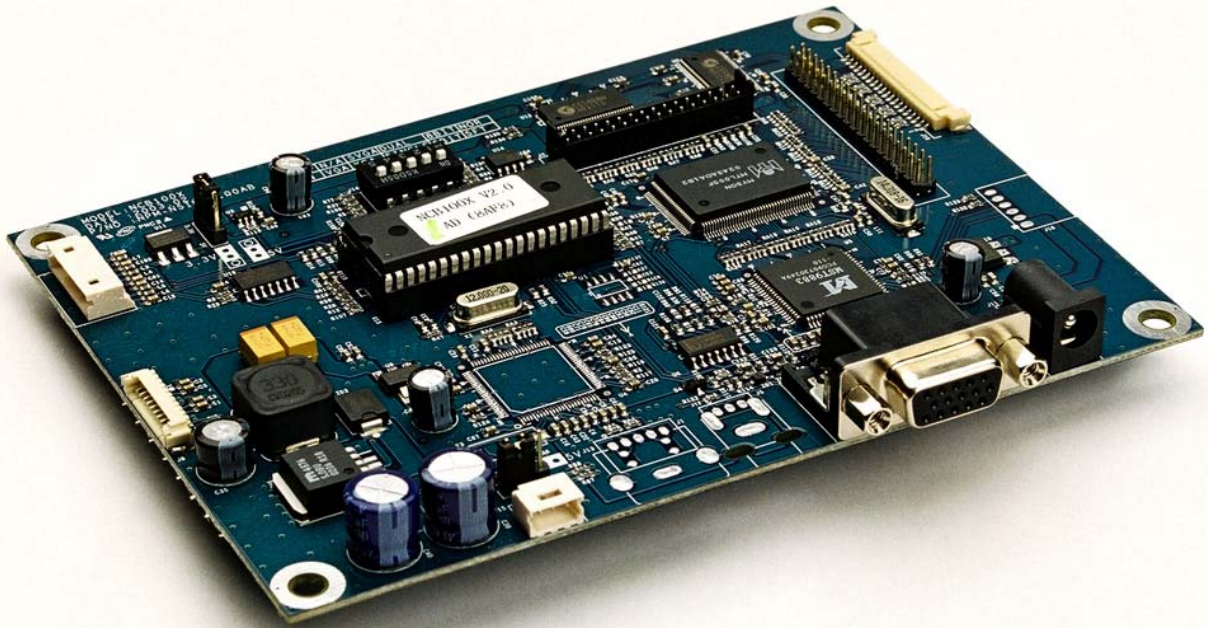


FOR LCD MONITOR (PC Only) Interface Controller
For 640X480, 800X600, 1024X768 Resolutions TFT LCD



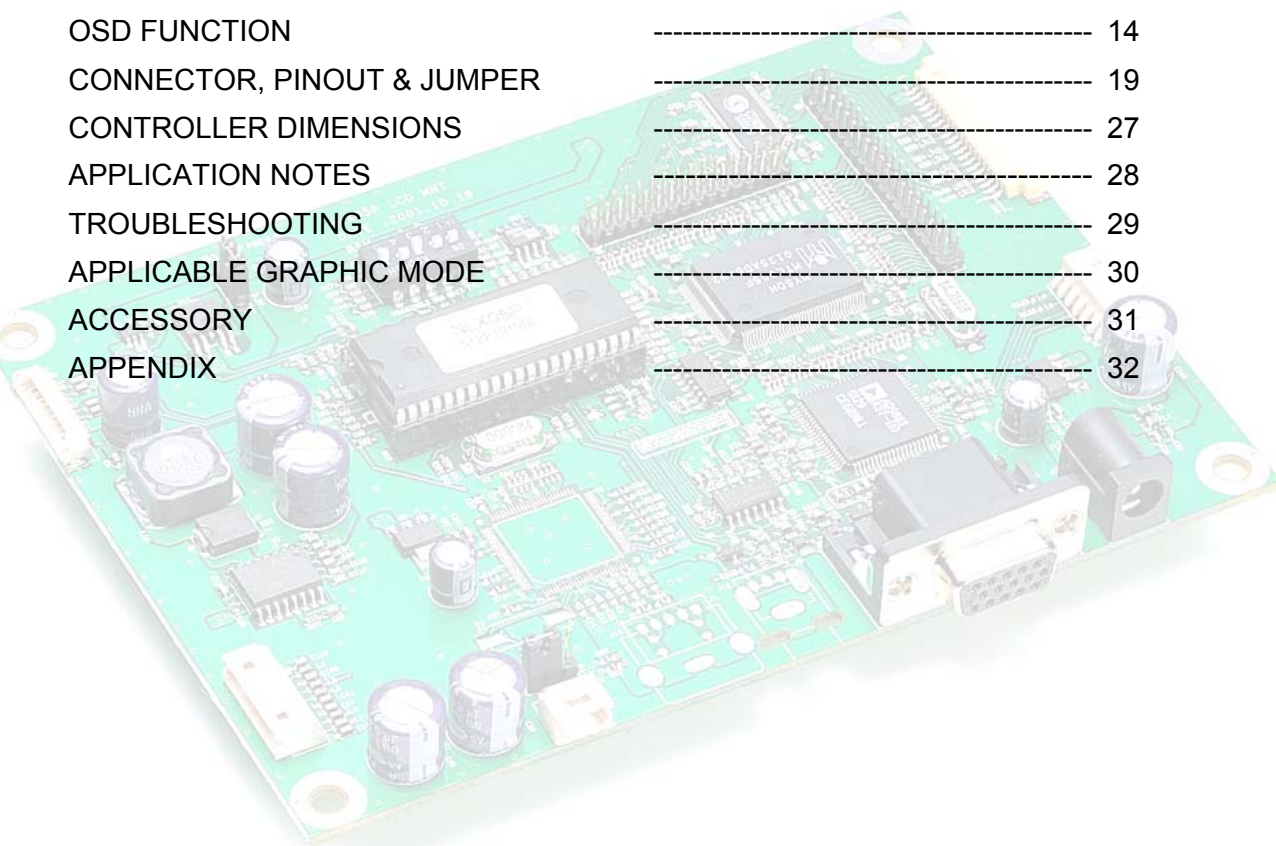
TFT LCD Monitor Control Board

NCB100X1-DS-AB

November 2003

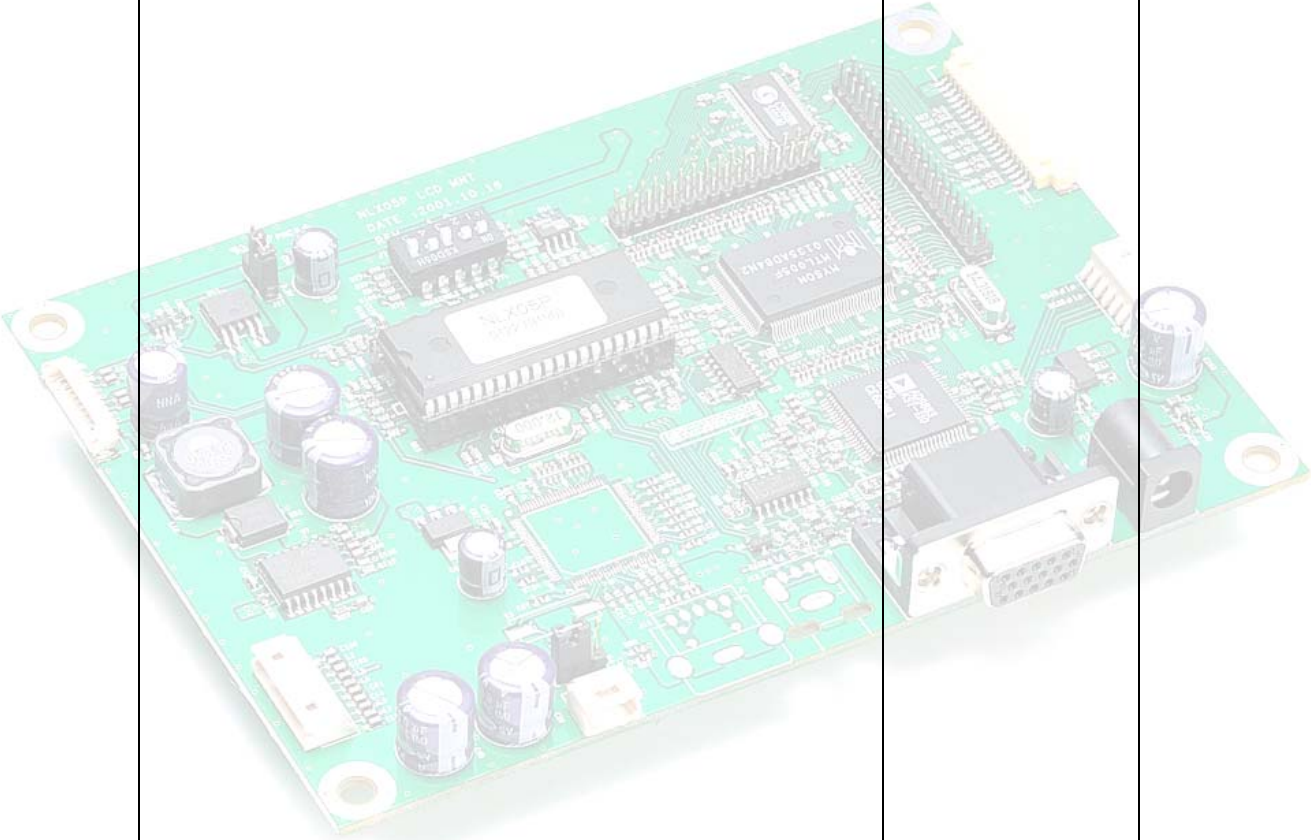
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History (revision date)

No	Description	Revision	Page
1	2003. 04 Release Data Sheet for NCB100X1	AA	6, 7
2	2003. 05 Update Data Sheet for NCB100X1	AB	



INTRODUCTION

Designed for LCD monitor and other flat panel display application the NCB100X1-R 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.
- ▶ Input Signal Support
 - All VESA standard
 - In case of VGA option (VGA Input support)
 - In case of SVGA option (VGA/SVGA Input support)
 - In case of XGA option (VGA/SVGA/XGA 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
- ▶ Connect the parts
- ▶ Understand the operation & function

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	Model name	For VGA panel	NCB100V3	
		For SVGA panel	NCB100S3	
		For XGA Panel	NCB100X3	
2	LCD Module	VGA~XGA TFT LCD (TTL/LVDS Interface)		
3	Signal Input	Analog RGB Input		
4	Resolution Support	H: 31 ~ 61kHz		
		V: 55 ~ 76Hz		
5	OSD Control	Menu, Select (AUTO), Up, Down, Power		5 keys
	Plug & Play	VESA DDC 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	

ELECTRICAL SPECIFICATION

Input characteristic

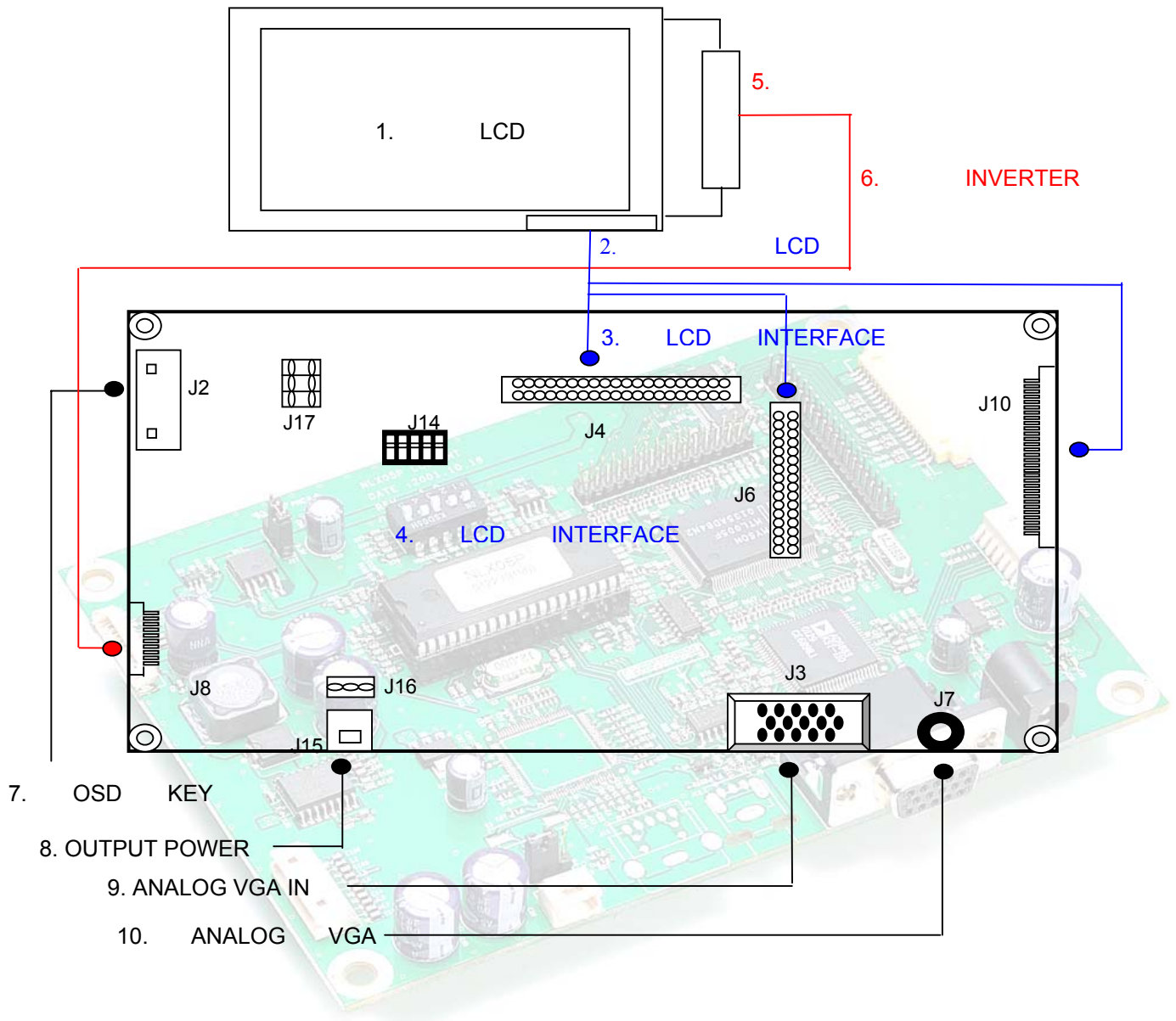
Description	Signal	Unit	Min	Typical	Max	Remarks
Power In (12Vdc)	Input	Vdc	11.4	12	12.6	
	Consumption	Watt		5		Board only
RGB Input						
	Analog RGB	Vp-p	0		0.7	
	Sync	Vdc	0		5.5	
	H Frequency	KHz	31		61	Depends on Mode
	V Frequency	Hz	55	60	75	

Output Characteristics

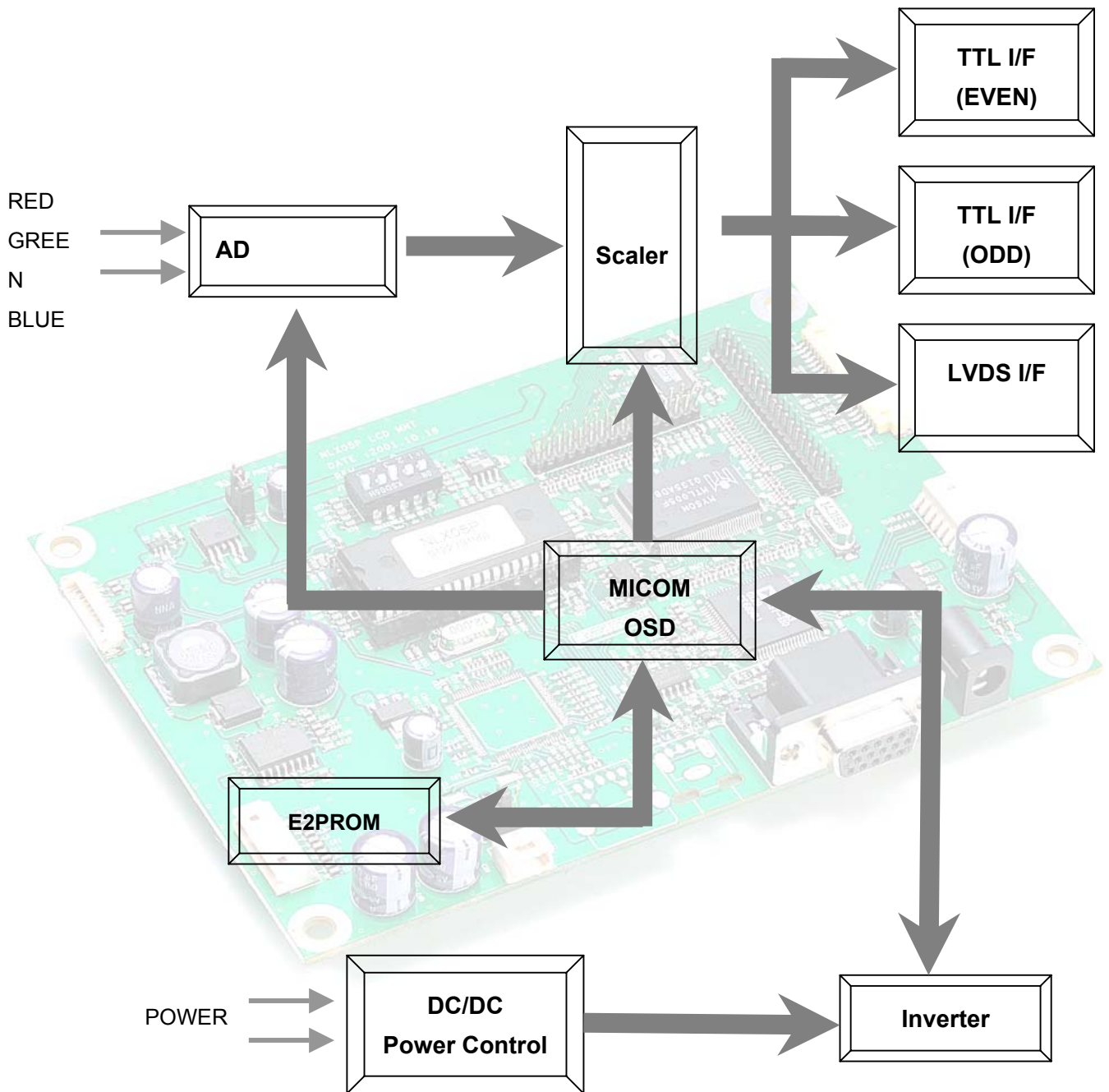
Description	Signal	Unit	Min	Typical	Max	Remarks
TTL LCD Interface						
	RGB Data	Vp-p		3.3		
	DE, Sync, Clock	Vp-p		3.3		
	Clock Freq.	MHZ	25		80	Depends on Mode
	LCD Power (5v)	Vdc	4.5	5	5.5	Jumper option
	LCD Power (3.3v)	Vdc	3.16	3.3	3.5	Jumper option
LVDS Interface						
	Differential output	MVp-p	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	3.3V		0	
			0		100	OSD Brightness

SYSTEM DESIGN

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 project 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 proceeding, it is important to familiarize yourself with the parts making up the system the various connectors, mounting holes and general layout of the controller. As many 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 interface 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 J14 on the right position following LCD panel specification. For selecting DC power level, put jumper marked J17 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 to provide a clean signal it is recommended that LCD signal cables should not be longer than 30cm. If loose wire cabling is utilized these can be a made into a harness with cable ties. You should take care when placing 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 has an inverter in it. 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. OSD Button:** See Operational Function section.
- 8. 3 Color LED:** This LED shows the state of controller.
 - Green – Normal state
 - Off – Off mode (Can't find video signals)
 - Amber – DPMS mode

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

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

11. 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 adequate insulation is provided for all areas of the PCB with special attention to high voltage parts such as the inverter.

12. Setup for operation

Once the circuit has been connected, a setup procedure for optimal 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 specifications 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 cable direct to J4 (for Single 6bits, or Single (Dual first) higher 6bit, J6 (8bit dual (J6) 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 J10 on the controller board. Plug the other end of cable to the LCD connector board (if connector board is required, otherwise the signal can be direct plug to the LCD panel connector).
3. **Inverter & Controller:** Plug the inverter cable to J8 on the controller board and the other end to the connector on the inverter.
4. **Function switch & Controller:** Plug the OSD switch mount cable to J2 on 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 set)} and switches (J14, Target panel selection) are set correctly. Details about the jumpers and switches setting table are in the following section
6. **VGA cable & Controller:** Plug the VGA cable to the connector J3 on 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:

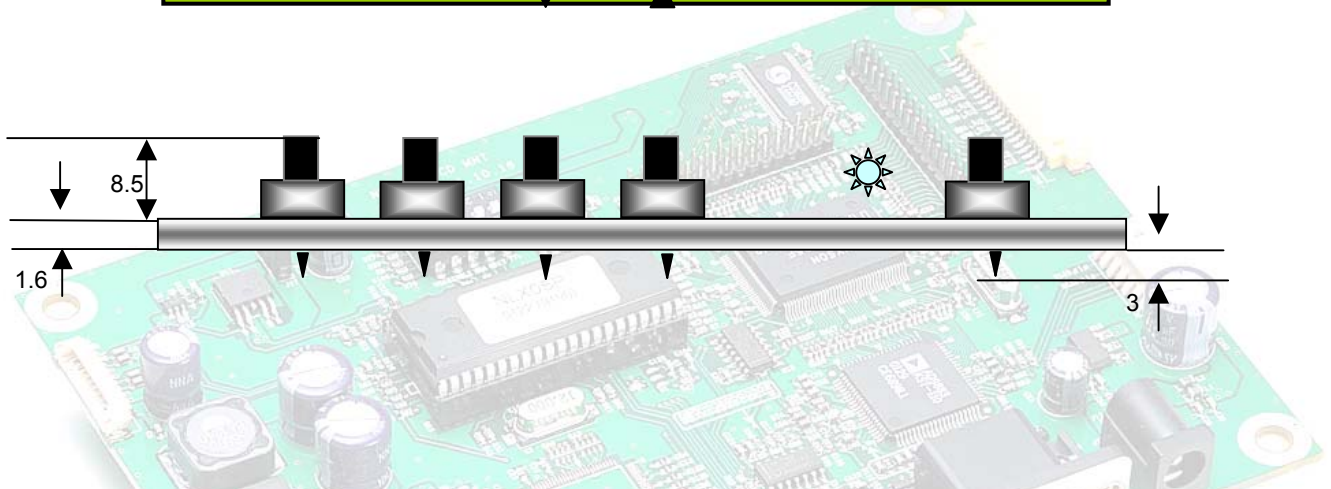
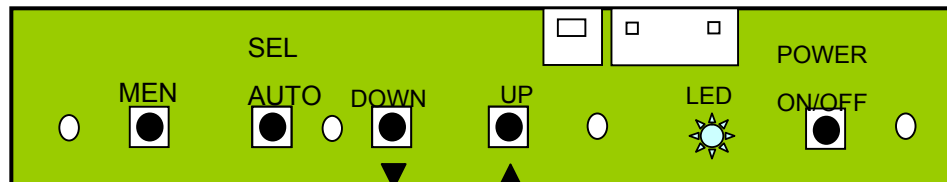
- If you use supplied cables & accessories, ensure that they are correct for the model of the panel and the controller.
- If you make your own cables & connectors refer carefully to both the panel & inverter specifications and the section in this manual, “Connectors, Pin outs & Jumpers” to ensure the 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 graphics performance. We recommend you to choose 60Hz vertical refresh rate – this will not cause screen flicker.

OSD

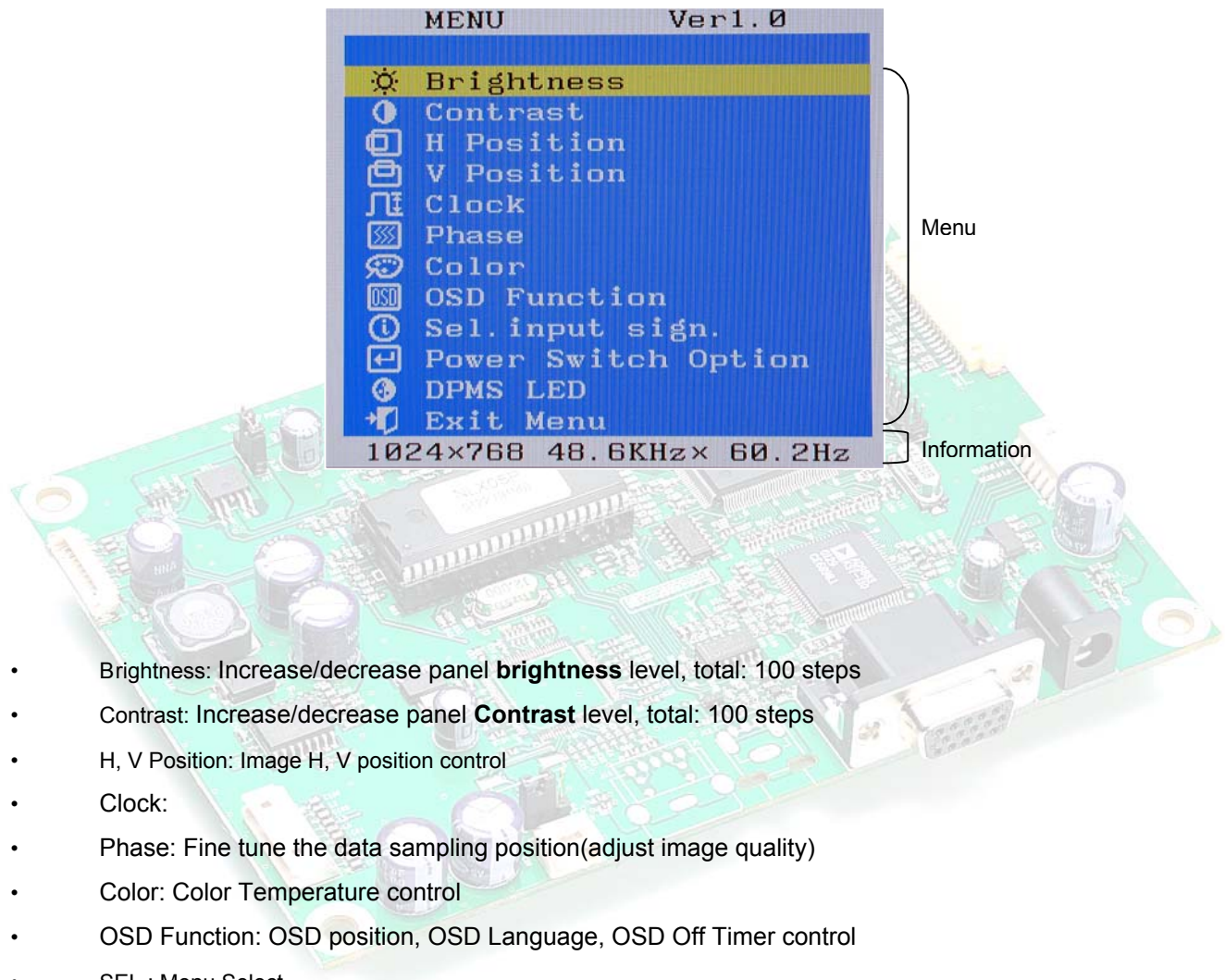
The OSD (On Screen Display) provides certain functions to have clear image and others. This board supports 4 buttons OSD operation as a standard. The control functions defined on OSD operation are as below. (unit: mm)



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		

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

OSD MAIN MENU



- Brightness: Increase/decrease panel **brightness** level, total: 100 steps
- Contrast: Increase/decrease panel **Contrast** level, total: 100 steps
- H, V Position: Image H, V position control
- Clock:
- Phase: Fine tune the data sampling position(adjust image quality)
- Color: Color Temperature control
- OSD Function: OSD position, OSD Language, OSD Off Timer control
- SEL : Menu Select
- Power Switch Option: Select Power Switch on/off.
- DPMS LED: When the DPMS mode select LED color how to Amber or Off
- Information: Displays current video mode and frequency

OSD FUNCTION

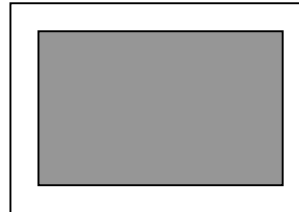
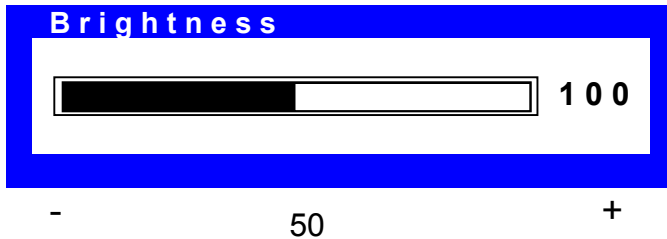
Brightness

Procedure

Menu > (Yellow bar Display) > Select

▼ Dark

▲ Bright



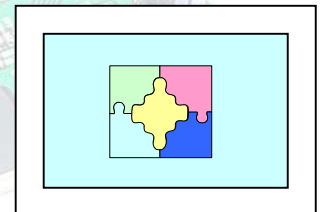
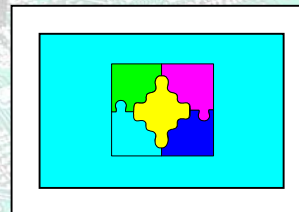
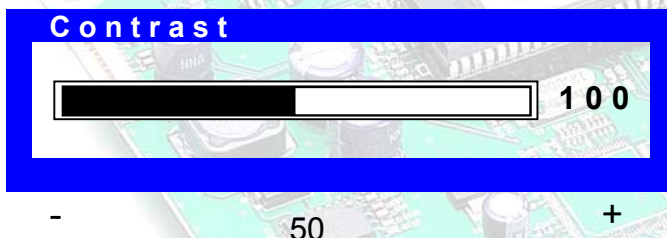
Contrast

Procedure

Menu > (Yellow bar Display) > Select

▼ Distinct

▲ Vague



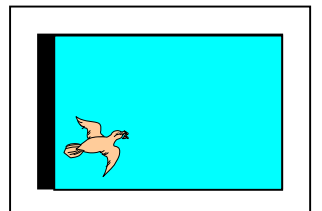
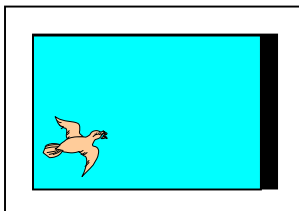
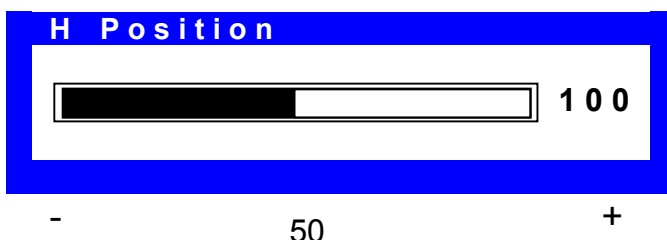
H Position

Procedure

Menu > (Yellow bar Display) > Select (H

▼

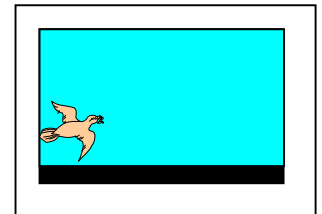
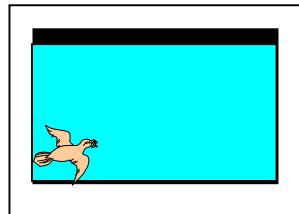
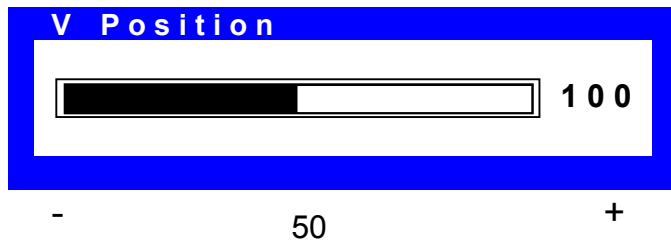
▲



V Position

Procedure

Menu > ▼ ▼ ▼ (Yellow bar Display) > Select (V



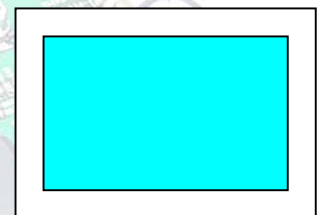
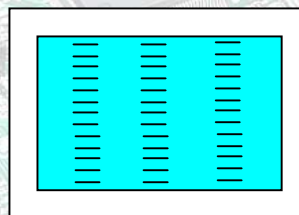
Clock

Procedure

Menu > ▼ ▼ ▼ ▼ (Yellow bar Display) > Select

Mismatch

Match



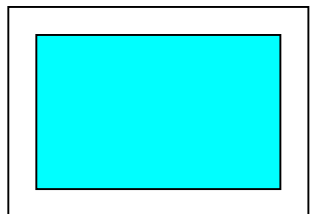
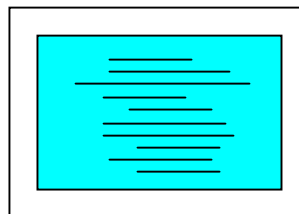
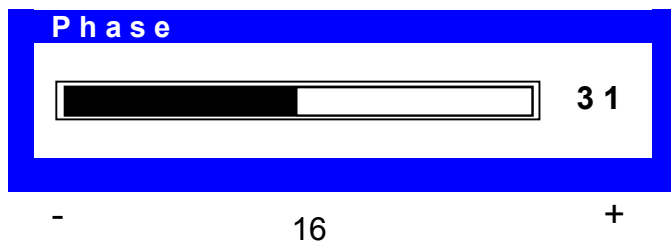
Phase

Procedure

Menu > ▼ ▼ ▼ ▼ ▼ (Yellow bar Display) > Select

Mismatch

Match



Color

Procedure

Menu > ▼ ▼ ▼ ▼ ▼ ▼

(Yellow bar Display) > Select (Sub Menu 1

Color

Preset 1

Preset 2

User Color

Preset 1: Default

Preset 2: bluish white

User Color: User Color Control

Sub Menu 1 > ▼ ▼ (Yellow bar Display) > select (Sub Menu 2 Display)

User Color

Red Gain

Green Gain

Blue Gain


Exit

Sub Menu 2 > Select (Yellow bar Display) > Red Color Control

Sub Menu 2 > ▼ Select (Yellow bar Display) > Green Color Control

Sub Menu 2 > ▼ ▼ Select (Yellow bar Display) > Green Color Con

Red

 **100**

-

50

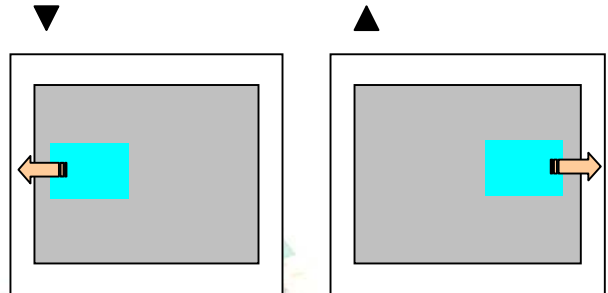
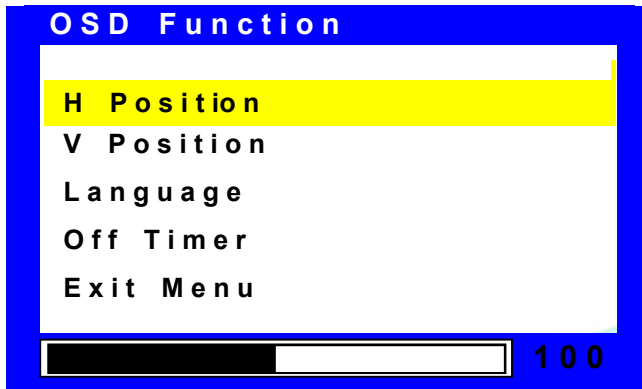
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OSD Function

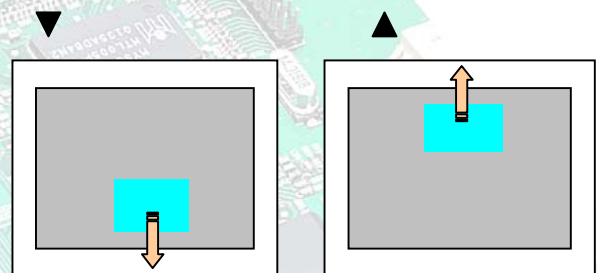
Procedure

Menu ▼ ▼ ▼ ▼ ▼ ▼ ▼

(Yellow bar Display) > Select (Sub Menu 1 Display)

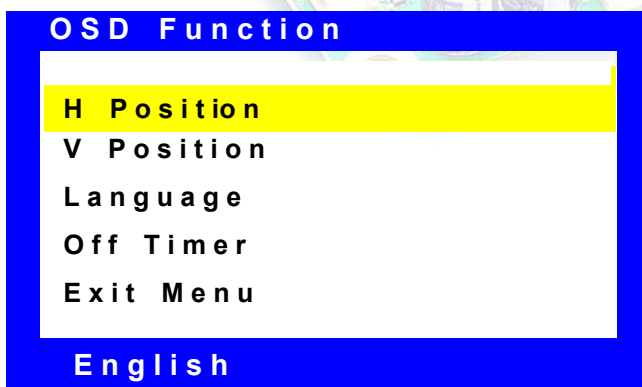


Select (Sub Menu 1 Display) <
Select



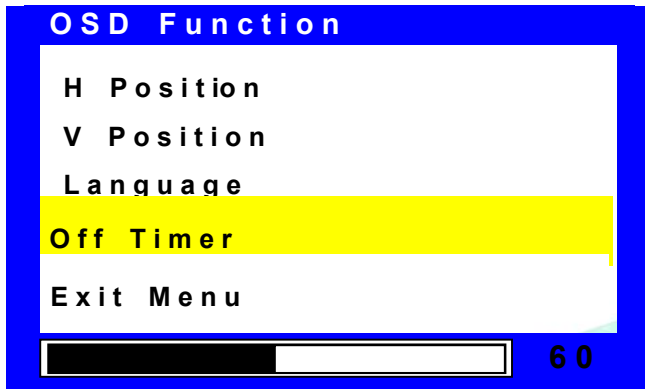
Select (Sub Menu 1 Display) < ▼ ▼ Select

→ Language Control (English → Español → Français → Deutsch → Italiano)



OSD Function

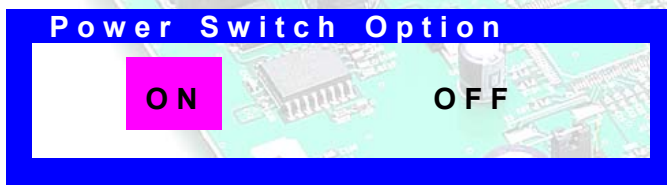
Select (Sub Menu 1 Display) < ▼ ▼ ▼ Select



OSD Menu Display Timer Control

Power Switch Option

Procedure Menu > ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ (Magenta bar Display) >



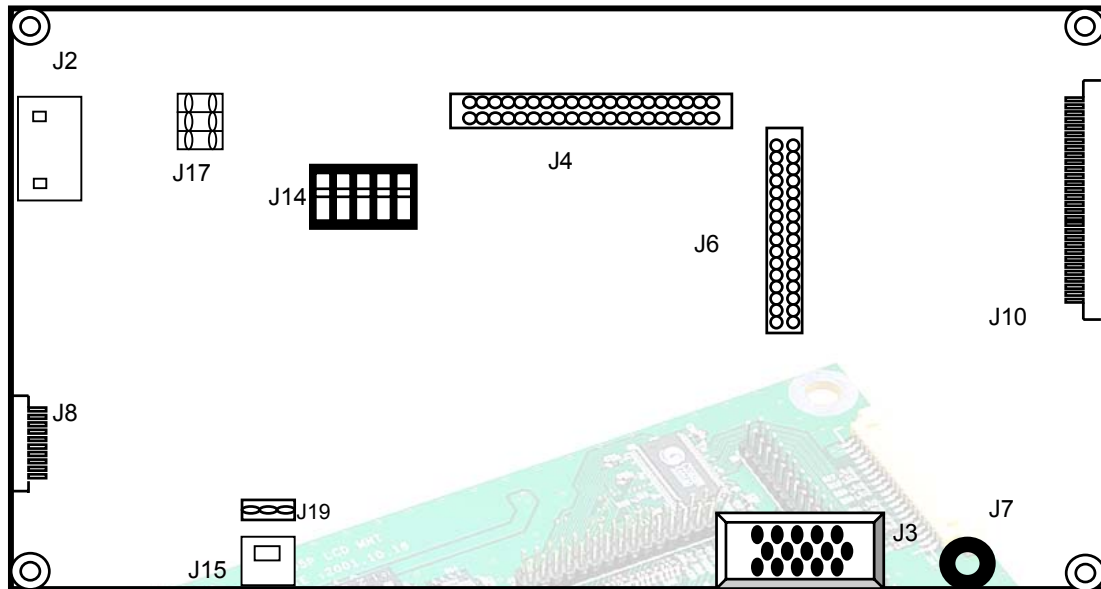
DPMS LED

Procedure Menu > ▼ ▼ ▼ ▼ ▼ ▼ ▼ ▼ (Magenta bar Display) >



CONNECTOR, PINOUT & JUMPERS

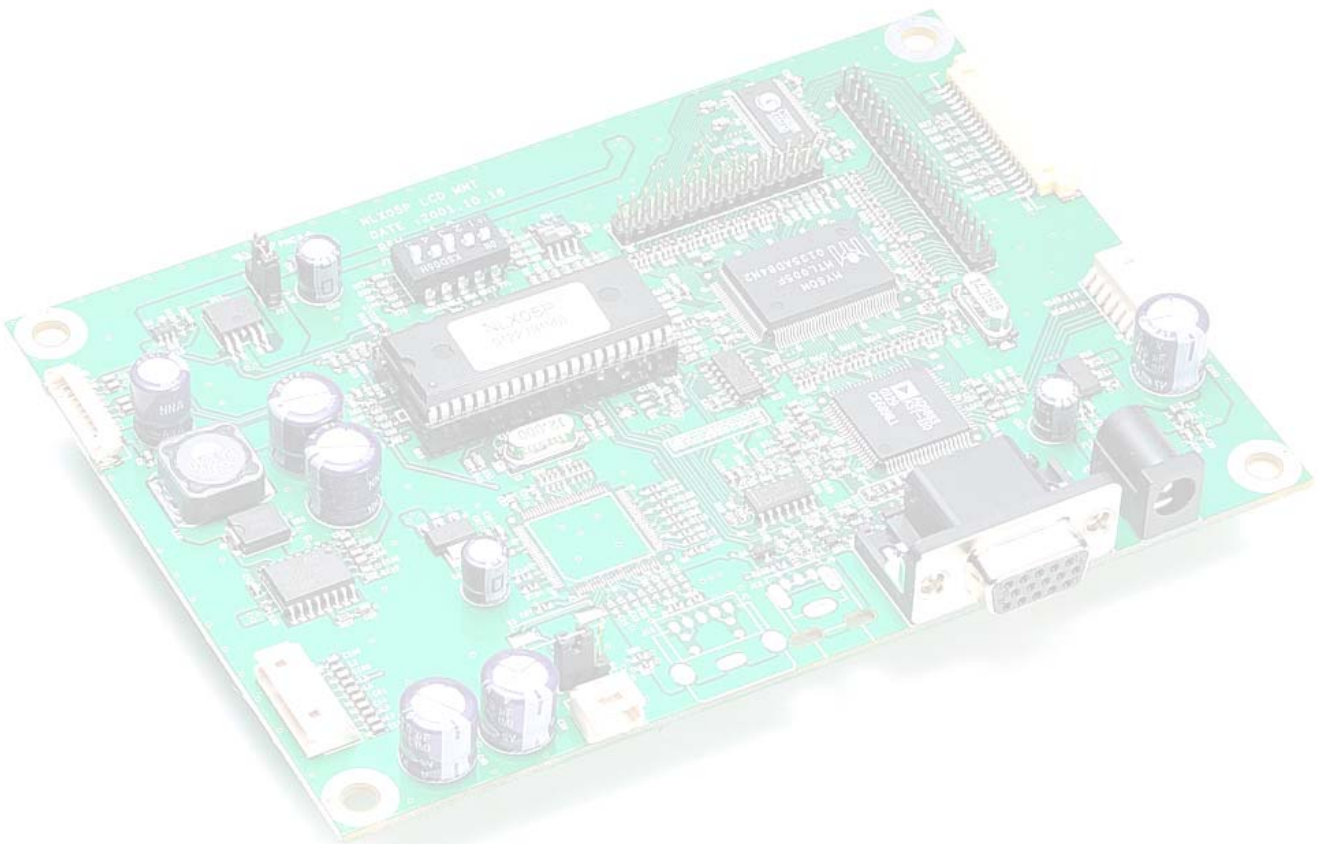
The various connectors are:



Summary

Reference	Description	Connector Type
J2	OSD control Connector	MOLEX 53015-0710 2.0mm RIGHT ANGLE
J3	D-SUB Jack	15P D-SUB 2.29MM RIGHT ANGLE
J4	LCD interface board Connector for TTL 6bit	16*2 HEADER PIN
J6	LCD interface board Connector for TTL 8bit & DUAL	20*2 HEADER PIN
J7	Input Dc power Jack	DC-001 2.5Ø
J8	Inverter Connector	YEON-HO 12505WR-10A00 10P 1.25MM
J9	D-SUB Connector	53015-1210 MOLEX 2.0mm RIGHT ANGLE
J10	LVDS Connector	YEON-HO 12505WR-20 20P 1.25MM
J11	DC power Connector	MOLEX 53015-0410 2.0mm RIGHT ANGLE

J14	Panel Type Select Switch	HDR5X2, 14pin
J15	Out Power Connector	MOLEX 53015-0310 2.0mm RIGHT ANGLE
J17	Panel Power Out Jumper	3*2 Header
J19	Out Power Jumper	HDR3X1 CON3P-BASE



J2: 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

J3: 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	VSNC	Vertical Sync
15	DSCL	Serial Clock Input

**J4: 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

**J6: LCD Interface connector for TTL type – 8bit dual
and 8bits single lower 2bit**

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	GND	Ground	21	GND	Ground
2	GND	Ground	22	GND	Ground
3	GND	Ground	23	GOB (7)	Green output data
4	GND	Ground	24	GOB (6)	Green output data
5	ROA (1)	Red output data	25	GOB (5)	Green output data
6	ROA (0)	Red output data	26	GOB (4)	Green output data
7	GOA (1)	Green output data	27	GOB (3)	Green output data
8	GOA (0)	Green output data	28	GOB (2)	Green output data
9	BOA (1)	Blue output data	29	GOB (1)	Green output data
10	BOA (0)	Blue output data	30	GOB (0)	Green output data
11	GND	Ground	31	GND	Ground
12	GND	Ground	32	GND	Ground
13	ROB (7)	Red output data	33	BOB (7)	Blue output data
14	ROB (6)	Red output data	34	BOB (6)	Blue output data
15	ROB (5)	Red output data	35	BOB (5)	Blue output data
16	ROB (4)	Red output data	36	BOB (4)	Blue output data
17	ROB (3)	Red output data	37	BOB (3)	Blue output data
18	ROB (2)	Red output data	38	BOB (2)	Blue output data
19	ROB (1)	Red output data	39	BOB (1)	Blue output data
20	ROB (0)	Red output data	40	BOB (0)	Blue output data

J7: 12V DC power supply

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

J8: 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

J10: 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

J14: Panel Type Select Switch

Pin No / Symbol		Description	
		ON	OFF
1: SFT	2: NOR	6Bits LVDS Panel	8Bits LVDS Panel
3: 6BIT	4: 8BIT	6BIT	8BIT
5: SINGLE	6: DUAL	1 Channel TTL	2 Channel TTL
7: XGA	8: SVGA	XGA	SVGA
9: VGA	10: N/A	VGA	Not Applicable

*** Refer to Appendix for setting**

J15: Power out connector

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

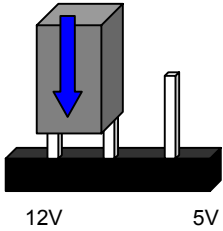
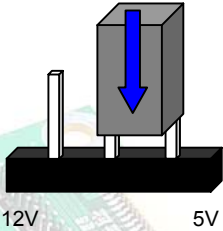
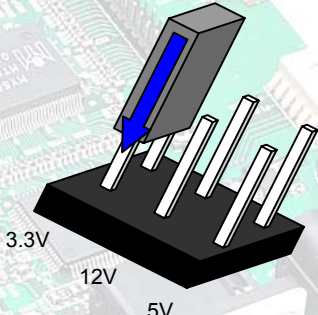
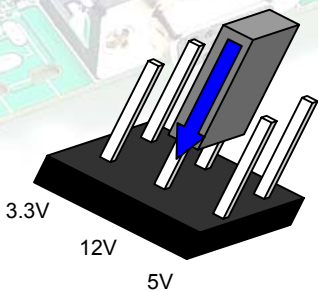
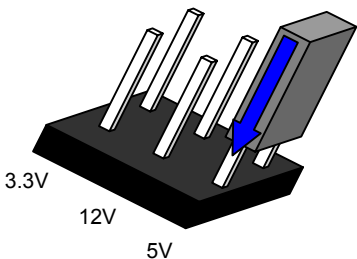
J16: On board +12V/+5V logic power enable select jumper

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

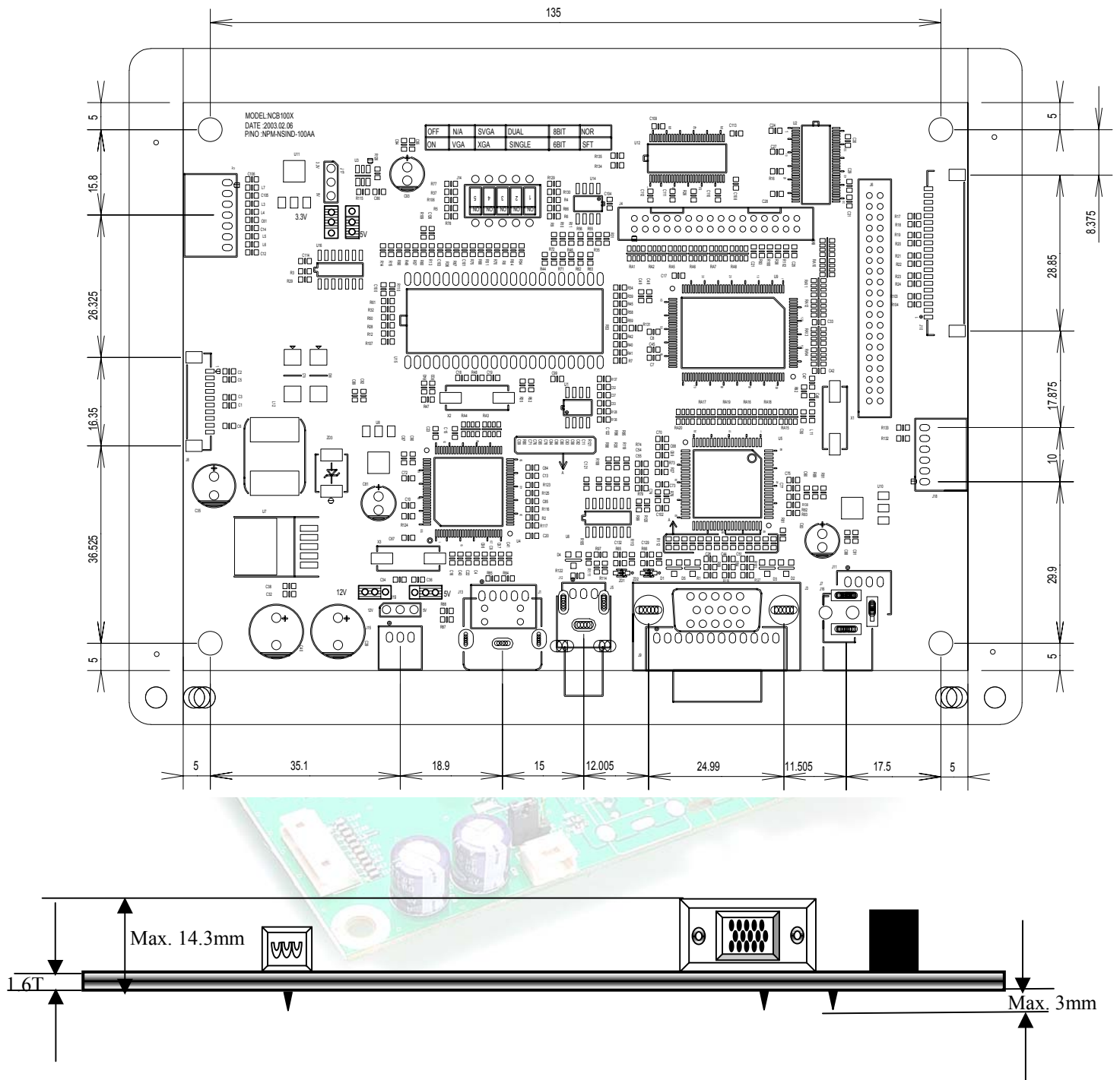
J17: LCD Panel power select jumper

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

Summary: jumpers setting

Reference	Description	Connector Type
J16	On board +12V logic power enable	 12V 5V
	On board +5V logic power enable	 12V 5V
J17	3.3V panel power CAUTION: Incorrect setting can damage panel	 3.3V 12V 5V
	12V panel power CAUTION: Incorrect setting can damage panel	 3.3V 12V 5V
	5V panel power CAUTION: Incorrect setting can damage panel	 3.3V 12V 5V

CONTROLLER DIMENSIONS



APPLICATION NOTES

USING THE CONTROLLER WITHOUT THE ATTACHED BOTTOMS

This is very straightforward:

- First, set up the controller/display system with the buttons. With the attached controller 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 potentially issues to consider with the 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: NCB100 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 flat panel display system it is 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, to identify the problem are a clearly.

No image:

- ▶ If the panel backlight is not working it may still be possible to just see some image.
- ▶ A lack of image is most likely to be caused by an 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, in 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 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 bigger or smaller, to scroll, to flicker badly or to have even no images.
- ▶ 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 :

- ▶ 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 more clearer and more stable image on a screen

Table 6.1) RGB input format

Spec Mode	Pixel Freq.	Horizontal Timing				Vertical Timing			
		Syn c	Freq.	Total	Activ e	Syn c	Freq.	Tota l	Active
	MHz	Pola r	KHz	Pixel	Pixel	Pola r	Hz	Line	Line
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@56Hz	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. **SUCH** can provide standard accessory for this board as below.

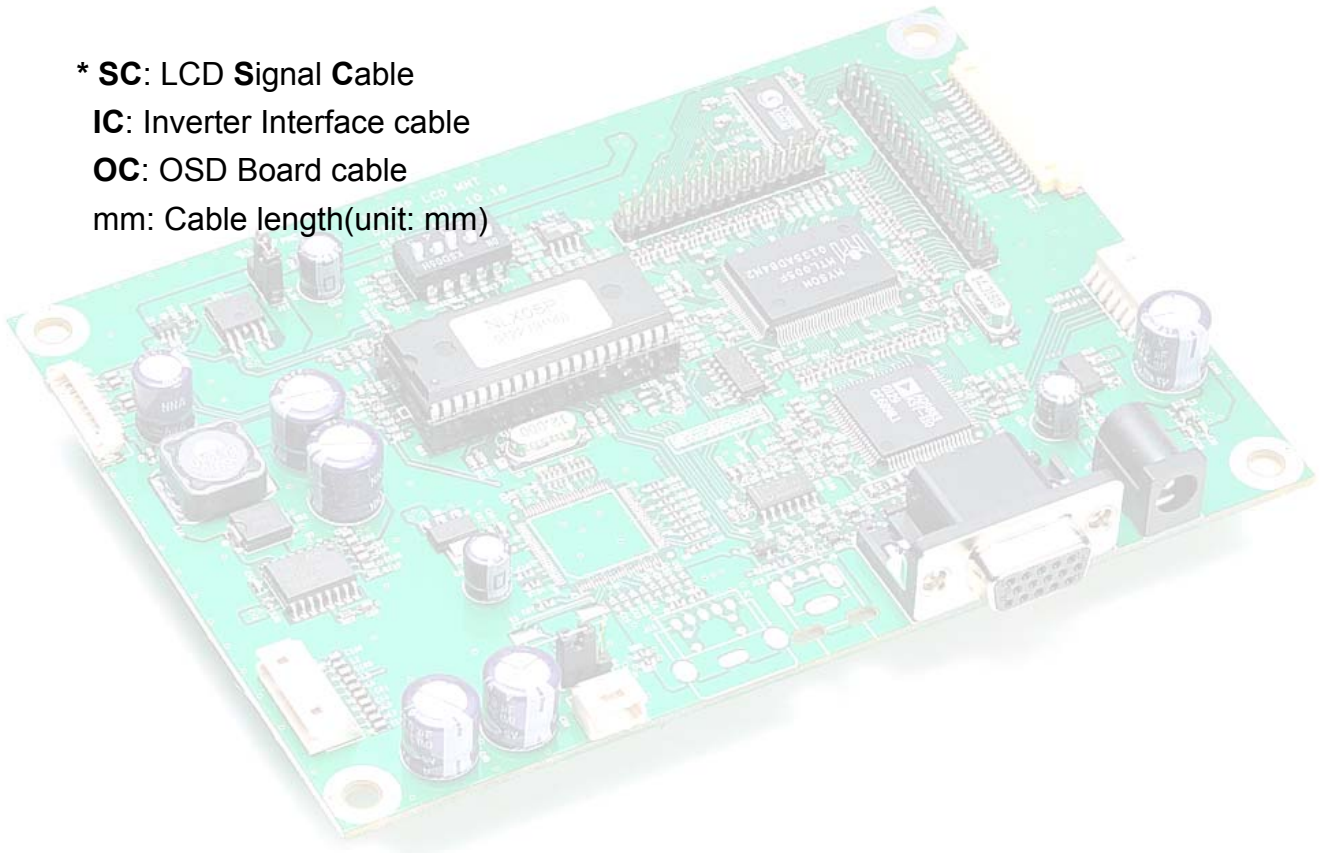
No.	Items	Part No.	Ex) LG. Philips LB064V2
1	LCD signal cable	SC-Panel Part No.-mm	SC-LB064V2-20
2	Inverter	Part no. of Manufacturer	GH006
3	Inverter cable	IC-Panel Part No.-mm	IC-GH006-20
4	OSD Board	NLX05-OSD	NLX05-OSD
5	OSD Cable	OC-NID01-mm	OC-NID01-20

* **SC**: LCD Signal Cable

IC: Inverter Interface cable

OC: OSD Board cable

mm: Cable length(unit: mm)



APPENDIX

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 NCB100 board. And SUCH will try continuously to the model names of the LCD panels that have been tested.

No.	LCD Model Name	LCD vendor	LCD VCC	Option ^(note1)	SW1	SW2	SW3	SW4	SW5
1	LB064V02	LG Philips	+3.3V	VS6S	ON	ON	ON	ON	ON
2	LP104V2	LG Philips	+3.3V	VS6S	ON	ON	ON	ON	ON
3	LB104V3	LG Philips	+3.3V	VS6S	ON	ON	ON	ON	ON
4	LP104S5	LG Philips	+3.3V	SS6S	ON	ON	ON	OFF	OFF
5	LP104S6	LG Philips	+3.3V	SS6S	ON	ON	ON	OFF	OFF
6	LB121S1	LG Philips	+3.3V	SS6S	ON	ON	ON	OFF	OFF
7	LB121S02	LG Philips	+3.3V	SS6S	ON	ON	ON	OFF	OFF
8	LC121S1	LG Philips	+3.3V	SS6S	ON	ON	ON	OFF	OFF
9	LP133X5	LG Philips	+5.0V	XS6S	ON	ON	ON	ON	OFF
10	LP133X7	LG Philips	+3.3V	XS6S	ON	ON	ON	ON	OFF
11	LP133X8	LG Philips	+3.3V	XS6S	ON	ON	ON	ON	OFF
12	LC150X01-C3	LG Philips	+12V	XS8N	OFF	OFF	ON	ON	OFF
13	LM150X05-A3	LG Philips	+5.0V	XD6S	ON	ON	OFF	ON	OFF
14	LM150X05-C3	LG Philips	+3.3V	XS8N	OFF	OFF	ON	ON	OFF
15	LM150X06-A3	LG Philips	+3.3V	XS8N	OFF	OFF	ON	ON	OFF
16	LM150X07-B4	LG Philips	+3.3V	XS8N	OFF	OFF	ON	ON	OFF
17	LM150X08-A4	LG Philips	+3.3V	XS8N	OFF	OFF	ON	ON	OFF
18	LM151X05	LG Philips	+3.3V	XD6S	ON	ON	ON	ON	OFF
19	LC151X01-C3	LG Philips	+5V	XS8N	OFF	OFF	ON	ON	OFF
20	HT10X21-100	HYDIS	+3.3V	XS6S	ON	ON	ON	ON	OFF
21	HT12X11	HYDIS	+3.3V	XS6S	ON	ON	ON	ON	OFF
22	HLT15X13	HYDIS	+3.3V	XS8N	OFF	OFF	ON	ON	OFF
23	HLT15X15	HYDIS	+3.3V	XS8N	OFF	OFF	ON	ON	OFF
24	HT15X22	HYDIS	+5.0V	XD8N	OFF	OFF	OFF	ON	OFF
25	LTM150XH-T01	SAMSUNG	+3.3V	XS6S	ON	ON	ON	ON	OFF
26	LTM150XH-L01	SAMSUNG	+3.3V	XS8N	OFF	OFF	ON	ON	OFF
27	LC201V02	LG Philips	+12V	VS8N	OFF	OFF	ON	ON	ON

Note1 : Abbreviated word : S^aS^b6^cS^d

(a) V/S/X : V VGA, S SVGA, X XGA

(b) S/D : SINGLE PORT, D DUAL PORT

(c) 6/8 : 6 6BITS 8 8BITS

(d) S/N : (SFT) SHIFT, N(NOR) NORMAL